



# ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A+' Grade by NAAC(CGPA:3.68/4.00)  
College with Potential for Excellence by UGC  
DST-FIST Supported & STAR College Scheme by DBT

## Faculty of Science

Bachelor of Science (B.Sc.)

**SUBJECT: MATHEMATICS**

B.Sc. II Semester

Paper- Major/ Minor

**Calculus and Differential Equations**

### Course Outcomes

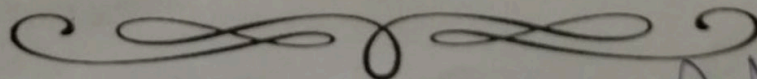
CO.No.	Course Outcomes	Cognitive Level
CO1	Sketch curves in a plane using its mathematical in the different coordinate system of reference.	U, E
CO2	Using the derivatives in Optimization Social sciences, Physics and Life sciences etc.	Ap
CO3	Formulate the Differential equations for various Mathematical models.	E
CO4	Using techniques to solve and analyze various Mathematical models.	Ap

### Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	6	40	60	100
<b>Total</b>	<b>6</b>		<b>100</b>	

### Evaluation Scheme

	Marks	
	Internal	External
<b>Theory</b>	3 Internal Exams of 20 Marks (During the Semester) (Best 2 will be taken)	1 External Exams (At the End of Semester)

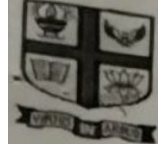


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## Content of the Course

### Theory

No. of Lectures (in hours per week): 6 Hrs. per week

Total No. of Lectures: 30 Hrs.

Maximum Marks: 60

Unit	Topics	No. of Lectures
I	1.1 Historical Background : 1.1.1. Development of Indian Mathematics: Ancient and Early Classical Period (till 500 CE) 1.1.2. A brief biography of Bhaskaracharya (with special reference to Lilavati and Madhava) 1.2 Successive differentiation 1.2.1 Leibnitz theorem 1.2.2 Maclaurin's series expansions 1.2.3 Taylor's series expansions 1.3 Partial Differentiation 1.3.1 Partial derivative of higher order 1.3.2 Euler's theorem on homogeneous functions 1.4 Asymptotes 1.4.1 Asymptotes of algebraic curves 1.4.2 Conditions for existence of Asymptotes 1.4.3 Parallel Asymptotes 1.4.4 Asymptotes of polar curves	21
II	2.1 Curvature 2.1.1 Formula of radius of Curvature 2.1.2 Curvature at origin 2.1.3 Centre of Curvature 2.2 Integration of transcendental functions 2.3 Introduction to Double and Triple Integral 2.4 Reduction formulae	12
III	3.1 Concavity and Convexity 3.1.1 Concavity and convexity of curves 3.1.2 Points of inflexion 3.1.3 Singular point 3.1.4 Multiple points  3.2 Tracing of curves 3.2.1 Curves represented by Cartesian Equation 3.2.1 Curves represented by Polar Equations	14

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	3.3 Quadrature 3.3.1 For Cartesian coordinates 3.3.2 For Polar coordinates 3.4 Rectification 3.4.1 For Cartesian coordinates 3.4.2 For Polar coordinates	
IV	4.1 Linear differential equations 4.1.1 Linear equations 4.1.2 Equations reducible to the linear form 4.1.3 Change of variables 4.2 Exact differential equations 4.3 first order and higher degree equations 4.3.1 Equation solvable for x, y and p 4.3.2 Equations homogeneous in x and y 4.3.3 Clairaut's equation 4.3.4 Singular solutions 4.3.5 geometrical meaning of a differential equation 4.4 Orthogonal trajectories	284
V	5.1 Linear differential equation with constant coefficients 5.2 Homogeneous linear ordinary differential equations 5.3 Linear differential equations of second order 5.4 Transformation of equations by changing the dependent variable/ independent variable 5.5 Method of variation of parameters.	284

## References

### Text Books:

1. Gorakh Prasad- Differential Calculus, Pothishala Private Ltd., Allahabad.
2. Gorakh Prasad- Integral Calculus, Pothishala Pvt. Ltd. Allahabad.
3. M. D. Raisinghanianar: Ordinary and Partial Differential equations. S. Chand & Co Ltd.2017
4. Gerard G. Emch.R. Sridharan M.D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency Vol. 3,2005
5. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके।

### Reference Books:

1. N.Piskunov - Differential and Integral Calculus, CBS Publishers,1996 .
2. G.F. Simmons- Differential Equation, Tata McGraw Hill, 1972.

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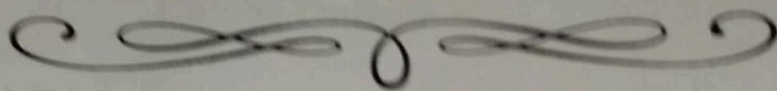
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3. E.A.Codington- An Introduction to ordinary differential Equation, Prentice Hall of India, 1961.
4. D.A.Murray- Introductory Course in Differential Equations, Orient Longman(India) 1967.
5. H.T.H. Piaggio- Elementary Treatise on Differential Equations and their Application, C.B.S. Publisher & Distributors, Delhi, 1985
6. Bibhutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House 1962



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