Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Program: Certificate Course		Class	B.Sc I Year
dk;Zdze % izek.k i=		d{kk	ch-,llh izFke o"kZ
Subject		Mathematics	Paper No.: 1
fo"k;		xf.kr	
Title of Paper	English	Algebra, Vector Analysis and Geometry (Paper : 1)	
ikB~;Øe dk 'kh"kZd	fgUnh	chtxf.kr] lfn'k fo'ys"k.k ,oa T;kfefr ¼iz'ui= %1½	
Course Type: Core		ikB~;Øe dk izdkj % dksj dkslZ	
Creadit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuksa½
Total Marks : 100		Max Marks : 30+70	Min Marks : 35
dqy vad %100		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
Hkkx& v ifjp;			
iwokZis{kk		bl dkslZ dk v/;;u djus ds fy,] Nk= us fo"k; xf.kr dk v/;;u d{kk 12 oh esa fd;k gksA	
Pre-requisite		To study this course a student must have had the subject Mathematics in class 12th	
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½ (CLO)		ikB~;Øe Nk=ksa dks l{ke djsxk % 1- vkO;wg dh tkfr dk mi;ksx djrs gq,] laoaf)Zr vkO;wg ds ifDar lksikud :i }kjk jSf[kd lehdj.kksa dh laxr vkSj vlaxr iz.kkfy;ksa dh igpku djus esaA 2- ,d oxZ vkO;wg ds fy, vkbxsu eku vkSj laxr vkbxsu lfn'k dks Kkr djus esaA 3- lfn'k dyu ds Kku dks T;kfefr esa mi;ksx djus esaA 4- f=foeh; T;kferh; vkd`fr;ksa ¼tSls 'kadq vkSj csyu½ ds fy, Kku esa o`f) djus esaA	
Course Learning Outcomes(CLO)		The Course will enable the Students to- 1- Recognize Consistent and Inconsistent systems of linear equations by the row echelon form of the Augmented Matrix using the rank of matrix	

	2- To find the Eigen values and corresponding Eigen vectors for a square matrix 3- Using the knowledge of vector calculus in geometry. 4- Enhance the knowledge of three dimensional geometrical figures (eg. Cone and cylinder).

Part-B Content of the course		
Hkkx& c ikB~;Øe dh fo"k;oLrq		
Unit	Topics	
Unit 1	(English)	Historical background, Development of Indian Mathematics, Later classical period(500-1250), A brief biography of Varahamihira and Aryabhatta, Rank of matrix, Echelon and Normal form of matrix, Characteristics equations of a matrix, Eigen - values,Eigen–vectors.
	¼fgUnh½	**,sfrgkfld i`"BHkwfe] Hkkjrh; xf.kr dk fodkl] mŸkj fpjizfrf"Br dky ¼500&1250½] ojkgfefgj vkSj vk;ZHkkV~V dh laf{klr thouh] vkO;wg dh tkfr] vkO;wg dk ,'ksyku ,oa izklkekU; :i] vkO;wg dk vfHkyky{kf.kd lehdj.k] vkbxsu eku] vkbxsu lfn'kA**
Unit 2	(English)	Cayley Hamilton Theorem, Application of cayley Hamilton theorem to find the inverse of a matrix, Application of matrix to solve a system of linear equations,Theoremson consistency and inconsistency of a system of linear equations, Solving linear equations up to three unknows.
	¼fgUnh½	**dSyh gsfeYVu izes;] vkO;wg dk O;qRØe Kkr djus esa dSyh&gsfeYVu izes; dk vuqiz;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy, vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrrk ,oa vlaxrrk ij izes;] rhu vKkr jkf'k;ks ds jSf[kd**

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

		lehdj.kksa ds gyA
Unit 3	(English)	Scalar and vector products of three and four vectors, Reciprocal vectors, vector differentiation, Rules of differentiation,Derivatives of triple products, Gradient, Divergence and curl, Directional derivatives, vectorIdentities, Vector Equations.
	¼fgUnh½	**rhu ,oa pkj lfn'kks dk vfn'k ,oa lfn'k xq.ku] O;qRØe lfn'k] lfn'k vodyu] vodyu ds fu;e] f=d xq.kuQyks ds vodyt] xzsfM;aV] Mk;ojtsal ,oa dyZ]** **fnd~ vodyt] lfn'k loZlfedk,a] lfn'k lehdj.k**
Unit 4	(English)	Vector integration, Gauss theorem(without proof) and problems based on it, Green theorem(without proof) and problems based on it, Stoke theorem(without proof) and problems based on it.
	¼fgUnh½	**lfn'k lekdyu]** **xkWl izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'u]** **xzhu izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'u]** **LVksd izes; ¼fcuk miifŸk½ ,oa bl ij vk/kkfjr iz'uA**
Unit 5	(English)	General equation of second degree, Tracing of conics, System of conics, cone, Equation of cone with given base, Generators of cone, Condition for three mutually perpendicular generators, Right circular cone, Cylinder, Equation of cylinder and its properties Right circular cylinder, Enveloping cylinder,
	¼fgUnh½	**f}rh; ?kkr dk O;kid lehdj.k] 'kkadoks dk vuqjs[k.k] 'kkadoks dk fudk;] 'kadq] fn, x, vk/kkj ds lkFk 'kadq dk lehdj.k] 'kadq ds tud] rhu ijLij yEcor tudksa gsrq izfrca/k] yEco`Ykh; 'kadq] csyu] csyu dk lehdj.k vkSj mlds izxq.k] yEco`Ykh; csyu] vUokyksi csyuA**

Part-CLearning Resources **Hkkx l vuq'kaflr v/;;u lalk/ku**
Text books. Reference books, other resourse **ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku**
Suggested Readings: **vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh: ikB~;iqLrds%** 1- K.B.Datta, Matrix and Linear Algebra prentice hall of india Pvt Ltd New Delhi 2000 2- Shanti Narayan: A text Book of vector Calculus . S. Chand & co. New Delhi1987 3- S.L.Loney: The Elements of Coordinate Geometry part 1. New age International(P) Ltd., Publishers, New Delhi 2016. 4- P.K. Jain and Khalil Ahmad: A text book of Analytical Geometry of three Dimensions, Willey Eastern Ltd. 1999. 5- Gerard G. Emch. R. Sridharan. M. D. Srinivas Contribution to the History of Indian Mathematics, Hindustan Book Agency, Vol.3.2005. 6- e/;izns'k xazFk vdkneh dh iqLrdsaA

Reference Books;
lanHkZ iqLrdsa ;
   1- Chandrika Prasad: A Text Book on Algebra and Theory of Equations, Pothishala Pvt Ltd,. Allahabad, 2017.
   2- N. Jocobson: Basic Algebra Vol.I and II, W.H.Freeman. 2009.

Signature of Mamber of B.O.S.   …………………..   …………………   ……………………   …………,………….. …………………

3- I.S.Luther and I.B.S. Passi : Algebra Vol. I and II Narosa publishing House, 1997.
4- N. Saran and S.N.Nigam Introduction to vector Analysis. Pothishala Pvt Ltd. Allahabad.1990.
5- Murray R Spiegel: vector Analysis Schaum Publishing Company , New York, 2017.
6- Gorakh Prasad and H.C.Gupta: Text book on Coordinate Geometry Pothishala Pvt Ltd Allahabad, 2000.
7- P.K.Jain and Khalil Ahmad: A text book of Analytical Geometry of Two dimensions Macmillan India Ltd. 1994.
8- S.L.Loney.The Elements of Coordinate Geometry Part-2 Macmillan, 1923.
9- N.Saran and D.N.Gupta Three Dimensional Coordinate Geometry Pothishala Pvt Ltd,. Allahabad, 1994.
10- R.J.T. Bell: Elementary Treatise on coordinate Geometry Of Three Dimensions Macmillan India Pvt Ltd, 1994.
11- Bibhutibhusan Datta and Avadesh Narayan singh: History of Hindu Mathematics, Asia Publishing House, 1962.

vuq'kaflr fMftVy lysVQkeZ osc fyad%
Suggested Digital platforms Web Links;
https;//epgp.inflibnet.ac.in
https;//freevideolectures.com/university/iit-roorkee
https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D
https;//www. Bhojvirtualuniversity.com

vuq'kaflr led{k vkWuykbu ikB;Øe
Suggested Equivalent Online Courses;
https;//nptel.ac.in/courses/111105122/
https;//nptel.ac.in/courses/111107112/
https;//nptel.ac.in/courses/111/101/111101080/

Signature of Mamber of B.O.S.   ………………..   ……………….   …………………….   ……………………..   …………………

PART-D Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: : 100
Continuous comprehensive Evaluation(CCE): 30
Exam : :70

Internal Assessment: Continuous comprehensive Evaluation(CCE)	Class Test Assignment /Presentation	**20** **10** Total Marks =30
External Assessment: Exam Time: 03.00 Hours	Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)	
		Total=70

Hkkx n vuq'kaflr ewY;kadau fof/k;ka
vuq'kaflr lrr~ ewY;kadau fof/k;ka

vf/kdre vad: 100
lrr~ O;kid ewY;kadau(CCE): 30
ijh{kk : 70

Signature of Mamber of B.O.S. …………………. …………………. ……………………… …………….……… …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

vkarfjd ewY;kdau lrr~ O;kid ewY;kdau(CCE)	Dykl VsLV vlkabuesaV @ izLrqfrdj.k¼isztsuVs'ku½	20 10 dqy ;ksx= 30
vkdyu% **ijh{kk le;%** 03.00?kaVs	vuqHkkxx¼v½rhu vfr y?kq iz'u¼izR;sd 50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	
		Total= 70

Program :Certificate Course		Class	B.Sc I Year
dk;Zdze % izek.k i=		d{kk	ch-,llh izFke o"kZ
Subject		Mathematics	Paper No.: 2
fo"k;		xf.kr	
Title of Paper	English	Calculus and Differential Equations (Paper 2)	
ikB~;Øe dk 'kh"kZd	fgUnh	dyu ,oa vody lehdj.k ¼iz'ui= %2½	
Course Type :Core		ikB~;Øe dk izdkj% dksj dkslZ	
Credit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV eku	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuksa½
Total Marks : 100		Max Marks : 30+70	Min Marks : 35
		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
Hkkxx& v ifjp;			
iwokZZis{kk		bl dkslZ dk v/;;u djus ds fy,] Nk= us fo"k;	

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

	xf.kr dk v/;;u d{kk 12 oh esa fd;k gksA
Pre-requisite	To study this course a student must have had the subject Mathematics in class 12th
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½	ikB~;Øe Nk=ksa dks l{ke djsxkA 1- fofHkUu lanfHkZr funsZ'kkad i)fr;ksa esa xf.krh; izxq.kks dk mi;ksx djrs gq, ,d lery esa oØksa dks js[kkafdr djus esaA 2- vuqdwyu lkekftd foKku HkkSfrdh vkSj thou foKku vkfn esa vodyt dk mi;ksx djus esaA 3- fofHkUu xf.krh; izfr:iksa ds fy, vody lehdj.k lw=c) djus esaA 4- fofHkUu xf.krh; izfr:iksa dks gy djus vkSj mudk fo'ys"k.k djus ds fy, rduhdksa dk mi;ksx djus esaA
Course Learning Outcome's(CLO)	The course will enable the students to- 1- Sketch curves in a plane using its Mathematical properties in the different coordinate systems of reference. 2- Using the derivatives in Optimization social sciences, Physics and Life sciences etc. 3- Formulate the differential Equationfor various Mathematical models. 4- Using techniques to solve and analyze various Mathematical models.

Part-B Content of the course		
Hkkkx& c ikB~;Øe dh fo"k;oLrq		
Unit	Syllabus	
Unit 1	(English)	Historical Background, Development of Indian Mathematics, Ancient and Early classical period till (500 CE), A brief biography of Bhaskaracharya (with special reference to Lilavati) and Madhava, Successive differentiation, Leibnitz theorem, Maclaurin's series Expansion, Taylor's series Expansion, Partial

		Differentiation : Partial Derivatives of higher Order, Euler's theorem on Homogeneous functions, Asymptotes: Asymptotes of Algebraic Curves, condition for Existence of Asymptotes, Parallel Asymptotes, Asymptotes of polar curves.
	¼fgUnh½	**,sfrgkfld i`"BHkwfe] Hkkjrh; xf.kr dk fodkl] izkphu vkSj izkjafHkd fpjizfrf"Br dky ¼500 lhbZ rd½] HkkLdjkpk;Z ¼yhykorh ds fo'ks"k lanHkZ esa½vkSj ek/ko dh laf{klr thouh] mŸkjksŸkj vodyu] ySouht izes;] eSDykfju Js.kh }kjk foLrkj] Vsyj Js.kh }kjk foLrkj] vkaf'kd vodyu] mPp dksfV ds vkaf'kd vodyt] le?kkr Qyuksa ij vk;yj izes;] vuarLi'khZ chth; oØks dh vuarLif'kZ;k¡] vuarLi'khZ ds vfLrRo gksus dk izfrcU/k] lekUrj vuarLif'kZ;k¡] /kzqoh; oØks dh vuarLif'kZ;k¡A**
Unit 2	(English)	Curvature: Formula for Radius of curvature, Curvature at Origin, Centre of Curvature, Concavity andConvexity: Concavity and Convexity of curves, Point of inflexion, Singular point, Multiple points, Tracing of curves: curves represented by Cartesian equation, Curves represented by Polar equation,
	¼fgUnh½	**oØrk & oØrk f=T;k ds fy; lw=] ewy fcUnq ij oØrk] oØrk dsUnz] mŸkyrk ,oa voryrk& oØkas dh mŸkyrk ,oa voryrk] ufr ifjorZu fcUnq] fofp= fcUnq] cgqy fcUnq] oØks dk vuqjs[k.k&dkrhZ; lehdj.kksa }kjk fu:fir oØ] /kzqoh; lehdj.kksa }kjk fu:fir oØA**

Unit 3	(English)	Intregration of transcendental functions, Introduction to Double and Triple Integral, Reduction formulae, Quadrature: for Cartesian coordinates, for polar coordinates, Rectification: for Cartesian coordinates, For polar coordinates,
	¼fgUnh½	**vCkhth; Qyuksa dk lekdjyu] f}d ,oa f=d lekdy dk ifjp;] leku;u lw=] {ks=dyu] dkrhZ; funsZ'kkadks ds fy,] /kqohZ; funsZ'kkadks ds fy,]** **pkidyu & dkrhZ; funsZ'kkadks ds fy,] /kqzoh; funsZ'kkadks ds fy,A**
Unit 4	(English)	Linear Differential equations: linear equation, Equations reducible to the Linear form, Change of variables, Exact differential equations, First order and Higher degree differential equations: Equations solvable for $x, y \ and$ p, Equations homogenous in x and y, Clairaut's Equation, Singular Solutions, Geometrical meaning of differential equations, Orthogonal trajectories.
	(fgUnh)	**jSf[kd vody lehdj.k% jSf[kd lehdj.k] jSf[kd lehdj.k esa lekus; vody lehdj.k] pjksa dk ifjorZu] ;FkkrFk vody lehdj.k] izFke dksfV ,oa mPp ?kkrh; vody lehdj.k% x, y vkSj p esa gy gksus ;ksX;Ax vkSj y esa le?kkr lehdj.k] Dysjkks dk lehdj.k] fofp= gy] vody lehdj.kksa ds T;kferh; vFkZ] ykfEcd laaNsfn;kaA**
Unit 5	(English)	Linear differential equation with constant coefficients, Homogeneous Linear ordinary differential equations, Linear differential equations of second order, Transformation of equations by changing the dependent / independent variable, Method of variation of parameters.

	(fgUnh)	**vpj xq.kkadks okys jSf[kd vody lehdj.k] lk/kkj.k jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd vody lehdj.k] ijra=@ Lora= pj ds ifjorZu }kjk lehdj.kksa dk :ikUrj.k] izkpy fopj.k fof/kA**

Part-C
Text books. Reference books, other resourse
Hkkx l vuq'kaflr v/;;u lalk/ku   ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

Suggested Readings:
vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh: ikB~;iqLrds%

1- Gorakh Prasad: Differential calculus, Pothishala Private Ltd. Allahabad, 2016

2- Gorakh Prasad: Integral Calculus, Pothishala Private Ltd. Allahabad, 2015

3- M.D. Raisinghania: Ordinary and Partial Differential equation, S.chand & Co. Ltd. 2017

4- Gerard G: Emch. R.Sridharan and M.D. Srinivas, contributions of the History of Indian Mathematics, Hindustan Book Agency. Vol.3. 2005.

5- e/;izns'k xazFk vdkneh dh iqLrdsaA

Reference Books;
lanHkZ iqLrdsa ;

1- N.Piskunov: Differential and Integral Calculus, CBS. Publisher 1996.

2- G.F. Simmons: Differential equation. Tata McGraw Hill 1972.

3- E.A.Codington: An Introduction to Ordinary differential equations. Prentice Hall of India. 1961.

4- D.A. Murray: IntroductoryCourse in Differential Equations. Orient Longman India (1967).

5- H.T. H Piaggio: Elementary Treatise on Differential Equations and their Applications C.B.S. Publisher & Distributors. Delhi. 1985.

6- Bibhutibhusan Datta and Avadesh Narayan Singh History of Hindu Mathematics,

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
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(As Recommended by the Board of Studies)
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Asia Publishing House, 1962
vuq'kaflr fMftVy lysVQkeZ osc fyad%
Suggested Digital platforms Web Links;
https;//epgp.inflibnet.ac.in
https;//freevideolectures.com/university/iit-roorkee
https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D
https;//www. bhojvirtualuniversity.com
vuq'kaflr led{k vkWuykbu ikB;Øe
Suggested Equivalent Online Courses;
https;//nptel.ac.in/courses/111106100/
https;//nptel.ac.in/courses/111/101/111101080/

Signature of Mamber of B.O.S.   ………………….   ………………….   ………………….   ……………………..   …………………

PART-D Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: : 100
Continuous comprehensive Evaluation(CCE): 30
Exam :   :70

Internal Assessment**:** Continuous comprehensive Evaluation(CCE)	Class Test Assignment /Presentation	**20** **10** Total Marks =30
External Assessment: Exam Time: 03.00 Hours	Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)	
		Total=70

Hkkx n vuq'kaflr ewY;kadau fof/k;ka
vuq'kaflr lrr~ ewY;kadau fof/k;ka

vf/kdre vad: 100
lrr~ O;kid ewY;kadau(CCE):   30
ijh{kk :   70

vkarfjd ewY;kadau lrr~ O;kid ewY;kadau(CCE)	Dykl VsLV vlkabuesaV @ izLrqfrdj.k¼isztsuVs'ku½	**20** **10** dqy ;ksx= **30**
vkdyu% **ijh{kk le;%** 03.00?kaVs	vuqHkkx¼v½rhu vfr y?kq iz'u¼izR;sd 50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	

Signature of Mamber of B.O.S.   ………………….   ………………. …………………..   …………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

		Total= **70**

Program: Certificate Course		Class	B.Sc I Year
dk;Zdze % izek.k i=		d{kk	ch-,llh izFke o"kZ
Subject		Mathematics	
fo"k;		xf.kr	
Course Type	ikB~;Øe dk izdkj	Elective-1	oSdfYid&1
Title of Paper	English	Matrices, Geometry and Vector Algebra	
ikB~;Øe dk 'kh"kZd	fgUnh	vkO;wg] T;kfefr ,oa lafn'k chtxf.kr	
Credit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV eku	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuksa½
Total Marks : 100		Max Marks : 30+70	Min Marks : 35
		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
Hkkx v & ifjp;			
iwokZZis{kk	bl ikB~;Øe dks mu lHkh fo"k;ksa ds fo|kfFkZ;ksa }kjk oSdfYid ds :i eas pquk tk ldrk gS ftuds ikl 12oha Lrj ij xf.krh; i`"BHkwfe ugha gSA		
Pre-requisite	This Course can be Opted as an Elective by the Students of all Subjects who do not have Mathematical Background at 12th Level.		

Signature of Mamber of B.O.S.   …………………….   …………….….   …………….……….   …………….……... ……………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½	fo|kFkhZ] O;olk; vkSj foKku ds fofHkUu {ks=ksa tSls ctV] fcØh iz{ksi.k ykxr vuqeku] iz;ksx ds ifj.kkeksa dk fo'ys"k.k vkfn esa vkO;wg] lkjf.kd] T;kfefr vkSj lfn'k n`f"Vdks.k dk mi;ksx djus esa l{ke gksxsaA
Course learning outcome	Student will be able to use the Matrices, Determinants, Geometry and Vector approach in different areas of business and science like Budgeting, Sales projection, cost estimation, alalysing the result of an Experiment etc.

Part-B Content of the course		
Hkkx& c ikB~;Øe dh fo"k;oLrq		
Unit	Syllabus	
Unit 1	(English)	Determinants, Basic properties of Determinants, Minor Determinants, Co –factors, Applications of Determinants Finding the Area of a Triangle.
	¼fganh½	lkjf.kd] lkjf.kd ds vk/kkjHkwr xq.k] mi&lkjf.kd] lg&[k.M] f=Hkqt dk {ks=Qy Kkr djus esa lkjf.kd ds vuqiz;ksxA
Unit 2	(English)	Matrices, Concept of matrics, Notation Order and Equality of Matrices, Types of Matrices, Transpose of matrix, Operations on Matrices- Addition and Multiplication with a Scalar, Simple Properties of Addition, Multiplication and Scalar Multiplication, Adjoint and Inverse of a Square matrix.
	¼fganh½	vkO;wg] vkO;wg dh vo/kkj.kk] vkO;wg dk vadu] Øe vkSj lekurk] vkO;wg ds izdkj] vkO;wg dk ifjorZ] vkO;wg ij laØ;k] ;ksx vkSj xq.kk] vfn'k ds lkFk xq.kk] ;ksx] xq.kk vkSj vfn'k xq.ku

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

		ds ljy xq.k/keZ] oxZ eSfVªDl dk lg[k.Mt vkSj izfrykseA
Unit 3	(English)	Two Dimensional Coordinate Geometry-Shifting of origion, Slope of a line, Angle between Two lines, Various forms of equations of a line in two dimension, parallel to axes, point slop form, slop intercept form, Two-point form, Intercept form and normal form, General Equation of a line, Distance of a point form a line in two dimension, Three Dimensional coordinate Geometry, Coordinate axes and coordinate planes, coordinates of a point, Distance Between Two Point and section formula
	¼fganh½	f}foeh; funsZ'kkad t;kfefr] ewyfoUnq dk LFkkukUrj.k] js[kk dk <ky] nks js[kkvksa ds chp dk dks.k] f}foeh; esa js[kk ds lehdj.kksa ds fofHkUUu :i] v{k ds lekukUrj] fcUnq <yku :i] <yku&var% [k.M :i] nks&fcUnq :i vUr% [k.M:i vkSj vfHkyEo :Ik] js[kk dk lkekU; lehdj.k] f}foeh; essa ,d js[kk ls ,d fcanq dh nwjh] f}foeh; funsZa'kkad T;kfefr] funsZa'kkad v{k vkSj funsZa'kkad lery] fcanq ds funsZa'kkad] nks fcanqvksa ds e/; dh nwjh vkSj [k.M lw=A
Unit 4	(English)	Vector and Scalars, Magnitude and direction of a vector, Direction cosines and direction ratios of a Vector, Types of vectors and position vector of a point, Negative of a Vector and components of a vector, Operations on vectors – Addition of vectors, Multiplication of a vector by a scalar, Position vector of a point dividing a line segment in a given ratio, Properties and Application of- Scalar (dot) product of vectors, vectors (cross) product of vectors.
	¼fganh½	lfn'k vkSj vfn'k] lfn'k dk ifjek.k vkSj fn'kk] lfn'k dh fn~d dksT;k vkSj fn~d vuqikr] lfn'kkas ds izdkj vkSj ,d fcsnq dk fLFkfr lfn'k] _.kkRed lfn'k vkSj ,d lfn'k ds ?kVdA lfn'k ij lafØ;k,a] lfn'kksa

		dk ;ksx] ,d vfn'k ls ,d lfn'k dk xq.ku] fn, x, vuqikr esa ,d fcanq dk fLFkfr lfn'k tks fdlh js[kk [kaM dks foHkkftr djrk gSA] izxq.k vkSj vuqiz;ksx] lfn'k dk vfn'k¼MkWV½ xq.kuQy] lfn'k dk lfn'k¼fr;Zd½ xq.kuQyA

Part-C Learning Resources
Hkkx l vuq'kaflr v/;;u lalk/ku
Text books. Reference books, other resourse
ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

Suggested Readings:
vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~; lkexzh:
ikB~;iqLrds%
  1. P.K. Mittal and Shanti Narayan: Vector Algebra, S.Chand Publishing, 2005.
  2. Nita H. Shah. Foram A. Thakkar Matrix and Determinant Fundamentals and Applications, CRC Press, 2020.
  3. G. Prasad; Coordinate Geometry of two and Three Dimensions, Axis

Publications, 2010. **4.** e/;izns'k xazFk vdkneh dh iqLrdsaA	

Reference Books;
lanHkZ iqLrdsa ;

1- Hari Kishan: A Textbook of Matrices, Atlantic Publishers & Dist.2008.
2- Hari Kishan: Vector Algebra and Calculus, Atlantic Publishers & Dist. 2007
3- K.C.Mathew, S.Veeraraghavan: A Textbook of Co-ordinate Geometry of Two and Three Dimensions, Chand Publication.1972.
4- Shanti Narayan and P.K.Mittal; A textbook of Matrices, S. Chand Publishing, 1953.

vuq'kaflr fMftVy lysVQkeZ osc fyad

https;//freevideolectures.com/university/iit-roorkee
https;//www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D
https;//epathshala.ncert.org.in

PART-D Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: : 100
Continuous comprehensive Evaluation(CCE): 30
Exam : :70

Internal Assessment: Continuous comprehensive Evaluation(CCE)	Class Test Assignment /Presentation	**20** **10** Total Marks =30

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

External Assessment: Exam Time: 03.00 Hours	Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)	
		Total=70

Hkkx n vuq'kaflr ewY;kadau fof/k;ka
vuq'kaflr lrr~ ewY;kadau fof/k;ka

vf/kdre vad: 100
lrr~ O;kid ewY;kadau(CCE):   30
ijh{kk :   70

vkarfjd ewY;kadau **lrr~ O;kid ewY;kadau**(CCE)	**DykI VsLV** **vlkabuesaV @** **izLrqfrdj.k¼isztsuVs'ku½**	**20** **10** **dqy ;ksx**= **30**
vkdyu% **ijh{kk le;%** 03.00?kaVs	vuqHkkx¼v½rhu vfr y?kq iz'u¼izR;sd 50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	
		Total= 70

Program: Certificate Course	Class	B.Sc I Year
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Subject	Mathematics	

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

fo"k;		xf.kr	
Course Type	ikB~;Øe dk izdkj	Elective 2	oSdfYid 2
Title of Paper	English	Mathematical Logic and Sets	
ikB~;Øe dk 'kh"kZd	fgUnh	xf.krh; rdZ vkSj leqPp;	
Creadit	Theory : 6	Medium of Teaching	English and Hindi (Both)
ØsfMV	LkSa)kfrd %6	f'k{k.k dk ek/;e	fgUnh ,oa vaxzsth ¼nksuks½
Total Marks : 100		Max Marks : 30+70	Min Marks : 35
		vf/kdre vad % 30+70	U;wure mRRkhZ.k vad %35
Hkkx& v ifjp;			
iwokZZis{kk	lHkh ds fy, miyC/k		
Pre-requisite	Open for all		
ikB~;Øe v/;;u dh ifjyfC/k;ka ¼dkslZ yfuZx vkmVde½ (CLO)	bl ikB~;Øe ds var esa Nk=fuez esa l{ke gksxsA 1- izR;sd lHkk"k.k esa rdZghu dFku ls rkfdZd dFku O;Dr djus ds fy, rdZ ds fl)karksa dks mi;ksx djus esaA 2- rkfdZd O;atdksa ds fy, IR;rk lkf.k;ksa dk fuekZ.k] rkfdZd rqY;rk ds fy, ijh{k.k dFku vkSj fo/ks; Hkk"kk dh Hkk"kk esa xf.krh; dFkuksa dks O;Dr djus esaA 3- fofHkUu oSpkfjd ;k okLrfod nqfu;k dh leL;kvksa ds lek/kku esa mi;qDr leqPp; IS)kafrd vo/kkj.kkvksa] lksp izfØ;k] midj.k vkSj rduhdksa dks mi;ksx djus esaA
Course Learning Outcomes	At the end of this course, the Students will be able to; 1. Using the Principles of logic to distinguish between sound and unsound reasoning in discourse of every body.

		2. Construct truth tables for logical expressions, test statements for logical equivalence and represent Mathematical statements in the language of predicate language.
		3. Using the appropriate set theoretic concepts thinking process, tools and techniques in the solution to various conceptual or real-world problems.
Part-B Content of the course		
Hkkx& c ikB~;Øe dh fo"k;oLrq		
Unit	Topics	
Unit 1	(English)	**Mathematical Logic-I-**Propositions and truth table, Negation Conjuction and Disjunction, Implications and Double implecation, Bi-conditional Propositions, Contrapositive Imlication and Converse, Contrapositive and Inverse propositions.
	¼fgUnh½	**xf.krh; rdZ& I-**lk/; vkSj lR;rk lkj.kh] fu"ks/k la;kstu vkSj fo;kstu] lksikf/kd vkSj f}&lksikf/kd] f}&izfrca/k lk/;] izfr/kukRed lksikf/kd vkSj foyske] izfr/kukRed ,oa izfrykse lk/;A
Unit 2	(English)	**Mathematical Logic-I-**Precedence of Logical Operators, Tautology and Contradiction, Propositional equivalence Logical equivalences, Predicates quantifiers-Introduction, Quantifiers, Binding Variables and Negations.
	¼fgUnh½	**xf.krh; rdZ& II-**rkfdZd ladkjdksa dh iwoZrk] iqu:fDr vkSj fojks/k] lk/;kRed rqY;rk% rkfdZd rqY;rk] fo/ks; vkSj izekf=d&ifjp;] izekf=d] ck/;dkjh pj vkSj fu"ks/kA
Unit 3	(English)	**Set Theory**: Introduction to sets, Finite and Infinite sets, Counting Principle, Standard set Operations- Classes of sets, Power set of a set, Difference and Symmetric difference of two sets, Set Identities, Generalized union

		and Intersections, Principle of Inclusion and Exclusion, Cardinality, Fuzzy sets and it's basic operations.
	¼fgUnh½	**leqPp; fl)kar% leqPp; dk ifjp;] ifjfer vkSj vifjfer leqPp;] x.ku fl)kar] ekud leqPp; lafØ;k& leqPp; ds oxZ] leqPp; dk ?kkr leqPp;] nks leqPp;ks dk varj vkSj lefer varj] leqPp; loZlfedk,a] lkekU;hd`r la?k vkSj loZfu"B] varosZ'ku vkSj viotZu dk fl)kar] x.kuh;rk] vLQqV leqPp; vkSj bldh vk/kkjHkwrlafØ;k,aA**
Unit 4	(English)	**Relations**- Cartesian product of sets, Composition of relations, Types of relations, Partitions, Equivalence relations, partial ordering relations, Congruence modulo relation.
	¼fgUnh½	**laca/k& leqPp;ksa dk dkrhZ; xq.kuQy] laca/kks dk la;kstu] laca/kks ds izdkj] foHkktu] rqY;rk laca/k] vkaf'kd Øfer laca/k] le¢ks"k ekM~;qyks laca/kA**

Part-C Learning Resources Hkkx l vuq'kaflr v/;;u lalk/ku
Text books. Reference books, other resourse ikB~; iqLrd] lanHkZ iqLrds] vU; lalk/ku

Suggested Readings:
vuq'kaflr lgk;d iqLrdsa@ xzaFk@ vU; ikB~; lalk/ku@ ikB~;
lekxzh:
ikB~;iqLrds%
   1. R.M.Somasundaram, Discrete Mathematical Structures PHI Learning Pvt Ltd.2003.
   2. Samar Ballav Bhoi: A Text book of Logic and sets Educreation Publishing.2018.
   3. Ganesh: Introduction to Fuzzy Sets and Fuzzy Logic; Prentice Hall India, Learning Pvt. Ltd 2006.
   4. e/;izns'k xazFk vdkneh dh iqLrdsaA

Reference Books;
lanHkZ iqLrdsa ;
  1- Ajit Kumar. S.Kumaresan, Bhaba kumar Sarma; A Foundation Course in Mathematics.Alpha Science International Ltd. 2018.
  2- R.P.Grimaldi. Discrete Marthematics and Combinatorial Mthematics, Pearson Education. 1998.
  3- Jean-Paul Tremblay. RManohar: Discrete Mathematics Structures with Applications to Computer Science, McGraw Hill Education 1st edition.2017
  4- G.J. Klir and B.Yuan: Fuzzy set and Fuzzy Logic Pearson.2015

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

vuq'kaflr fMftVy lysVQkeZ osc fyad

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7w%3D%3D

https;//epathshala.ncert.org.in

PART-D Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: : 100
Continuous comprehensive Evaluation(CCE): 30
Exam :   :70

Internal Assessment: Continuous comprehensive Evaluation(CCE)	Class Test Assignment /Presentation	**20** **10** Total Marks =30
External Assessment: Exam Time: 03.00 Hours	Section (A) Three very Short Questions (50 Words Each) Section (B) Four Short Questions (200 Words Each) Section (C) Two Long Questions (500 Words Each)	
		Total=70

Hkkx n vuq'kaflr ewY;kdau fof/k;ka
vuq'kaflr lrr~ ewY;kdau fof/k;ka

vf/kdre vad: 100
lrr~ O;kid ewY;kdau(CCE):   30
ijh{kk :   70

vkarfjd ewY;kdau **lrr~ O;kid** **ewY;kdau**(CCE)	**Dykl VsLV** **vlkabuesaV @** **izLrqfrdj.k¼isztsuVs'ku½**	**20** **10** **dqy ;ksx**= **25**
vkdyu%	vuqHkkx¼v½rhu vfr y?kq iz'u¼izR;sd	

Signature of Mamber of B.O.S.   …………………. …………………. ……………………. …………………….. ………………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

ijh{kk le;% 03.00?kaVs	50 'kCn½ vuqHkkx ¼c½ pkj y?kq iz'u¼izR;sd 200 'kCn½ vuqHkkx ¼l½ nks nh?kZ iz'u¼izR;sd 500 'kCn½	
		Total= 70

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Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class		B.Sc. / B.A. II Year	
Subject	**(English)**	**Mathematics**	**Paper No.: I**
	(हिन्दी)	गणित	
Title of the paper	**(English)**	**Abstract Algebra**	
	(हिन्दी)	अमूर्त बीजगणित	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	(English)	**Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties**
	(हिन्दी)	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय समूह एवं सामान्य प्रगुण।
Unit II	(English)	**Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.**
	(हिन्दी)	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय, फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।
Unit III	(English)	**Homomorphism and Isomorphism of groups. Fundamental theorem**

		of homomorphism. Transformation and Permutation group. S_n (various subgroups of S_n $n < 5$ to be studied). Cayley's theorem.
	(हिन्दी)	**lewgksa dh lekdkfjrk ,oa rqY;dkfjrk] lekdkfjrk dk ewyHkwr izes;] :ikUrj.k ,oa Øep; lewg S_n ¼ S_n ds fofHkUu milewg] ladfYir gS fd $n < 5$ ½ dSyh izes;A**
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of Automorphism, Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian gropus and non-abelian groups.
	(हिन्दी)	समूह स्वकारिता, अंतः स्वाकारिता, स्वाकारिताओं का समूह, संयुग्मिता संबंध और केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन–आबेली समूह के लिये कौषी का प्रमेय।

Unit V	(English)	Definition and basic properties of rings, Ring homomorphism subrings. Ideals and Quotient rings, Polynomial rings & its properties, Integral domain, principal ideal domain. Euclidean domains and unique factorization domains field and quotient fields.
	(हिन्दी)	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण, पूर्णांकीय प्रांत मुख्य गुणजावली प्रांत, यूक्लीडियन प्रांत एवं अद्वितीय गुणन खंडीकरण प्रांत, क्षेत्र एवं विभाग क्षेत्र।

Text Books

1. I.N.Herstein – Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977
2. PB Bhattacharya, S.K. Jain and S R Nagpaul – Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Signature of Mamber of B.O.S.   …………………..   …………………..   …………………..   ………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Reference Books :

1. Shantinarayan – A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.
2. Surjeet Singh – A Text Book of Modern Algebra.
3. N. Jacobson – Basic Algebra, Vol, I and II, W. II. Freeman.
4. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House

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Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class		B.Sc. / B.A. II Year		
Subject	(English)	Mathematics	**Paper No.: II**	
	(हिन्दी)	गणित		
Title of the paper	(English)	Advanced Calculus		
	(हिन्दी)	उच्च कलन		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50		

Unit	*Syllabus*	
Unit I	(English)	Definition of a sequence, Theorems on limits of sequences, Indeterminate Forms, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence, Absolute and conditional convergence of series of real and complex term, Rearrangment of series.
	(हिन्दी)	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, अनिर्धाय रूप, परिबद्ध एवं एकदिष्ट अनुक्रम कॉषी का अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉषी का समाकल परीक्षण, कॉषी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण। वास्तविक एवं समिश्र पदों की श्रेणियों का निरपेक्ष एवं प्रतिबंधमयी अभिसरण।
Unit II	(English)	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.
	(हिन्दी)	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलों के लिये डार्बू का मध्यवर्ती मान प्रमेय।
Unit III	(English)	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on

		homogeneous functions. Taylor's theorem for functions of two variables, Jacobians.
	(हिन्दी)	**nks pjksa ds Qyuksa dh lhek ,oa lkarR;] vkaf'kd vodyu pjksa dk ifjorZu] le?kkr Qyuksa ij vk;yj dk izes;] nks pjksa ds Qyuksa ds fy;s Vsyj dk izes;] tsdksfc;uA**

Unit IV	(English)	**Envelops, Evolutes, Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.**
	(हिन्दी)	अन्वालोप, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लैग्रांज के गुणांकों की विधि, बीटा एवं गामा फलन।
Unit V	(English)	**Double and triple integrals, volumes and surfaces of solids of revolution, Dirichlet's integrals, change of order of integration in double integrals.**
	(हिन्दी)	द्विक एवं त्रि–समाकल, ठोस के परिभ्रमण से जनित आयतन एवं पृष्ठ, ड्रीचलेंटस् समाकल द्विक समाकल के क्रम का परिवर्तन।

Text Books

1. R.R. Goldbeg – Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi
2. Gorakh Prasad – Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad
3. Gorakh Prasad – Integral Calculus, Pothishala Pvt. Ltd. Allahabad
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. Gabriel Klaumber – Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975
2. T.M. Apostol – Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985
3. D. Soma Sundaram and B. Choudhary – A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.

Signature of Mamber of B.O.S.   …………………   …………………   ……………………   ………………….. …………………

4. Murray R. Spiegel – Theory and problems of advance Calculus, Schaum Publishing Co, New York.

5. O.E. Stanaitis – An introduction to Sequences, Series and improper integrals.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	**Paper No.: III**
	(हिन्दी)	गणित	
Title of the paper	(English)	Differential Equations	
	(हिन्दी)	अवकल समीकरण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total : 50	

Unit	Syllabus	
Unit I	(English)	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.
	(हिन्दी)	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।
Unit II	(English)	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.
	(हिन्दी)	लॉप्लास रूपांतरण, लॉप्लास रूपांतरण की रैखिकता, लॉप्लास रूपांतरण के लिये अस्तित्व प्रमेय। अवकलजों एवं समाकलों का लॉप्लाज रूपांतरण, स्थानांतर प्रमेय, रूपांतरणों का अवकलन एवं समाकलन।
Unit III	(English)	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving, Initial value problems of second order linear differential equations with constant coefficients.
	(हिन्दी)	izfrykse ykWlykl :ikarj.k] laoyu izes;] izkjafHkd eku leL;vksa ds fy, f}rh; dksfV ds vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa ykWlykl :ikarj.kksa ds vuqiz;ksxA

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Unit IV	(English)	**Partial differential equations of the first order, Lagrarange's solutions, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method.**
	(हिन्दी)	प्रथम कोटि के आंषिक अवकल समीकरण, लैग्रांज विधि, विषिष्ट प्रकार के अवकल समीकरण का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरला से हल, चारपिट की व्यापक विधि।
Unit V	(English)	**Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficient. Partial differential equations reducible to equations with constant co-efficients, equation of vibrating string, Heat equation, Laplace equation and their solutions.**
	(हिन्दी)	द्वितीय व उच्च कोटि के आंषिक अवकल समीकरण, द्वितीय कोटि के आंषिक अवकल समीकरणों का वर्गीकरण अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों में समानेय आंषिक अवकल समीकरण, कम्पनेय डोरी का समीकरण, ऊष्मा समीकरण, लाप्लास समीकरण एवं इनके हल।

Text Books

1. Sharma and Gupta – Integral Transform, Pragati , Prakashan Meerut.
2. Sharma and Gupta – Differential Equation, Pragati , Prakashan Meerut.
3. Raysinghania – Differential Equaitons, S. Chand & Company, New Delhi
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. D.A. Murray – Introductory course in differential equation, Orient Longman, India, 1967.
2. G.F. Simnons – Differential Equations, Tata Mcgraw Hill, 1972.
3. E.A. Codington – An introduction to Ordinary differential equations. Prentice Hall of India,1961
4. H.T.H. Piaggio – Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.

Signature of Mamber of B.O.S.   …………………   …………………   …………………   ………………….. …………………

5. E.D. Rainville – Special Functions, The Macmillan Company, New York.

Theory

Class		B.Sc. / B.A. III Year	
Subject	**(English)**	**Mathematics**	**Paper No.: I**
	(हिन्दी)	गणित	
Title of the paper	**(English)**	**Linear Algebra and Numerical Analysis**	
	(हिन्दी)	रैखिक बीजगणित एवं संख्यात्मक विश्लेषण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	**(English)**	**Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.**
	(हिन्दी)	सदिष समष्टि की परिभाषा एवं उदाहरण उपसमष्टि उपसमष्टियां का योग एवं प्रत्यक्ष योग, रैखिक विस्तृति, रैखिक परतंत्रता, स्वतंत्रता एवं उनके मूल गुणधर्म आधार, आधार का अस्तित्व प्रमेय, विस्तार प्रमेय आधार में अवयवों की संख्या की

		अपरिवर्तनशील विमीय परिमित विमीय सदिष समष्टि का उपसमष्टि की पुरक उपसमष्टि का अस्तित्व उपसमष्टियों के योग की विमा, विभाग समष्टि एवं उसकी विमा।
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear-Quadratic and Hermitian forms.
	(हिन्दी)	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों की बीज गणित जाति शून्यता प्रमेय, आधार का परिवर्तन द्वैत समष्टि, द्विद्वैत समष्टि एवं प्राकृतिक तुल्याकारिता, एडज्वाइन्ट का रैखिक रूपांतरण, रैखिक रूपांतरणों के आइगन मान एवं आइगन सदिष, विकर्णीकरण, द्विएकघात, द्विघाती एवं हर्मितीय समघात।

Unit III	(English)	Inner Product Spaces – Cauchy-Schwartz inequality, orthogonal vectors, orthogonal complements, orthonormal sets and bases, Bessel's inequality for finite dimensional spaces, Gram-Schmidi orthogonalization process.
	(हिन्दी)	vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd lfn'k] ykafcr iwjd] izlkekU; ykafcd leqPp; ,oa vk/kkj] ifjfer foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV ykafcdrk izØeA
Unit IV	(English)	Solution of Equations : Bisection, Secant, Regula Falsi, Newton's Methods Roots of second degree Polynomial equations. Interpolation : Lagrange interpolation, Divided differences, Interpolation formula using Differences, Numerical Quadrature, Newtorn – Cote's formulae, Gauss Quadrature formulae.
	(हिन्दी)	समीकरणों के हल – द्वि–विभाजन विधि, सिकेन्ट विधि, रेग्यूला फाल्सी विधि,

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

		न्यूटन विधि, द्वितीय घात के बहुपद समीकरण के मूल। अन्तर्वेषन – लैग्रांज अन्तर्वेषन, विभाजित अंतर, अंतर के उपयोग से अन्तर्वेषन सूत्र संख्यात्मक क्षेत्रकलन न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र।
Unit V	(English)	Linear equations direct methods for solving systems of linear equations (Gauss elimination, L.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single step method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration, methods based on numerical differentiation.
	(हिन्दी)	रैखिक समीकरण, रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियाः (गाउस विलोपन, एल–यू वियोजन, चोलेस्की वियोजन) पुनरावृत्ती विधियाँ (जकाबी विधि, गाउस सिडेल विधि), साधारण अवकल समीकरण आयलर विधि, एकल चरण विधि, रूंग कुट्टा विधि, बहुचरण विधि, मिलने–सिम्पसन विधि, संख्यात्मक समाकलन पर आधारित विधियाँ एवं संख्यात्मक अवकलन पर आधारित विधियाँ।

Text Books

1. K.B. Datta – Matrix and Linear Algebra, Prentice hall of India Pvt. Ltd, New Delhi, 2000.
2. S.S. Sastry – Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

Reference Books :

1. K. Hoffman and R. Kunze – Linear Algebra, 2nd Edition, Prentice Hall Englewood Cliffs New Jersey, 1971.
2. S.K. Jain. A Gunawardena & P.B. Bhattacharya – Basic Linear Algebra with MATLAB Key College Publishing (Springer - Verlag) 2001.
3. S, Kumarsaran – Linear Alebra, A Bermetric Approach Prentice – Hall of India, 2000.
4. Balaguruswamy – Numerical methods, Tata Mc Graw Hill Publications, New York.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class		B.Sc. / B.A. III Year		
Subject	(English)	**Mathematics**	**Paper No.: II**	
	(हिन्दी)	गणित		
Title of the paper	(English)	**Real and Complex Analysis**		
	(हिन्दी)	वास्तविक एवं सम्मिश्र विष्लेषण		
Compulsory Paper		**Medium of Teaching : Hindi, English**		
Maximum Marks		**Total : 50**		

Unit	Syllabus	
Unit I	(English)	**Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables, Schwartz's and Young's theorem, Implicit function theorem.**
	(हिन्दी)	रीमान समाकल, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान प्रमेय, दो चरों के वास्तविक मान फलनों के आंषिक अवकलज एवं अवकलनीयता, स्वार्ज एवं यंग के प्रमेय, अस्पष्ट फलन प्रमेय।
Unit II	(English)	**Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullan's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.**
	(हिन्दी)	अनुचित समाकल एवं उनका अभिसरण तुलना परीक्षण आबेल एवं डिरिक्ले का परीक्षण, प्रचालिक फलनों के रूप में फ्रुलानी समाकल, सांतत्य, एक प्राचल के फलन के समाकल अवकलनीयता एवं समाकलनीयता, अर्द्ध एवं पूर्ण अंतरालों की फोरियर श्रेणी।

Signature of Mamber of B.O.S.   ………………….   …………………   ……………………   ………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Unit III	(English)	**Definition and examples of metric spaces, Neighbourhoods, Limit points, interior points, Open and closed sets. Closure and interior, Boundary points, Subspace of metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real number as a complete ordered field. Dense subsets Baire Category theorem, Separable, second countable and first countable spaces, Continuous functions, Uniform continuity, Properties of Continuous functions on Compact sets.**
	(हिन्दी)	**nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehl;] lhek fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod la[;k,sa] la?ku mileqPp; ck;j&dsVsxjh izes;] i`FkDdj.k] f}rh; x.kuh; ,oa izFke x.kuh; lef"V]** सतत फलन, एकसमान सांतत्य, संहत समुच्चय**ksa ij lrr~ Qyuksa ds izxq.kA**
Unit IV	(English)	**Continuity and differentiability of compex function. Analytic functions, Cauchy-Reimann equations. Harmonic functions, Cauchy's Theorem, Cauchy's Integral Formula**
	(हिन्दी)	सम्मिश्र फलनों की सातत्यता और अवकलनीयता, विश्लैषिक फलन, कौषी–रीमान समीकरण, हारमोनिक फलन, कौषी प्रमेय एवं कौषी समाकलन सूत्र।

Unit V	(English)	Power Series representation of an analytical function, Taylor's series, Laurant's series, Singularities, Cauchy's Residue Theorem, Contour Integration.
	(हिन्दी)	घात श्रेणी, वैश्लेषिक कलन का निरूपण, टेलर की श्रेणी, लॉरेन्ट की श्रेणी, विलक्षणता (सिंगुलेरटीज) कॉषी का अवषेष प्रमेय, परिरेखा (कंटूर) समाकलन।

Text Books

1. Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi
2. G.J. Simmons – Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963
3. L.V. Alhfors, complex analysis Mc Graw Hill, New York
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. Water Rudin – Real and Complex Analysis Mc Graw Hill, New York.
2. Ponnusway – Complex Analysis, Narosa Publication, New Delhi.
3. R.V. Churchill & J.W. Brown, Complex Variables and Application, 5th Edition, Mc Graw Hill, New York, 1990.

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Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class		B.Sc. / B.A. III Year	
Subject	(English)	Mathematics	**Paper No.: III**
	(हिन्दी)	गणित	
Title of the paper	(English)	Discrete Mathematics	
	(हिन्दी)	विविक्त गणित	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total : 50	

Unit	Syllabus	
Unit I	(English)	Boolean functions – disjunctive & conjunctive normal forms (canonical & dual canonical), Bools's expansion theorem. Relations – Binary relation, Inverse relation, Composite relation, Equivalence relation, Equivalence classes & its properties Partition of a set.
	(हिन्दी)	बूलीय फलन – वियोजनीय एवं संयोजनीय प्रसामान्य रूप (केनोनिकल एवं ड्रूअल केनानिकल), बूल का विस्तार प्रमेय। संबंध – द्विचर संबंध, प्रतिलोम संबंध, संयोजित संबंध, तुल्यता संबंध, तुल्यता वर्ग एवं उसके गुण धर्म, समुच्चय का विभाजन।
Unit II	(English)	Partial order relation, Partially ordered sets, totally ordered sets. Hasse diagram, maximal and minimal element first and last element. Lattice – definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.
	(हिन्दी)	अंषतः क्रम संबंध, अंषतः क्रमित समुच्चय, पूर्णत क्रमित समुच्चय, हैसूह आरेख, उच्चिष्ठ एवं निम्निष्ठ अवयव, प्रथम एवं अन्तिम अवयव, जालक – परिभाषा एवं उदाहरण, द्वैत जालक, परिबद्ध जालक, वितरणीय जालक, पूरक जालक।
Unit III	(English)	Graph – Definition types of graphs, Subgraphs, walk-path, circuit, connected and disconnected graphs. Euler graph. Hamiltonian path and circuit, shortest path in weighted graph. Dijkstra's Algorithm for shortest paths.
	(हिन्दी)	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k] xeu] iFk ,oa

		ifjiFk laca) ,oa vlac) xzkQ vkW;yj xzkQ] gsfeYVksfu;u iFk vkSj ifjiFk] Hkkfjr vkys[k esa y?kqRre iFk gsrq MkWbdL=k ,YxksfjFkeA

Unit IV	(English)	**Trees and its properties, Rooted tree, Binary tree,Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.**
	(हिन्दी)	वृक्ष एवं उसके गुण धर्म, नियत वृक्ष, द्विवचर वृक्ष, जनक वृक्ष, आलेख की जाति एवं शून्यता, कुस्कल एवं प्राइम की एल्गोरिथम।
Unit V	(English)	**Matrix representation of graph – Incidence and Adjacency matrix. Cutset and its properties. Planar graphs (definition) Kuratowski's two graphs.**
	(हिन्दी)	आलेख का आव्यूह निरूपण – इन्सीडेंस एवं एडजेन्सी आव्यूह , कटसेट्स एवं उसके प्रगुण, प्लानर आलेख (परिभाषा), कुराटोव्हस्की के द्विआलेख।

Text Books

1. C.L.Liu – Elements of Discrete Mathematics, Mcgraw Hill, New-York
2. Narsingh Deo – Graph Theroy, Prentice Hall
3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

M.Sc. SEMESTER I

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-I	Paper No : I (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total 100	Main Exam:	70	C.C.E:	30

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.		Semester: I
Subject	Mathematics		
Title of the paper	Real Analysis	Paper No : II (Compulsory)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Topology-I	Paper No : III (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   …………………..   …………………   ……………………   …………….……….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.		Semester:	I
Subject	Mathematics			
Title of the paper	Advanced Discrete Mathematics-I		Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English		Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30	
Unit I	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.			
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices			
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.			
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.			
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph			
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.			

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   …………………..   …………………..   ……………………   ……………….…….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

M.Sc. SEMESTER II

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.
Unit V	Algebra of linear transformation,Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Lebesque Measure & Integration	Paper No : II	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.
Unit IV	The L^p-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of $L^{p.}$
Unit V	Dual of space when $1 \le P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Separation axioms T_0, T_1, T_2, T_3, T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   …………………..   ………………….   ……………………   ………………….....   …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Complex Analysis-II	Paper No : IV	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.
Unit III	Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-Verlag. 2. H.K.Pathak, complex variable

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30
Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.		
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.		
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.		
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.		
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)		
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill		

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

M.Sc. SEMESTER III

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Functional Analysis-I	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   ………………..   ………………….   ……………………   …………….…….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Integral Transform-I	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.
Unit II	Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   …………………..   ………………….   ……………………   …………….…….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Operations Research-I	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Theory of Linear Operators-I	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.
Unit V	Spectral properties of compact linear operators.
Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S. ………………….. …………………. …………….……… ………….…….…... …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

M.Sc. SEMESTER IV

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Functional Analysis-II	Paper No : I	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.
Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   …………………..   ………………….   ……………………   …………….,……...   …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester:	IV
Subject	Mathematics		
Title of the paper	Integral Transform-II	Paper No : II	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.
Unit II	Finite Fourier Transform and Fourier Integral.
Unit III	Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.
Unit IV	Application for Fourier Transform to Boundary value problems.
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems

Recommended Books	1. Integral Transforms by Goyal and Gupta.
	2. Integral Transforms by I.N. Sneddon.
	3. Integral Transforms by Gupta and Vashishtha.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

lass	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Operations Research-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995.

	4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.
	5. H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.
	6. Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Theory

Class	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-II	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30
Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.		
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.		
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.		
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.		
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.		
Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.		
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.		

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Mamber of B.O.S.   ………………..   ……………….   ……………………   …………….……... …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Course: B.Sc. (Scheme Of Examination)

Theory Papers	Title of paper	Marks			Compulsory/Optional
		Theory	C.C.E	Total	
B.SC.I-YEAR					
Paper I	Algebra , Vector Analysis &Geometry	70	30	100	Major
Paper II	Calculus & Differential Equations	70	30	100	Major /Minor /Elective
B.SC. II YEAR					
Paper 1	Abstract Algebra	50			
Paper II	Advanced Calculus	50	50	200	
Paper III	Differential Equations	50			
B.SC. III YEAR					
Paper I	Linear Algebra & Numerical Analysis	50			Compulsory
Paper II	Real And Complex Analysis	50	50	200	Compulsory
Paper III	Discrete Mathematics	50			Optional

Signature of Mamber of B.O.S.   …………………….   …………………….   …………………………   …………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Scheme of examination

Course: M.Sc. (2 Years Degree Course)

<table>
<tr><td colspan="6">SEMESTER I</td></tr>
<tr><td rowspan="2">Theory Papers</td><td rowspan="2">Title of paper</td><td rowspan="2">Compulsory/Optional</td><td colspan="3">Marks</td></tr>
<tr><td>Theory</td><td>C.C.E</td><td>Total</td></tr>
<tr><td>Paper I</td><td>Advanced Abstract Algebra-I</td><td>Compulsory</td><td>70</td><td>30</td><td>100</td></tr>
<tr><td>Paper II</td><td>Real Analysis</td><td>Compulsory</td><td>70</td><td>30</td><td>100</td></tr>
<tr><td>Paper III</td><td>Topology-I</td><td>Compulsory</td><td>70</td><td>30</td><td>100</td></tr>
<tr><td>Paper IV</td><td>Complex Analysis-I</td><td>Compulsory</td><td>70</td><td>30</td><td>100</td></tr>
<tr><td>Paper V</td><td>Advanced Discrete Mathematics - I</td><td>Optional</td><td>70</td><td>30</td><td>100</td></tr>
<tr><td>Paper VI</td><td>Job Oriented Project Work</td><td>Compulsory</td><td>--</td><td>--</td><td>50</td></tr>
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Signature of Mamber of B.O.S.   …………………..   ……………….   ………………….   ………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

		SEMESTER II				
Paper I	Advanced Abstract Algebra-II	Compulsory	70	30	100
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100
Paper III	Topology-II	Compulsory	70	30	100
Paper IV	Complex Analysis-II	Compulsory	70	30	100
Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
		SEMESTER III				
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
		SEMESTER IV				
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100

Signature of Mamber of B.O.S.   …………………….   …………………….   …………………………   ……………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Paper III	Advanced Graph Theory -II	Optional	70	30	100	
Paper IV	Operations Research-II	Optional	70	30	100	
Paper V	Theory of Linear Operators-II	Optional	70	30	100	
Paper VI	Comprehensive Viva-Voce	Compulsory	--	--	50	
Paper VII	Internship	Compulsory	--	--	100	

Signature of Mamber of B.O.S.   ………………….   ………………….   ………………….   ……………………..   …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Syllabus

2021 -2022

Semester / yearly Pattern

Subject: MATHEMATICS

Date of submission in Autonomous Examination cell:

Signature of Mamber of B.O.S.   …………………..   ……………….   …………………….   …………..…….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Signature
H.O.D.

Course outcomes (COS)
Class : B.Sc. II Year
Paper : I
Title : Abstract Algebra Mathematics

The objective of this course is to help all the students to develop a positive attitude towards.

1. Group theory and applications of Group, Subgroups, Cyclic groups and its properties.
2. Have a deeper understanding of Lagrange's theorem Fermal's theorem. Normal subgroups and Quotient groups.
3. Have a solid knowledge of Homomorpism, Isomorphism of groups, Fundamental theorem of homomorphism, Caley's theorem.
4. Students will be enable to developing important skills in problem solving techniques of Rings, Subrings, Ideal, Integral domain and Field.
5. Students will be enable to stimulate interest in learing of Group Automorphism, Cauchy's theorem and Conjugacy relation.

Course outcomes (COS)
Class : B.Sc. II Year
Paper : II
Title : Advaced Calculus Mathematics

In this course students will be enable to :

1. Analyzing and describing the behviour of sequences, limit. Cauchy's theorem, Tests of Convergence.
2. Students have a deeper understanding of Continuity, Mean value theorems and Darboux's value theorem.

3. Students have a solid knowledge of partial differentiation, Euler's Taylor's theorem for function of two variables and Jacobians.

4. Students will be enable to developing important skill in problem solving method of Envelops, Evolutes, Maxima and Minima, Beta and Gamma Function.

5. Students will be enable to stimulate interest in learning of Double and triple integrals, volume and surface, change of order of integration.

Course outcomes (COS)
Class : B.Sc. II Year
Paper : III
Title : Differential Equations Mathematics

In this course students will be enable to :

1. Analyzing and describing the behavior of series solution, power series method, Bessel's, Legendre's equations and functions and their properties, Recurrence relations.

2. Students have a deeper understanding of Laplace Transformation and its properties, shifting theorems, differentiation and integration of transforms.

3. Students have a solid knowledge of inverse Laplace transform, convolution theorem, applications, initial value problem.

4. Students will be enable to developing important skills in problem solving of second order partial differential equation, Higher order partial differential equations, homogeneous and non homogenous equations , heat equation, laplace equation and equation of vibrating string.

5. Students will be enable to stimulate interest in learning of partial differential equation of Ist order, Lagrange's solution, general method, charpit's general method.

Signature of Mamber of B.O.S.   …………………   …………………   …………………   …………………….. …………………

Course outcomes (COS)
Class : B.Sc. III Year
Paper : I
Title : Linear Algebra and Numerical Analysis

The objective of this course is to provide understanding of vector space, Quotient space, Rank-Nullity Theorem and wide aspects of Numerical Analysis in which solution of equations, Interpolation and direct methods for solving systems of linear equations have been included.

1. Students will be able to define and give examples of vector spaces, sub-spaces, Linear span, Linear dependence and independence, Basis, Dimensions etc.
2. They will have the knowledge of linear transformation, inner product spaces, Quotient spaces, Cauchy-Schwartz inequality orthogonal and orthonormal sets.
3. Students will learn to find Eigen values and Eigen vectors of a matrix which is used in the study of chemical reactions and geometry.
4. They will be able to solve problems by using Regula-Falsi, Secant, Newton's methods and also will be able to find Interpolation and Numerical Quadrature.
5. Students would be able to solve system of linear equations by Elimination method, and ordinary differential equations by Euler's method, Runge-Kutta method, Milin-Simpson method.

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Course outcomes (COS)
Class: B.Sc. III Year
Paper: II
Title: Real and Complex Analysis

The objective of this paper / course is to provide deep knowledge and understanding of Real and complex analysis.

1. Students will be able to define Riemann-Integral, Its properties, Improper Integrals, Its convergence, Fourier series, Frullani's Integra.
2. They will be able to prove mean-value theorem, Schwartz's and Young's theorem. Cantor's intersection theorem, Baire's category theorem.
3. Students will be able to define metric spaces, neighbourhoods, limit point, interior point, open and closed sets, uniform continuity, compactness, sequential compactness, connectedness etc.
4. Students will have the knowledge of complex numbers, Analytic functions, Harmonic functions, Fixed points, cross ratio and conformal mappings.

Course outcomes (COS)
Class : B.Sc. III Year
Paper : III (optional)
Title : Discrete Mathematics

The objective of this paper is to understand the topics of Discrete mathematics in which Boolean functions, lattice and types of it are included students will be able to make graphs and circuits.

Signature of Mamber of B.O.S.   …………………   ………………….   ……………………   ……………………..   …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

1. Students will be able to define and identify various types of relations like binary relation, Inverse relation, composite and equivalence relation.
2. They would be able to differentiate among various types of sets like partially and totally ordered sets and lattices like dual and bounded lattice etc.
3. The students will be able to draw various graphs and circuits and would be able to find shortest paths.
4. Students would be able to state various properties of tree, rooted tree, binary tree, they will be able to find Rank and Nullity of Graph.
5. They would be able to write the algorithm, Kruskal's algorithm and prime algorithm

M.sc. (Mathematics)
Program Specific Outcome

- Students will be able to analyze the problems and interpret data for investigating problems in the field of Mathematics.

- Student of Mathematics can pursue higher studies (M.Phil., Ph. D) to attain research positions. Students can get jobs in various fields both in the private and public sector. Some of the common job positions or profiles for a math enthusiast are Assistant Professor, Research Analyst, Assistant Scientist, Training Manager etc. They can apply for jobs in Banking sector, Aerospace and Defense, Automobile, IT and Software, Railways, and the Manufacturing sector. As Mathematician, one can be involved in research and development in specialized branches such as Commutative Algebra and Algebraic Geometry, Discrete Mathematics and Coding Theory, Groups, Semi groups and Topology, Applied Mathematics and Differential Equations, Functional Integration, Operator Theory/Operator Algebras, Mathematical Biology, Mathematics Education.

- Besides Industrial sector there are ample opportunities in Academics, like in School Education Department and Higher Education Department.

- Students will be able to understand the wide potential of the subject Mathematics, and its implementation in sustainable development.

**Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22**

Syllabus

Post Graduate

2021-2022

Semester   Pattern

Subject: MATHEMATICS

Date of submission in Autonomous Examination cell:

*Signature
H.O.D.*

Signature of Mamber of B.O.S.   …………………..   …………………..   …………………..   …………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

COURSE OUTCOMES
SEMESTER-I

Paper I : **The objective of this course is to provide Normal and subnormal series of groups and Perfect and Finite Fields.**
Advanced Abstract Algebra-I

➢ **Students will be able to solve problems related to concept of groups, Nilpotent groups.**
➢ **Student will be able to facilitate the understanding of the structure of a problem where the problem involves a permutation group: e.g. Nature of the roots of a polynomial equation.**

Paper II: Real Analysis **The objective of this course is to provide knowledge of Riemann-Stieltjes integral and its properties**

➢ **Students will be able to solve problems related to convergence of series and sequence of functions.**
➢ **Students will be able to apply Implicit function and inverse function theorem.**
➢ **Students will be able to solve problems related to functions of several variables in Real Analysis.**

Paper III : **The objective of this course is to provide knowledge of Sets and**
Topology-I **Topological Spaces.**

➢ **Students will be able to give proofs of Zorn's lemma and Lindelof's theorem.**
➢ **Students will be able define Countable and Uncountable sets and infinite sets.**
➢ **Students will be able to understand the concept of path connectedness and locally connected spaces.**

Paper **Complex** **Analysis**	**IV:**	**The objective of this course is to provide knowledge of Complex Integration and Residues**

> **Students will be able to proof Morera's Theorem, Cauchy_Goursat theorem, Cauchy's Residue Theorem.**

> **Students will be able to state properties of Bilinear transformations.**

> **Students will be able to give definition and examples of conformal mappings.**

Paper **Advanced** **Discrete** **Mathematics-I**	**V:**	**The objective of this course is to Students will be aware about Semi groups ,Lattices, Boolean Algebra, and Graph Theory.**

> **Students will be able to understand the concept of Homomorphism of Semi groups and monoids.**

> **Students will be able to state properties of Lattices as Algebraic systems.**

> **Students will be able to understand the concept of Boolean Algebra to Switching theory.**

> **Students will be able to give definition and examples of Graph and its various Types.**

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

COURSE OUTCOMES

SEMESTER-II

Paper I: **The objective of this course is to provide understanding of**
Advances **Modules and Algebra of Linear Transformation**
Abstract
Algebra-II

> ➢ **Students will be able to define and give examples of Modules, Sub-Modules, Cyclic modules and Primary modules.**
> ➢ **Students will be able to give proofs of Hilbert basis theorem, Noether_Laskar theorem and Wedderburn Artin theorem.**

Paper II: **The objective of this course is to aware students about**
Lebesgue **Lebesgue outer measure and integration of Non Negative**
Measure and **Functions**
Integration

> ➢ **Students will be able to define and give examples of outer measure, Measurable sets, Convex functions and Uniform Convergence.**
> ➢ **Students will be able to proof Jensen's inequality, Holder and Minkowski inequalities.**
> ➢ **Students will be able to solve the problem related to Integration of series.**

Paper III: **The objective of this course is to provide understanding of**
Topology-II **separation axioms, Net and Filters.**

> ➢ **Students will be able to define separation axioms, T0 ,T1 ,T2 ,T3 ,T4 spaces.**
> ➢ **Students will be able to state properties of separation**

Signature of Mamber of B.O.S. …………………. …………………. ……………………… ………………….. …………………

axioms and T0 ,T1 ,T2 ,T3 ,T4 spaces.

➢ Students will be able to solve Homotopy of paths, Compactness and proof of theorem of Algebra.

Paper   IV: The objective of this course is to provide understanding of Gamma function and its Properties and Canonical Products.
Complex
Analysis-II

➢ Students will be able to give proofs of Weierstrass Factorization theorem, Mittage –Leffler's Theorem, Bloch's theorem, Picard theorem.

➢ Students will be able to state Schwantz reflection Principle, Jenson's Formula Harmonic function

Paper   V: The objective of this course is to provide knowledge about Matrix Representation and Theory of Automata.
Advanced
Discrete
Mathematics-II

➢ Students will be able to understand the concept of Discrete Numerical Functions.

➢ Students will be able to state properties of Lattices as Algebraic systems.

➢ Students will be able to understand the concept of Boolean Algebra to Switching theory.

➢ Students will be able to give definition and examples of Graph and its various Types.

Signature of Mamber of B.O.S.   ………………..   ………………….   ……………………   …………………….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

COURSE OUTCOMES

SEMESTER-III

Paper I :Functional Analysis -I

The objective of this course is to provide understanding about Normed Linear Spaces, subspaces and Linear Functionals.

> Students will be able to understand definition and properties of Normed linear spaces, Banach Spaces, Linear Operator, Linear functionals and Hibert Spaces.
> Students will be able solve examples of Banach Spaces and Dual Spaces.
> Students will be able to give the proof of Riesz's Lemma and understand compactness.

Paper II: Integral Transform-I

The objective of this course is make students understandable about Laplace Transform and Laplace equations in two dimensions.

> Students will be able to solve the problem of Laplace Transformation and Laplace Equation.
> Students will be able to apply differential equation, Integral equation and Heat conduction equation in one dimension

Paper III: Advanced Graph theory -I

The objective of this course is to provide understanding of concept of Tree and Planar Graphs

> Students will be able to define Properties of Tree and Cut-Sets.

Signature of Mamber of B.O.S.   …………………..   …………………   ……………………   …………………….. …………………

> **Students will be able to understand Euler Graph , Hamiltonian Paths and Kuratowski's two graph .**

Paper IV: Operations Research   **The objective of this course is to provide understanding of model in Operation & Research**

> **Students will be able to understand Characteristics of Operation & Research**

> **Students will be able to solve Linear Programming Problem, Simplex Methods and Fundamental Property of Duality.**

Paper V: Theory of Linear Operators-I   **The objective of this course is to make students understandable about Spectral Theory and its properties of Bounded Linear Operators**

> **Students will be able to understand Regular Value Resolvent Set.**

> **Students will be able understand complex Banach Space and Banach Alegbra .**

> **Students will be able to understand properties of compact linear operators.**

Sarojini Naidu Govt Girls P.G.(Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

COURSE OUTCOMES

SEMESTER IV

Paper I:
Functional Analysis -II
The objective of this paper will give the students the fare idea of concept of Hilbert adjoint operator and Zorn's Lemma

➢ Student will be able to define and give examples self adjoint operator, Unitary operator, Normal operator and Positive operator.

➢ Student will able to give proof of Hahn Banach Theorem, Category Theorem and Open mapping theorem.

➢ Student will able to define strong & weak convergence of operators.

Paper II: Integral Transform-II
The objective is to provide an understanding of various concepts of Fourier Transform

➢ Student will be able to solve problems related to Finite Fourier Transform and Boundary Value Problem.

➢ Student will be able to solve Convolution Theorem and Parseval's identity for Fourier Transform.

Paper III: Advanced Graph Theory-II
The objective is to demonstrate & Matrix Representation of Graphs and Trees as Directed Graph.

➢ Students will develop ability to understand Cut set matrix

and Chromatic Number.
➢ **Students will able to solve Four color problem and fundamental Circuits in Digraphs.**

Paper IV: Operation Research-II	**The objective of this paper is to give knowledge of solving various problem of operation research**

➢ **Students will be able to solve Transportation problem, assignment problem and PERT/CPM path problem.**

➢ **Students will be able to concept of Game theory and its solution by linear programming.**

Paper V: Theory of Linear Operators-II	**The objective of this course is to aware students about further knowledge of Spectral properties of compact Linear operators, Positive operators and Projection operators.**

➢ **Students will be able to solve theorems of Fredholm type and understand the concept of Bounded Self-adjoined Linear operators.**

➢ **Students will be able to perform product and square root of Positive operators.**

➢ **Students will be able to understand properties of Projection.**

Signature of Mamber of B.O.S.   …………………..   ………………….   …………………….   …………….……….. …………………

Sarojini Naidu Govt Girls P.G.(Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session : 2021-22

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21
Theory

Class		B.Sc. / B.A. I Year	
Subject	(English)	**Mathematics**	**Paper No.: I**
	(हिन्दी)	गणित	
Title of the paper	(English)	**Algebra and Trigonometry**	
	(हिन्दी)	बीजगणित एवं त्रिकोणमिति	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	(English)	**Rank of matrix, Normal & Echelon form of a matrix, Characteristics equations of a matrix, Eigen values, Eigen vectors, Linear Independence of row and column matrix.**
	(हिन्दी)	आव्यूह की जाति, आव्यूह की प्रासामान्य एवं ऐसेलॉन रूप, आव्यूह का अभिलाक्षणिक समीकरण, आयगेन मान, सदिष, पंक्ति एवं स्तम्भ आव्यूह की स्वतंत्रता।
Unit II	(English)	**Cayley Hamilton theorem and its use in finding inverse of a matrix, application of matrix to solve a system of linear (homogenous and non-homogenous) equations, theorems on consistency and inconsistency of system of linear equations, solving linear equations upto three unknown.**
	(हिन्दी)	केली–हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रम आव्यूह (समघात एवं असमघात) ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय के हल के लिये आव्यूह का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर प्रमेय, तीन अज्ञात राषियों तक के रैखिक समीकरणों के हल।
Unit III	(English)	**Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equation. Reciprocal equations, Descarte's rule of signs.**
	(हिन्दी)	**,d pj ds lkekU; cgqinksa ds lehdj.k ds xq.kkadksa ,oa ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k] O;qRØe lehdj.k] fpUgksa dk fndkrsZa fu;eA**
Unit IV	(English)	**Logic – Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalance, Algebra of propositions, Boolean Algebra – definition and properties , Boolean Functions, switching circuits and its applications, logic gates and circuits.**
	(हिन्दी)	तर्कषास्त्र – तर्क संयोजक, सत्यता सारणी, पुनरूक्ति और व्याघात, तार्किक तुल्यता, साध्यों का बीजगणित। बूलीय बीजगणित – परिभाषा एवं उसके गुणधर्म, बूलीय फलन, स्विचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ।

Signature of Member of B.O.S. ……………   ……………   ……………   ……………   ………………

Unit V	(English)	De-Moivre's theorem and its application, direct and inverse circular and hyperbolic functions, expansion of trigonometric functions, logarithm of complex quantities, Gregory's series, summation of trignometrical series.
	(हिन्दी)	डी–मोइवर्स प्रमेय एवं इसके अनुप्रयोग, प्रत्यक्ष एवं व्युत्क्रम वृत्तीय एवं अतिपरवलयिक फलन त्रिकोणमितीय फलनों का विस्तार, सम्मिश्र संख्याओं का लघुगणक, ग्रीगोरी श्रेणी त्रिकोणमितीय श्रेणियों का योग।

Text Books

1. S.L. Loney – Plane Trigonometry Part - II
2. K.B.Datta – Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi 2000.
3. Chadrika Prasad – A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd. Allahabad
4. C.L.Liu – Elements of Discrete Mathematics (Second Edition), Mc Graw Hill, International Edition, Computer Science Series, 1986.
5.. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. H.S.Hall and S.R. Knight – Higher Algebra H.M. Publication 1994.
2. N. Jacobson – Basic Algebra Vol.I and II, W.H. Freeman.
3. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House
4. N. Saran and R.S. Gupta – Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. I Year		
Subject	(English)	**Mathematics**	**Paper No.: II**	
	(हिन्दी)	गणित		
Title of the paper	(English)	**Calculus and Differential Equations**		
	(हिन्दी)	कलन एवं अवकल समीकरण		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		**Total : 50**		

Unit	Syllabus	
Unit I	(English)	**Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.**
	(हिन्दी)	उत्तरोत्तर अवकलन, लैबनीज प्रमेय, मेक्लारिन एवं टेलर श्रेणी में विस्तार। अनंतस्पर्शी।
Unit II	(English)	**Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curcves in Cartesian and polar coordinates.**
	(हिन्दी)	वक्रता, उत्तलता एवं अवतलता का परीक्षण, नति परिवर्तन बिन्दु, बहुबिन्दु, कार्तीय एवं ध्रुवीय निर्देषांकों में वक्रों का अनुरेखण।
Unit III	(English)	**Integration of transcendental functions, Definite Integrals, Reduction formulae, Quadrature, Rectification.**
	(हिन्दी)	**vchth; Qyuksa dk lekdyu] fuf'pr lekdyu] lekU;u lw=] {ks=dyu ,oa pkidyuA**
Unit IV	(English)	**Linear differential equations and equations reducible to the linear form, Exact differential equation, first order and higher degree equations solvable for x, y and p, Chairaut's equation and singular solutions, geometrical meaning of a differential equations, Orthogonal trajectories.**
	(हिन्दी)	रैखिक अवकलन समीकरण एवं रैखिक समीकरण में समानेंय अवकल समीकरण, यथातथ अवकल समीकरण x, y एवं p में हल होने योग्य प्रथम कोटि एवं उच्च धातीय अवकल समीकरण, क्लेरो का समीकरण और विचित्र हल। अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदिया।

Unit V	(English)	Linear differential equation with constant coefficient, Homogeneous linear ordinary differential equation, Linear differential equation of second order, transformation of equations by chainging the dependent variable / independent variable, method of variation of parameters.
	(हिन्दी)	अचर गुणांकों वाले रैखिक अवकल समीकरण, साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण स्वतंत्र चर ⁄ परतंत्र चर के परिवर्तन द्वारा समीकरणों का रूपांतरण, प्राचल विचरा विधि।

Text Books

1. Gorakh Prasad – Differential Calculus, Pothishala Private Ltd. Allahabad
2. Gorakh Prasad – Integral Calculus, Pothishala Private Ltd. Allahabad
3. D.A. Murray – Introductory Course in Differential Equations, Orient Longman (India) 1967
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. G.F. Simmons – Differential Equations, Tata Mc Graw Hill, 1972
2. E.A. Codington – An Introduction to ordinary differential equation, Prentice Hall of India, 1961
3. H.T.H. Piaggio – Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, Delhi, 1985
4. S.G. Deo – Differential Equations, Narosa Publishing House.
5. N. Pishkunov – Differential and Integral Calculus, Peace Publishers, Moscow.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. I Year	
Subject	(English)	**Mathematics**	**Paper No.: III**
	(हिन्दी)	गणित	
Title of the paper	(English)	**Vector Analysis and Geometry**	
	(हिन्दी)	सदिष विष्लेषण एवं ज्यामिति	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	(English)	**Product of four vectors, Reciprocal vectors, vector differentiation, Gradient divergence and curl in Cartesian and cylindrical co-ordinates, Higher order derivatives, vector identities and vector equations.**
	(हिन्दी)	चार सदिषों का गुणन, व्युत्क्रम सदिष, सदिषअवकलन, कार्तीय एवं बेलनाकार निर्देषांकों में ग्रेडियट, डायवरजेन्स एवं कर्ल। उच्च कोटि अवकलज, सदिष समिकायें एवं सदिष समीकरण।
Unit II	(English)	**Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them. Application to geometry, curves in space, curvature and torsion, Serret – Frenet's formula.**
	(हिन्दी)	सदिष समाकलन, गॉस, ग्रीन एवं स्टोककी प्रमेय (बिना उपपत्ति) एवं इन पर आधारित प्रष्न। ज्यामिति में अनुप्रयोग, समष्टि में वक्र, वक्रता एवं मरोड़, सैरेट, फ्रेनेट सूत्र।
Unit III	(English)	**General equation of second degree, tracing of conics, system of conics, polar equation of a conic.**
	(हिन्दी)	**f}rh; ?kkr ds O;kid lehdj.k 'kkadoks dk vuqjs[k.k] 'kkado fudk;] 'kkado dk /kzqoh; lehdj.kA**
Unit IV	(English)	**Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone, equation of cylinder and its properties.**
	(हिन्दी)	दिये गये आधार पर शंकु का समीकरण, शंकु के जनक, तीन परस्पर लम्बवत जनकों हेतु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का समीकरण और इसके प्रगुण।

Unit V	(English)	Central conicoids, Paraboloid, eppipsoid, hyperboloid of one and two sheets and their properties.
	(हिन्दी)	केन्द्रीय शांकवज, एक और द्वि–पृष्ठीय के परवलयज, दीर्घवृत्तज, अतिपरवलयज एवं उनके गुणधर्म।

Text Books

1. N. Saran and S.N. Nigam – Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad
2. Gorakh Prasad and H.C. Gupta – Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad
3. N. Saran and R.S.Gupta – Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad (Unit IV)

Reference Books :

1. R.j.T. Bell – Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan

    India Ltd., 1994 (Unit - V)
2. Murray R. Spiegel – Theory and Problems of Advance Calculus, Schaum Publishing Company, New York.
3. Murray R. Spiegel – Vector Analysis, Schaum Publishing Company, New York.
4. Shanti Narayan – A Text Book of Vector Calculus, S. Chand & Co. New Delhi.
5. Shanti Narayan – A Text Book of Vector Algebra, S. Chand & Co. New Delhi.
6. S.L. Loney – The Elements of Coordinate Geometry, Macmillan and Company, London.
7. P.K. Jain and Khalil Ahmad – A text book of Analytical Geometry of Two Dimensions, MacMillan Indian Ltd., 1994.
8. P.K. Jain and Khalil Ahmad – A text book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1994.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. II Year		
Subject	(English)	**Mathematics**	**Paper No.: I**	
	(हिन्दी)	गणित		
Title of the paper	(English)	**Abstract Algebra**		
	(हिन्दी)	**अमूर्त बीजगणित**		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		**Total : 50**		

Unit	*Syllabus*	
Unit I	(English)	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties
	(हिन्दी)	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय समूह एवं सामान्य प्रगुण।
Unit II	(English)	Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.
	(हिन्दी)	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय, फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।
Unit III	(English)	Homomorphism and Isomorphism of groups. Fundamental theorem of homomorphism. Transformation and Permutation group. S_n (various subgroups of S_n $n < 5$ to be studied). Cayley's theorem.
	(हिन्दी)	lewgksa dh lekdkfjrk ,oa rqY;kdkfjrk] lekdkfjrk dk ewyHkwr izes;] :ikUrj.k ,oa Øep; lewg S_n ¼ S_n ds fofHkUu milewg] ladfYir gS fd $n < 5$ ½ dSyh izes;A
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of Automorphism, Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian gropus and non-abelian groups.
	(हिन्दी)	समूह स्वकारिता, अंतः स्वकारिता, स्वकारिताओं का समूह, संयुग्मिता संबंध और केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन–आबेली समूह के लिये कौषी का प्रमेय।

Signature of Member of B.O.S. ....

Unit V	(English)	Definition and basic properties of rings, Ring homomorphism subrings. Ideals and Quotient rings, Polynomial rings & its properties, Integral domain, principal ideal domain. Euclidean domains and unique factorization domains field and quotient fields.
	(हिन्दी)	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण, पूर्णांकीय प्रांत मुख्य गुणजावली प्रांत, यूक्लीडियन प्रांत एवं अद्वितीय गुणन खंडीकरण प्रांत, क्षेत्र एवं विभाग क्षेत्र।

Text Books

1. I.N.Herstein – Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977
2. PB Bhattacharya, S.K. Jain and S R Nagpaul – Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.
3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. Shantinarayan – A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.
2. Surjeet Singh – A Text Book of Modern Algebra.
3. N. Jacobson – Basic Algebra, Vol, I and II, W. II. Freeman.
4. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21
Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	**Paper No.: II**
	(हिन्दी)	गणित	
Title of the paper	(English)	Advanced Calculus	
	(हिन्दी)	उच्च कलन	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total : 50	

Unit	*Syllabus*	
Unit I	(English)	Definition of a sequence, Theorems on limits of sequences, Indeterminate Forms, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence, Absolute and conditional convergence of series of real and complex term, Rearrangment of series.
	(हिन्दी)	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, अनिर्धाय रूप, परिबद्ध एवं एकदिष्ट अनुक्रम कॉषी का अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉषी का समाकल परीक्षण, कॉषी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण। वास्तविक एवं समिश्र पदों की श्रेणियों का निरपेक्ष एवं प्रतिबंधमयी अभिसरण।
Unit II	(English)	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.
	(हिन्दी)	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलों के लिये डार्बू का मध्यवर्ती मान प्रमेय।
Unit III	(English)	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables, Jacobians.
	(हिन्दी)	nks pjksa ds Qyuksa dh lhek ,oa lkarR;] vkaf'kd vodyu pjksa dk ifjorZu] le?kkr Qyuksa ij vk;yj dk izes;] nks pjksa ds Qyuksa ds fy;s Vsyj dk izes;] tsdksfc;uA

Signature of Member of B.O.S. ....

Unit IV	(English)	**Envelops, Evolutes, Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.**
	(हिन्दी)	अन्वालोप, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लैग्रांज के गुणांकों की विधि, बीटा एवं गामा फलन।
Unit V	(English)	**Double and triple integrals, volumes and surfaces of solids of revolution, Dirichlet's integrals, change of order of integration in double integrals.**
	(हिन्दी)	द्विक एवं त्रि–समाकल, ठोस के परिभ्रमण से जनित आयतन एवं पृष्ठ, ड्रीचलेंटस् समाकल द्विक समाकल के क्रम का परिवर्तन।

Text Books

1. R.R. Goldbeg – Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi
2. Gorakh Prasad – Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad
3. Gorakh Prasad – Integral Calculus, Pothishala Pvt. Ltd. Allahabad
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. Gabriel Klaumber – Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975
2. T.M. Apostol – Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985
3. D. Soma Sundaram and B. Choudhary – A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.
4. Murray R. Spiegel – Theory and problems of advance Calculus, Schaum Publishing Co, New York.
5. O.E. Stanaitis – An introduction to Sequences, Series and improper integrals.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. II Year	
Subject	(English)	Mathematics	**Paper No.: III**
	(हिन्दी)	गणित	
Title of the paper	(English)	**Differential Equations**	
	(हिन्दी)	अवकल समीकरण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	(English)	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.
	(हिन्दी)	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।
Unit II	(English)	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.
	(हिन्दी)	लॉप्लास रूपांतरण, लॉप्लास रूपांतरण की रैखिकता, लॉप्लास रूपांतरण के लिये अस्तित्व प्रमेय। अवकलजों एवं समाकलों का लॉप्लाज रूपांतरण, स्थानांतर प्रमेय, रूपांतरणों का अवकलन एवं समाकलन।
Unit III	(English)	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving, Initial value problems of second order linear differential equations with constant coefficients.
	(हिन्दी)	izfrykse ykWlykl :ikarj.k] laoyu izes;] izkjafHkd eku leL;kvksa ds fy, f}rh; dksfV ds vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa ykWlykl :ikarj.kksa ds vuqiz;ksxA

Unit IV	**(English)**	Partial differential equations of the first order, Lagrarange's solutions, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method.
	(हिन्दी)	प्रथम कोटि के आंशिक अवकल समीकरण, लैग्रांज विधि, विशिष्ट प्रकार के अवकल समीकरण का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरला से हल, चारपिट की व्यापक विधि।
Unit V	**(English)**	Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficient. Partial differential equations reducible to equations with constant co-efficients, equation of vibrating string, Heat equation, Laplace equation and their solutions.
	(हिन्दी)	द्वितीय व उच्च कोटि के आंशिक अवकल समीकरण, द्वितीय कोटि के आंशिक अवकल समीकरणों का वर्गीकरण अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों में समानेय आंशिक अवकल समीकरण, कम्पनेय डोरी का समीकरण, ऊष्मा समीकरण, लाप्लास समीकरण एवं इनके हल।

Text Books

1. Sharma and Gupta – Integral Transform, Pragati , Prakashan Meerut.
2. Sharma and Gupta – Differential Equation, Pragati , Prakashan Meerut.
3. Raysinghania – Differential Equaitons, S. Chand & Company, New Delhi
4. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books :

1. D.A. Murray – Introductory course in differential equation, Orient Longman, India, 1967.
2. G.F. Simnons – Differential Equations, Tata Mcgraw Hill, 1972.
3. E.A. Codington – An introduction to Ordinary differential equations. Prentice Hall of India,1961
4. H.T.H. Piaggio – Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.
5. E.D. Rainville – Special Functions, The Macmillan Company, New York.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. III Year	
Subject	(English)	Mathematics	**Paper No.: I**
	(हिन्दी)	गणित	
Title of the paper	(English)	Linear Algebra and Numerical Analysis	
	(हिन्दी)	रैखिक बीजगणित एवं संख्यात्मक विश्लेषण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total : 50	

Unit	*Syllabus*	
Unit I	(English)	Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.
	(हिन्दी)	सदिष समष्टि की परिभाषा एवं उदाहरण उपसमष्टि उपसमष्टियां का योग एवं प्रत्यक्ष योग, रैखिक विस्तृति, रैखिक परतंत्रता, स्वतंत्रता एवं उनके मूल गुणधर्म आधार, आधार का अस्तित्व प्रमेय, विस्तार प्रमेय आधार में अवयवों की संख्या की अपरिवर्तनषील विमीय परिमित विमीय सदिष समष्टि का उपसमष्टि की पुरक उपसमष्टि का अस्तित्व उपसमष्टियों के योग की विमा, विभाग समष्टि एवं उसकी विमा।
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear-Quadratic and Hermitian forms.
	(हिन्दी)	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों की बीज गणित जाति शून्यता प्रमेय, आधार का परिवर्तन द्वैत समष्टि, द्विद्वैत समष्टि एवं प्राकृतिक तुल्याकारिता, एडज्वाइन्ट का रैखिक रूपांतरण, रैखिक रूपांतरणों के आइगन मान एवं आइगन सदिष, विकर्णीकरण, द्विएकघात, द्विघाती एवं हर्मितीय समघात।

Signature of Member of B.O.S.   ……………   ……………   ……………   ……………   ………………

Unit III	**(English)**	Inner Product Spaces – Cauchy-Schwartz inequality, orthogonal vectors, orthogonal complements, orthonormal sets and bases, Bessel's inequality for finite dimensional spaces, Gram-Schmidi orthogonalization process.
	(हिन्दी)	vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd lfn'k] ykafcr iwjd] izlkekU; ykafcd leqPp; ,oa vk/kkj] ifjfer foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV ykafcdrk izØeA
Unit IV	**(English)**	Solution of Equations : Bisection, Secant, Regula Falsi, Newton's Methods Roots of second degree Polynomial equations. Interpolation : Lagrange interpolation, Divided differences, Interpolation formula using Differences, Numerical Quadrature, Newtorn – Cote's formulae, Gauss Quadrature formulae.
	(हिन्दी)	समीकरणों के हल – द्वि–विभाजन विधि, सिकेन्ट विधि, रेग्यूला फाल्सी विधि, न्यूटन विधि, द्वितीय घात के बहुपद समीकरण के मूल। अन्तर्वेषन – लैग्रांज अन्तर्वेषन, विभाजित अंतर, अंतर के उपयोग से अन्तर्वेषन सूत्र संख्यात्मक क्षेत्रकलन न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र।
Unit V	**(English)**	Linear equations direct methods for solving systems of linear equations (Gauss elimination, L.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single step method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration, methods based on numerical differentiation.
	(हिन्दी)	रैखिक समीकरण, रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियाः (गाउस विलोपन, एल–यू वियोजन, चोलेस्की वियोजन) पुनरावृत्ती विधियाँ (जकाबी विधि, गाउस सिडेल विधि), साधारण अवकल समीकरण आयलर विधि, एकल चरण विधि, रूंग कुट्टा विधि, बहुचरण विधि, मिलने–सिम्पसन विधि, संख्यात्मक समाकलन पर आधारित विधियाँ एवं संख्यात्मक अवकलन पर आधारित विधियाँ।

Text Books

1. K.B. Datta – Matrix and Linear Algebra, Prentice hall of India Pvt. Ltd, New Delhi, 2000.
2. S.S. Sastry – Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

Reference Books :

1. K. Hoffman and R. Kunze – Linear Algebra, 2nd Edition, Prentice Hall Englewood
   Cliffs New Jersey, 1971.
2. S.K. Jain. A Gunawardena & P.B. Bhattacharya – Basic Linear Algebra with MATLAB
   Key College Publishing (Springer - Verlag) 2001.
3. S, Kumarsaran – Linear Alebra, A Bermetric Approach Prentice – Hall of India, 2000.
4. Balaguruswamy – Numerical methods, Tata Mc Graw Hill Publications, New York.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21
Theory

Class		B.Sc. / B.A. III Year	
Subject	(English)	Mathematics	**Paper No.: II**
	(हिन्दी)	गणित	
Title of the paper	(English)	**Real and Complex Analysis**	
	(हिन्दी)	वास्तविक एवं सम्मिश्र विश्लेषण	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	Syllabus	
Unit I	(English)	Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables, Schwartz's and Young's theorem, Implicit function theorem.
	(हिन्दी)	रीमान समाकल, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान प्रमेय, दो चरों के वास्तविक मान फलनों के आंषिक अवकलज एवं अवकलनीयता, स्वार्ज एवं यंग के प्रमेय, अस्पष्ट फलन प्रमेय।
Unit II	(English)	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullan's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.
	(हिन्दी)	अनुचित समाकल एवं उनका अभिसरण तुलना परीक्षण आबेल एवं डिरिक्ले का परीक्षण, प्रचालिक फलनों के रूप में फ़्रुलानी समाकल, सांतत्य, एक प्राचल के फलन के समाकल अवकलनीयता एवं समाकलनीयता, अर्द्ध एवं पूर्ण अंतरालों की फोरियर श्रेणी।

Unit III	**(English)**	**Definition and examples of metric spaces, Neighbourhoods, Limit points, interior points, Open and closed sets. Closure and interior, Boundary points, Subspace of metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real number as a complete ordered field. Dense subsets Baire Category theorem, Separable, second countable and first countable spaces.**
	(हिन्दी)	**nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehl;] lhek fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod la[;k;sa] la?ku mileqPp; ck;j&dsVsxjh izes;] i`FkDdj.k f}rh; x.kuh; ,oa izFke x.kuh; lef"VA**
Unit IV	**(English)**	**Continuous functions, Extension theorem, Uniform continuity, Compactness, Sequential compactness. Totally bounded spaces. Finite intersection property, Continuous functions and compact sets. Connectedness.**
	(हिन्दी)	सतत फलन, विस्तार प्रमेय, एकसमान सांतत्य, संहतता, अनुक्रमणीय सहतता पूर्ण परिबद्ध समिष्टि, परिमित सर्वनिष्ठ प्रगुण, संतत फलन एवं संहत समुच्चय, संबद्धता।
Unit V	**(English)**	**Complex numbers as ordered pairs, Geometric representation of complex numbers. Continuity and differentiability of compex function. Analytic functions, Cauchy-Reimann equations. Harmonic functionsMobius transformations. Fixed points, Cross ratio. Inverse points. Conformal Mappings.**
	(हिन्दी)	सम्मिश्र संख्या क्रमित युग्म के रूप में सम्मिश्र संख्या का ज्यामितिय निरूपण, सम्मिश्र, फलनों की सातत्यता और अवकलनीयता, विश्लैषिक फलन, कौषी–रीमान समीकरण, प्रसंवादी फलन, मोबियस रूपांतरण, स्थिर बिन्दु तिर्यक अनुपात, प्रतिलोम बिन्दु, कॉनफार्मल फलन।

Text Books

1. **Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi**
2. **G.J. Simmons – Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963**
3. **L.V. Alhfors, complex analysis Mc Graw Hill, New York**
4. **मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।**

Reference Books :

1. **Water Rudin – Real and Complex Analysis Mc Graw Hill, New York.**
2. **Ponnusway – Complex Analysis, Narosa Publication, New Delhi.**
3. **R.V. Churchill & J.W. Brown, Complex Variables and Application, 5th Edition, Mc Graw Hill, New York, 1990.**

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		B.Sc. / B.A. III Year	
Subject	(English)	**Mathematics**	**Paper No.: III**
	(हिन्दी)	गणित	
Title of the paper	(English)	**Discrete Mathematics**	
	(हिन्दी)	विविक्त गणित	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	

Unit	*Syllabus*	
Unit I	(English)	**Boolean functions – disjunctive & conjunctive normal forms (canonical & dual canonical), Bools's expansion theorem. Relations – Binary relation, Inverse relation, Composite relation, Equivalence relation, Equivalence classes & its properties Partition of a set.**
	(हिन्दी)	बूलीय फलन – वियोजनीय एवं संयोजनीय प्रसामान्य रूप (केनोनिकल एवं डूअल केनानिकल), बूल का विस्तार प्रमेय। संबंध – द्विचर संबंध, प्रतिलोम संबंध, संयोजित संबंध, तुल्यता संबंध, तुल्यता वर्ग एवं उसके गुण धर्म, समुच्चय का विभाजन।
Unit II	(English)	**Partial order relation, Partially ordered sets, totally ordered sets. Hasse diagram, maximal and minimal element first and last element. Lattice – definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.**
	(हिन्दी)	अंषतः क्रम संबंध, अंषतः क्रमित समुच्चय, पूर्णत क्रमित समुच्चय, हैसूह आरेख, उच्चिष्ठ एवं निम्निष्ठ अवयव, प्रथम एवं अन्तिम अवयव, जालक – परिभाषा एवं उदाहरण, द्वैत जालक, परिबद्ध जालक, वितरणीय जालक, पूरक जालक।
Unit III	(English)	**Graph – Definition types of graphs, Subgraphs, walk-path, circuit, connected and disconnected graphs. Euler graph. Hamiltonian path and circuit, shortest path in weighted graph. Dijkstra's Algorithm for shortest paths.**
	(हिन्दी)	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k] xeu] iFk ,oa ifjiFk laca) ,oa vlac) xzkQ vkW;yj xzkQ] gsfeYVksfu;u iFk vkSj ifjiFk] Hkkfjr vkys[k esa y?kqRre iFk gsrq MkWbtdL=k ,YxksfjFkeA

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Unit IV	(English)	**Trees and its properties, Rooted tree, Binary tree,Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.**
	(हिन्दी)	वृक्ष एवं उसके गुण धर्म, नियत वृक्ष, द्विवचर वृक्ष, जनक वृक्ष, आलेख की जाति एवं शून्यता, कुस्कल एवं प्राइम की एल्गोरिथम।
Unit V	(English)	**Matrix representation of graph – Incidence and Adjacency matrix. Cutset and its properties. Planar graphs (definition) Kuratowski's two graphs.**
	(हिन्दी)	आलेख का आव्यूह निरूपण – इन्सीडेंस एवं एडजेन्सी आव्यूह , कटसेट्स एवं उसके प्रगुण, प्लानर आलेख (परिभाषा), कुराटोव्हस्की के द्विआलेख।

Text Books

1. C.L.Liu – Elements of Discrete Mathematics, Mcgraw Hill, New-York
2. Narsingh Deo – Graph Theroy, Prentice Hall
3. मध्यप्रदेष हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21
Theory

M.Sc. SEMESTER I

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: I
Subject	**Mathematics**	
Title of the paper	**Advanced Abstract Algebra-I**	**Paper No : I (Compulsory)**
Medium of instructions (Teaching)	**English**	**Question Paper Language:** **English**
Maximum Marks	**Total 100** **Main Exam: 70**	**C.C.E: 30**

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Real Analysis	Paper No : II (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		M.Sc / M.A.		Semester: I	
Subject		**Mathematics**			
Title of the paper		**Topology-I**		**Paper No : III (Compulsory)**	
Medium of instructions (Teaching)		**English**		**Question Paper Language: English**	
Maximum Marks		**Total: 100**	**Main Exam: 70**	**C.C.E: 30**	
Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.				
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.				
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.				
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.				
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.				
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.				

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Advanced Discrete Mathematics-I	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

M.Sc. SEMESTER II

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		M.Sc / M.A.		Semester: II	
Subject		Mathematics			
Title of the paper		Advanced Abstract Algebra-II		Paper No : I	
Medium of instructions (Teaching)		English		Question Paper Language: English	
Maximum Marks		Total: 100	Main Exam: 70	C.C.E: 30	
Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.				
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.				
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.				
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.				
Unit V	Algebra of linear transformation,Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.				
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.				

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Lebesque Measure & Integration	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100 | Main Exam: 70	C.C.E: 30

Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.
Unit IV	The L^p-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L^p.
Unit V	Dual of space when $1 \leq P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 · C.C.E: 30

Unit I	Separation axioms T_0,T_1,T_2,T_3,T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology,Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Member of B.O.S.   ……………   ……………   ……………   ……………   ………………

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		M.Sc / M.A.		Semester:		II
Subject		**Mathematics**				
Title of the paper		**Complex Analysis-II**		**Paper No : IV**		
Medium of instructions (Teaching)		**English**		**Question Paper Language: English**		
Maximum Marks		**Total: 100**	**Main Exam: 70**		**C.C.E: 30**	
Unit I		Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation				
Unit II		Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.				
Unit III		Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.				
Unit IV		Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.				
Unit V		The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.				
Recommended Books		1. J.B. Conway, Functions of one complex variable, Springer-Verlag.				

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill

Note : Setting is to be Done Strictly From Recommended Books.

Signature of Member of B.O.S. ....

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

M.Sc. SEMESTER III

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Functional Analysis-I	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class		M.Sc / M.A.		Semester:	III
Subject		Mathematics			
Title of the paper		Integral Transform-I		Paper No : II	
Medium of instructions (Teaching)		English		Question Paper Language: English	
Maximum Marks		Total: 100	Main Exam: 70	C.C.E:	30
Unit I		Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.			
Unit II		Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.			
Unit III		Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.			
Unit IV		Application of Laplace Transform to electrical circuits, Application to Beams.			
Unit V		Heat conduction equation in one dimension, Application to heat conduction equation.			
Recommended Books		1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.			

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Operations Research-I	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.
Reference	1. S.D. Sharma, Operation Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. (This book comes with a CD containing software) 3. G.Hadley, Linear Programming, Narosa Publishing House, 1995. 4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass. 5. H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York.

Signature of Member of B.O.S.   ……………   ……………   ……………   ……………   ………………

	6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi **7.** N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Theory of Linear Operators-I	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.
Unit V	Spectral properties of compact linear operators.
Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

M.Sc. SEMESTER IV

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Functional Analysis-II	Paper No : I	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.

Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Integral Transform-II	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100 Main Exam: 70	C.C.E: 30

Unit I	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.
Unit II	Finite Fourier Transform and Fourier Integral.
Unit III	Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.
Unit IV	Application for Fourier Transform to Boundary value problems.
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transforms by I.N. Sneddon. 3. Integral Transforms by Gupta and Vashishtha.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

lass	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Operations Research-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995. 4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass. 5. H.A. Taha, Operations Research,- An Introduction Macmillan

	Publishing.
	6. **Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.**
	7. **N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.**

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College,
Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2020-21

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Theory of Linear Operators-II	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.

Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini NaiduGovt.GirlsPostgraduate Autonomous college, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-I	Paper No : I (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total 100	Main Exam: 70	C.C.E: 30

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.		Semester: I
Subject	Mathematics		
Title of the paper	Real Analysis		Paper No : II (Compulsory)
Medium of instructions (Teaching)	English		Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	Paper No : III (Compulsory)
Title of the paper	Topology-I	
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester:		I
Subject	Mathematics			
Title of the paper	Advanced Discrete Mathematics-I	Paper No : V(l) (optional)		
Medium of instructions (Teaching)	English	Question Paper Language: English		
Maximum Marks	Total: 100	Main Exam:	70	C.C.E: 30

Unit I	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

M.Sc. SEMESTER II

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.
Unit V	Algebra of linear transformation,Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester:	II	
Subject	Mathematics			
Title of the paper	Lebesque Measure & Integration	Paper No : II		
Medium of instructions (Teaching)	English	Question Paper Language: English		
Maximum Marks	Total: 100	Main Exam: 70	C.C.E:	30
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.			
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.			
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.			
Unit IV	The L^P-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of $L^{p.}$			
Unit V	Dual of space when $1 \leq P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.			
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.			

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Separation axioms T_0,T_1,T_2,T_3,T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology,Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Complex Analysis-II	Paper No : IV	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.
Unit III	Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-Verlag.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

M.Sc. SEMESTER III

Signature of members of B.O.S ---------   ----------   -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Signature of members of B.O.S ---------   ----------   -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Functional Analysis-I	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Integral Transform-I	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.
Unit II	Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Operations Research-I	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.
Reference	1. S.D. Sharma, Operation Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. (This book comes with a CD containing software) 3. G.Hadley, Linear Programming, Narosa Publishing House, 1995. 4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass.

Signature of members of B.O.S ---------- ---------- --------------
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	5. H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York. 6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi 7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-I	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.
Unit V	Spectral properties of compact linear operators.
Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

M.Sc. SEMESTER IV

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Functional Analysis-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.
Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester:	IV
Subject	Mathematics		
Title of the paper	Integral Transform-II	Paper No : II	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.
Unit II	Finite Fourier Transform and Fourier Integral.
Unit III	Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.
Unit IV	Application for Fourier Transform to Boundary value problems.
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transforms by I.N. Sneddon. 3. Integral Transforms by Gupta and Vashishtha.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Advanced Graph Theory-II	Paper No : III	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.		Semester: IV	
Subject	Mathematics			
Title of the paper	Operations Research-II		Paper No : IV	
Medium of instructions (Teaching)	English		Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30	
Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.			
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.			
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)			
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.			
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.			
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.			
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995.			

Signature of members of B.O.S ---------   ----------   --------------
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	4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.
	5. H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.
	6. Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-II	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.
Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.

Note : Setting is to be Done Strictly From Recommended Books.

Course: B.Sc. (3 Years Degree Course)

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Scheme of examination

Theory Papers	Title of paper	Marks			Compulsory/Optional
		Theory	C.C.E I+II+III+IV	Total	
		150	50	200	
B.SC.I-YEAR					
Paper I	Algebra and Trigonometry	50			Compulsory
PaperII	Calculus & Differential Equations	50	50	200	Compulsory
Paper III	Vector Analysis & Geometry	50			Compulsory
B.SC. II YEAR					
Paper 1	Abstract Algebra	50			Compulsory
Paper II	Advanced Calculus	50	50	200	Compulsory
Paper III	Differential Equations	50			Compulsory
B.SC. III YEAR					
Paper	Linear Algebra & Numerical Analysis	50			Compulsory
Paper	Real & Complex Analysis	50	50	200	Compulsory
Paper	Discrete Mathematics	50			Optional

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Scheme of examination

Course: M.Sc. (2 Years Degree Course)

SEMESTER I					
Theory Papers	Title of paper	Compulsory/Optional	Marks		
			Theory	C.C.E	Total
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100
Paper II	Real Analysis	Compulsory	70	30	100
Paper III	Topology-I	Compulsory	70	30	100
Paper IV	Complex Analysis-I	Compulsory	70	30	100
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER II					
Paper I	Advanced Abstract Algebra-II	Compulsory	70	30	100
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100
Paper III	Topology-II	Compulsory	70	30	100
Paper IV	Complex Analysis-II	Compulsory	70	30	100

Signature of members of B.O.S ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER III					
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER IV					
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100
Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory	--	--	50
Paper VII	Internship	Compulsory	--	--	100

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Syllabus

2019-2020

Semester / Yearly Pattern

Subject: MATHEMATICS

	CONTENTS		Page No.

Date of submission in Autonomous Examination cell:

Signature

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college,
Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

H.O.D.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20
Theory

Class		B.Sc. / B.A. I Year	
Subject	**(English)**	Mathematics	**Paper No.: I**
	¼fgUnh½	**xf.kr**	
Title of the paper	**(English)**	**Algebra and Trigonometry**	
	¼fgUnh½	**chtxf.kr ,oa f=dks.kfefr**	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		Syllabus	Recommended Books
Unit I	**(English)**	Rank of matrix, Normal & Echelon form of a matrix, Characteristics equations of a matrix, Eigen values, Eigen vectors, Linear Independence of row and column matrix.	
	¼fgUnh½	vkO;wg dh tkfr] vkO;wg dh izklkekU; ,oa ,slsykWu :i] vkO;wg dk vfHkyk{kf.kd lehdj.k] vk;xsu eku] lfn'k] iafDr ,oa LrEHk vkO;wg dh Lora=rkA	
Unit II	**(English)**	Cayley Hamilton theorem and its use in finding inverse of a matrix, application of matrix to solve a system of linear (homogenous and non-homogenous) equations, theorems on consistency and inconsistency ofa system of linear equations, solving linear equations upto three unknown.	
	¼fgUnh½	dsyh&gSfeYVu izes; ,oa vkO;wg dk O;qRØe vkO;wg ¼le?kkr ,oa vle?kkr½ Kkr djus esa bldk mi;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy;s vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrk ,oa vlaxrk ij izes;] rhu vKkr jkf'k;ksa rd ds jSf[kd lehdj.kksa ds gyA	
Unit III	**(English)**	Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equation. Reciprocal equations, Descarte's rule of signs.	

Signature of Member of B.O.S. …………… …………… …………… …………… ………………

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

	¼fgUnh ½	,d pj ds lekekU; cgqinksa ds lehdj.k ds xq.kkadksa ,oa ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k] O;qRØe lehdj.k] fpUgksa dk fndkrsZa fu;eA
Unit IV	**(English)**	Logic – Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalance, Algebra of propositions, Boolean Algebra – definition and properties , Boolean Functions, switching circuits and its applications, logic gates and circuits.
	¼fgUnh ½	rdZ'kkL= & rdZ la;kstd] lR;rk lkj.kh] iqu:fDr vkSj O;k?kkr] rkfdZd rqY;rk] lk/;ksa dk chtxf.krA cwyh; chtxf.kr & ifjHkk"kk ,oa mlds xq.k/keZ] cwyh; Qyu] fLopu ifjiFk ,oa mlds vuqiz;ksx] rdZ}kj ,oa ifjiFkA
Unit V	**(English)**	De-Moivre's theorem and its application, direct and invese circular and hyperbolic functions, expansion of trigonometric functions, logarithm of complex quantities, Gregory's series, summation of trignometrical series.
	¼fgUnh ½	Mh&eksbolZ izes; ,oa blds vuqiz;ksx] izR;{k ,oa O;qRØe o`Rrh; ,oa vfrijoyf;d QyuQ f=dks.kferh; Qyuksa dk foLrkj] lfEeJ la[;kvksa dk y?kqx.kd] xzhxksjh Js.kh f=dks.kferh; Jsf.k;ksa dk ;ksxA

Text Books

1. S.L. Loney – Plane Trigonometry Part - II

2. K.B.Datta – Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd, New Delhi 2000.

3. Chadrika Prasad – A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd. Allahabad

4. C.L.Liu – Elements of Discrete Mathematics (Second Edition), Mc Graw Hill, International Edition, Computer Science Series, 1986.

5.. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Signature of Member of B.O.S.   ……………   ……………   ……………   ……………   ………………

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

Reference Books :

1. H.S.Hall and S.R. Knight – Higher Algebra H.M. Publication 1994.
2. N. Jacobson – Basic Algebra Vol.I and II, W.H. Freeman.
3. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House
4. N. Saran and R.S. Gupta – Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad.

Theory

Class		B.Sc. / B.A. I Year	
Subject	**(English)**	**Mathematics**	**Paper No.: II**
	¼fgUnh½	**xf.kr**	
Title of the paper	**(English)**	**Calculus and Differential Equations**	
	¼fgUnh½	**dyu ,oa vody lehdj.k**	
Compulsory Paper		Medium of Teaching : Hindi, English	
Maximum Marks		**Total : 50**	**Main Exam:**	**C.C.E.:**

Unit		Syllabus	Recommended Books
Unit I	**(English)**	Succssive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.	
	¼fgUnh½	mRrjksRrj vodyu] yScuht izes;] esDykfju ,oa Vsyj Js.kh esa foLrkjA vuarLi'khZA	
Unit II	**(English)**	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curcves in Cartesian and polar coordinates.	
	¼fgUnh½	oØrk] mRryrk ,oa voryrk dk ijh{k.k] ufr ifjorZu fcUnq] cgqfcUnq] dkrhZ; ,oa /kzqoh; funsZ'kkadksa eas oØksa dk vuqjs[k.kA	
Unit III	**(English)**	Integration of transcendental functions, Definite Integrals, Reduction formulae, Quadrature, Rectification.	
	¼fgUnh½	vchth; Qyuksa dk lekdyu] fuf'pr lekdyu] lekU;u lw=] {ks=dyu ,oa pkidyuA	
Unit IV	**(English)**	Linear differential equations and equations reducible to the linear form, Exact differential equation, first order and higher	

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		degree equations solvable for x, y and p, Chairaut's equation and singular solutions, geometrical meaning of a differential equations, Orthogonal trajectories.	
	¼fgUnh ½	jSf[kd vodyu lehdj.k ,oa jSf[kd lehdj.k esa lekusa; vody lehdj.k] ;FkkrFk vody lehdj.k x, y ,oa p esa gy gksus ;kssX; izFke dksfV ,oa mPp /kkrh;Z vody lehdj.k] Dysjks dk lehdj.k vkSj fofp= gyA vody lehdj.k dk T;kferh; vFkZ] ykafcd laNsfn;kA	
Unit V	(English)	Linear differential equation with constant coefficient, Homogeneous linear ordinary differential equation, Linear differential equation of second order, transformation of equations by chainging the dependent variable / independent variable, method of variation of parameters.	
	¼fgUnh ½	vpj xq.kkadksa okys jSf[kd vody lehdj.k] lk/kkj.k jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd vody lehdj.k Lora= @ pj ijra= pj ds ifjorZu }kjk lehdj.kksa dk :ikarj.k] izkpy fopkj fof/kA	

Text Books

1. Gorakh Prasad – Differential Calculus, Pothishala Private Ltd. Allahabad

2. Gorakh Prasad – Integral Calculus, Pothishala Private Ltd. Allahabad

3. D.A. Murray – Introductory Course in Differential Equations, Orient Longman (India) 1967

4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Reference Books :

1. G.F. Simmons – Differential Equations, Tata Mc Graw Hill, 1972
2. E.A. Codington – An Introduction to ordinary differential equation, Prentice Hall of India, 1961
3. H.T.H. Piaggio – Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, Delhi, 1985
4. S.G. Deo – Differential Equations, Narosa Publishing House.

Signature of Member of B.O.S. ……………   ……………   ……………   ……………   ………………

5. N. Pishkunov – Differential and Integral Calculus, Peace Publishers, Moscow.

Theory

Class		B.Sc. / B.A. I Year		
Subject	**(English)**	**Mathematics**	**Paper No.: III**	
	¼fgUnh½	**xf.kr**		
Title of the paper	**(English)**	**Vector Analysis and Geometry**		
	¼fgUnh½	**lfn'k fo'ys"k.k ,oa T;kfefr**		
Compulsory Paper		**Medium of Teaching : Hindi, English**		
Maximum Marks		**Total : 50**	**Main Exam:**	**C.C.E.:**

Unit		*Syllabus*	*Recommended Books*
Unit I	**(English)**	Product of four vectors, Reciprocal vectors, vector differentiation, Gradient divergence and curl in Cartesian and cylindrical co-rodinates, Higher order derivatives, vector identities and vector equations.	
	¼fgUnh½	pkj lfn'kksa dk xq.ku] O;qRÙûe lfn'k] lfn'kvodyu] dkrhZ; ,oa csyukdkj funsZ'kdksa esa xzsfM;V] Mk;ojtsUl ,oa dyZ mPp dksfV vodt] lfn'k lfedk;s ,oa lfn'k lehdj.kA	
Unit II	**(English)**	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them. Application to geometry, curves in space, curvature and torsion, Serret – Frenet's formula.	

Signature of Member of B.O.S.   ....

	¼fgUnh ½	lfn'k lekdyu] xkWl] xzhu ,oa LVksddh izes; ¼fcuk miifÙk½ ,oa bu ij vk/kkfjr iz'uA T;kfefr esa vuqiz;ksx] lef"V esa oØ] oØrk ,oa ejksM+] lSjsV] ÝsusV lw=A	
Unit III	(English)	General equation of second degree, tracing of conics, system of conics, polar equation of a conic.	
	¼fgUnh ½	f}rh; ?kkr ds O;kid lehdj.k] 'kkadoksa dk vuqjs[k.k] 'kkado fudk;] 'kkado dk /kzqoh; lehdj.kA	
Unit IV	(English)	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone, equation of cylinder and its properties.	
	¼fgUnh ½	fn;s x;s vk/kkj ij 'kadq dk oehdj.k] 'kadq ds tud] rhu ijLij yEcor tudksa gsrq izfrc?k] yEco`Rrh; 'kadq] csyu dk lehdj.k vkSj blds izxq.kA	
Unit V	(English)	Central conicoids, Paraboloid, eppipsoid, hypterboloid of one and two sheets and their properties.	
	¼fgUnh ½	dsUnzh; 'kkadot] ,d vkSj f}&i`"Bh; ds ijoy;t nh?kkZo`Rrt] vfrijoy;t ,oa muds xq.k/keZA	

Text Books

1. N. Saran and S.N. Nigam – Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad

2. Gorakh Prasad and H.C. Gupta – Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad

3. N. Saran and R.S.Gupta – Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad (Unit IV)

Reference Books :

1. R.j.T. Bell – Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit - V)
2. Murray R. Spiegel – Theory and Problems of Advance Calculus, Schaum Publishing Company, New York.

Signature of Member of B.O.S. …………… …………… …………… …………… ………………

3. Murray R. Spiegel – Vector Analysis, Schaum Publishing Company, New York.

4. Shanti Narayan – A Text Book of Vector Calculus, S. Chand & Co. New Delhi.

5. Shanti Narayan – A Text Book of Vector Algebra, S. Chand & Co. New Delhi.

6. S.L. Loney – The Elements of Coordinate Geometry, Macmillan and Company, London.

7. P.K. Jain and Khalik Ahmad – A text book of Analytical Geometry of Two Dimensions, MacMillan Indian Ltd., 1994.

8. P.K. Jain and Khalik Ahmad – A text book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1994.

Theory

Class		B.Sc. / B.A. II Year		
Subject	(English)	Mathematics	**Paper No.: I**	
	¼fgUnh½	xf.kr		
Title of the paper	(English)	Abstract Algebra		
	¼fgUnh½	vewrZ chtxf.kr		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		*Syllabus*	*Recommended Books*
Unit I	(English)	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties	
	¼fgUnh½	lewg dh ifjHkk"kk ,oa lekU; izxq.k] milewg] mileqPp; ls tfur milewg] pØh; lewg ,oa lekU; izxq.kA	
Unit II	(English)	Coset decomposition, Lagrange's theorem and its corollaries including Fermat's theorem, Normal subgroups, Quotient groups.	

	¼fgUnh ½	lgleqPp; fo;kstu] ySxzkat izes; ,oa bldh miizes;] izlkekU; milewg] foHkkx lewgA	
Unit III	(English)	Homomorphism and Isomorphism of groups. Fundamental theorem of homomorphism. Transformation and Permutation group. S_n (various subgroups of S_n $n < 5$ to be studied). Cayley's theorem.	
	¼fgUnh ½	lewgksa dh lekdkfjrk ,oa rqY;dkfjrk] lekdkfjrk dk ewyHkwr izes;] :ikUrj.k ,oa Øep; lewg S_n ¼ S_n ds fofHkUUu milewg] ladfYir gS fd $n < 5$ ½ dSyh izes;A	
Unit IV	(English)	Group Automorphism, Inner Automorphism, Group of Automorphism, Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian gropus and non-abelian groups.	
	¼fgUnh ½	lewg Lodkfjrk] var% Lokdkfjrk] Lokdkfjrkvksa dk lewg] la;qfXerk laca/k vkSj dsUnzh;dkjd] izlkekU;d] x.kuk fl)kar ,oa ifjfer lewg dk oxZ lehdj.kA ifjfer vkcsyh ,oa vu&vkcsyh lewg ds fy;s dkS'kh dk izes;A	
Unit V	(English)	Definition and basic properties of rings, Ring homomorphism subrings. Ideals and Quotient rings, Polynomial rings & its properties, Interal domain and Field.	
	¼fgUnh ½	oy; dh ifjHkk"kk ,oa lkekU; izxq.k] oy; lekdkfjrk] mioy;] xq.ktkoyh ,oa foHkkx oy;] cgqin oy; ,oa mlds izxq.k] iw.kkZdh; izkar ,oa {ks=A	

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

Text Books

1. I.N.Herstein – Topics in Algebra. Willey Eastern Ltd. New Delhi, 1977

2. PB Bhattacharya, S.K. Jain and S R Nagpaul – Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997.

3. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Reference Books :

1. Shantinarayan – A text Book of Modern Abstract Algebra, S. Chand and Company, New Delhi.
2. Surjeet Singh – A Text Book of Modern Algebra.
3. N. Jacobson – Basic Algebra, Vol, I and II, W. II. Freeman.
4. I.S. Luther and I.B.S. Passi – Algebra. Vol I and II, Narosa Publishing House

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20
Theory

Class		B.Sc. / B.A. II Year		
Subject	**(English)**	Mathematics	**Paper No.: II**	
	¼fgUnh½	**xf.kr**		
Title of the paper	**(English)**	**Advanced Calculus**		
	¼fgUnh½	**mPp dyu**		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		Syllabus	Recommended Books
Unit I	**(English)**	Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences. Cauchy's convergence criterion, series of non-negative terms, comparison test. Cauchy's integral test. Cauchy's root test, ratio tests. Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence.	
	¼fgUnh½	vuqØe dh ifjHkk"kk] vuqØe dh lhek ij izes;] ifjc) ,oa ,dfn"V vuqØe dkW'kh dk vfHklj.k ekin.M] v_.kkkRed inksa dh Js.kh] rqyuk ijh{k.k] dkW'kh dk lekdy ijh{k.k] dkW'kh dk ewy ijh{k.k] vuqikr ijh{k.k] jkch dk ijh{k.k] y?kqx.kdh; ijh{k.k] ,dkUrj Js.kh] fycuht ijh{k.k] fujis{k ,oa izfrca/kh vfHklj.kA	
Unit II	**(English)**	Continuity of functions of single variable, sequential continuity. Properties of continuous functions. Uniform continuity, chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.	
	¼fgUnh½	lkarR; ¼,d pj Qyu½] vuqØe.kh; lkarR;k] lakr Qyuksa ds xq.k/keZ] ,d leku lkarR;] vodyuh;rk dk J`a[kyk fu;e e/;eku izes; ,oa mudk T;kehrh; vFkZ vodyksa ds fy;s MkcwZ dk e/;orhZ eku izes;A	

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Unit III	**(English)**	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables, Jacobians.	
	¼fgUnh ½	nks pjksa ds Qyuksa dh lhek ,oa lkarRp] vkaf'kd vodyu pjksa dk ifjorZu] le?kkr Qyuksa ij vk;yj dk izes;] nks pjksa ds Qyuksa ds fy;s Vsyj dk izes;] tsdksfc;uA	
Unit IV	**(English)**	Envelops, Evolutes, Maxima and Minima of functions of two variables. Lagrange's multiplier method. Beta and Gamma Functions.	
	¼fgUnh ½	vUokyksiZ] dsUnzt] nks pjksa ds Qyuksa dk mfPp"B ,oa fufEu"B] ySxzkat ds xq.kkadksa dh fof/k] chVk ,oa xkek QyuA	
Unit V	**(English)**	Double and triple integrals, volumes and surfaces of solids of revolution Dirichlet's integrals, change of order of integration in double integrals.	
	¼fgUnh ½	f}d ,oa f=&lekdy] Bksl ds ifjHkze.k ls tfur vk;ru ,oa iz"B] Mªhpysa VI~ lekdy f}d lekdy ds Øe dk ifjorZuA	

Text Books

1. R.R. Goldbeg – Real Analysis, Oxford & I.B.H. Publishing Co. New Delhi

2. Gorakh Prasad – Differenatial Calculus, Pothishala Pvt. Ltd. Allahabad

3. Gorakh Prasad – Integral Calculus, Pothishala Pvt. Ltd. Allahabad

4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Signature of Member of B.O.S. …………… …………… …………… …………… ………………

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

Reference Books :

1. Gabriel Klaumber – Mathematical Analysis, Marcel Dekkar, Inc, New York, 1975

2. T.M. Apostol – Mathmematical Analysis, Narosa Publishing House, New Delhi, 1985

3. D. Soma Sundaram and B. Choudhary – A first Course in mathematical Analysis, Narosa Publishing, House , New Delhi, 1997.

4. Murray R. Spiegel – Theory and problems of advance Calculus, Schauma Publishing Co, New York.

5. O.E. Stanaitis – An introduction to Sequences, Series and improper integrals.

Theory

Class		B.Sc. / B.A. II Year		
Subject	**(English)**	Mathematics	**Paper No.: III**	
	¼fgUnh½	xf.kr		
Title of the paper	**(English)**	**Differential Equations**		
	¼fgUnh½	**vody lehdj.k**		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		*Syllabus*	*Recommended Books*
Unit I	**(English)**	Series solutions of differential equations. Power series method. Bessel and Legendre equations, Bessel's and Legendre's functions and their properties – recurrence and generating function. Orthogonality of functions.	
	¼fgUnh½	vody lehdj.k dk Js.kh gy] ?kkr Js.kh gy] csly ,oa ystsUMªs lehdj.k] csly ,oa ystsUMªs Qyu ,oa muds xq.k/keZ] iqujko`Rr ,oa tud Qyu] Qyu dh ykfEcdrkA	
Unit II	**(English)**	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems. Differentiation and integration of transforms.	
	¼fgUnh½	ykWIykl :ikarj.k] ykWIykl :ikarj.k dh jSf[kdrrk] ykWIykl :ikarj.k ds fy;s vfLrRo izes;A vodytksa ,oa	

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		lekdyksa dk ykWIykt :ikarj.k] LFkkukarj izes;] :ikarj.k dk vodyu ,oa lekdyuA	
Unit III	**(English)**	Inverse Laplace transforms, Convolution theorem. Application of Laplace transformation in Solving linear differential equations with constant coefficients.	
	¼fgUnh½	izfrykse ykWIykl :ikarj.k] laoyu izes;] vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa ykWIykl :ikarj.kksa ds vuqiz;ksxA	

Unit IV	**(English)**	Partial differential equations of the first order, Lagrarange's solutions, Some special types of equations which can be solved easily by methods other than the general method, Charpit's general method.	
	¼fgUnh½	izFke dksfV ds vkaf'kd vody lehdj.k] ySxzkkat fof/k] fof'k"V izdkj ds vody lehdj.k dk O;kid fof/k ds vfrfjDr vU; fof/k }kjk ljyk ls gy] pkjfiV dh O;kid fof/kA	
Unit V	**(English)**	Partial differential equations of second and higher orders. Classification of partial differential equations of second orde. Homogeneous and non-homogeneous equations with constant coefficient. Partial differential equations reducible to equations with constant co-efficients.	
	¼fgUnh½	f}rh; o mPp dksfV ds vkaf'kd vody lehdj.k] f}rh; dksfV ds vkaf'kd vody lehdj.kksa dk oxhZdj.k vpy xq.kkadksa ds le?kkr ,oa vle?kkr lehdj.k] vpj xq.kkadksa esa lekus; vkaf'kd vody lehdj.kA	

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

Text Books

1. Sharma and Gupta – Integral Transform, Pragati , Prakashan Meerut.

2. Sharma and Gupta – Differential Equation, Pragati , Prakashan Meerut.

3. Raysinghania – Differential Equaitons, S. Chand & Company, New Delhi

4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Reference Books :

1. D.A. Murray – Introductory course in differential equation, Orient Longman, India, 1967.
2. G.F. Simnons – Differential Equations, Tata Mcgraw Hill, 1972.
3. E.A. Codington – An introduction to Ordinary differential equations. Prentice Hall of India,1961
4. H.T.H. Piaggio – Elementary Treatise on Differential equations and their applications, C.B.S. Publisher and Distributors, Delhi, 1985.
5. E.D. Rainville – Special Functions, The Macmillan Company, New York.

Theory

Class		B.Sc. / B.A. III Year		
Subject	(English)	Mathematics	**Paper No.: I**	
	¼fgUnh½	xf.kr		
Title of the paper	(English)	Linear Algebra and Numerical Analysis		
	¼fgUnh½	jSf[kd chtxf.kr ,oa la[;kRed fo'ys"k.k		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		*Syllabus*	*Recommended Books*
Unit I	(English)	Definition and examples of Vector spaces, subspaces, sum and direct sum of subspaces. Linear span, Linera dependence, independence and their basic properties, Basis, Existence Theorem for basis. Extension Theorem, Invariance of the number of elements of a basis. Dimension, Finite dimensional vector spaces, Existence of complementary subspace of a subspace of finite dimensional vector space. Dimension of sum of subspaces. Quotient space and its dimension.	

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	¼fgUnh ½	lfn'k lef"V dh ifjHkk"kk ,oa mnkgj.k milef"V milef"V;ka dk ;ksx ,oa izR;{k ;ksx] jSf[kd foLr`fr] jSf[kd ijra=rk] Lora=rk ,oa muds ewy xq.k/keZ vk/kkj] ifjfer foeh; lfn'k lef"V;k¡] vk/kkj dk vfLrRo izes;] foLrkj izes; vk/kkj esa vo;ksxsa dh la[;k dh vifjorZu'khy foeh; ifjfer foeh; lfn'k lef"V dk milef"V dh iqjd milef"V dk vfLrRo milef"V;ksa ds ;ksx dh foek] foHkkx lef"V ,oa mldh foekA	
Unit II	(English)	Linear transformations and their respresentation as matrices, Algebra of linear transformation, Rank-Nullity theorem, change of basis, dual space, bi-dual space and natural isomorphism, adjoint of a linear transformation, eigen values and eigen vectors of a linear transformation, Diagonaatisation. Billinear-Quadratica and Hermitian forms.	
	¼fgUnh ½	jSf[kd :ikarj.k ,oa udk vkO;wg fu:i.k] jSf[kd :ikarj.kksa dh cht xf.kr tkfr 'kwU;rk izes;] vk/kkj dk ifjorZu }Sr lef"V] f}}Sr lef"V ,oa izkd`frd rqY;dkfjrk] jSf[kd :ikarj.k dk layXu :ikarj.k] jSf[kd :ikarj.kksa ds vkbxu eku ,oa vkbxu lfn'k] fod.khZdj.k] f},d?kkr] f}?kkrh ,oa gfeZrh; le?kkrA	
Unit III	(English)	Inner Product Spaces – Cauchy-Schwartz inequality, orthogonal vectors, orthogonal complements, orthonormal sets and bases, Bessel's inequality for finite dimensional spaces, Gram-Schmidi orthogonalization process.	
	¼fgUnh ½	vkarj xq.ku lef"V & dkS'kh Lokts vlfedk] ykafcd lfn'k] ykafcr iwjd izlkekU; ykafcd leqPp; ,oa vk/kkj]	

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20

		ifjfer foeh; lef"V;ksa gsrq csly dh vlfedk] xzke f'eV ykafcdrk izØeA	
Unit IV	(English)	Solution of Equations : Bisection, Secant, Regula Falsi, Newton's Methods Roots of second degree Polynomials. Interpolation : Lagrance interpolation, Divided differences, Interpolation formula using Differences, Numerical Quadrature, Newtorn – Cote's formulae, Gauss Quadrature formulae.	
	¼fgUnh½	lehdj.kksa ds gy & f}&foHkktu fof/k] jsX;wyk QkYlh fof/k] U;qVufof/k] f}rh; ?kkr ds cgqin lehdj.k ds ewyA vUrZos'ku & ySxzkat vUrZos'ku] foHkkftr varj] varj ds mi;ksx ls vUrZos'ku lw= la[;kRed {ks=dyu U;qVu dksV~l lw=] xkml {ks=dyu lw=A	
Unit V	(English)	Linear equations direct methods for solving systems of linear equations (Gauss elimination, I.U. decomposition, Cholesky decomposition). Iterative methods (Jacobi, Gauss – Seidal reduction methods). Ordinary differential equations : Euler method, Single sep method, Runge-Kutta's method, Multistep methods, Milne Simpson method, Methods based on Numercal integration, methods based on numerical differentiation.	
	¼fgUnh½	jSf[kd lehjd.k] jSf[kd lehdj.kkas ds fudk; dks gy djus dh izR;{k fof/k;k% ¼xkml foyksiu] ,y&;w fo;kstu] pksysLdh fo;kstu½' iqujko`Ùkh fof/k;k¡ ¼tdkch fof/k] xkml flMsy fof/k½] lk/kkj.k vody lehdj.k vk;j fof/k] ,dy pj.k fof/k] :ax dqV~Vk fof/k] cgqpj.k fof/k] feyus&flEilu fof/k] la[;kRed lekdyu ij	

		vk/kkfjr fof/k;k¡ ,oa la[;kRed vodyu ij vk/kkfjr fof/k;k¡A	

Text Books

1. K.B. Datta – Matrix and Linear Algebra, Practice hall of India Pvt. Ltd, New Delhi, 2000.

2. S.S. Sastry – Introductory Mehtods of Numerical Analysis, PHI Learning Pvt. Ltd.

Reference Books :

1. K. Hoffman and R. Kunze – Linear Algebra, 2nd Edition, Prentice Hall Englewood Cliffs New Jersey, 1971.
2. S.K. Jain. A Gunawardena & P.B. Bhattacharya – Basic Linear Algebra with MATLAB Key College Publishing (Springer - Verlag) 2001.
3. S, Kumarsaran – Linear Alebra, A Bermetric Approac Prentice – Hall of India, 2000.
4. Balaguruswamy – Numerical methods, Tata Mc Graw Hill Publications, New York.

Sarojini Naidu Govt. Girls' P. G. (Autonomous) College, Shivaji Nagar, Bhopal
Syllabus for Mathematics
(As Recommended by the Board of Studies)
Session: 2019-20
Theory

Class		B.Sc. / B.A. III Year		
Subject	**(English)**	Mathematics	**Paper No.: II**	
	¼fgUnh½	xf.kr		
Title of the paper	**(English)**	**Real and Complex Analysis**		
	¼fgUnh½	**okLrfod ,oa lfEeJ fo'kys"k.k**		
Compulsory Paper		Medium of Teaching : Hindi, English		
Maximum Marks		Total : 50	Main Exam:	C.C.E.:

Unit		*Syllabus*	*Recommended Books*
Unit I	**(English)**	Riemann integral, Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables, Schwartz's and Young's theorem, Implicit function theorem.	
	¼fgUnh½	jheku lekdy] lrr ,oa ,dfn"V Qyuksa dh lekdyuh;rk] lekdyu dk ewyHkwr izes;] lekdyuksa ds ek/;eku izes;] nks pjksa ds okLrfod eku Qyuksa ds vkaf'kd vodyt ,oa vodyuh;rk] LoktZ ,oa ;ax ds izes;] vLi"V Qyu izes;A	
Unit II	**(English)**	Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullanl's integral as a function of a parameter. Continuity, derivability and integrability of an integral of a function of a parameter. Fourier series of half and full intervals.	
	¼fgUnh½	vuqfpr lekdy ,oa mudk vfHklkj.k rqyuk ijh{k.k vkcsy ,oa fMfjDys dk ijh{k.k] izpkfyd Qyuksa ds :i esa Ýqykuh lekdy] lkarR;] ,d izkpy ds Qyu ds lekdy vodyuh;rk ,oa lekdyuh;rk v)Z ,oa iw.kZ varjkyksa dh Qksfj;j Js.khA	

Unit III	**(English)**	Definition and examples of metric spaces, Neighbourhoods, Limit points, interior points, Open and closed sets. Closure and interior, Boundary points, Subspace of metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real number as a complete ordered field. Dense subsets Baire Category theorem, Separable, second countable and first countable spaces.	
	¼fgUnh ½	nwfjd lef"V dh ifjHkk"kk ,oa mnkgj.k] lkehI;] lhek fcUnq vkarfjd fcUnq] foo`r ,oa lao`r leqPp;] laojd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dks'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :i esa okLrfod la[;k;sa] la?ku mileqPp; ck;j&dsVsxjh izes;] i`FkDdj.k f}rh; x.kuh; ,oa izFke x.kuh; lef"VA	
Unit IV	**(English)**	Continuous functions, Extension theorem, Uniform continuity, Compacteness, Sequential compactness. Totally bounded spaces. Finite intersection property, Continuous functions and compact sets. Connectedness.	
	¼fgUnh ½	lrr Qyu] foLrkj izes;] ,dleku lkarR;] lagrrk] vuqØe.kh; lgrrk iw.kZ ifjc) lef"V] ifjfer loZfu"B izxq.k] lrr Qyu ,oa lagr leqPp;] lac)rkA	
Unit V	**(English)**	Complex numbers as ordered pairs, Geometric representation of complex numbers. Continuity and differentiability of compex function. Analytic functions, Cauchy-Reimann equations. Harmonic functionsMobius transformations. Fixed points, Cross ratio. Inverse points. Conformal Mappings.	
	¼fgUnh ½	lfEeJ la[;k Øfer ;qXe ds :i esa lfEeJ la[;k dk T;kfefr; fu:i.k] lfEeJ] Qyuksa dh lkrR;rk vkSj	

		vodyuh;rk] fo'ySf"kd Qyu] dkS'kh&jheku lehdj.k] izlaoknh Qyu] eksfc;l :ikarj.k] fLFkj fcUnq fr;Zd vuqikr] izfrykse fcUnq] dkWuQkeZy QyuA	

Text Books

1. Mathematical analytis by S.C. Malik and Savita Arora, New Age Publication, Delhi

2. G.J. Simmons – Introduction to Topology and Modern Analysis, Mc Graw Hill, New York 1963

3. L.V. Alhfors, complex analysis Mc Graw Hill, New York

4. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Reference Books :

1. Water Rudin – Real and Complex Analysis Mc Graw Hill, New York.
2. Ponnusway – Complex Analysis, Narosa Publication, New Delhi.
3. R.V. Churchill & J.W. Brown, Complex Variables and Application, 5th Edition, Mc Graw Hill, New York, 1990.

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Theory

Class		B.Sc. / B.A. III Year		
Subject	**(English)**	**Mathematics**	**Paper No.: III**	
	¼fgUnh½	**xf.kr**		
Title of the paper	**(English)**	**Discrete Mathematics**		
	¼fgUnh½	**fofoDr xf.kr**		
Compulsory Paper		**Medium of Teaching : Hindi, English**		
Maximum Marks		**Total : 50**	**Main Exam:**	**C.C.E.:**

Unit		*Syllabus*	*Recommended Books*
Unit I	**(English)**	Boolean functions – disjunctive & conjunctive normal forms (canonical & dual canonical), Bools's expansion theorem. Relations – Binary relation, Inverse relation, Composite relation, Equivalence relation, Equivalence classes & its properties Partition of a set.	
	¼fgUnh½	cwyh; Qyu & fo;kstuh; ,oa la;kstuh; izlkekU; :i ¼dsuksfudy ,oa Mwvy dsukfudy½] cwy dk foLrkj izes;A laca/k & f}pj laca/k] izfrykse laca/k] la;ksftr laca/k] rqY;rk laca/k] rqY;rk oxZ ,oa mlds xq.k /keZ] leqPp; dk foHkktuA	
Unit II	**(English)**	Partial order relation, Partially ordered sets, totally ordered sets. Hasse diagram, maximal and minimal element first and last element. Lattice – definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.	

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	¼fgUnh ½	va'kr% Øe laca/k] va'kr% Øfer leqPP;] iw.kZr Øfer leqPp;] gSlwg vkjs[kd mfPp"B ,oa fufEu"B vo;o] izFke ,oa vfUre vo;o] tkd & ifjHkk"kk ,oa mnkgj.k] }Sr tkyd] ifjc) tkyd] forj.kh; tkyd] iwjd tkydA	

Unit III	**(English)**	Graph – Definition types of graphs, Subgraphs, walk-path, circuit, connected and disconnected graphs. Euler graph. Hamiltonian path and circuit, shortest path in weighted graph. Dijkstra's Algorithm for shortest paths.	
	¼fgUnh ½	vkys[k & ifjHkk"kk ,oa izdkj mi vkys[k xeu] iFk ,oa ifjiFk laca) ,oa vlac) xzkQ vkW;yj xzkQ] gsfeYVksfu;u iFk vkSj ifjiFk] Hkkfjr vkys[k esa y?kqRre iFk gsrq MkWbtdL=k] ,YxksfjFkeA	
Unit IV	**(English)**	Trees and its properties, Rooted tree, Binary tree,Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.	
	¼fgUnh ½	o`{k ,oa mlds xq.k /keZ] fu;r o`{k] f}opj o`{k] tud o`{k vkys[k dh tkfr ,oa 'kwU;rk] dqLdy ,oa izkbe dh ,YxksfjFkeA	
Unit V	**(English)**	Matrix representation of graph – Incidnece and Adjacency matrix. Cutset and its properties. Planar graphs (definition) Kuratowski's two graphs.	
	¼fgUnh ½	vkys[k dk vkO;wg fu:i.k & bUlhMsal ,oa ,MtsUlh vkO;wg] dVlsV~l ,oa mlds izxq.k] Iykuj vkys[k ¼ifjHkk"kk½] dqjkVksOgLdh ds f}vkys[kA	

Text Books

1. C.L.Liu – Elements of Discrete Mathematics, Mcgraw Hill, New-York

2. Narsingh Deo – Graph Theroy, Prentice Hall

3. e/;izns'k fgUnh xzUFk vdkneh dh iqLrdsaA

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2018-2019.
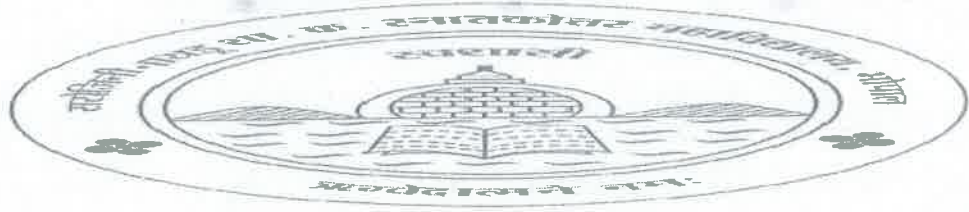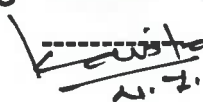
B.Sc. I YEAR

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SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE
SHIVAJI NAGAR BHOPAL - 462016 (M.P.)
Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ सत्र – 2018-19

THEORY

Class	**B.Sc.**	1st Year
Subject	**Mathematics**	
Title of the Paper	**Algebra and Trigonometry** बीजगणित एवं त्रिकोणमिति	Paper No. **First/प्रथम**
Medium of instructions (Teaching)	English/Hindi अंग्रेजी / हिन्दी	Question Paper Language: **English/Hindi** अंग्रेजी / हिन्दी
Maximum Marks	Total: **50**	

Unit - 1	Rank of a matrix, Normal & Echelon from of a matrix. Characteristic equations of a matrix. Eigen values. Eigen vectors. Linear Independence of row and column matrix.
इकाई–1	आव्यूह की जाति, आव्यूह का प्रासामान्य एवं ऐशेलॉन रूप, आव्यूह का अभिलाक्षणिक समीकरण, आयगेन मान, आयगेन सदिश, पंक्ति एवं स्तम्भ आव्यूह की स्वतंत्रता।
Unit - 2	Cayley Hamilton theorem and its use in finding inverse of a matrix application of matrix to solve a system of linear (homogenous and non-homogenous) equations, theorems on consistency and inconsistency of a system of linear equations, solving linear equations upto three unknowns.
इकाई–2	केली – हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रम आव्यूह (समघात एवं असमघात) ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय के हल के लिये आव्यूह का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर प्रमेय, तीन अज्ञात राशियों तक के रैखिक समीकरणों के हल।
Unit - 3	Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equations. Reciprocal equations. Descarte's rule of signs.
इकाई–3	एक चर के सामान्य बहुपदों के समीकरण के गुणांकों एवं मूलों के बीच संबंध, समीकरणों का रूपांतरण, व्युत्क्रम समीकरण, चिन्हों का दिकार्ते नियम।

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Ghan 4.7.18

H3 2017/18

Wyas 24.7.18

Kavita. L.7.

Shraddha 4.7.18

Unit - 4	Logic - Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalence, Algebra of propositions. Boolean Algebra-definition and properties, switching circuits and its applications, logic gates and circuits.
इकाई—4	तर्कशास्त्र – तर्क संयोजक, सत्यता सारणी, पुनरूक्ति और व्याघात, तार्किक तुल्यता, साध्यों का बीजगणित। बूलीय बीजगणित – परिभाषा एवं उसके गुणधर्म। स्विचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ।
Unit - 5	De- Moivre's theorem and its application, direct and inverse circular and hyperbolic functions. expansion of trignometric functions, Logarithm of complex quantities. Gregory's series, summation of trignometrical series.
इकाई—5	डी – मोइवर्स प्रमेय एवं इसके अनुप्रयोग प्रत्यक्ष एवं व्युत्क्रम वृत्तीय एवं अतिपरवलयिक फलन। त्रिकोणमितीय फलनों का विस्तार, सम्मिश्र संख्याओं का लघुगणक, ग्रीगोरी श्रेणी, त्रिकोणमितीय श्रेणियों का योग।

Text Books:

1.   S.I. Loney - Plane Trigonometry Part- II
2.   K.B. Datta - Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
3.   Chandrika Prasad - A Text Book on Algebra and Theory of Equations, Pothishala Pvt.Ltd., Allahabad.
4.   C.L. Liu - Elements of Discrete Mathematics (Second Edition). MeGraw Hill, International Edition, Computer Science Series, 1986.
5.   मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें।

Reference Books:

1.   H.S. Hall and S.R. Knight - Higher Algebra H.M. Publication, 1994.
2.   N. Jacobson - Basic Algebra Vol. I and II , W.H. Freeman.
3.   I.S. Luther and I.B.S. Passi - Algebra Vol I and II, Narosa Publishing House.
4.   N.Saran and R.S. Gupta - Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad.

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2

Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ सत्र – 2018-19

THEORY

Class	B.Sc.	1st Year
Subject	Mathematics	
Title of the Paper	Calculus and Differential Equations कलन एवं अवकल समीकरण	Paper No. Second/द्वितीय
Medium of instructions (Teaching)	English/Hindi अंग्रेजी / हिन्दी	Question Paper Language: English/Hindi अंग्रेजी / हिन्दी
Maximum Marks	Total: 50	

Unit - 1	Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.
इकाई–1	उत्तरोत्तर अवकलन, लैबनीज प्रमेय, मॅक्लारिन एवं टेलर श्रेणी में विस्तार। अनंतस्पर्शी।
Unit - 2	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curves in Cartesian and polar coordinates.
इकाई–2	वक्रता, उत्तलता एवं अवतलता का परीक्षण, नति परिवर्वन बिन्दु, बहुबिन्दु, कार्तीय एवं ध्रुवीय निर्देशांकों में वक्रों का अनुरेखण।
Unit - 3	Integration of transcendental functions, Definite Integrals, Reduction formulae Quadrature, Rectification.
इकाई–3	अबीजीय फलों का असमकलन, निश्चित समाकलन, समानयन सूत्र, क्षेत्रकलन एवं चापकलन।
Unit - 4	Linear differential equations and equations reducible to the linear form, Exact differential equations, First order and higher degree equations solvable for x.y and p, Clairaut's equation and singular solutions, geometrical meaning of a differential equation, Orthogonal trajectories.

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इकाई—4	रैखिक अवकल समीकरण एवं रैखिक समीकरण में समानेय अवकल समीकरण, यथातथ अवकल समीकरण, x, y और b में हल होने योग्य प्रथम कोटि एवं उच्च धातीय अवकल समीकरण, क्लेरो का समीकरण और विचित्र हल। अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदियॉं।
Unit - 5	Linear differential equations with constant coeffieients, Homogencous linear ordinary differential equations. Linear differential equations of second order, transformation of equations by changing the dependent variable independent variable method of variation of parameters.
इकाई—5	अचर गुणांकों वाले रैखिक अवकल समीकरण, साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण, स्वतंत्र चर / परतंत्र चर के परिवर्तन द्वारा समीकरणों का रूपांतरण, प्राचल विचरण विधि।

Text Books:
1. Gorakh Prasad - Differential Calculus, Pothishala Private Ltd., Allahabad.
2. Gorakh Prasad - Integral Calculus, Pothishala Private Ltd., Allahabad.
3. D.A. Murray, Introductory Course in Differential equations, Orient Longman (Indian), 1967.
4. मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें।

Reference Books:
1. G.F. Simmons - Differential equations, Tata McGraw Hill, 1972.
2. E.A. Codington - An Introduction to ordinary differential equation, Prentice Hall of Indian, 1961.
3. H.T.H. Piaggio- Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, New Delhi 1985.
4. S.G. Deo- Differential Equations, Narosa Publishing House.
5. N.Piskunov - Differential and Integral Calculus, Peace Publishers, Moscow.

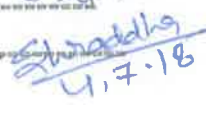**Signature of Members of B.O.S.**

SAROJINI NAIDU GOVERNMENT GIRLS P. G. AUTONOMOUS COLLEGE
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Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ सत्र – 2018-19

THEORY

Class	**B.Sc.**	1st Year
Subject	**Mathematics**	
Title of the Paper	**Vector Analysis and Geometry** सदिश विश्लेषण एवं ज्यामिति	Paper No. **Third**/तृतीय
Medium of instructions (Teaching)	English/Hindi अंग्रेजी / हिन्दी	Question Paper Language: **English/Hindi** अंग्रेजी / हिन्दी
Maximum Marks	Total: **50**	

Unit - 1	Scalar and vector product of three vectors, product of four vectors, Reciprocal vectors, vector differentiation. Gradient, Divergence and curl.
इकाई–1	तीन सदिशों का अदिश एवं सदिश गुणन, चार सदिशों का गुणन, व्युत्क्रम सदिश, सदिश अवकलन, ग्रेडियंट, डायवरजेन्स एवं कर्ल।
Unit - 2	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them.
इकाई–2	सदिश समाकलन, गॉस, ग्रीन एवं स्टोककी प्रमेय (बिना उपपत्ति) एवं इन पर आधारित प्रश्न।
Unit - 3	General equation of second degree, tracing of conics, system of conies, polar equation of conic.
इकाई–3	द्वितीय घात के व्यापक समीकरण, शांकवो का अनुरेखण, शांकव निकाय, शांकव का ध्रुवीय समीकरण।
Unit - 4	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators. Right circular cone, Equation of cylinder and its properties.
इकाई–4	दिए गए आधार पर शंकु का समीकरण, शंकु के जनक, तीन परस्पर लम्बवत जनको हेतु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का समीकरण और इसके प्रगुण।

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Unit - 5	Central conicoids, Paraboloids, plane sections of conicoids, Generating lines.
इकाई–5	केन्द्रीय शांकवज, परवलयज, शांकवज के समतल प्रच्छेद, जनक रेखाऐं।

Text Books:

1. N. Saran and S.N. Nigam - Introduction to Vector Analysis Pothishala Pvt.Ltd., Allahabad.
2. Gorakh Prasad and H.C. Gupta- Text Book on Coordinate Geometry, Pothishala Private Ltd., Allahabad.
3. N.Saran and R.S. Gupta - Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad (unit IV).
4. मध्यप्रदेश हिन्दी ग्रंथ अकादमी की पुस्तकें।

Reference Books:

1. R.J.T. Bell - Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit-V).
2. Murray R. Spiegel - Theory and Problems of Advance Calculus Sehaum Publishing Company, New Yark.
3. Murray R. Spiegel - Vector Analysis, Sehaum Publishing Company, New Yark.
4. Shanti Narayan - A Text Book of Vector Calculus, S.Chand & Co., New Delhi.
5. Shanti Narayan - A Text Book of Vector Algebra, S.Chand & Co., New Delhi.
6. S.L. Loney - The Elements of Coordinate Geometry, Macmillan and Company, London.
7. P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Two Dimensions, Macmillan Indian Ltd., 1994.
8. P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1999.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:..........2016-2017.

सत्र / Session : 2018-19

Max. Marks/अधिकतम अंक	:	50
Class/कक्षा	:	B.Sc./B.A.
Year/वर्ष	:	Second /द्वितीय
Subject/विषय	:	Mathematics/गणित
Paper / प्रश्नपत्र	:	First/प्रथम
Title/शीर्षक	:	Abstract Algebra
		अमूर्त बीजगणित

Unit-1	Definition and basic properties of groups, subgroups, subgroups generated by a subset, Cyclic groups and simple properties.
ईकाई—1	समूह की परिभाषा एवं सामान्य प्रगुण, उपसमूह, उपसमुच्चय से जनित उपसमूह, चक्रीय समूह एवं सामान्य प्रगुण
Unit-2	Coset decomposition. Lagrange's theorem and its corollaries including Fermat's theorem. Normal subgroups. Quotient groups.
ईकाई—2	सहसमुच्चय वियोजन, लैग्रांज प्रमेय एवं इसकी उपप्रमेय फर्मा प्रमेय, प्रसामान्य उपसमूह, विभाग समूह।
Unit-3	Homomorphism and Isomorphism of groups. Fundamental theorem of homomorphism. Transformation and Permutation group. S_n (various subgroups of S_n, n<5 to be studied). Cayley's theorem.
ईकाई—3	समूहों की समाकारिता एवं तुल्याकारिता, समाकारिता का मूलभूत प्रमेय, रुपान्तरण एवं क्रमचय समूह S_n(S_n के विभिन्न उपसमूह, संकल्पित है कि n<5). कैली प्रमेय।
Unit-4	Group Automorphism. Inner Automorphism. group of Automorphisms. Conjugacy relation and Centraliser. Normaliser. Counting principle and class equation of a finite group. Cauchy's theorem for finite abelian groups and non-abelian groups.

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ईकाई–4	समूह स्वकारिता, अंतः स्वकारिता, स्वकारिताओं का समूह, संयुग्मिता सबंध और केन्द्रीयकारक, प्रसामान्यक, गणना सिद्धांत एवं परिमित समूह का वर्ग समीकरण। परिमित आबेली एवं अन–आबेली समूह के लिए कौशी का प्रमेय।
Unit-5	Definition and basic properties of rings, Ring homomorphism subrings, Ideals and Quotient rings, Polynomial rings & its properties, Integral domain and Field.
ईकाई–5	वलय की परिभाषा एवं सामान्य प्रगुण, वलय समाकारिता, उपवलय, गुणजावली एवं विभाग वलय, बहुपद वलय एवं उसके प्रगुण, पूर्णाकीय प्रांत एवं क्षेत्र।}

Text Books:

1. I. N. Herstein-Topics in Algebra. Wiley Eastern Ltd. New Delhi. 1977.

2. PB Bhattacharya, S. K. Jain and S R Nagpaul-Basic Abstract Algebra. Wiley Eastern, New Delhi. 1997

3. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books:

1. Shantinarayan-A text Book of Modern Abstract Algebra, S.Chand and Company, New Delhi.

2. Surjeet Singh- A Text Book of Modern Algebra.

3. N. Jacobson- Basic Algebra, Vol. I and II. W. H. Freeman.

4. I. S. Luther and I. B. S. Passi- Algebra., Vol I and II, Narosa Publishing House.

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8

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:.........2016-2017.

Max. Marks/अधिकतम अंक	: 50
Class/कक्षा	: B.Sc./B.A.
Year/वर्ष	: Second/ द्वितीय
Subject/विषय	: Mathematics/गणित
Paper / प्रश्नपत्र	: Second/द्वितीय
Title/शीर्षक	: Advanced calculus
	उच्च कलन

Unit-1	Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion. series of non-negative terms. comparison test, Cauchy's intergral test, Cauchy's root test, ratio tests, Raabe's tests, logarithmic tests. Alternating series. Leibnitz's test. Absolute and conditional convergence.
ईकाई–1	अनुक्रम की परिभाषा, अनुक्रम की सीमा पर प्रमेय, परिबद्ध एवं एकदिष्ट अनुक्रम काँशी का अभिसरण मापदण्ड, अऋणात्मक पदों की श्रेणी, तुलना परीक्षण, कॉशी का समाकल परीक्षण, कॉशी का मूल परीक्षण, अनुपात परीक्षण, राबी का परीक्षण, लघुगणकीय परीक्षण, एकान्तर श्रेणी, लिबनीज परीक्षण, निरपेक्ष एवं प्रतिबंधी अभिसरण।
Unit-2	Continuity of functions of single variable. sequential continuity. Properties of continuous functions. Uniform continuity. chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives.
ईकाई–2	सांतत्य (एक चर फलन), अनुक्रमणीय सांतत्या, संतत फलनों के गुणधर्म, एक समान सांतत्य, अवकलनीयता का श्रृंखला नियम, मध्यमान प्रमेय एवं उनका ज्यामितीय अर्थ, अवकलों के लिए डार्बू का मध्यवर्ती मान प्रमेय।
Unit-3	Limit and continuity of functions of two variables. Partial differentiation, Change of variables. Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables. Jacobians.

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ईकाई—3	दो चरों के फलनों की सीमा एवं सातत्य, आंशिक अवकलन, चरों का परिवर्तन, समघात फलनों पर आयलर का प्रमेय, दो चरों के फलनों के लिए टेलर का प्रमेय, जेकोबियन।
Unit-4	Envelopes, Evolutes, Maxima and Minima of functions of two variables, Lagrange's multiplier method, Beta and Gamma Functions.
ईकाई—4	अन्वालोर्प, केन्द्रज, दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ, लेग्रांज के गुणांको की विधि, बीटा एवं गामा फलन।
Unit-5	Double and triple integrals, volumes and surfaces of solids of revolution Dirichlet's integrals, change of order of integration in double integrals.
ईकाई—5	द्विक एवं त्रि-समाकल, ठोस के परिभ्रमण से जनित आयतन एवं प्रष्ठ, ड़ीचलेटस् समाकल, द्विक समाकल के क्रम का परिवर्तन।

Text Books:

1. R. R. Goldbeg -Real Analysis, Oxford& I.B.H. Publishing co., New Delhi
2. Gorakh Prasad- Differential Calculus, Pothishala Pvt. Ltd, Allahabad.
3. Gorakh Prasad- Integral Calculus, Pothishala Pvt. Ltd. Allahabad
4. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Books:

1. Gabriel Klaumber- Mathematical Analysis, Marcel Dekkar. Inc. New York, 1975
2. T. M. Apostol- Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
3. D. Soma Sundaram and B. Choudhary- A first Course in mathematical Analysis, Narosa Publishing, House, New Delhi, 1997.
4. Murray R. Spiegel- Theory and problems of advance Calculus, Schauma Publishing Co., New York
5. O. E. Stanaitis- An Introduction to Sequences, Series and improper Integrals.

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Chau 4.7.18

4.7.18
Shraddha
4.7.18

Vyas 4.7.18

Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ सत्र — 2018-19

Max. Marks/अधिकतम अंक	:	50	
Class/कक्षा	:	B.Sc./B.A.	
Year/वर्ष	:	Second / द्वितीय	
Subject/विषय	:	Mathematics/गणित	
Paper / प्रश्नपत्र	:	Third/तृतीय	
Title/शीर्षक	:	Differential Equations	
		अवकल समीकरण	

Unit-1	Series solutions of differential equations. Power series method. Bessel and Legendre equations. Bessel's and Legendre's functions and their properties- recurrence and generating function. Orthogonality of functions.
ईकाई—1	अवकल समीकरण का श्रेणी हल, घात श्रेणी हल, बेसल एवं लेजेन्ड्रे समीकरण, बेसल एवं लेजेन्ड्रे फलन एवं उनके गुणधर्म, पुनरावृत्त एवं जनक फलन, फलन की लाम्बिकता।
Unit-2	Laplace Transformation. Linearity of the Laplace transformation. Existence theorem for Laplace transforms. Laplace transforms of derivatives and integrals. Shifting theorems, Differentiation and integration of transforms.
ईकाई—2	लॉप्लास रुपांतरण, लॉप्लास रुपांतरण की रैखिकता, लॉप्लास रुपांतरण के लिए अस्तित्व प्रमेय। अवकलजों एवं समाकलों का लॉप्लास रुपांतरण, स्थनांतर प्रमेय, रुपांतरणों का अवकलन एवं समाकलन।
Unit-3	Inverse Laplace transforms. Convolution theorem. Application of Laplace transformation in Solving linear differential equations with constant coefficients.
ईकाई—3	प्रतिलोम लॉप्लास रुपांतरण, संवलन प्रमेय, अचर गुणांको वाले रैखिक अवकल समीकरणों को हल करने में लॉप्लास रुपांतरणों के अनुप्रयोग।
Unit-4	Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method.

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ईकाई—4	प्रथम कोटि के आंशिक अवकल समीकरण, लैग्रांज विधि, विशिष्ट प्रकार के अवकल समीकरण का व्यापक विधि के अतिरिक्त अन्य विधि द्वारा सरलता से हल, चारपिट की व्यापक विधि।
Unit-5	Partial differential equations of second and higher orders. Classification of partial differential equations of second order. Homogeneous and non-homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.
ईकाई—5	द्वितीय व उच्च कोटि के आंशिक अवकल समीकरण, द्वितीय कोटि के आंशिक अवकल समीकरणों का वर्गीकरण, अचल गुणांकों के समघात एवं असमघात समीकरण, अचर गुणांकों में समानेय आंशिक अवकल समीकरण।

Text Book:

1. Sharma and Gupta- Integral Transform, Pragati, Prakashan Meerut.
2. Sharma and Gupta- Differential Equation, Pragati, Prakashan Meerut.
3. Raysinghania- Differential Equation, S. Chand & Company, New Delhi.
4. मध्यप्रदेश हिन्दी ग्रन्थ अकादमी की पुस्तकें।

Reference Book:

1. D. A. Murray - Introductory course in differential equation, Orient Longman, India, 1967
2. G. F. Simnons – Differntial Equations, Tata Mcgraw Hill, 1972.
3. E.A. Codington - An introduction to Ordinary differential equations, Prentice Hall of India, 1961
4. H. T. H. Piaggio – Elementary Treatise on Differential equations and their applications. C. B. S. Publisher and Distributors, Delhi, 1985.
5. E. D. Rainville – Special Functions, The Macmillan Company, New York.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class		B.Sc./B.A.	Semester: V
Subject	(English)	Mathematics	**Paper No.: I**
	हिन्दी	गणित	
Title of the paper	(English)	Linear Algebra, Numerical Analysis	
	हिन्दी	रैखीय बीजगणित, संख्यात्मक विश्लेषण	
Medium of instructions (Teaching)		Both English & हिन्दी	Question Paper Language: Both हिन्दी & English
Maximum Marks	Total : 150	Main Exam :100	C.C.E : 50
Unit		Syllabus	
Unit I	(English)	Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces. Existence theorem for basis. Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vector subspaces.	
	हिन्दी	सदिश समष्टि की परिभाषा एवं उदाहरण, उपसमष्टि, उपसमष्टियों का योग एवं सीधा योग, रैखिक विस्तृति, रैखिक आश्रितता, स्वतंत्रता एवं उनके मूल गुणधर्म, आधार, परिमित विमीय सदिश समष्टियाँ, आधार का	
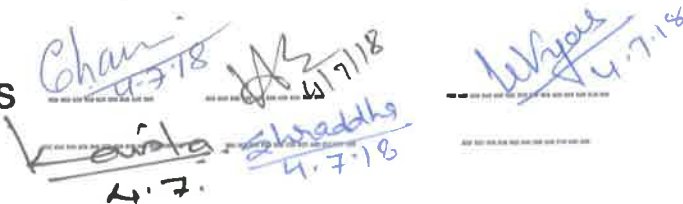
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13

		अस्तित्व प्रमेय, आधार समुच्चय में अवयवों की संख्या की अपरिवर्तनशीलता, विमा, सदिश उपसमष्टियों के योग की विमा ।
Unit II	(English)	Linear transformations and their representation as matrices. The algebra of linear transformations. The rank - nullity theorem, Eigen values and eigen vectors of a liner transformation, Diagonalisation, Quotient space and its dimension.
	हिन्दी	रैखिक रूपांतरण एवं उनका आव्यूह निरूपण, रैखिक रूपांतरणों का बीज गणित, जाति शून्यता प्रमेय, रैखिक रूपांतरणों के आयगन मान एवं आयगन सदिश विकर्णीकरण, विभाग समष्टि एवं उसकी विमा।
Unit III	(English)	Approximations, Errors and its types, Solution of Equations: Bisection, Secent, Regula Falsi, Newton-Raphson Method and their order of convergence, roots of second degree Polynomials, Interpolation: Lagrange interpolation, Divided Differences, Interpolation formulae using Differences and derivations of Interpolation formula.
	हिन्दी	सन्निकटन, त्रुटियां एवं उसके प्रकार, समीकरणों के हल द्विभाजन, सीकेन्ट, रेग्युला फाल्सी तथा
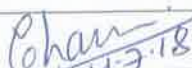
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14

		न्युटन–रॉप्सन विधि एवं उसकी अभिबिन्दुता की कोटि, द्वितीय घात बहुपदों के मूल। अर्न्तवशनः लग्रांजे अर्न्तवशन, विभाजित अंतर, अंतर के उपयोग से अर्न्तवशन सूत्र एवं अर्न्तवशन सूत्रों की उत्पत्ति।
Unit IV	(English)	Linear Equations : Direct Methods for Solving Systems of Linear Equations, Gauss elimination, Gauss Jordan Method, LU Decomposition, Cholesky Decomposition, Iterative Methods: Jacobi Method, Gauss - Seidel Method, Relaxation Method, Methods Based on Numerical Differentiation.
	हिन्दी	रैखिकसमीकरण : रैखिक समीकरणों के निकाय को हल करने की प्रत्यक्ष विधियां, गाउस विलोपन, गाउस जार्डन विधि, एल यू वियोजन, चोलेस्की वियोजन;, पुनरावृत्ति विधियां, जेकोबी विधि, गाउस सिडेल विधि, रिलेक्सेशन विधि, संख्यात्मक अवकलन पर आधारित विधियां।
Unit V	(English)	Ordinary Differential Equations: Euler Method, Eulers Modified Method, Single-step Methods Runge-Kutta's Method, Multi-step Methods, Milne Method, Numerical Quadrature, Newton-Cote's

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		Formulae, Gauss Quadrature Formulae, Methods Based on Numerical Integration with their derivation.
	हिन्दी	साधारण अवकल समीकरण आयलर विधि, आलर संशोधित विधि, एकल चरण विधि, रूंग–कुटटा विधि, बहुचरण विधि, मिलने विधि, संख्यात्मक क्षेत्रकलन, न्युटन कोट्स सूत्र, गाउस क्षेत्रकलन सूत्र, संख्यात्मक समाकलन पर आधारित विधियां एवं उनकी उत्पत्ति।
Recommended Books	(English)	1. K. Hofman and R.Kunze, Linear Algebra, 2nd Edition, Prentice Hall Englewood Cliffs, New Jersey 1971. 2. C.E. Frooerg. Introduction to Numerical Analysis(Second Edition L Addison-Wesley-1979. 3. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods Probles and Solutions, New Age International (P) Ltd, 1996.
Reference Book		1. E. Balaguruswamy - Numerical Method Tata Mc Graw_ Hill Pub. Com - New Yark 2. K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd, New Delhi, 2000

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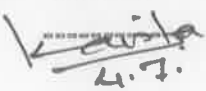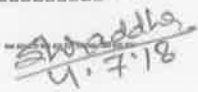
16

		3. S.K. Jain, A Gunawardena & P.B. Bhattacharya, Basic Linear Algebra with MATLAB Key college Publishing (Springer-Verlag) 2001. 4. S.Kumarsaran, Linear Algebra A Geometric Approach Prentice _ Hall of India) 2000.
	हिन्दी	म.प्र.हिन्दी ग्रंथ अकादमी की पुस्तकें।

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17

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class		B.Sc./B.A.	Semester: VI
Subject	(English)	Mathematics	Paper No.: I
	हिन्दी	गणित	
Title of the paper	(English)	Real Analysis, Discrete Mathematics and statistics.	
	हिन्दी	वास्तविक विश्लेषण, विविक्त गणित एवं सांख्यिकी	
Medium of instructions (Teaching)		Both English & हिन्दी	Question Paper Language: Both हिन्दी & English
Maximum Marks	Total : 150	Main Exam :100	C.C.E : 50
Unit		Syllabus	
Unit I	(English)	Riemann integral, Algebra of Riemann integrable functions, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean velue theorems of integral calculus.	
	हिन्दी	रीमान समाकल, रीमान समाकलनीय फलनों का बीज गणित, सतत एवं एकदिष्ट फलनों की समाकलनीयता, समाकलन का मूलभूत प्रमेय, समाकलनों के माध्यमान प्रमेय	
Unit II	(English)	Definition and examples of metric spaces, Neighborhoods, Limit points, Interior points, Open and closed sets, Closure and interior, Boundary	

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		points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Definition of Continuous functions and its illustrations.
	हिन्दी	दूरीक समष्टि की परिभाषा एवं उदाहरण सामीप्य, सीमा बिन्दु, अंतः बिन्दु, विवृत्त एवं संवृत समुच्चय, संवरणक एवं अभ्यंतर, परिसीमा बिन्दु, दूरीक समष्टि की उप समष्टि, कौशी अनुक्रम, पूर्णता, केन्टर का सर्वनिष्ठ प्रमेय, संकुचन सिद्धांत, पूर्ण क्रमित क्षेत्र के रूप में वास्तविक संख्यायें सतत फलन की परिभाषा एवं उसके उदाहरण।
	(English)	Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of propositions, Quantifiers: Universal and Existential Quantifiers, Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.
Unit III	हिन्दी	तर्क का बीज गणित, पुनरुक्तियों का विरोध का पुनरावलोकन, तार्किक तुल्यता, साध्यों का बीजगणित, प्रमात्रीकारकः आस्तित्व प्रमात्रीकारक एवं सर्व प्रमात्रीकारक, बूलय बीजगणित एवं उसके गुणधर्म, डी—मार्गन नियम, वैद्युत परिपथों का बीजगणित एवं उनके अनुप्रयोग।

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19

Unit IV	(English)	Boolean Function, Disjunction and Conjunction Normal Forms, Bools Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial order Relation.
	हिन्दी	बूलीय फलन वियोजनीय एवं संयोजनीय प्रसामान्य रूप, बूल का प्रसार प्रमेय द्विचर संबंध, तुल्यता संबंध, विभाजन एवं आंशिक क्रम संबंध।
Unit V	(English)	Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation , expectation of sum and product of random variables, Moment generating function , Theoretical distribution: Binomial, Poisson distributions and their properties and uses.
	हिन्दी	प्रायिकता, सतत प्रायिकता, प्रायिकता घनत्व फलन तथा उनके अनुपयोग (सतत प्रायिकता बंटन के लिये माध्य, बहुलक, माध्यिका तथा मानक विचलन ज्ञात करने के लिये) गणितीय प्रत्याशा, यादृच्छिक चरों के योग एवं गुणन की प्रत्याशा, आघूर्ण जनक फलन, सैद्धांतिक बंटनः द्विपद पॉयजन बंटन तथा उसके

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		गुणधर्म एवं उपयोग।
Recommended Books	(English)	1. R.R. Gpldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970. 2. G.F. Simmons. Introduction to Topology and Modem Analysis, McGraw-Hill, 1963. 3. T.M. Apostol, Mathematical Analysis, Norosa Publishing House. New Delhi, 1 4. C.L. Liu., Elements of Discrete Mathematics (Second Edition), McGraw Hill, International Editiojns, Computer Science scries 1986.
Reference Book		1. T.M. Apostol, Mathematical Analysis, Norosa Publishing House, New Delhi, 1985. 2. S.Lang. Undergrauate Anallysis, Springger-Veriag, New York, 1983. 3. D.Somasundaram and B.Choudhary, A first Course in Mathematical Analysis. Narosa Publshing House, New Delhi, 1997. 4. Shanti Narayan, A Course of Mathematical Analysis. S.Chand & Co. Delhi. 5. R.K.Jain and S.K. Kaushik, An introductions to Real Analysis, S.Chand & Co., 2000. 6. P.K. Jain and K/Ahmed Matric Spaces, Narosa Publishing House New Delhi, 1996. 7. S.Lang, Undergraduate Analysis, Ppringer-

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		Verlag, New Youk 1983.
		8. E.T. Copson, Metric Spaces, Combridge University Press, 1968.
		9. S.Lang. Undergraduate Analysis, Springer-Veriag, New Youk 1983.
Elementary Statistics		1. Statistics by M.Ray. 2. Mathematical Statistics by J.N.Kapoor, H.C.Saxena (S.Chand) 3. Fundamentals of Mathematical Statistics, Kapoor and Gupta.
	हिन्दी	म.प्र.हिन्दी ग्रंथ अकादमी की पुस्तकें।

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22.

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.		Semester: I
Subject	Mathematics		
Title of the paper	Advanced Abstract Algebra-I		Paper No : I (Compulsory)
Medium of instructions (Teaching)	English		Question Paper Language: English
Maximum Marks	Total 100	Main Exam: 70	C.C.E: 30

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.
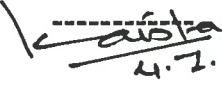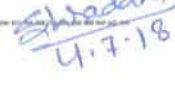
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester:	I
Subject	Mathematics		
Title of the paper	Real Analysis	Paper No : II (Compulsory)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)

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Signature of members of B.O.S

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Topology-I	Paper No : III (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam:	70	C.C.E:	30

Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.
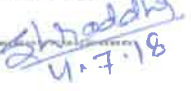
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester:	I
Subject	Mathematics		
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

Signature of members of B.O.S

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2018-2019.

Theory

Class	M.Sc / M.A.	Semester:		I
Subject	Mathematics			
Title of the paper	Advanced Discrete Mathematics-I	Paper No : V(I) (optional)		
Medium of instructions (Teaching)	English	Question Paper Language: English		
Maximum Marks	Total: 100	Main Exam:	70	C.C.E: 30

Unit I	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:............ 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.
Unit V	Algebra of linear transformation, Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Lebesque Measure & Integration	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.
Unit IV	The L^p-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L^p.
Unit V	Dual of space when $1 \leq P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.

Note : Setting is to be Done Strictly From Recommended Books.
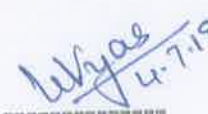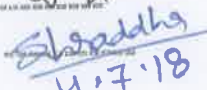
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
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Session:……….. 2018-2019.

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Separation axioms T_0, T_1, T_2, T_3, T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.
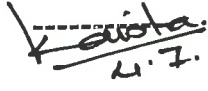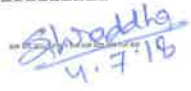
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
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Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Complex Analysis-II	Paper No : IV	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.
Unit III	Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-Verlag.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
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Session:............ 2018-2019.

Theory

Class	M.Sc / M.A.	Semester:		II
Subject	Mathematics			
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)		
Medium of instructions (Teaching)	English	Question Paper Language: English		
Maximum Marks	Total: 100	Main Exam:	70	C.C.E: 30

Unit	
Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill

Note : Setting is to be Done Strictly From Recommended Books.
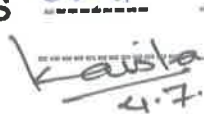
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: III	
Subject	Mathematics		
Title of the paper	Functional Analysis-I	Paper No : I	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit	Content
Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.		Semester:	III
Subject	Mathematics			
Title of the paper	Integral Transform-I		Paper No : II	
Medium of instructions (Teaching)	English		Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E:	30

Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.
Unit II	Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.

Note : Setting is to be Done Strictly From Recommended Books.

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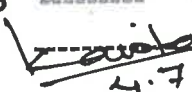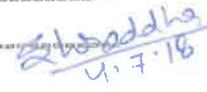# Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:............ 2018-2019.

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.
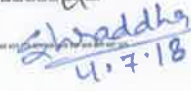
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
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Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.		Semester: III	
Subject	Mathematics			
Title of the paper	Operations Research-I		Paper No : IV	
Medium of instructions (Teaching)	English		Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam:	70	C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.
Reference	1. S.D. Sharma, Operation Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. (This book comes with a CD containing software) 3. G.Hadley, Linear Programming, Narosa Publishing House, 1995. 4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass.

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36

	5. H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York.
	6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Company Ltd, New Delhi
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:............ 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Theory of Linear Operators-I	Paper No : V(I) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.
Unit V	Spectral properties of compact linear operators.
Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.

Note : Setting is to be Done Strictly From Recommended Books.
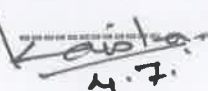
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Functional Analysis-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.
Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.
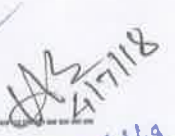
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:............ 2018-2019.

Theory

Class	M.Sc / M.A.		Semester:	IV	
Subject	Mathematics				
Title of the paper	Integral Transform-II		Paper No : II		
Medium of instructions (Teaching)	English		Question Paper Language: English		
Maximum Marks	Total: 100	Main Exam:	70	C.C.E:	30

Unit I	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.
Unit II	Finite Fourier Transform and Fourier Integral.
Unit III	Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.
Unit IV	Application for Fourier Transform to Boundary value problems.
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transforms by I.N. Sneddon. 3. Integral Transforms by Gupta and Vashishtha.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Session:........... 2018-2019.

Theory

lass	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Operations Research-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995.

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	4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.
	5. H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.
	6. Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.

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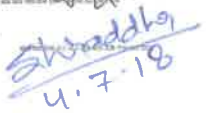
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:........... 2018-2019.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	Paper No : V(I)
Title of the paper	Theory of Linear Operators-II	(optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.

Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.

Note : Setting is to be Done Strictly From Recommended Books.

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Semester Wise Syllabus for *Mathematics*
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Session:………2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-I	Paper No : I (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total 100	Main Exam:	70	C.C.E:	30

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.		Semester: I
Subject	Mathematics		
Title of the paper	Real Analysis		Paper No : II (Compulsory)
Medium of instructions (Teaching)	English		Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30
Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.		
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.		
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.		
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.		
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,		
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.		
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)		

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
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Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Topology-I	Paper No : III (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

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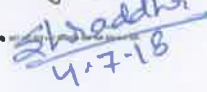   ------------   -----------   -----------

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Session:……….. 2019-2020.

Theory

Class		M.Sc / M.A.		Semester: I	
Subject		Mathematics			
Title of the paper		Advanced Discrete Mathematics-I		Paper No : V(l) (optional)	
Medium of instructions (Teaching)		English		Question Paper Language: English	
Maximum Marks		Total: 100	Main Exam: 70	C.C.E: 30	
Unit I		Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.			
Unit II		Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices			
Unit III		Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.			
Unit IV		Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.			
Unit V		Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph			
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.				

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M.Sc. SEMESTER II

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.
Unit V	Algebra of linear transformation,Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
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Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Lebesque Measure & Integration	Paper No : II	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30
Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.		
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.		
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.		
Unit IV	The L^p-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of L^p.		
Unit V	Dual of space when $1 \leq P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.		
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.		

Note : Setting is to be Done Strictly From Recommended Books.
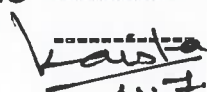
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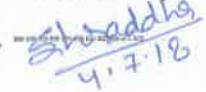
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Separation axioms T_0, T_1, T_2, T_3, T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology,Wiley Eastern.

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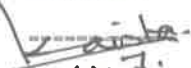   ------------   -----------   -----------

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Complex Analysis-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.
Unit III	Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-Verlag.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

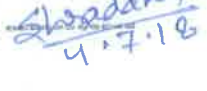---------------   -----------   -----------

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

M.Sc. SEMESTER III

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Functional Analysis-I	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Integral Transform-I	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100 | Main Exam: 70	C.C.E: 30

Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.
Unit II	Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Operations Research-I	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.
Reference	1. S.D. Sharma, Operation Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. (This book comes with a CD containing software) 3. G.Hadley, Linear Programming, Narosa Publishing House, 1995. 4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass.

Signature of members of B.O.S   ---------   ----------   --------------

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	5. **H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York.** 6. **Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi** 7. **N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.**

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: III	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-I	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30
Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.		
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.		
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.		
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.		
Unit V	Spectral properties of compact linear operators.		
Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,		
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.		

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

M.Sc. SEMESTER IV

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Functional Analysis-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.
Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------- ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	**M.Sc / M.A.**	**Semester:**	**IV**
Subject	**Mathematics**		
Title of the paper	**Integral Transform-II**	**Paper No : II**	
Medium of instructions (Teaching)	**English**	**Question Paper Language: English**	
Maximum Marks	**Total: 100**	**Main Exam: 70**	**C.C.E: 30**

Unit I	**Fourier Transform, Infinite Fourier transform, Complex Fourier transform.**
Unit II	**Finite Fourier Transform and Fourier Integral.**
Unit III	**Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.**
Unit IV	**Application for Fourier Transform to Boundary value problems.**
Unit V	**Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems**
Recommended Books	**1. Integral Transforms by Goyal and Gupta.** **2. Integral Transforms by I.N. Sneddon.** **3. Integral Transforms by Gupta and Vashishtha.**

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

lass	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Operations Research-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam:	70	C.C.E:	30

Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995.

Signature of members of B.O.S ---------- ---------- --------------

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	4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.
	5. H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.
	6. Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Theory

Class	M.Sc / M.A.	Semester: IV	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-II	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.
Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.

Note : Setting is to be Done Strictly From Recommended Books.

Course: B.Sc. (3 Years Degree Course)

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Scheme of examination

Theory Papers	Title of paper	Marks			Compulsory/Optional
		Theory	C.C.E I+II+III+IV	Total	
		150	50	200	

B.SC.I-YEAR					
Paper I	Algebra and Trigonometry	50			Compulsory
PaperII	Calculus & Differential Equations	50	50	200	Compulsory
Paper III	Vector Analysis & Geometry	50			Compulsory
B.SC. II YEAR					
Paper 1	Abstract Algebra	50			Compulsory
Paper II	Advanced Calculus	50	50	200	Compulsory
Paper III	Differential Equations	50			Compulsory
B.SC. III YEAR					
Paper	Linear Algebra & Numerical Analysis	50			Compulsory
Paper	Real & Complex Analysis	50	50	200	Compulsory
Paper	Discrete Mathematics	50			Optional

Signature of members of B.O.S ----------   -----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Scheme of examination

Course: M.Sc. (2 Years Degree Course)

Theory Papers	Title of paper	Compulsory/Optional	Marks		
			Theory	C.C.E	Total
SEMESTER I					
Paper I	Advanced Abstract Algebra-I	Compulsory	70	30	100
Paper II	Real Analysis	Compulsory	70	30	100
Paper III	Topology-I	Compulsory	70	30	100
Paper IV	Complex Analysis-I	Compulsory	70	30	100
Paper V	Advanced Discrete Mathematics - I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER II					
Paper I	Advanced Abstract Algebra-II	Compulsory	70	30	100
Paper II	Lebesgue Measure & Integration	Compulsory	70	30	100
Paper III	Topology-II	Compulsory	70	30	100
Paper IV	Complex Analysis-II	Compulsory	70	30	100

Signature of members of B.O.S ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER III					
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER IV					
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100
Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory	--	--	50
Paper VII	Internship	Compulsory	--	--	100

Signature of members of B.O.S ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

Syllabus
2019-2020

Semester / Yearly Pattern

Subject: MATHEMATICS

CONTENTS   Page No.

Date of submission in Autonomous Examination cell:

                                                    Signature

Signature of members of B.O.S   ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise /Yearly Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2019-2020.

H.O.D.

Signature of members of B.O.S ----------   ----------   -------------

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Sarojini NaiduGovt.GirlsPostgraduate Autonomous college, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….2017-2018.

Theory

Class		B.Sc./B.A.	Semester: III
Subject	**(English)**	**Mathematics**	**Paper No.: I**
	fgUnh	**xf.kr**	
Title of the paper	**(English)**	Real Analysis, Differential Equation, Abstract Algebra	
	fgUnh	**okLrfod fo'ys"k.k] vody lehdj.k] vewrZ cht&xf.kr**	
Medium of instructions (Teaching)		**Both English & fgUnh**	**Question Paper Language: Both fgUnh & English**
Maximum Marks	**Total : 150**	**Main Exam :100**	**C.C.E : 50**
Unit		**Syllabus**	
Unit I	**(English)**	Definition of a sequence, Theorems on limits of sequences, Bounded and monotonic sequences, Cauchy's convergence criterion, Series of non-negative terms, Comparison test, Cauchy's integral test, Ratio test, Raabe's test, logarithmic test, Leibnitz's theorem, Absolute and conditional convergence	
	fgUnh	**vuqØe dh ifjHkk"kk] vuqØeksa dh lhekvksa ij izes;] ifjc) ,oa ,dfn"V vuqØe] dkW"kh ds vfHklj.k dk ekinaM] v_.kkRed inksa dh Js.kh] rqyuk ijh{k.k] dkW"kh dk lekdy ijh{k.k] vuqikr ijh{k.k] jkWch dk**	

Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

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Unit II	(English)	Series Solution of Differential Equations-Power series Method, Bessel's Equation ,Bessel's function and its properties, recurrence and generating relations, Legendre's Equation, Legendre's function and its properties, recurrence and generating relations.
	fgUnh	**vody lehdj.kksa dh Js.kh gy] ?kkr&Js.kh fof/k] csly dk lehdj.k] csly dk Qyu ,oa mlds xq.k/keZ] iqujkxeu ,oa tud laca/k] yhts.Mj dk lehdj.k] yhts.Mj dk Qyu ,oa mlds xq.k/keZ] iqujkxeu ,oa tud laca/kA**
Unit III	(English)	Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals, Shifting theorem, Differentiation and integration of transforms, Inverse Laplace transforms, Convolution theorem, Applications of Laplace transformation in solving linear differential equations with constant coefficients.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

	fgUnh	**yklykl :ikarj.k] yklykl :ikarj.kksa dh ykafcdrk] yklykl :ikarj.ksa dk vfLrRo izes;] vodyksa ,oa lekdyksa ds yklykl :ikarj.k] LFkkukarj.k izes;] :ikarj.kksa dk vodyu ,oa lekdyu] izfrykse yklykl :ikraj.k] leyu izes;] vpj xq.kkadksa okys jSf[kd vody lehdj.kksa dks gy djus esa yklykl :ikarj.kksa ds vuqiz;ksxA**
Unit IV	(English)	Definition and basic properties of group, Order of an element of a group, Subgroups, Algebra of subgroups, Cyclic groups and their simple properties, Coset decomposition and related theorems, Lagrange's theorem and its consequences.
	fgUnh	**lewg dh ifjHkk"kk ,oa ewyHkwr xq.k/keZ] lewg ds vo;o dh dksfV] milewg] milewgks dk chtxf.krA pØh; lewg ,oa muds Ik/kkj.k xq.k/keZ] lg leqPp; foHkktu ,oa lacaf/kr izes;]**

Signature of members of B.O.S ---------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

		ysxzkats izes; ,oa mlds fuxeuA
Unit V	(English)	Normal sub group, Quotient groups, homomorphism and isomorphism of groups, Kernel of homomorphism of groups, fundamental theorem of homomorphism of groups, Permutation groups (even and odd permutations), Alternating groups A_n, Cayley's theorem.
	fgUnh	**izlkekU; milewg] foHkkx lewg] lewgksa dh ledkfjrk ,oa rqY;dkfjrk] ledkfjrk dh vf"V] lewgks dh ledkfjrk dk ewyHkwr izes;] Øep; lewg ¼le ,oa fo"ke Øep;½ ,dkarj lewg A_n dSyh dk izes;-**
Recommended Books	**(English)**	1. R.R. Goldberg, Real Analysis, I.B.H. Publishing Co. New Delhi, 1970. 2. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd. Allahabad. 3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & sons, 1999. 4. I. N. Herstein – Topics in Algebra, Wiley Eastern Ltd. New Delhi 1977.

Signature of members of B.O.S --------- ---------- --------------
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		5. Sharma and Gupta-Integral Transform, Pragati Prakashan Meerut
	fgUnh	**1- e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA**

Signature of members of B.O.S ---------   ----------   -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER IV

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class		B.Sc./B.A.	Semester: IV
Subject	(English)	Mathematics	**Paper No.: I**
	fgUnh	**xf.kr**	
Title of the paper	(English)	Abstract Algebra, Advanced Calculus, Partial Differential equation, complex Analysis	
	fgUnh	**vewrZ chtxf.kr izxr dyu] vkaf'kd vodyu lehdj.k ,oa lfeJ fo'ys"k.k**	
Medium of instructions (Teaching)		**Both English & fgUnh**	**Question Paper Language: Both fgUnh & English**
Maximum Marks	**Total : 150**	**Main Exam :100**	**C.C.E : 50**
Unit		**Syllabus**	
Unit I	(English)	Group automorphisms, inner automorphism, Group of automorphisms, Conjugacy relation and centraliser, Normaliser, Counting principle and the class equation of a finite group, Cauchy's theorem for finite abelian groups and non- abelian groups.	
	fgUnh	**lewg Lodkfjrk ¼Lole:irk½] varj Lodkfjrk] Lodkfjrkvksa dk lewg] la;qXerk laca/k ,oa dsUnzh;dkj.k] izlkekU;d] x.kuk fl)kar ,oa ifjfer lewg dk oxZ lehdj.kA ifjfer vkcsyh ,oa vu&vkcsyh lewgksa ds fy;s dks'kh**	

Signature of members of B.O.S ---------   ----------   --------------
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		izes;A
Unit II	(English)	Introduction to rings, subrings, integral domains and fields, simple properties and examples, ring homomorphism, ideals and quotient rings.
	fgUnh	**oy;] mioy;] iw.kZdkyh; izkar ,oa {ks= dk ifjp; ljy xq.k/keZ ,oa mnkgj.k] oy; lekdkfjrk] xq.ktkoyh ,oa foHkkx oy;A**
Unit III	(English)	Maxima, Minima and saddle points of functions of two variables, Improper integrals and their convergence, Comparison test, Abel's and Dirichlet's tests, Beta and Gamma functions.
	fgUnh	**nks pjksa ds Qyuksa dk mfPp"B] fufEu"B ,oa IsMy fcUnq] fo"ke lekdy ,oa mudk vfHkklj.k] rqyuk ijh{k.k vkcsy ,oa fMfjDys dk ijh{k.k chVk ,oa xkek QyuA**
	(English)	Partial Differential equations of the first order. Lagrange's solution. Some special types of

Unit IV		equations which can be solved sold easily by methods other than general methods Charpit's general methods of solution, Partial differential equations of second and higher orders. Homogeneous and non- Homogeneous equations with constant coefficients
	fgUnh	**izFke dksfV ds vkaf'kd vody lehdj.k] ysxzkats dk gy] dqN fof'k"V izdkj ds lehdj.k ftUgsa O;kid fof/k ds vykok Ijy fof/k Is gy fd;k tk Idsa] gy ds fy, pkjfiV dh O;kid fof/k] }rh; ,oa mPprj dksfV ds vkaf'kd vody lehdj.k] vpj xq.kkadksa ds le?kkrh; ,oa vle?kkrh; lehdj.k] vkaf'kd vody lehdj.k tks vpj xq.kkadksa okys lehdj.kksa esa ifjorZuh; gSA**
Unit V	(English)	Continuity and differentiability of Complex functions, Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed points, cross ratio
	fgUnh	**IfEeJ Qyuksa dk IkarR; ,oa vodyuh;rkA oS'ysf"kd Qyu] dkS'kh**

Signature of members of B.O.S   ----------   -----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

		jheku lehdj.k] izlaoknh Qyu] eksfc;l :ikarj.k] fLFkj fcUnq] fr;Zad vuqikrA
Recommended Books	**(English)**	1. T.M. Apostol, Mathematical Analysis Narosa Publishing House, New Delhi 1985 2. N. Piskunov , Differential and Integral Calculus, Peace Publishers, Moscow. 3. S.C. Malik, Mathematical Analysis, Wiley Eastern Ltd., New Delhi. 4. N. Jacobson, Basis Algebra, Vols, I & II. W.H. Freeman, 1980 (also published by Hindustan Publishing Company.) 5. Shanti Narayan, A Text Book of Modern Abstract Algebra, S. Chand & Co. New Delhi 6. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Wiley Eastern, New Delhi, 1997. 7. I. S. L.uther and I.B. S. Passi, Alegebra Vol- I , II, Narosa Publishing House. 8. R. V. Churchill & J.W. Brown, Complex Variables and Applications, 5th Edition, McGraw-Hili New. York. 1990 9. Mark; J. Ablowitz & A. S. Fokas. Complex Variables : Introduction and Applications, Cambridge University Press, South Asian Edition, 1998 10. Ponnuswamy : Complex Analysis, Narosa Publishing Co.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

	fgUnh	**e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA**

Signature of members of B.O.S   ---------   ----------   -------------
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B.Sc. SEMESTER V

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class		B.Sc./B.A.	Semester: V
Subject	**(English)**	Mathematics	**Paper No.: I**
	fgUnh	**xf.kr**	
Title of the paper	**(English)**	Linear Algebra, Numerical Analysis	
	fgUnh	**jS[kh; chtxf.kr] la;kRed fo'ys"k.k**	
Medium of instructions (Teaching)		**Both English & fgUnh**	**Question Paper Language: Both fgUnh & English**
Maximum Marks	**Total : 150**	**Main Exam :100**	**C.C.E : 50**
Unit		**Syllabus**	
Unit I	(English)	Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces. Existence theorem for basis. Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vector subspaces.	
	fgUnh	**lfn'k lef"V dh ifjHkk"kk ,oa mnkgj.k] milef"V] milef"V;ksa dk ;ksx ,oa lh/kk ;ksx] jSf[kd foLr`fr] jSf[kd vkfJrrk] Lora=rk ,oa muds ewy xq.k/keZ] vk/kkj] ifjfer foeh; lfn'k**	

Signature of members of B.O.S ---------- ---------- --------------
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		lef"V;kWa] vk/kkj dk vfLrRo izes;] vk/kkj leqPp; esa vo;oksa dh la[;k dh vifjoZru'khyrk] foek] lfn'k milef"V;ksa ds ;ksx dh foek A
Unit II	(English)	Linear transformations and their representation as matrices. The algebra of linear transformations. The rank - nullity theorem, Eigen values and eigen vectors of a liner transformation, Diagonalisation, Quotient space and its dimension.
	fgUnh	jSf[kd :ikarj.k ,oa mudk vkO;wg fu:i.k] jSf[kd :ikarj.kksa dk cht xf.kr] tkfr 'kwU;rk izes;] jSf[kd :ikarj.kksa ds vk;xu eku ,oa vk;xu lfn'k fod.khZdj.k] foHkkx lef"V ,oa mldh foekA
Unit III	(English)	Approximations, Errors and its types, Solution of Equations: Bisection, Secent, Regula Falsi, Newton-Raphson Method and their order of convergence, roots of second degree Polynomials, Interpolation: Lagrange interpolation, Divided

Signature of members of B.O.S ---------   ----------   --------------
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		Differences, Interpolation formulae using Differences and derivations of Interpolation formula.
	fgUnh	**lfUudVu] =qfV;ka ,oa mlds izdkj] lehdj.kksa ds gy f}Hkktu] lhdsUV] jsX;qyk QkYlh rFkk** **U;qVu&jkWIlu fof/k ,oa mldh vfHfcUnqrk dh dksfV] f}rh; ?kkr cgqinksa ds ewyA vUrZo'ku% yxkkts vUrZo'ku] foHkkfir varj] varj ds mi;ksx Is vUrZo'ku lw= ,oa vUrZo'ku lw=ksa dh mRifRrA**
Unit IV	(English)	Linear Equations : Direct Methods for Solving Systems of Linear Equations, Gauss elimination, Gauss Jordan Method, LU Decomposition, Cholesky Decomposition, Iterative Methods: Jacobi Method, Gauss - Seidel Method, Relaxation Method, Methods Based on Numerical Differentiation.
	fgUnh	**jSf[kdlehdj.k % jSf[kd lehdj.kksa ds fudk; dks gy djus dh izR;{k fof/k;ka]**

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		xkml foyksiu] xkml tkMZu fof/k] ,y ;w fo;kstu] pksysLdh fo;kstu(] iqujko`fRr fof/k;ka] tsdksch fof/k] xkml flMsy fof/k] fjysDls'ku fof/k] la[;kRed vodyu ij vk/kkfjr fof/k;kaA
Unit V	(English)	Ordinary Differential Equations: Euler Method, Eulers Modified Method, Single-step Methods Runge-Kutta's Method, Multi-step Methods, Milne Method, Numerical Quadrature, Newton-Cote's Formulae, Gauss Quadrature Formulae, Methods Based on Numerical Integration with their derivation.
	fgUnh	**lk/kkj.k vody lehdj.k vk;yj fof/k] vkyj la'kksf/kr fof/k] ,dy pj.k fof/k] :ax&dqVVk fof/k] cgqpj.k fof/k] feyus fof/k] la[;kRed {ks=dyu] U;qVu dksV~l lw=] xkml {ks=dyu lw=] la[;kRed lekdyu ij vk/kkfjr fof/k;ka ,oa mudh mRifRrA**

Signature of members of B.O.S --------- ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Recommended Books	**(English)**	1. K. Hofman and R.Kunze, Linear Algebra, 2nd **Edition, Prentice Hall Englewood Cliffs, New Jersey 1971.** **2. C.E. Frooerg. Introduction to Numerical Analysis(Second Edition L Addison-Wesley-1979.** **3. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods Probles and Solutions, New Age International (P**) Ltd, 1996.
Reference Book		1. E. Balaguruswamy - Numerical Method Tata Mc Graw_ Hill Pub. Com - New Yark 2. K.B. Datta, Matrix and Linear Algebra, Prentice hall of India Pvt.Ltd, New Delhi, 2000 3. S.K. Jain, A Gunawardena & P.B. Bhattacharya, Basic Linear Algebra with MATLAB Key college Publishing (Springer-Verlag) 2001. 4. S.Kumarsaran, Linear Algebra A Geometric Approach Prentice _ Hall of India) 2000.
	fgUnh	**e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA**

Signature of members of B.O.S --------- ---------- -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER VI

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class		B.Sc./B.A.	Semester: VI
Subject	**(English)**	Mathematics	**Paper No.: I**
	fgUnh	**xf.kr**	
Title of the paper	**(English)**	Real Analysis, Discrete Mathematics and statistics.	
	fgUnh	**okLrfod fo'ys"k.k] fofoDr xf.kr ,oa lkaf[;dh**	
Medium of instructions (Teaching)		**Both English & fgUnh**	**Question Paper Language: Both fgUnh & English**
Maximum Marks	**Total : 150**	**Main Exam :100**	**C.C.E : 50**
Unit		**Syllabus**	
Unit I	(English)	Riemann integral, Algebra of Riemann integrable functions, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean velue theorems of integral calculus.	
	fgUnh	**jheku lekdy] jheku lekdyuh; Qyuksa dk cht xf.kr] Irr ,oa ,dfn"V Qyuksa dh lekdyuh;rk] lekdyu dk ewyHkwr izes;] lekdyuksa ds ek/;eku izes;**	
	(English)	Definition and examples of metric spaces, Neighborhoods, Limit points, Interior points, Open	

Signature of members of B.O.S ---------   ----------   --------------

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Unit II		and closed sets, Closure and interior, Boundary points, Subspace of a metric space, Cauchy sequences, Completeness, Cantor's intersection theorem, Contraction principle, Real numbers as a complete ordered field, Definition of Continuous functions and its illustrations.
	fgUnh	**nwjhd lef"V dh ifjHkk"kk ,oa mnkgj.k lkehl;] lhek fcUnq] var% fcUnq] foo`Rr ,oa lao`r leqPp;] laoj.kd ,oa vH;arj] ifjlhek fcUnq] nwjhd lef"V dh mi lef"V] dkS'kh vuqØe] iw.kZrk] dsUVj dk loZfu"B izes;] ladqpu fl)kar] iw.kZ Øfer {ks= ds :I esa okLrfod la[;k;sa lrr Qyu dh ifjHkk"kk ,oa mlds mnkgj.kA**
Unit III	(English)	Algebra of Logic, Tautologies and Contradictions, logical equivalence, Algebra of propositions, Quantifiers: Universal and Existential Quantifiers, Boolean Algebra and its properties, Demorgan's law, Algebra of Electric circuits and its applications.
	fgUnh	**rdZ dk cht xf.kr] iqu:fDr;ksa dk fojks/k dk iqujkoyksdu] rkfdZd rqY;rk] lk/;ksa dk chtxf.kr]**

Signature of members of B.O.S --------- --------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

		izek=hdkjd% vkfLrRo izek=hdkjd ,oa loZ izek=hdkjd] cwy; chtxf.kr ,oa mlds xq.k/keZ] **Mh&ekxZu fu;e] oS|qr ifjiFkksa dk chtxf.kr ,oa muds vuqiz;ksxA**
Unit IV	(English)	Boolean Function, Disjunction and Conjunction Normal Forms, Bools Expansion Theorem. Binary Relations, Equivalence Relations, Partitions and Partial order Relation.
	fgUnh	**cwyh; Qyu fo;kstuh; ,oa la;kstuh; izlkekU; :i] cwy dk izlkj izes; f}pj laca/k] rqY;rk laca/k] foHkktu ,oa vkaf'kd Øe laca/kA**
Unit V	(English)	Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation , expectation of sum and product of random variables, Moment generating function , Theoretical distribution: Binomial, Poisson distributions and their properties and uses.
	fgUnh	**izkf;drk] Irr izkf;drk] izkf;drk ?kuRo**

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

		Qyu rFkk muds vuqi;ksx ¼lrr izkf;drk caVu ds fy;s ek/;] cgqyd] ekf/;dk rFkk ekud fopyu Kkr djus ds fy;s½ xf.krh; izR;k'kk] ;n`fPNd pjksa ds **;ksx ,oa xq.ku dh izR;k'kk] vk?kw.kZ tud Qyu] IS)kafrd caVu% f}in ikW;tu caVu rFkk mlds xq.k/keZ ,oa mi;ksxA**
Recommended Books	**(English)**	1. R.R. Gpldberg, Real Analysis, Oxford & IBH Publishing Co., New Delhi, 1970. 2. G.F. Simmons. Introduction to Topology and Modem Analysis, McGraw-Hill, 1963. 3. T.M. Apostol, Mathematical Analysis, Norosa Publishing House. New Delhi, 1 4. C.L. Liu., Elements of Discrete Mathematics (Second Edition), McGraw Hill, International Editiojns, Computer Science scries 1986.
Reference Book		1. T.M. Apostol, Mathematical Analysis, Norosa Publishing House, New Delhi, 1985.

Signature of members of B.O.S   ----------   ----------   --------------
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		2. S.Lang. Undergrauate Anallysis, Springger-Veriag, New York, 1983.
		3. D.Somasundaram and B.Choudhary, A first Course in Mathematical Analysis. Narosa Publshing House, New Delhi, 1997.
		4. Shanti Narayan, A Course of Mathematical Analysis. S.Chand & Co. Delhi.
		5. R.K.Jain and S.K. Kaushik, An introductions to Real Analysis, S.Chand & Co., 2000.
		6. P.K. Jain and K/Ahmed Matric Spaces, Narosa Publishing House New Delhi, 1996.
		7. S.Lang, Undergraduate Analysis, Ppringer-Verlag, New Youk 1983.
		8. E.T. Copson, Metric Spaces, Combridge University Press, 1968.
		9. S.Lang. Undergraduate Analysis, Springer-Veriag, New Youk 1983.
Elementary Statistics		1. Statistics by M.Ray.
		2. Mathematical Statistics by J.N.Kapoor, H.C.Saxena (S.Chand)
		3. Fundamentals of Mathematical Statistics, Kapoor and Gupta.

Signature of members of B.O.S ---------- -----------   ---------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

	fgUnh	e-iz-fgUnh xzaFk vdkneh dh iqLrdsaA

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER I

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	Paper No : I (Compulsory)
Title of the paper	Advanced Abstract Algebra-I	
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total 100	Main Exam: 70 C.C.E: 30

Unit I	Normal & Subnormal series of groups, Composition series, Jordan-Holder series.
Unit II	Solvable & Nilpotent groups.
Unit III	Extension fields. Roots of polynomials, Algebraic and transcendental extensions. Splitting Fields. Separable and inseparable extension.
Unit IV	Perfect fields, Finite fields, Algebraically closed fields.
Unit V	Automorphism of extension, Galois extension. Fundamental theorem of Galois theory .Solution of polynomial equations by radicals, insolubility of general equation of degree.5 by radicals.
Recommended Book	1. I.N. Herstein, Topics in Algebra, Wiley Eastern, New Delhi. 2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.		Semester: I
Subject	Mathematics		
Title of the paper	Real Analysis	Paper No : II (Compulsory)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Definition and existence of Riemann-Stieltjes integral and its properties, Integration and differentiation.
Unit II	Integration of vector-valued functions, Rectifiable curves. Rearrangements of terms of a series. Riemann's theorem.
Unit III	Sequences and series of functions, point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, uniform convergence and continuity, uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation.
Unit IV	Functions of several variables, linear transformations, Derivatives in an open subset of R^n Chain rule, partial derivatives, differentiation, and inverse function theorem.
Unit V	Derivatives of higher orders, Power series, uniqueness theorem for power series, Abel's and Tauber's theorems. Implicit function theorem,
Recommended Books	1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill.
Reference	1. T.M. Apostal, Mathematical Analysis Narosa. 2. H.L. Royden , Real Analysis, Macmillan (Indian Edition)

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Topology-I	Paper No : III (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Countable and uncountable sets. Infinite sets and Axiom of Choice. Cardinal numbers and its arithmetic. Schroeder-Bernstein theorem. Statement of Cantor's theorem and the continuum hypothesis. Zorn's lemma. Well-ordering theorem.
Unit II	Definition and examples of topological spaces. Closed sets. Closure. Dense subsets. Neighborhoods, interior exterior and boundary. Accumulation points and derived sets. Bases and sub-bases, Subspaces and relative topology.
Unit III	Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems. Continuous functions and homeomorphism.
Unit IV	First and Second Countable spaces. Lindeiof's theorems. Separable spaces. Second Countability and Separability.
Unit V	Path- connectedness, connected spaces. Connectedness on Real line. Components, Locally connected spaces.
Recommended Books	1. J.R. Munkres, Topology- A first course. Prentice-hall of India. 2. G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill. 3. K.D. Joshi, Introduction to general topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Complex Analysis-I	Paper No : IV (Compulsory)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Complex integration, Cauchy-Goursat theorem. Cauchy integral formula, Higher order derivatives
Unit II	Morera's theorem. Cauchy's inequality. Liouville's theorem. The fundamental theorem of algebra. Taylor's theorem.
Unit III	The maximum modulus principle. Schwartz lemma. Laurent series. Isolated singularities. Meromorphic function theorem, argument principle Rouche,s theorem inverse function theorem.
Unit IV	Residues. Cauchy's residue theorem. Evaluation of integrals. Branches of many valued functions with special reference to argz, log z, z^a.
Unit V	Bilinear transformations, their properties and classification. Definitions and examples of conformal mappings.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-verlag.

Note : Setting is to be Done Strictly From Recommended Books

Signature of members of B.O.S   ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: I
Subject	Mathematics	
Title of the paper	Advanced Discrete Mathematics-I	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Semi groups & Monoids- sub semi groups sub monoids Homomorphism of semi groups and monoids. Congruence relation and Quotient Semi groups. Direct products. Basic Homomorphism Theorem.
Unit II	Lattices- Lattices as partially ordered sets, their properties, Lattices as Algebraic systems, sub lattices, Bounded lattices, Distributive Lattices, Complemented lattices
Unit III	Boolean Algebra- Boolean Algebras as lattices, various Boolean identities. Joint irreducible elements, minterms, maxterms, minterm Boolean forms, canonical forms, minimization of Boolean functions. Applications of Boolean Algebra to switching theory (Using AND, OR, & NOT gates) the Karnaugh method.
Unit IV	Graph Theory- Definition and types of graphs. Paths & circuits. Connected graphs. Euler graphs, weighted graphs (undirected) Dijkstra's Algorithm. Trees, Properties of trees, Rooted & Binary trees, spanning trees, minimal spanning tree.
Unit V	Complete Bipartite graphs, Cut-sets, properties of cut sets, Fundamental Cut-sets & circuits, Connectivity and Separability, Planar graphs, Kuratowski's two graphs, Euler's formula for planar graph
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER II

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Advanced Abstract Algebra-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Introduction to modules, Examples, sub modules quotient modules module Homomorphism, isomorphism. Finitely generated modules, cyclic modules.
Unit II	Simple modules, Semisimple modules, Free modules, Schur's lemma.
Unit III	Noetherain & Artinian modules and rings, Hilbert basis theorem. Wedderburn-Artin theorem.
Unit IV	Uniform modules, Primary modules, Noether-laskar theorem. Fundamental structure theorem of modules over a principal ideal domain.
Unit V	Algebra of linear transformation,Characterstics roots , Matrices , Matrix of linear transformation , Similarity of linear transformation , invariant spaces, Reduction to triangular forms.
Recommended Books	1. P.B. Bhattacharya, S.K. Jain ,S K. Nagpaul, Basic abstract Algebra, Cambridge. University Press, (Indian Edition) 2. I.N.Herstein ,Topics in Algebra , Wiley Eastern , New Delhi.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S   ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Lebesque Measure & Integration	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Lebesgue outer measure. Measurable sets. Regularity. Measurable functions. Borel and Lebesgue measurability. Non-measurable sets.
Unit II	Integration of Non-negative functions. The General integral. Integration of Series, Riemann and Lebesgue integrals.
Unit III	The Four derivatives. Functions of Bounded variation. Lebesgue Differentiation Theorem, Differentiation and integration.
Unit IV	The L^P-spaces, Convex functions, jensen's inequality. Holder and Minkowski inequalities. Completeness of $L^{p.}$
Unit V	Dual of space when $1 \leq P < \infty$ convergence in Measure, uniform. Convergence and almost uniform convergence.
Recommended Books	1. G.D.Barra ,Measure theory and integration . 2. Real Analysis by Royden.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

lass	M.Sc / M.A.	Semester: II
Subject	Mathematics	
Title of the paper	Topology-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Separation axioms T_0, T_1, T_2, T_3, T_4: their Characterizations and basic properties. Urysohn's lemma. Tietze extension theorem.
Unit II	Compactness. continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property. Sequentially and countably compact compact sets. Local compactness.
Unit III	Tychonoff product topology in terms of standard sub-base and its characterizations. Projection maps. Separation axioms and product spaces. Connectedness and product spaces. Compactness and product spaces (Tychonoffs theorem) countability and product space.
Unit IV	Net and filters. Topology and convergence of nets hausdorffness and nets. Compactness and nets. Filters and their convergence. Canonical way of converting nets to filters and vice-versa. ultra-filters and compactness.
Unit V	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.
Recommended Books	1. James R. Munkres Topology, A First Course. Prentice Hall of India Pvt. Ltd. New Delhi. 2. G.F Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill Book Company. 3. K.D.Joshi, Introduction to General Topology, Wiley Eastern.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------- ---------- --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester:	II
Subject	Mathematics		
Title of the paper	Complex Analysis-II	Paper No : IV	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Weierstrass factorization theorem. Gamma and its properties. Riemann Zeta function. Riemann's functional equation
Unit II	Mittage-Leffler's theorem. Analytic continuation. Uniqueness of direct analytic continuation. Uniqueness of analytic continuation along a curve. Power series method of analytic continuation.
Unit III	Schwartz reflection principle. Harmonic function on disc. Harnack inequality and theorem. Dirichlet problem. Green's function.
Unit IV	Canonical products. Jenson's formula. Hadamard's three circles theorem. Order of an entire function. Exponent of convergence. Borels theorem. Hadamard's factorization theorem.
Unit V	The range of an analytic function. Bloch's theorem. The little Picard theorem. Schottky's theorem. Montel Caratheodary and great Picard theorem. Univalent function. Bieberbach conjecture and the ¼ –theorem.
Recommended Books	1. J.B. Conway, Functions of one complex variable, Springer-Verlag.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: II	
Subject	Mathematics		
Title of the paper	Advanced Discrete Mathematics-II	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, incidence matrix Cut set matrix ,path matrix , circuit matrix , Adjacency matrix , directed graphs definition of types of directed graphs , Binary search trees.
Unit II	Discrete numerical functions , Asymptotic behavior of numerical functions ,generating functions , Recurrence relations , linear Recurrence relations with constant coefficients , homogeneous solution , particular solution , total solution.
Unit III	Computability and formal Languages , Languages , phrase structure Grammars derivation , sentential forms ,Language generated by grammar, Regular, Context-Free, and Context* Sensitive Grammars.
Unit IV	Finite State Automata , diagram & Languages determined by Automata , Finite state Acceptors ,deterministic and Non-deterministic Finite Automata finite State machines and their Transition Table & Diagrams. Equivalence machines.
Unit V	Reduced machines , Kleen's Theorem (statement only)Pumping Lemma , Moore and Mealy machines ,Turing Machine , Regular Expressions and corresponding Regular Language.(definition only)
Recommended Books	1. J.P. Tremblay & R. Manobar, Discrete mathematical Structures, McGraw Hill. 2. N. Deo, Graph Theory with applications, Preritice-Hill

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER III

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Functional Analysis-I	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Normed Linear spaces, Banach Spaces and examples. Properties of normed linear spaces Basic Properties of finite dimensional normed linear spaces.
Unit II	Normed linear subspace, equivalent norms, Ries'z lemma and compactness. quotient space of normed linear spaces and its completeness.
Unit III	Linear operator, Bounded linear operator and continuous operators.
Unit IV	Linear functional, bounded linear functional, Dual spaces with examples.
Unit V	Hilbert space, orthogonal complements, orthonormal sets and sequences. Representation of functional on Hilbert spaces.
Recommended Books	1. E.Kreyszig, Introductory functional analysis with application, Jhon Wiley & sons, New York 1978. 2. G.F. Simmous, Introductions to Topology & Modern Analysis, Tata Mc Graw Hill, New York.
Reference	1. B.Choudhary and Sudarshan Nanda, Functional Analysis with applications Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Integral Transform-I	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English

Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Laplace Transform, Inverse Laplace Transform. Transforms of derivatives, Shifting theorem, convolution Theorem.
Unit II	Application to Differential Equations, Application to Integral equations. Solution of simulates differential equations.
Unit III	Laplace Equation in two dimension, Wave Equation in one dimension Application to wave equation.
Unit IV	Application of Laplace Transform to electrical circuits, Application to Beams.
Unit V	Heat conduction equation in one dimension, Application to heat conduction equation.
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transform by Sneddon.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

lass	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-I	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Revision of graph theoretic preliminaries. Isomorphism of graphs, subgraphs.
Unit II	Walks, Paths and circuits, Connected graphs, Disconnected graphs and components, Euler Graphs, Operations of Graphs, Hamiltonian paths and circuits The traveling salesman problem.
Unit III	Trees, Properties of trees, Distance and centers in a tree, Rooted and Binary trees, Spanning trees, Fundamental circuits, spanning trees in a weighted graph.
Unit IV	Cut-sets, Properties of a cut-set, Fundamental circuits and cut-sets, connectivity and reparability.
Unit V	Planar graphs, Kuratowski's two graphs, Different Representations of a planer graph, Detection of Planarity, Geometric Dual, Combinational Dual.
Recommended Books	1. Graph theory with applications to Engineering and Computer Science by Narsingh Deo. Prentice Hall of India. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ----------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: III
Subject	Mathematics	
Title of the paper	Operations Research-I	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70 C.C.E: 30

Unit I	Operations Research and its scope, Origin and Development of Operations Research, Characteristics of Operations Research.
Unit II	Model in Operations Research, Phase of Operations Research, Uses and Limitations of Operation Research, Linear Programming Problems.
Unit III	Mathematical Formulation, Graphical Solution Method.
Unit IV	General Linear Programming Problem: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and Cyclic Problems, problem of degeneracy.
Unit V	Duality, Fundamental properties of duality and theorem of duality.
Recommended Book	1. Kanti Swarup, PO.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons., New Delhi.
Reference	1. S.D. Sharma, Operation Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995. (This book comes with a CD containing software) 3. G.Hadley, Linear Programming, Narosa Publishing House, 1995. 4. G. Hadley, Linear and Dynamic programming, Addison-Wesley Reading Mass.

Signature of members of B.O.S   ----------   ----------   --------------

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	5. H.A. Taha, operations research- An introduction, Macmillan Publishing Co. Inc., New York.
	6. Prem Kumar Gupta and D.S,. Hira, Operation Research, an Introduction, S.Chand & Compary Ltd, New Delhi
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt.Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: III	
Subject	Mathematics		
Title of the paper	Theory of Linear Operators-I	Paper No : V(l) (optional)	
Medium of instructions (Teaching)	English	Question Paper Language: English	
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Spectral Theory in finite dimensional normed spaces. Regular value resolvent set and spectrum.
Unit II	Spectral Properties of Bounded Linear Operators resolvent and spectral mapping theorem for polynomials.
Unit III	Spectral redius of a bounded linear operator on a complex banach space. Banach Algebra, Further properties of Banach Algebras.
Unit IV	Compact linear operators on normed spaces, further properties of compact linear operators.
Unit V	Spectral properties of compact linear operators.

Recommended Books	1. E. Kreyszing, Introductory functional analysis with applications. Jhon Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis Tata McGraw Hill, New York,
Reference	1. P.R. Halmos, Introctuion to Hilbert space and the theory of spectral Multiplicity, socond Edition, Chelsea Publishing Co New York, 1957. 2. N. Dund Ford and J.T. Schwartz. Linear operator-3 part inter science/Wile New Youk, 1958-74 3. G. Bachman and L. Narcil, Functional analysis for academic press New York 1966.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER IV

Signature of members of B.O.S   ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Functional Analysis-II	Paper No : I
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Hilbert adjoint operator and its properties, self adjoint, Unitary and normal operators positive operator.
Unit II	Zorn's Lemma Hahn-Banach Thorem for real linear spaces, Hahn-Banach theorem for complex linear space and normed linear spaces.
Unit III	Adjoint operators on normed spaces, relation between adjoint operator and Hilbert adjoint operator, Reflexive spaces, Reflexivity of Hilbert space.
Unit IV	Category theorem - Baire's Category theorem, uniform boundedness theorem and some of its application, strong and weak convergence in normed spaces.
Unit V	Convergence of sequences of operators and functionals, open mapping theorem, closed graph theorem, contraction theorem.
Recommended Books	1. E.Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons, New York 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastern Ltd.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Integral Transform-II	Paper No : II
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Fourier Transform, Infinite Fourier transform, Complex Fourier transform.
Unit II	Finite Fourier Transform and Fourier Integral.
Unit III	Convolution theorem, Perseval's Identity for Fourier series, Parseval's Identity for Fourier transform.
Unit IV	Application for Fourier Transform to Boundary value problems.
Unit V	Introduction to Hankel and Mellin Transforms, Fourier Series and Boundary value problems
Recommended Books	1. Integral Transforms by Goyal and Gupta. 2. Integral Transforms by I.N. Sneddon. 3. Integral Transforms by Gupta and Vashishtha.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

lass	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Advanced Graph Theory-II	Paper No : III
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Matrix representation of graphs, Incidence matrix Submatrices of A(G), Circuit Matrix, Fundamental circuit matrix and Rank of B, An application to a switching Network.
Unit II	Cut-set Matrix, Relationships among Af, Bf and Cf, path matrix, Adjacency matrix.
Unit III	Chromatic Number, chromatic Partitioning, chromatic Polynomial, Coverings, matching's.
Unit IV	The four color problem, directed graph, some types of Digraphs, Digraphs and Binary relations, Euler digraphs, Directed paths and connectedness.
Unit V	Trees with directed graphs, Arborescence, Fundamental Circuits in Digraphs. Matrix A,B and C of Digraphs, Adjacency matrix of a Digraph.
Recommended Books	1. Graph theory with applications to Engineering and computer science by Narsingh Deo. 2. Graph theory by Harary.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- --------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Operations Research-II	Paper No : IV
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Transportation problems: North-West Corner Method Least-Cost Method. Vogel's Approximation Method, MODI Method. Exceptional cases and problem of degeneracy.
Unit II	Assignment problems, Non-Linear Programming Techniques-Kuhn-Tucker Conditions, Non-negative constraints.
Unit III	Network analysis, constraints in Network, Construction of network, Critical Path Method(CPM) PERT, PERT calculation, Resource Leveling by Networks Techniques and advances of network (PERT/CPM)
Unit IV	Simulation: Monte-Carlo Simulation. Simulation of Networks, Advantage and Limitation of Simulation.
Unit V	Game theory- Two persons, Zero-sum Games, Maximin-Minimax principle, games without saddle points- Mixed strategies, Graphical solution of 2xm and mx2 games, solution by Linear Programming.
Recommended Books	1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.
Reference	1. S.D. Sharma, Operations Research. 2. F.S. Hiller and G.J. Lieberman, Industrial Engineering Series, 1995 (This book comes with a CD containing Software) 3. G.Hadley, linear programming, Narosa Publishing House, 1995.

Signature of members of B.O.S ---------   ----------   --------------

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	4. G.Hadley, linear and dynamic programming, Addison- Wesley Reading mass.
	5. H.A. Taha, Operations Research,- An Introduction Macmillan Publishing.
	6. Prem Kumar Gupta and D.S. Hira, Operations Research, an Introduction S.Chand & Company Ltd., New Delhi.
	7. N.S. Kambo, Mathematical Programming Techniques, Affiliated East-West Pvt, New Delhi, Madras.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S --------- ---------- -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Theory

Class	M.Sc / M.A.	Semester: IV
Subject	Mathematics	
Title of the paper	Theory of Linear Operators-II	Paper No : V(l) (optional)
Medium of instructions (Teaching)	English	Question Paper Language: English
Maximum Marks	Total: 100	Main Exam: 70	C.C.E: 30

Unit I	Further spectral properties of compact linear operators, Operator Equation involving compact linear operators.
Unit II	Further theorems of Fredholm type, Bi-orthonormal system, Fredholm Alternative, Equicontinuous sequence, compact integral operator.
Unit III	Spectral properties of Bounded Self-Adjoint linear operators, Further Properties of Bounded Self-Adjoint linear operators.
Unit IV	Positive operators: Product of positive operators, monotone sequences of bounded self adjoint operators, square roots of positive operator.
Unit V	Projection Operators: Product and sum of projections. Further properties of projections.
Recommended Books	1. E.Kreyszing, Introductory Functional Analysis with Application, John Wiley & Sons, New York, 1978. 2. G.F. Simmons, Introduction to Topology & Modern Analysis McGraw Hill, New York.
Reference	1. P.R. Halmons, Introduction to Hilbert space and the theory of Spectral Multiplicity, Second Edition, Chelsea Publishing co. Y.Y., 1957. 2. N.Dund Ford and J.T. Schwartz, Linear operator-3 part inter science/Wiley, New York.

Note : Setting is to be Done Strictly From Recommended Books.

Signature of members of B.O.S ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Course: B.Sc. (3 Years Degree Course)

Theory Papers	Title of paper	Marks			Compulsory/Optional
		Theory	C.C.E	Total	
Paper I	Algebra and Trigonometry				Compulsory
PaperII	Calculus,&Differential Equations				Compulsory
Paper III	Vector Analysis &Geometry				
SEMESTER III					
Paper	Calculus, Differential equation& Mechanics	100	50	150	Compulsory
SEMESTER IV					
Paper	Advanced Calculus,Partial Differential Equations ,Complex Analysis & Abstract Algebra	100	50	150	Compulsory
SEMESTER V					
Paper	Real Analysis, Linear Algebra , Elementary Discrete Mathematics	100	50	150	Compulsory
SEMESTER VI					
Paper	Metric Spaces, Numerical Analysis,Elementary Statistics	35	15	50	Compulsory
Paper	Internship		100		Compulsory

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Scheme of examination

Course: M.Sc. (2 Years Degree Course)

SEMESTER I					
Theory Papers	**Title of paper**	**Compulsory/Optional**	**Marks**		
			Theory	**C.C.E**	**Total**
Paper I	**Advanced Abstract Algebra-I**	**Compulsory**	**70**	**30**	**100**
Paper II	**Real Analysis**	**Compulsory**	**70**	**30**	**100**
Paper III	**Topology-I**	**Compulsory**	**70**	**30**	**100**
Paper IV	**Complex Analysis-I**	**Compulsory**	**70**	**30**	**100**
Paper V	**Advanced Discrete Mathematics - I**	**Optional**	**70**	**30**	**100**
Paper VI	**Job Oriented Project Work**	**Compulsory**	**--**	**--**	**50**
SEMESTER II					
Paper I	**Advanced Abstract Algebra-II**	**Compulsory**	**70**	**30**	**100**
Paper II	**Lebesgue Measure & Integration**	**Compulsory**	**70**	**30**	**100**
Paper III	**Topology-II**	**Compulsory**	**70**	**30**	**100**
Paper IV	**Complex Analysis-II**	**Compulsory**	**70**	**30**	**100**

Signature of members of B.O.S ----------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Paper V	Advanced Discrete Mathematics-II	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER III					
Paper I	Functional Analysis - I	Compulsory	70	30	100
Paper II	Integral Transforms - I	Optional	70	30	100
Paper III	Advanced Graph Theory -I	Optional	70	30	100
Paper IV	Operations Research-I	Optional	70	30	100
Paper V	Theory of Linear Operators-I	Optional	70	30	100
Paper VI	Job Oriented Project Work	Compulsory	--	--	50
SEMESTER IV					
Paper I	Functional Analysis - II	Compulsory	70	30	100
Paper II	Integral Transforms - II	Optional	70	30	100
Paper III	Advanced Graph Theory -II	Optional	70	30	100
Paper IV	Operations Research-II	Optional	70	30	100
Paper V	Theory of Linear Operators-II	Optional	70	30	100
Paper VI	Comprehensive Viva-Voce	Compulsory	--	--	50
Paper VII	Internship	Compulsory	--	--	100

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Signature of members of B.O.S   -----   -------   ------------
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Syllabus

2017-2018

Semester Pattern

Subject: MATHEMATICS

Date of submission in Autonomous Examination cell:

Signature
H.O.D.

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER I

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER II

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER III

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER IV

Signature of members of B.O.S ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER V

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

B.Sc. SEMESTER VI

Signature of members of B.O.S   ---------   ----------   --------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER I

Signature of members of B.O.S   ---------   ----------   -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER II

Signature of members of B.O.S   ---------   ----------   -------------

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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER III

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

M.Sc. SEMESTER IV

Signature of members of B.O.S --------- ---------- -------------
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Sarojini Naidu Govt. Girls Postgraduate Autonomous college, Shivaji Nagar, Bhopal
Semester Wise Syllabus for *Mathematics*
(As recommended by Board of studies)
Session:……….. 2017-2018.

Signature of members of B.O.S ---------   ----------   -------------
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Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ l= & 2017-18

THEORY

Class	**B.Sc.**	1st Year
Subject	**Mathematics**	
Title of the Paper	**Algebra and Trigonometry** **chtxf.kr ,oa f=dks.kfefr**	Paper No. **First/izFke**
Medium of instructions (Teaching)	English/Hindi **vaxzsth@fgUnh**	Question Paper Language: **English/Hindi** **vaxzsth@fgUnh**
Maximum Marks	Total: **50**	Main Exam : **40** C.C.E. : **10**

Unit - 1	Rank of a matrix, Normal & Echelon from of a matrix. Characteristic equations of a matrix. Eigen values. Eigen vectors. Linear Independence of row and column matrix.
bdkbZ&1	vkOgwg dh tkfr] vkO;wg dk izklkekU; ,oa ,s'ksykWu :i] vkO;wg dk vfHkyk{kf.kd lehdj.k] vk;xsu eku] vk;xsu lfn'k] iafDr ,oa LrEHk vkO;wg dh Lora=rkA
Unit - 2	Cayley Hamilton theorem and its use in finding inverse of a matrix application of matrix to solve a system of linear (homogenous and non-homogenous) equations, theorems on consistency and inconsistency of a system of linear equations, solving linear equations upto three unknowns.
bdkbZ&2	dsyh & gSfeYVu izes; ,oa vkO;wg dk O;qRØe vkO;wg ¼le?kkr ,oa vle?kkr½ Kkr djus esa bldk mi;ksx] jSf[kd lehdj.kksa ds fudk; ds gy ds fy;s vkO;wg dk iz;ksx] jSf[kd lehdj.kksa ds fudk; dh laxrrk ,oa vlaxrrk ij izes;] rhu vKkr jkf'k;ksa rd ds jSf[kd lehdj.kksa ds gyA
Unit - 3	Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equations. Reciprocal equations. Descarte's rule of signs.

Signature of Members of B.O.S.

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bdkbZ&3	,d pj ds lkekU; cgqinksa ds lehdj.k ds xq.kkadksa ,oa ewyksa ds chp laca/k] lehdj.kksa dk :ikarj.k] O;qRØe lehdj.k] fpUgksa dk fndkrsZ fu;eA

Signature of Members of B.O.S.

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Unit - 4	Logic - Logical connectives, Truth Tables, Tautology, Contradiction, Logical Equivalence, Algebra of propositions. Boolean Algebra-definition and properties, switching circuits and its applications, logic gates and circuits.
bdkbZ&4	rdZ'kkL= & rdZ la;kstd] IR;rk lkj.kh] iqu:fDr vkSj O;k?kkr] rkfdZd rqY;rk] lk/;ksa dk chtxf.krA cwyh; chtxf.kr & ifjHkk"kk ,oa mlds xq.k/keZA fLopu ifjFk ,oa mlds vuqiz;ksx] rdZ}kj ,oa ifjiFkA
Unit - 5	De- Moivre's theorem and its application, direct and inverse circular and hyperbolic functions. expansion of trignometric functions, Logarithm of complex quantities. Gregory's series, summation of trignometrical series.
bdkbZ&5	Mh & eksbolZ izes; ,ao blds vuqiz;ksx izR;{k ,oa O;qRØe o`Rrh; ,oa vfrijoy;d QyuA f=dks.kferh; Qyuksa dk foLrkj] lfEeJ la[;kvksa dk y?kqx.kd] xzhxksjh Js.kh] f=dks.kferh; Jsf.k;ksa dk ;ksxA

Text Books:
1. S.I. Loney - Plane Trigonometry Part- II
2. K.B. Datta - Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
3. Chandrika Prasad - A Text Book on Algebra and Theory of Equations, Pothishala Pvt.Ltd., Allahabad.
4. C.L. Liu - Elements of Discrete Mathematics (Second Edition). MeGraw Hill, International Edition, Computer Science Series, 1986.
5. e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

Reference Books:
1. H.S. Hall and S.R. Knight - Higher Algebra H.M. Publication, 1994.
2. N. Jacobson - Basic Algebra Vol. I and II , W.H. Freeman.
3. I.S. Luther and I.B.S. Passi - Algebra Vol I and II, Narosa Publishing House.
4. N.Saran and R.S. Gupta - Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad.

Signature of Members of B.O.S.

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Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ **l= & 2017-18**

THEORY

Class	**B.Sc.**	1st Year
Subject	**Mathematics**	
Title of the Paper	**Calculus and Differential Equations** **dyu ,oa vody lehdj.k**	Paper No. **Second/f}rh;**
Medium of instructions (Teaching)	English/Hindi **vaxzsth@fgUnh**	Question Paper Language: **English/Hindi** **vaxzsth@fgUnh**
Maximum Marks	Total: **50**	Main Exam : **40**	C.C.E. : **10**

Unit - 1	Successive differentiation, Leibnitz theorem, Maclaurin's and Taylor's series expansions, Asymptotes.
bdkbZ&1	mRrjksRrj vodyu] yScuht izes;] eWDykfju ,oa Vsyj Js.kh esa foLrkjA vuarLi'khZA
Unit - 2	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curves in Cartesian and polar coordinates.
bdkbZ&2	oØrk] mRryrk ,oa voryrk dk ijh{k.k] ufr ifjroZu fcUnq] cgqfcUnq] dkrhZ; ,oa /kqzoh; funsZ'kkadksa esa oØksa dk vuqjs[k.kA
Unit - 3	Integration of transcendental functions, Definite Integrals, Reduction formulae Quadrature, Rectification.
bdkbZ&3	vchth; Qyksa dk vledyu] fuf'pr lekdyu] leku;u lw=] {ks=dyu ,oa pkidyuA
Unit - 4	Linear differential equations and equations reducible to the linear form,

Signature of Members of B.O.S.

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	Exact differential equations, First order and higher degree equations solvable for x.y and p, Clairaut's equation and singular solutions, geometrical meaning of a differential equation, Orthogonal trajectories.
bdkbZ&4	jSf[kd vody lehdj.k ,oa jSf[kd lehdj.k esa lekusa; vody lehdj.k] ;FkkrFk vody lehdj.k] x, y vkSj b eas gy gksus ;ksX; izFke dksfV ,oa mPp /kkrh; vody lehdj.k] Dysjkos dk lehdj.k vkSj fofp= gyA vody lehdj.k dk T;kferh; vFkZ] ykafcd laNsfn;kWaA
Unit - 5	Linear differential equations with constant coeffieients, Homogencous linear ordinary differential equations. Linear differential equations of second order, transformation of equations by changing the dependent variable independent variable method of variation of parameters.
bdkbZ&5	vpj xq.kkadksa okys jSf[kd vody lehdj.k] lk/kkj.k jSf[kd le?kkr vody lehdj.k] f}rh; dksfV ds jSf[kd vody lehdj.k] Lora= pj@ijra= pj ds ifjorZu }kjk lehdj.kksa dk :ikarj.k] izkpy fopj.k fof/kA

Text Books:
1. Gorakh Prasad - Differential Calculus, Pothishala Private Ltd., Allahabad.
2. Gorakh Prasad - Integral Calculus, Pothishala Private Ltd., Allahabad.
3. D.A. Murray, Introductory Course in Differential equations, Orient Longman (Indian), 1967.
4. e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

Reference Books:
1. G.F. Simmons - Differential equations, Tata McGraw Hill, 1972.
2. E.A. Codington - An Introduction to ordinary differential equation, Prentice Hall of Indian, 1961.
3. H.T.H. Piaggio- Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, New Delhi 1985.
4. S.G. Deo- Differential Equations, Narosa Publishing House.
5. N.Piskunov - Differential and Integral Calculus, Peace Publishers, Moscow.

Signature of Members of B.O.S.

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Syllabus of Mathematics for Annual Exam System
(As recommended by Board of Studies)
Session/ l= & 2017-18

THEORY

Class	**B.Sc.**	1st Year
Subject	**Mathematics**	
Title of the Paper	**Vector Analysis and Geometry** **lfn'k fo'ys"k.k ,oa T;kfefr**	Paper No. **Third/r`rh;**
Medium of instructions (Teaching)	English/Hindi **vaxzsth@fgUnh**	Question Paper Language: **English/Hindi** **vaxzsth@fgUnh**
Maximum Marks	Total: **50**	Main Exam : **40**	C.C.E. : **10**

Unit - 1	Scalar and vector product of three vectors, product of four vectors, Reciprocal vectors, vector differentiation. Gradient, Divergence and curl.
bdkbZ&1	rhu lfn'kksa dk vfn'k ,oa lfn'k xq.ku] pkj lfn'kksa dk xq.ku] O;qRØe lfn'k] lfn'k vodyu] xzsfM;aV] Mk;ojtsUl ,oa dyZA
Unit - 2	Vector Integration, Theorems of Gauss, Green, Stoke (without proof) and problems based on them.
bdkbZ&2	lfn'k lekdyu] xkWl] xzhu ,oa LVksddh izes; ¼fcuk miifRr½ ,oa bu ij vk/kkfjr iz'uA
Unit - 3	General equation of second degree, tracing of conics, system of conies, polar equation of conic.
bdkbZ&3	f}rh; ?kkr ds O;kid lehdj.k] 'kkadoksa dk vuqjs[k.k] 'kkado fudk;] 'kkado dk /kqozh; lehdj.kA
Unit - 4	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators. Right circular cone, Equation of cylinder and its properties.
bdkbZ&4	fn, x, vk/kkj ij 'kadq dk lehdj.k] 'kadq ds tud] rhu ijLij yEcor

Signature of Members of B.O.S.

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	tudks gsrq izfrca/k] yEco`Rrh; 'kadq] csyu dk lehdj.k vkSj blds izxq.kA
Unit - 5	Central conicoids, Paraboloids, plane sections of conicoids, Generating lines.
bdkbZ&5	dsUnzh; 'kkadot] ijoy;t] 'kkadot ds lery izPNsn] tud js[kk,saA

Text Books:
1.   N. Saran and S.N. Nigam - Introduction to Vector Analysis Pothishala Pvt.Ltd., Allahabad.
2.   Gorakh Prasad and H.C. Gupta- Text Book on Coordinate Geometry, Pothishala Private Ltd., Allahabad.
3.   N.Saran and R.S. Gupta - Analytical Geometry of Three Dimension. Pothishala Pvt.Ltd., Allahabad (unit IV).
4.   e/;izns'k fgUnh xzaFk vdkneh dh iqLrdsaA

Reference Books:
1.   R.J.T. Bell - Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit-V).
2.   Murray R. Spiegel - Theory and Problems of Advance Calculus Sehaum Publishing Company, New Yark.
3.   Murray R. Spiegel - Vector Analysis, Sehaum Publishing Company, New Yark.
4.   Shanti Narayan - A Text Book of Vector Calculus, S.Chand & Co., New Delhi.
5.   Shanti Narayan - A Text Book of Vector Algebra, S.Chand & Co., New Delhi.
6.   S.L. Loney - The Elements of Coordinate Geometry, Macmillan and Company, London.
7.   P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Two Dimensions, Macmillan Indian Ltd., 1994.
8.   P.K. Jain and Khalil Ahmad - A Text Book of Analytical Geometry of Three Dimensions, Willey Eastern Ltd., 1999.

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