SATAVAHANA UNIVERSITY

DEPARTMENT OF MATHEMATICS

B.A./B.Sc.(MATHEMATICS)

Course structure, Syllabus, Scheme of instruction and Examination

Choice Based Credit System

(With effect from the academic year 2019-2020)

Year	Sem-ester	Course Code	Paper	Subject	Hours per week		Credits	Marks		
					Theory	Tutor-als*		IA	Univ.. Exam	Total
1	I	DSCI	I	Differential & Integral calculus	5	1	5	20	80	100
	II	DSCII	II	Differential Equations	5	1	5	20	80	100
2	III	DSCIII	III	Real Analysis	5	1	5	20	80	100
	IV	DSCIV	IV	Algebra	5	1	5	20	80	100
3	V	DSCV	V	Linear algebra	5	1	5	20	80	100
	VI	DSE VI	VI-A	Numerical analysis	5	1	5	20	80	100
			VI-B	Integral transforms	5	1	5	20	80	100
			VI-C	Analytical solid Geometry	5	1	5	20	80	100
2	III	SEC-I	MSEC1	Theory of equations	2	--	2	10	40	50
	III	SEC-II	MSEC2	Number theory	2	--	2	10	40	50
	IV	SEC-III	MSEC3	Logic and sets	2	--	2	10	40	50
	IV	SEC-IV	MSEC4	Vector Calculus	2	--	2	10	40	50
3	V	GE	MGE/A	Basic mathematics Or Mathematics of finance & insurance	4	-	4	20	80	100
			MGE/B	Verbal reasoning for aptitude test	4	-	4	20	80	100
3	VI	project/ optional	MPW/MOP	Mathematical modeling	4	-	4	20	80	100

***Tutorials**: Problem solving session for each 20 student's one batch.

Each batch should engage by two teachers.

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Semester		Paper code
I	**Paper-I – Differential and integral calculus**	MS1MP1

Theory: 5 credits and Tutorials: 0 credits
Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The course is aimed at exposing the students to some basic notions in differential calculus.
Outcome: By the time students complete the course they realize wide ranging applications of the subject.

Unit- **I**

Partial Differentiation: Introduction - Functions of two variables - Neighbourhood of a point (a, b) - Continuity of a Function of two variables, Continuity at a point - Limit of a Function of two variables - Partial Derivatives - Geometrical representation of a Function of two Variables - Homogeneous Functions.

Unit- **II**

Theorem on Total Differentials - Composite Functions - Differentiation of Composite Functions - Implicit Functions - Equality of $f_{xy}(a, b)$ and $f_{yz}(a, b)$ - Taylor's theorem for a function of two Variables - Maxima and Minima of functions of two variables – Lagrange's Method of undetermined multipliers.

Unit- **III**

Curvature and Evolutes: Introduction - Definition of Curvature - Radius of Curvature - Length of Arc as a Function, Derivative of arc - Radius of Curvature - Cartesian Equations - Newtonian Method - Centre of Curvature - Chord of Curvature.
Evolutes: Evolutes and Involutes - Properties of the evolute.
Envelopes: One Parameter Family of Curves - Consider the family of straight lines - Definition - Determination of Envelope.

Unit- **IV**

Lengths of Plane Curves: Introduction - Expression for the lengths of curves $y = f(x)$ - Expressions for the length of arcs $x = f(y)$; $x = f(t)$, $y = \phi(t)$; $r = f(\theta)$
Volumes and Surfaces of Revolution: Introduction - Expression for the volume obtained by revolving about either axis - Expression for the volume obtained by revolving about any line - Area of the surface of the frustum of a cone - Expression for the surface of revolution - Pappus Theorems - Surface of revolution.

Text:

- Shanti Narayan, P.K. Mittal Differential Calculus, S.CHAND, NEW DELHI

- Shanti Narayan Integral Calculus, S.CHAND, NEW DELHI

References:

- William Anthony Granville, Percey F Smith and William Raymond Longley; Elements of the differential and integral calculus

- Joseph Edwards , Differential calculus for beginners

- Smith and Minton, Calculus

- Elis Pine, How to Enjoy Calculus

- Hari Kishan, Differential Calculus

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Semester		Paper code
II	**Paper-II – Differential Equations**	MS2MP2

Theory: 5 credits and Tutorials: 0 credits

Theory: 5 hours /week and Tutorials: 1 hours /week

Objective: The main aim of this course is to introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

Outcome: After learning the course the students will be equipped with the various tools to solve few types differential equations that arise in several branches of science.

Unit- **I**

Differential Equations of first order and first degree: Introduction - Equations in which Variables are Separable - Homogeneous Differential Equations - Differential Equations Reducible to Homogeneous Form - Linear Differential Equations - Differential Equations Reducible to Linear Form - Exact differential equations - Integrating Factors - Change in variables - Total Differential equations – Equations of the form :$dx/P=dy/Q=dz/R$

Unit- **II**

Differential Equations first order but not of first degree: Equations Solvable for p - Equations Solvable for y - Equations Solvable for x - Equations that do not contain x (or y)- Equations Homogeneous in x and y - Equations of the First Degree in x and y - Clairaut's equation. Applications of First Order Differential Equations : Growth and Decay - Dynamics of Tumour Growth - Radioactivity and Carbon Dating - Compound Interest - Orthogonal Trajectories

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Unit- **III**

Higher order Linear Differential Equations: Solution of homogeneous linear differential equations with constant coefficients - Solution of non-homogeneous differential equations $P(D)y = Q(x)$ with constant coefficients by means of polynomial operators when $Q(x) = be^{ax}$, $b \sin ax/b \cos ax$, bx^k, $V e^{ax}$ - Method of undetermined coefficients.

Unit- **IV**

Method of variation of parameters - Linear differential equations with non constant coefficients - The Cauchy - Euler Equation - Legendre's Linear Equations - Miscellaneous Differential Equations. Partial Differential Equations: Formation and solution- Equations easily integrable - Linear

equations of first order.

Text:

- Zafar Ahsan,Differential Equations and Their Applications

References:

- Frank Ayres Jr, Theory and Problems of Differential Equations.
- Ford, L.R ; Differential Equations.
- Daniel Murray, Differential Equations.
- S. Balachandra Rao, Differential Equations with Applications and Programs.
- Stuart P Hastings, J Bryce McLead; Classical Methods in Ordinary Differential Equations.

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Pattern of university examination paper for each semester and each paper having 5 credits

Time 3 hours

Section (A) MARKS 4 X 8=32

Answer any 4 questions
Each question carry equal marks.

Q.1 Question from unit-I

Q.2 Question from unit-I

Q.3 Question from unit-II

Q.4 Question from unit-II

Q.5 Question from unit-III

Q.6 Question from unit-III

Q.7 Question from unit-IV

Q.8 Question from unit-IV

Section (B) MARKS 4X 12=48

Answer ALL questions.
Each question carry equal marks.

Q.13.a) Question from unit-I

OR

b) Question from unit-I

Q.14. a) Question from unit-II

OR

b)Question from unit-II

Q.15. a) Question from unit-III

OR

b) Question from unit-III

Q.16. a) Question from unit-IV

OR

b)Question from unit-IV

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Pattern of Internal assessment-I for each semester and each paper having 5 credits

MARKS 5X 2=10

Answer any 5 questions.
Each question carry equal marks.

Q.1 Question from unit-I

Q.2 Question from unit-I

Q.3 Question from unit-I

Q.4 Question from unit-I

Q.5 Question from unit-II

Q.6 Question from unit-II

Q.7 Question from unit-II

Q.8 Question from unit-II

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Pattern of Internal assessment-II for each semester and each paper having 4 credits

MARKS 5X 2=10

Answer any 5 questions.
Each question carry equal marks.

Q.1 Question from unit-III

Q.2 Question from unit-III

Q.3 Question from unit-III

Q.4 Question from unit-III

Q.5 Question from unit-IV

Q.6 Question from unit-IV

Q.7 Question from unit-IV

Q.8. Question from unit-IV