RayatShikshanSanstha's

Yashavantrao Chavan Institute of Science, Satara

Syllabus for Bachelor of Science Part – I

1. TITLE: **Mathematics**

2. YEAR OF IMPLEMENTATION: 2018-19

3. PREAMBLE: The syllabus of Mathematics for B.Sc.-I gives sound knowledge with deep understanding of Mathematics to undergraduate students. Student learns Mathematics as one of the subject at B.Sc.-I. The goal of syllabus to make the study of Mathematics popular, interesting among the students for higher studies. The new syllabus is based on basic and applications.

This syllabus is outcome of the discussion and suggestions of subject experts and faculty members.

4. GENERAL OBJECTIVES OF THE COURSE:

1. Student learns basic concepts in Mathematics and also geometrical figures & Graphical displays.

2. Student should be able to perform Mathematical operations.

3. Develop Mathematical curiosity and use inductive and deductive reasoning while solving problems.

4. Student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical science.

5. DURATION: 1 Year

6. PATTERN: CBCS Semester System

7. MEDIUM OF INSTRUCTION: English

8. STRUCTURE OF COURSE: Theory & Practical

1) FIRST SEMESTER ------- (NO. OF PAPERS 2 & Practical)

		Theory				Practical	
Sr.No	Subject Title	Paper No & Paper Code	No. Of Lectures per Week	Credits		No. of Lectures per Week	Credits
1		Paper-I BMT101 Paper-II BMT102	5	4	Practical Paper-I: BMP103	4	2

2) SECOND SEMESTER ------- (NO. OF PAPERS 2& Practical)

		Theory				Practical	
Sr.No	Subject Title	Paper No & Paper Code	No. Of Lectures per Week	Credits		No. of Lectures per Week	Credits
1		Paper-III BMT201 Paper-IV BMT202	5	4	Practical Paper-II: BMP203	4	2

2) Structure and Titles of Papers of B.Sc. Course:

B.Sc. I Semester I

Paper I : Differential Calculus-I

Paper II : Differential Equations-I

B.Sc. I Semester II

Paper III :Differential Calculus-II

Paper IV :Differential Equations-II

3) OTHER FEATURES:

A) LIBRARY :

Reference and Textbooks, Journals and Periodicals, Reference Books for Advanced Books for Advanced studies. –List Attached

REFERENCE BOOKS				
Sr No.	**Accession no.**	**Title of Reference Book**	**Name of Author**	**Publisher**
1	R-001.1	Basic Graph Theory	K.R.Parthasarathy	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
	R-001.2	Basic Graph Theory	K.R.Parthasarathy	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
2	R-002	Differential and Integral calculus	N.Piskunov	MIR publishrs Moscow
3	R-003	Introduction to Topology and Modern Algebra	G.F.Simmons	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
4	R-004	Mathematics for Degree student Bsc-III	Dr. P.K.Mittal	S.chand
5	R-005	Communication Theory	J.S.Katre	Tech. Max publications pune.
6	R-006	Bio-Mathematics	Dr.Sudhir.k.Pundir & Dr.RimplePundir	Pragati Prakashan.
	R-007	Ordinary and Partial differential equation	Dr.M.D. Raisinghania	S.chand
8	R-008	Methods of Mathematical physics	R.Courant & D.Hillbert	Wiley Eatern private Ltd New Delhi.
9	R-009	A course of Modern Analysis	E.T.Whittaker & G.N.Watson	Cambridge university press
10	R-010	Differential Calculus	Shantinarayan & Dr.P.K.Mittal	S.chand

11	R-011	Intoduction to Discrete Mathematics	Dr.M.k.Sen & Dr.B.C.Chakraborty	Arunabha sen, Books and ALLIEED LTD
12	R-012	Algebraic Structure	Asharani Singal	Rastogi and co Meerut
13	R-013	Functional Analysis	Balmohan Vishnu Limoye	Wiley Eatern private Ltd New Delhi.
14	R-014	Integration theory & Functional Analysis	Pundir & pundir	Pragati Prakashan.
15	R-015	Calculus & Analysis	G.K.Hebalkar	
16	R-016	Functional Analysis	Walter Rudin	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
17	R-017	Operation Research	Kantiswarup & P.K.Gupta manmohan	S.Chand & Sons
18	R-018	Fourier series & BVP	R.V.Chaurchil	Mc Graw-Hill publishing Co.Ltd
19	R-019	Higher Algebra	A.Kurosh	MIR publishrs Moscow
20	R-020	Introduction to Mathematics	K.M.Agashe	Venus prakashan Pune.
21	R-021	A course of pure Mathematics	G.H. Hardy	Cambridge university press
22	R-022	Measure theory	K.P.Gupta	Krishna publication mandir
23	R-023	Linear Programing & theory of games	K.P.Gupta Manmohan	S.Chand & Sons
24	R-024	0	H.L.Manocha	Prentice Hall of India
25	R-025	Mastering Turbo Pascal	Tom Swan	BPB
26	R-026	Elements of computer programing	R.Ramaswami	
27	R-027	A course of mechanics	J.C.Pal	Vikas publication house private Ltd
28	R-028	Integral Transform	A.R.Vashistha & R.K.Gupta	Krishna Prakashan Mandir
29	R-029	Problems & theorems in analysis	G.Polya & G.Szego	Sprtinger-verdag NEW_YORK Heidelberg,Berlin
30	R-030	Elementary Differential Equation	Eararl.D.Rainville, Philip.E.Bedient	Macmillan Publishing co.inc.new york
31	R-031	An Introduction to Matrices	S.C.Gupta	S.Chand & Sons
32	R-032	Operation Mathematics	R.V.Chaurchil	S.Chand & Sons ,Mc Graw-Hill kogakasha ltd
33	R-033	Principal of Mathematical Analysis	Walter Rudin	
34	R-034	Measure theory	P.R.Halmos	Sprtinger-verdag NEW_YORK Heidelberg,Berlin
35	R-035	Introduction to Real variable thory	Subhas chandra saxena, S.M.shaha	Prentice Hall of India
36	R-036	A first course in Abstract Algebra	John.B.Fraleigh	

37	R-037	Topics in Algebra	I.N.Herstein	Vikas publication house private Ltd
38	R-038	Real & Complex analysis	Walter Rudin	Mc Graw-Hill publishing Co.Ltd
39	R-039	Ordinary and Partial differential equation	Dr.M.D. Raisinghania & R.S.Aggrawal	S.Chand
40	R-040	A Book On Mechanics	A.D.Gupta and D.T.Parashar	Lamxmi Publication
41	R-041	Introduction to Mathematics	K.M.Agashe	Venus prakashan Pune.
42	R-042	Differential Calculus	T.R.Prabhakar , J.D Gupta	S.Chand & Sons
43	R-043	Mathematical Methods	J.N Sharma,R.K.Gupta	Krishna Prakashan Mandir,Meerut
44	R-044	The theory of Functions	E.C.Titchmarsh and M.A,FRS	Oxford University Press
45	R-045	Introductory Lessons in Modern Mathematical Concept	P.L.Bhatnagar	Affiliated East West New Delhi
46	R-046	Co-ordinate Geometry Of Two and three Dimensions	P.Bal Subhramanym,K.G.Subramanian	Krishna prakashan mandir Meerut
47	R-047	Mathematical Analysis-II	J.N. Sharama & A.R.Vashistha	Krishna prakashan mandir Meerut
48	R-048	The use of integral transform	IANN.Shedoon	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
49	R-049	Topology	James Dugundji	Universal bookstall New Delhi
50	R-050	Differential Calculus	Shantinarayan	S.Chand & co. New Delhi
51	R-051	Integrals & operators	Irving.E.Segal, Ray.A.Kunze	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
52	R-052	First course in logic	K.T.Basantani	Deepak prakashan Bombay
53	R-053	Elements of computer programing	R.Ramaswami	
54	R-054	Ordinary differential equations with Laplace Transform	Dr.Gundhar Paria	Scholars publication Indore.
55	R-055	Special functions	J.N. Sharama & R.K.Gupta	Krishna prakashan mandir Meerut
56	R-056	Differential Equations	R.D.Bhatt	Vipul prakashan Bombay
57	R-057	Elements of co-ordinate geometry	Prof. B.A.Chopade	Sqahitya seva prakashan satara
58	R-058	The theory of Lebesgue measure & integraton	Keshva Prasad Gupta	Krishna prakashan mandir Meerut
59	R-059	Linear Programing.	R.K.Gupta	Krishna prakashan mandir Meerut
60	R-060	Buisness Mathematics	K.T.Kashid, M.G.Chapekar	Venus prakashan Pune.

61	R-061	Topology	M.L.Khanna	Jai prakashan Nath & co.
62	R-062	Functional Analysis	M.L.Khanna	Jai prakashan Nath & co.
63	R-063	Functions of a Complex variable	Dr.J.C.Chaturvedi	students friends & co.
64	R-064	Linear Algebra	M.L.Khanna	Jai prakashan Nath & co.
65	R-065	Numerical Analysis & Number theory	Dr. H.C.Madhekar	Aanand prakashan
66	R-066	First course in Functional Analysis	Casper Goffman, George pedrick	Prentice Hall of India
67	R-067	Methods of Mathematical physics, Vol-II	R.Courant & D.Hillbert	Academic press Inc.New York
68	R-068	Theory & application of special functions	Richard.A.Askey	AcademicPress New York Sanfrancaiscu London
69	R-069	The H -functions of One & Two Variables With Applications	H.M.Shrivastava,K.C Gupta ,S.p Goyal	South Asian Publishers New Delhi Madras
70	R-070	Tables of Integral Transform Vol-I	Harry Barteman	Mc Graw-Hill publishing Co.Ltd
71	R-071	Tables of Integral Transform Vol-II	Harry Barteman	Mc Graw-Hill publishing Co.Ltd
72	R-072	Higher Transcendental functions Vol-I	Harry Barteman	Mc Graw-Hill publishing Co.Ltd
73	R-073	Higher Transcendental functions Vol-II	Harry Barteman	Mc Graw-Hill publishing Co.Ltd
74	R-074	Higher Transcendental functions Vol-III	Harry Barteman	Mc Graw-Hill publishing Co.Ltd
75	R-075	Determinants Vol-II (Thoery of Equations)	William Snow Burnside & Arthur Wiiliam Panton	S.chand
76	R-076	Schams outline series on Matrices	Frank Ayres	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
77	R-077.1	General Topology	s.J.tegeli & Dr.D.A.Patil	SUMS
	R-077.2	General Topology	s.J.tegeli & Dr.D.A.Patil	SUMS
78	R-078	Mathematical Analysis	V.Ganpathy Iyer	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
79	R-079	Methods of Real analysis	R.R.Goldberg	Oxford & IBH publishing co.New Delhi
80	R-080	Special functions of Mathematical Physics & Chemistry	IANN.Shedoon	
81	R-081	A Book On Mechanics	Om.P.Chug	Laxmi publication New Delhi
82	R-082	Vector Analysis & Introduction to Tensor analysis	Murray. R. Spiegal	Tata Mc Graw-Hill publishing Co.Ltd New Delhi
83	R-083	Special Functions of Applied Mathematics	B.C.Carlson	Academic press Inc.New York
84	R-084	A short Table of Integrals	Peirce. Foster	Oxford & IBH publishing

				co.New Delhi
85	R-085	Elements of Real Analysis	Shantinarayan	S.Chand
86	R-086	An Introduction to Numerical Analysis	Devi Prasad	Narosa publishing
87	R-087	A Primer of Real Functions	Ralphp.Boas, JR	The Mathematical associaton of America
88	R-088	Tensor Techniques	Dr.L.N.Katkar	SUMS
89	R-089	Distribution theory & Transform Analysis	Zemanian. A.H	
90	R-090	Set theory	charls.C.pinter	
91	R-091	Introduction to Computer Science	Francis Scheid	
92	R-092	Programing with Fortran	Symour Lipschutz Apthur Poe.	
93	R-093	Programing with Pascal	Byrons.Gottfried	Mc Graw-Hill Book Co.
94	R-094	Integral Calculus	Shantinarayan, Dr.P.K.Mittal	S.Chand
95	R-095	Differential Geometry	Dr.L.N.Katkar & Dr.M.S.Bapat	Dr.Rajendra.D. Kankariya
96	R-096	Integral Equations And Boundary Value Problem	Pundir & pundir	Pragati Prakashan.
97	R-097	Numerical Analysis	Goel-Mittal	Pragati Prakashan.
98	R-098	Linear Algebra	K.P.Gupta	Pragati Prakashan.
99	R-099	Metric Spaces	Pundir & pundir	Pragati Prakashan.
100	R-100	Complex Analysis	Goyal, Gupta & Pundir	Pragati Prakashan.

List of Journals:

Sr.No	Name of Journals
1	Current science
2	Journal of Indian Mathematical Society
3	Resonance
4	Global Journal of pure and applied Mathematics
5	Trajectory

B) SPECIFIC EQUIPMENTS:

Necessary to run the Course.

LCD, Projector, Visualizer, Smart board

c) Laboratory Equipments:

1. Computer
2. Scientific Calculator

RayatShikshanSanstha's

Yashavantrao Chavan Institute of Science, satara

Syllabus Introduced from June, 2018

B.Sc. Part I : Subject Title

Semester –I

Theory : Paper I: Title of Paper: Differential Calculus-I

Unit-1 Limits and continuity of Real Valued functions [10]

1.1 $\varepsilon - \delta$ definition of limit of function of one variable, Left hand Side and Right Hand Side limits.

1.2 Properties of limits. (Statements Only)

1.3 Continuous Functions :

1.3.1 Definition : Continuity at a point and Continuous functions on interval

1.3.2 Theorem: If f and g are continuous functions at point $x = a$, then $f + g,\ f - g, fg$ and $\frac{f}{g}$ are continuous at point $x = a$. (Without Proof)

1.3.3 Theorem: Composite function of two continuous functions is continuous.

1.3.4 Examples on continuity.

1.4 Classification of Discontinuities (First and second kind), Removable Discontinuity, Jump Discontinuity.

1.5 Definition: Bounded sets, Least Upper Bound (Supremum) and Greatest Lower bound (infimum).

1.5.1 Least Upper Bound axiom, Greatest Lower bound axiom and its Consequences.

(R_2: page No. 45 to 51)

Unit-2 Properties of continuity of Real Valued functions [8]

2.1 Theorem: If a function f is continuous in the closed interval [a,b] then it is bounded in [a,b]

2.2 Theorem : If a function f is continuous in the closed interval [a,b], then it attains its bounds at least once in [a, b].

2.3 Theorem: : If a function f is continuous in the closed interval [a,b] and if $f(a)$ and $f(b)$ are of opposite signs then there exists $c \in (a, b)$ such that $f(c) = 0$.

2.4 Theorem: : If a function f is continuous in the closed interval [a,b] and if $f(a) \neq f(b)$ then f assumumes every value between $f(a)$ and $f(b)$.

(R_2: page No. 57 to 69)

Unit- 3 Differentiation [6]

3.1 Definitions: Differentiability at a point, Left Hand derivative ,Right Hand Derivative, Differentiability in the interval $[a, b]$.

3.2 Examples on derivative.

3.3 Geometrical interpretation of a derivative.

3.4 Theorem: Continuity is necessary but not a sufficient condition for the existence of a derivative.

3.5 Darboux's Theorem on derivative

(R_2: Page No. 67 to 110)

Unit-4 Successive Differentiation (12)

4.1 Introduction.

4.2 n^{th} order derivative of some standard functions : $(ax + b)^m$, e^{ax}, a^{mx}, $\frac{1}{ax+b}$, $\log(ax + b)$, $\sin(ax + b)$, $\cos(ax + b)$, $e^{ax} \sin(bx + c)$, $e^{ax} \cos(bx + c)$.

4.3 Examples.

4.3 Leibnitz's Theorem.

4.4 Examples on Leibnitz's Theorem.

(R_3: Page No. 124 to 130)

Recommended Books:

R_1: G. B. Thomas and R. L. Finney, **Calculus and Analytical Geometry**, Pearson Education, 2007.

R_2: Shanti Narayan, **Differential Calculus**, S. Chand and Company, New Delhi. 2004.

R_3: G.V. Kumbhojkar and H.V. Kumbhojkar, Differential and Integral Calculus

R_4: H. Anton, I. Birens and Davis, **Calculus**, John Wiley and Sons, Inc.2002.

Reference Books:

1) Shanti Narayana and P. K. Mittal, **A Course of mathematical Analysis**, S. Chand andCompany, New Delhi. 2004.

2) S. C . Malik and Savita Arora, **Mathematical Analysis (Second Edition)**, New Age International Pvt. Ltd., New Delhi, Pune, Chennai.

3) Maity and Ghosh, **Differential Calculus**, New Central Book Agency (P) limited,Kolkata, India. 2007

Learning Objectives:

Unit-1: Student learns ε-δ definition of limit of a function of one variable. They classify discontinuities.

Unit-2: Student learns important properties of continuous functions.

Unit-3 : Student learns Differentiability of a function and geometrical meaning of derivative. They find left hand derivative and right hand derivatives.

Unit-4 : Student learn to find n^{th} derivative of functions as well as find n^{th} derivative of product of two functions.

Theory : Paper II: Title of Paper: Differential Equations

Unit 1:Differential Equations of first order and first degree (10)

1.1 Revision : Definition of Differential equation, order and degree of Differential equation.

1.2 Definition : Exact Differential equations.

1.2.1 Theorem: Necessary and sufficient condition for exactness.

1.2.2 Working Rule for solving an exact differential equation.

1.2.3 Integrating Factor (I.F.) by using rules (without proof).

1.2.4 Examples.

1.3 Linear Differential Equation: Definition.

1.3.1 Method of solution.

1.3.2 Examples.

1.4 Bernoulli's Differential Equation : Definition.

1.4.1 Method of solution.

1.4.2 Examples.

1.5 Orthogonal trajectories: Cartesian and polar co-ordinates.

1.5.1 Examples.

(R_3: Page No. 25 to 50)

Unit-2 Differential Equations of first order but not of first degree (8)

2.1 Introduction.

2.2 Equations solvable for p : Method and Examples.

2.3 Equations solvable for x : Method and Examples.

2.4 Equations solvable for y : Method and Examples.

2.5 Definition :Clairaut's equation.

2.5.1 Method of solution and Examples.

2.6 Equations Reducible to Clairaut's form by substitutions and examples.

(R_3: Page No. 59 to 64)

Unit-3 Linear Differential Equations with constant Coefficients –I (9)

3.1 Introduction

3.1.1 Definition : Complementary function(C.F.) and particular integral(P.I.), operator D.

3.1.2 Property : $(D-a)(D-b)y = (D-b)(D-a)y$

3.2 General Solution of f(D)y=0 .

3.2.1 Solution of f(D)y=0 when A.E. has non-repeated roots.

3.2.2 Solution of f(D)y=0 when A.E. has repeated roots.

3.2.3 Solution of f(D)y=0 when A.E. has non-repeated roots real and complex roots.

3.3 Examples.

Unit-4 Linear Differential Equations with constant Coefficients –II (9)

4.1 Meaning of symbol $\frac{1}{f(D)}$.

4.2 General solution of f(D) y=X.

4.3 Theorem : (A) $\frac{1}{D-a}\, X = e^{ax} \int X\, e^{-ax} dx$

(B) $\frac{1}{D+a}\, X = e^{-ax} \int X\, e^{ax} dx$

4.4 General Methods to find Particular Integral and Examples.

4.5 Theorem : $\frac{1}{(D-a)^n} e^{ax} = \frac{x^n}{n!} e^{ax}; n \in \mathbb{Z}^+$.

4.6 Short methods to find Particular Integrals when X is in the form $e^{ax}, \sin ax, \cos ax, x^m, e^{ax}V, xV$ (V is function of x).

4.7 Examples.

For Unit 3 and 4 (R_3: Page No. 75 to 125)

Recommended Books:

R_1: H.V. Kumbhojkar, Dattar and Bapat, Calculus and Differential Equations, Nirali Prakashan.

R_2: Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.

R_3: Diwan and Agashe, Differential Equations

Reference Books:

1) R. K. Ghosh and K. C, Maity, An Introduction to Differential Equations, Seventh Edition,2000; Book and Allied (P) Ltd

2) Sharma and Gupta, Differential Equation, Krishna Prakashan, Media co., Meerut.

3) D. A. Murray, Introductory course in Differential Equations, Khosala Publishing House,Delhi.

4) M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand Publications

Learning Objectives:

Unit-1: Student learns exact differential equations , condition for exactness, Integrating Factors (I.F.), linear differential equations and Bernoulli's equation.

Unit-2: Student learns differential equation of first order but not of first degree.

Student learns Clairaut's equation, equation reducible to clairaut's form.

Unit-3: Student learns to find general solution of $f(D)y = 0$.

Unit-4: Student learns to find general solution of $f(D)y = X$

Practical – I

1. Continuity of function
2. Successive Differentiation: n^{th} order derivative
3. Leibnitz's theorem
4. Linear Differential Equations
5. Bernoulli's Differential Equations
6. Orthogonal trajectories: Cartesian co-ordinates
7. Orthogonal trajectories: polar co-ordinates
8. Clairaut's Form and Equations Reducible to Clairaut's Form
9. Linear Differential Equations with constant Coefficients-I

   (for $X = e^{ax}, \sin ax, \cos ax$)
10. Linear Differential Equations with constant Coefficients- II

    (for $X = x^m, e^{ax}V,\ xV$)

Books Recommended:

1)H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.

2) Shanti Narayan, Differential Calculus

3) H.V. Kumbhojkar, Dattar and Bapat, Calculus and Differential Equations, Nirali Prakashan.

4) Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.

5) Diwan and Agashe, Differential Equations

Learning Outcomes:-

1) Student learns continuous functions and discontinuous functions.

2) Student find n^{th} derivative of functions.

3) Using Leibnitz theorem students obtain n^{th} derivative of product of two functions.

4) Student solve linear differential equations.

5) Student solve Examples on Bernoullis differential equations.

6) Student can find Orthogonal trajectories: for given Cartesian equation of curves

7)Student can find Orthogonal trajectories: for given polar equation of curves

8) Students solve clairauts equation and equations reducible to clairauts form.

9) Student solve the differential equations with constant coefficients

(for $X = e^{ax}, \sin ax\,, \cos ax$)

10) Student solve the differential equations with constant coefficients

(for $X = x^m, e^{ax}V,\ xV$)

Semester -II

Theory : Paper III: Title of Paper: Differential Calculus-II

Unit 1: Mean Value Theorems (9)

3.1 Rolle's Theorem

3.1.1 Geometrical interpretation

3.1.2 Examples on Rolle's theorem

3.2 Lagrange's Mean Value Theorem

3.2.1 Geometrical interpretation of,

3.2.2 Examples

3.3 Cauchy's Mean Value Theorem

3.3.1 Examples

(R_2: page No. 136 to 139 and 166 to 167)

Unit 2 : Series Expansion and Indeterminate Forms (8)

2.1Taylor's Theorem with Lagrange's and Cauchy's form of remainder (statement only)

2.2Maclaurin's Theorem with Lagrange's and Cauchy's form of remainder (statement only)

2.3 Maclaurin's Series for $e^x, \sin x, \cos x, \log(1+x), \log(1-x), (1+x)^n, \frac{1}{1+x}, \frac{1}{1-x}$

2.4 Examples on Taylor's series and Maclaurin's series

2.5 Indeterminate Forms : L'hospital's rule ((statement only).

The Forms $\frac{0}{0}, \frac{\infty}{\infty}, 0 \times \infty, \infty - \infty, 0^0, \infty^0, 1^\infty$ and Examples

(R_2: page No. 165to 174) ; (R_3: page No. 29 to 44)

Unit-3 Partial Differentiation(10)

3.1 Introduction: Functions of two variables, Limit and Continuity of functions of two variables,

3.2 Partial derivative, partial derivative of higher orders, Chain Rule (Statement only) and its Examples

3.3 Homogeneous functions: Definition with illustrations

3.4 Euler's theorem on homogenous functions

3.4.1 If $f(x, y)$ and $f(x, y)$ is a homogenous function of x, y of degree n, then $x^2 \frac{\partial^2 f}{\partial x^2} + y \frac{\partial^2 f}{\partial x \partial y} + y^2 \frac{\partial^2 f}{\partial y^2} = n(n-1)f.$

3.4.2 If $F(u) = f(x, y)$ and $f(x, y)$ is a homogenous function of x, y of degree n, then $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y} = n \frac{F(u)}{F'(u)}$

3.4.3 If $F(u) = f(x, y)$ and $f(x, y)$ is a homogenous function of x, y of degree n, then $x^2 \frac{\partial^2 f}{\partial x^2} + y \frac{\partial^2 f}{\partial x \partial y} + y^2 \frac{\partial^2 f}{\partial y^2} = n(n-1)f$

(R_3: page No. 11.1to 11.23)

Unit 4-Extreme Values(9)

4.1 Maxima and Minima for function of two variables : Definition of Maximum, Minimum and Stationary values of function of two variables

4.2 Conditions for maxima and minima (Statement Only) and Examples

4.3 Lagrange's Method of undetermined multipliers of two variables and Examples on it

(R_3: page No. 7.1to 7.79)

Recommended Books:

R_1: 1) G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007

R_2:Differential Calculus by Shanti Narayan

R_3: G.V. Kumbhojkar and H.V. Kumbhojkar, Differential and Integral Calculus

Reference Books:

1) Shanti Narayana and P. K. Mittal, **A Course of mathematical Analysis**, S. Chand andCompany, New Delhi. 2004.

2) S. C . Malik and Savita arora, **Mathematical Analysis (second Edition)**, New AgeInternational Pvt. Ltd., New Delhi, Pune, Chennai.

3) Maity and Ghosh, **Differential Calculus**, New Central Book Agency (P) limited,Kolkata, India. 2007

Learning Objectives:

Unit-1: Student learns Rolle's theorem, Lagrange's mean value theorem and Cauchy's mean value theorem. They solve the examples on these theorems.

Unit-2: Student learns Taylor's theorem, Maclaurin's Theorem, Maclaurin's series, and indeterminate forms.

Unit-3: Student learns function of two variables, limit and continuity of function of two variables, partial differentiation, Euler's theorem on homogeneous function.

Unit - 4: Student can find maxima and minima of function of two variables. Also find stationary value by Lagrange's Method of undetermined multipliers method.

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Theory : Paper IV: Title of Paper: Differential Equations-II

Unit 1: Homogeneous Linear Differential Equations (8)

1.1 General Form of Homogeneous Linear Differential Equation

1.2 Method of Solution and Examples

1.3 Equations Reducible to Homogeneous Linear Form

1.4 Examples

(R_2: Page No. 14 to 29)

Unit-2 Second Order Linear Differential Equations (14)

2.1 General Form

2.2 Complete solution when one integral is known: Method and Examples

2.3 Transformation of the equation by changing the dependent variable and Examples(Removal of First Order Derivative)

2.4 Transformation of the equation by changing the independent variable and Examples

2.5 Method of Variation of Parameters and Examples

(R_3: page No. 256 to 276)

Unit-3 Ordinary Simultaneous Differential Equations (6)

3.1 Simultaneous Linear Differential Equation of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$

3.2 Method of solving Simultaneous Linear Differential Equation

3.3 Geometrical Interpretation

3.4 Examples

(R_3:Page no. 137 to 148)

Unit-4 Total Differential Equations (8)

4.1 Total differential Equation $Pdx + Qdy + Rdz = 0$

4.2 Necessary Condition for Integrability of Total Differential Equation

4.3 Method of solving Total Differential Equations :

a) Method of Inspection

b) One variable regarding as constant

4.4 Geometrical Interpretation

4.5 Geometrical Relation Between Total Differential Equation and Simultaneous Linear Differential Equation

4.6 Examples

(R_1: Page no. 110 to 148)

Recommended Books:

R_1: Sharma and Gupta, Differential Equation, Krishna Prakashan, Media co., Meerut.

R_2: D.A. Murray, Introductory course on Differential Equations, Orient Longman,(India),1967.

R_3: M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand Pub.

Reference Books:

1) R. K. Ghosh and K. C, Maity, An Introduction to Differential Equations, Seventh Edition,2000; Book and Allied (P) Ltd

2) Diwan and Agashe, Differential Equations

3) D. A. Murray, Introductory course in Differential Equations, Khosala Publishing House,Delhi.

Learning Objectives:

Unit-1: Student learns homogeneous linear differential equation and methods of solution.

Unit-2: Student can solve second order differential equation

i) when one integral is known

ii) by changing dependant variable

iii) by changing independent variable

. iv) by method of variation of parameter

Unit-3: Student learns ordinary simultaneous differential equations. They come know the geometrical interpretation.

Unit-4: Student learns the condition for integrability of $Pdx+Qdy+Rdz=0$ and solve the total differential equations. They come know the geometrical interpretation

Practical-II

1. Lagrange's Mean Value Theorem
2. Cauchy's Mean Value Theorem
3. Indeterminate forms
4. Extreme values
5. Lagrange's undetermined multiplier method
6. Homogeneous Linear Differential Equations and Reducible to Homogeneous Linear Differential Equations
7. Second Order Linear Differential Equations(One solution is known)
8. Second Order Linear Differential Equations(By Changing Dependent Variable)
9. Second Order Linear Differential Equations(By Changing Independent Variable)
10. Total Differential Equations

Books Recommended:

1)H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.

2) Shanti Narayan, Differential Calculus

3) H.V. Kumbhojkar, Dattar and Bapat, Calculus and Differential Equations, Nirali Prakashan.

4) Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.

5) Diwan and Agashe, Differential Equations

Learning Outcomes

1) Student solve examples on Lagranges Mean Value Theorem.

2) Student solve examples on Cauchy's Mean Value Theorem.

3)Students identify indeterminate forms and can find their limits.

4) Students can determine maximum and minimum values

5)Students can find stationary values by Lagrange's method.

6) Student solve Examples on homogeneous linear differential equations.

And reducible to homogeneous differential equationform.

7) Student solve Examples onsecond order linear differential equations when one solution is known.

8) By changing dependant variable student solve second order linear differential equations.

9) By changing independent variable student solve second order linear differential equations.

10) Students solve examples on total differential equations.