"Dissemination of Education for Knowledge, Science and Culture"
- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

Vivekanand College, Kolhapur (Autonomous)

DEPARTMENT OF MATHEMATICS

B.Sc. Part - I
Semester-I & II

SYLLABUS

Under Choice Based Credit System

to be implemented from Academic Year 2018-19

B.Sc. I (Sem -I and II) Mathematics

Course Structure

B. Sc. Part-I [Semester I]

Course code	Title o the course	Instructions Lectures /Week	Duration of term end exam	Marks Term end exam	Marks (Internal) Continuous Assessment	Credit
DSC -1003 A	Differential Calculus	5	3 hours	80	20	4

B. Sc. Part-I [Semester II]

Course code	Title o the course	Instructions Lectures /Week	Duration of term end exam	Marks Term end exam	Marks (Internal) Continuous Assessment	Credit
DSC -1003 B	Differential equations	5	3 hours	80	20	4

Computational Mathematics Lab- DSC 1003(PR) Total Credit 04

Course code	Title of the course	Instructions Lectures /Week	Duration of term end exam	Marks [End of academic year]	Credit
DSC 3A	Differential Calculus	4	3 hours	50	4
DSC 3B	Differential Equations	4	3 hours		

B. Sc. Mathematics Part – I CBCS
Semester - I Paper- I
Differential Calculus (DSC -1003A)

Theory: 60Hours (75 lectures of 48 minutes) - Credits -4

Course Outcomes: After the completion of the course the student will be able to -

CO1: Understand higher order derivative and its application

CO2: Identify a asymptote of function and sketch the graph of the function

CO3: Understand the consequences of various mean value theorems on differentiable functions

CO4: Calculate the limit and examine the continuity of a function at a point

CO5: Employ the theorem on properties of continuity in various examples

CO6: Understand the geometrical interpretation of mean value theorem

Unit	Syllabus	Lectures/ Teaching Hours	Credits
Module 1	**Higher order Derivatives:** Successive Differentiation:n^{th} order derivative of standard functions: $y=(ax+b)^m$, $y=e^{ax}$, $y=a^{mx}$, $y=1/(ax+b)$, $y=\log(ax+b)$, $y=\sin(ax+b)$, $y=\cos(ax+b)$, $y=e^{ax}\sin(bx+c)$, $y=e^{ax}\cos(bx+c)$, Examples on n^{th} order derivatives, Leibnitz's theorem, Partial differentiation, Chain rule (without proof) and its examples, Euler's theorem on homogenous functions, Maxima and Minima for functions of two variables, Lagrange's method of undetermined multipliers	15	1
Module 2	**Tracing of Curves and its rectification:** Introduction, Definition of Terms: Tangents, Normals, Curvature, Asymptotes, Singular Points, Procedure for tracing of curve given in Cartesian form, Common Curves, Parametric representation of curves and tracing of parametric curves, Polar representation of curves and tracing of polar curves, Rectification of the curves Length of the arc of a curve given by $y=f(x)$, Length of the arc of the curve given by $r=f(\theta)$	15	1
Module 3	**Mean Value Theorem and Indeterminate Forms** : Rolle's Theorem, Geometrical interpretation of Rolle's Theorem, Examples on Lagrange's Mean Value Theorem (L.M.V.T.), Geometrical interpretation of L.M.V.T., Examples on L.M.V.T., Cauchy's Mean Value Theorem (C.M.V.T.), Examples on C.M.V.T., Taylor's Theorem with Lagrange's and Cauchy's form of remainder, Maclaurin's Theorem with Lagrange's and Cauchy's form of remainder, Maclaurin's series for sin x, cos x, e^x, log (1+x), $(1+x)^m$,Examples on Maclaurin's series,	15	1

	Examples on maxima and minima of function, Indeterminate Forms		
Module 4	**Limits and Continuity of real valued functions :** $\in -\delta$ definition of the limit of a function of one variable, Left hand sides limit and right hand sides limit, Theorem om limits(statement only), Continuous function and their properties, If f and g are two real valued functions of a real variables which are continuous at x = c i) f + g ii) f – g iii)f.g are continuous at x = c. and iv) f/g is continuous at x = c , g(c) ≠ 0, Composite function of two continuous functions is continuous, Classification of discontinuities (First and second kind), simple discontinuities ,Removable discontinuity, Jump discontinuity of first kind, Jump discontinuity of second kind, Differentiability at a point, left hand derivative, right hand derivative, differentiability in the interval [a, b], Theorem: Continuity is necessary but not a sufficient condition of differentiability, If function f is continuous in closed interval [a, b], then it is bounded in [a, b], If function f is continuous in closed interval [a, b], then it attains its bounds at least one in [a, b].If a function f is continuous in a closed interval [a, b] and if f(a), f(b) are of opposite signs then there exists c ∈ [a, b] such that f(c) = 0, If a function f is continuous in a closed interval [a, b] and if f(a) ≠ f(b)then f assumes every value between f(a) and f(b).	15	1

Reference Books:

1) H. Anton, I. Birens and Davis, Calculus, John Wiley and Sons, Inc.2002.
2) G. B. Thomas and R. L. Finney, Calculus and Analytical Geometry, Pearson Education,2007.
3) Maity and Ghosh, Differential Calculus, New Central Book Agency (P) limited,Kolkata,India. 2007.
4) Shanti Narayana and P. K. Mittal, **A Course of mathematical Analysis**, S. Chand andCompany, New Delhi. 2004.
5) S. C . Malik and Savita arora, **Mathematical Analysis (second Edition)**, New AgeInternational Pvt. Ltd., New Delhi, Pune, Chennai.

B. Sc. Mathematics Part – I CBCS
Semester - I Paper- I
Differential Equationa (DSC -1003b)
Theory: 60Hours (75 lectures of 48 minutes) - Credits -4

Course Outcomes: After the completion of the course the student will be able to -

CO1: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order
CO2: Calculate P. I. and C.F. of different types of differential equations
CO3: Solve homogeneous and non – homogeneous partial differential equation
CO4: Solve homogeneous and non homogeneous differential equation.
CO5: Solve the differential equation of degree more than one
CO6: Classify the partial differential equations

Unit	**Syllabus**	**Lectures/ Teaching Hours**	**Credits**
Module 1	**Differential Equations of First Order and First Degree:**Exact Differential Equations: Necessary and Sufficient condition for exactness, Working Rule for solving an Exact Differential Equation, Integrating Factors, Integrating Factor by Inspection and examples, Integrating Factor by using Rules (Without Proof) and examples, Linear Differential Equations: Definition, Method of Solution and Examples, Bernoulli's Equation: Definition, Method of Solution and Examples. Differential Equations of First Order But Not of First Degree: Equation solvable for p, equation solvable for x, equation solvable for y, Clairaut's form, equation reducible to Clairaut's equation	15	1
Module 2	**Linear Differential Equations With Constant Coefficients:**: Introduction. General Solution, Determination of Complementary Function, The Symbolic Function 1/f(D):Definition., Theorems about 'D' Determination of Particular Integral, General Method of Getting P.I, Short Methods of Finding P.I. when X is in the form e^{ax}, sin ax , cos ax , x^m(m being a Positive Integer), e^{ax}V , x V where Vis a function of x, Examples. Homogeneous Linear Differential Equations (The Cauchy-Euler Equations): Introduction, Method of Solution, Legendre's Linear Equations. Method of Solution of Legendre's Linear Equations.Examples	15	1
Module 3	**Second Order Linear Differential**	15	1

	Equations: The General Form.Complete Solution when one Integral is known: Method and Examples. Transformation of the Equation by changing the dependent variable (Removal ofFirst order Derivative). Transformation of the Equation by changing the independent variable.,Method of Variation of Parameters. Examples. Ordinary Simultaneous Differential Equations and Total Differential Equations: Simultaneous Linear Differential Equations of the Form $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$ Methods of Solving simultaneous Linear Differential Equations. Total (or Pfaffian) differential equations Pdx + Qdy + Rdz = 0, Necessary condition for Integrability of total differential equation, The condition for exactness Methods of solving total differential equations :A) Method of Inspection B)One variable regarding as a constant, Geometrical Interpretation of Ordinary Simultaneous Differential Equations , Geometrical Interpretation of Total Differential Equations, Geometrical Relation between Total Differential equations and Simultaneous differential equations		
Module 4	**Partial Differential Equations:** Introduction Order and Degree of Partial Differential Equations, Linear and non-linear Partial Differential Equations, Classification of first order Partial Differential Equations, Formation of Partial Differential Equations by the elimination of arbitrary constants, Formation of Partial Differential Equations by the elimination of arbitrary functionsØ from the equation Ø(u,v) = 0 where u and v are functions of x, y and z., Examples First order Partial Differential Equations: First Order Linear Partial Differential Equations, Lagrange's equations Pp + Qq = R, Lagrange's methods of solving Pp + Qq = R, Examples, : First Order Non-linear Partial Differential Equations. Complete integral, particular integral, singular integral and General integral Method of getting singular integral directly from the partial differential equation offirst order, Charpit's method, Examples, Special methods f solutions applicable to certain standard forms, Only p and q present, Clairaut's	15	1

	equations, Only p, q and z present, *f(x,p)* = *g(y,q)*, *examples*		

Reference Books:

1) M. D. Raisinghania, Ordinary and Partial Differential Equations, Eighteenth Revisededition 2016; S. Chand and Company Pvt. Ltd. New Delhi
2) Shepley L. Ross, Differential Equations, Third Edition 1984; John Wiley and Sons, NewYork
3) Ian Sneddon, Elements of Partial Differential Equations, Seventeenth Edition, 1982;Mcgraw-Hill International Book Company, Auckland
4) R. K. Ghosh and K. C, Maity, An Introduction to Differential Equations, Seventh Edition,2000; Book and Allied (P) Ltd
5) D. A. Murray, Introductory course in Differential Equations, Khosala Publishing House,Delhi.

B. Sc. Part – I CBCS
Semester - I and II

COMPUTATIONAL MATHEMATICS LAB (I)
DSC-1003A(PR)DSC 3A: DIFFERENTIAL CALCULUS
60 Hours (75 Lectures) credits 2

1) Examples on Leibnitz's theorem
2) Examples on Euler's theorem
3) Applications of De Moivre's Theorem
4) Tracing of curves in Cartesian form
5) Polar coordinates and tracing of curves in polar form
6) Radius of curvature for Cartesian curve i.e. For y = f(x) or x = f(y).
7) Radius of curvature for Parametric curve (i. e. x = f(t), y = g(t)) and radius ofcurvature for polar curve (i.e. r = f(□))
8) Examples on Lagrange's Mean Value theorem
9) Examples on Cauchy's Mean Value theorem
10) L'Hospital Rule: $\frac{0}{0}$, $\frac{\infty}{\infty}$, $\infty-\infty$, 0^∞, 1^∞, ∞^∞ .

COMPUTATIONAL MATHEMATICS LAB
(II)DSC 3B: DIFFERENTIAL EQUATIONS
60 Hours (75 Lectures) credits 2

1) Orthogonal trajectories (Cartesian)
2) Orthogonal trajectories (Polar)
3) Simultaneous Differential Equations
4) Total differential Equations
5) Examples on Linear Differential Equations with Constant Coefficients
6) Examples on Exact Differential Equations
7) Examples on Charpit's method.

8) Examples on Clairaut' s Forms.
9) Plotting family of solutions of second order differential equations
10) Plotting of Curves.

Structure of B. Sc. I (Semester I&II) (Mathematics)

B. Sc. I	Subject (Core Course)	No. of Lect.	Hours	Credit
Semester-I	MATHEMATICS-DSC 1003A : DIFFERENTIAL CALCULUS	5	4	4
	MATHEMATICS LAB(I): DSC 1003(PR) : DIFFERENTIAL CALCULUS	4	3.2	2
Semester-II	MATHEMATICS -DSC 1003B: DIFFERENTIAL EQUATIONS	5	4	4
	MATHEMATICS LAB(II)- DSC 1003B(PR): DIFFERENTIAL EQUATIONS	4	3.2	2

SCHEME OF MARKING (THEORY)

Sem.	DSC	Marks	Evaluation	Sections	Answer Books	Standardof passing
I	DSC1003 A	80	Semeste rwise	Two sections each of 40marks	As per Instructi on	35% (28 marks)
II	DSC1003 B	80	Semeste rwise	Two sections each of 40 marks	As per Instructi on	35% (28marks)

SCHEME OF MARKING (CIE) Continuous Internal Evaluation

Sem.	DSC	Marks	Evaluatio n	Sections	Answe r Books	Standar dof passing
I	DSC1003 A	20	Concurre nt	-	As per Instructi on	35% (7 marks)
II	DSC1003 B	20	Concurre nt	-	As per Instructi on	35% (7 marks)

SCHEME OF MARKING (PRACTICAL)

Sem.	DSC	Marks	Evaluation	Sections	Standard ofpassing
I AND II	DSC1003 A (pr) DSC1003 A (pr)	50	Annual	As per Instructi on	35% (18 marks)

Nature of Question Paper

Instructions*: 1)** *All the questions are* ***compulsory*.*

2) Answers to the two sections should be written in ***same*** *answer book.*

3) Figures to the right indicate ***full*** *marks.*

4) Draw neat labeled diagrams ***wherever*** *necessary.*

5) Use of log table/calculator is allowed.

Time : 3 hours **Total Marks: 80**

SECTION-I

Q.1. Choose correct alternative. 8

i)

A) B) C) D)

ii)

A) B) C) D)

iii)

A) B) C) D)

iv)

A) B) C) D)

v)

A) B) C) D)

vi)

A) B) C) D)

vii)

A) B) C) D)

viii)

A) B) C) D)

A) B) C) D)

Q.2. **Attempt any two.** **16**

A)

B)

C)

Q.3. **Attempt any four.** **16**

A)

B)

C)

D)

E)

F)

SECTION-II

Q.4. **Choose correct alternative.** **8**

i)

A) B) C) D)

ii)

A) B) C) D)

iii)

A) B) C) D)

iv)

A) B) C) D)

v)

A) B) C) D)

A) B) C) D)

vi)

A) B) C) D)

vii)

A) B) C) D)

viii)

A) B) C) D)

Q.5. Attempt any two. **16**

A)

B)

C)

Q.6. Attempt any four. **16**

A)

B)

C)

D)

E)

F)