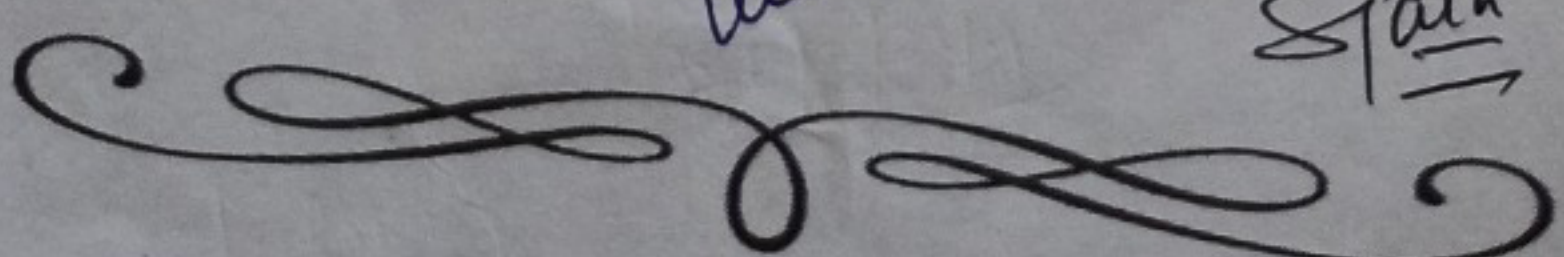# ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

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. IV Semester
Paper- Major/ Minor
Advanced Calculus and Partial Differential Equations

Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Understand many properties of the real line R and sequences.	U
CO2	Calculate the limit superior, the limit inferior, and the limit of a bounded sequence.	E
CO3	Apply the mean value theorems and Taylor's theorem.	Ap
CO4	Apply the various tests to determine convergence and absolute convergence of an infinite series of real numbers.	Ap
CO5	Formulate, classify and transform partial differential equations into canonical form.	E

Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	6	40	60	
Total	6		100	100

Nandni
26/7/24

M.Ambe
26/7/24

ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Evaluation Scheme

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

Content of the Course
Theory

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

Total No. of Lectures: 90 Hrs.   Maximum Marks: 60

Unit	Topics	No. of Lectures

I	1.1 Historical background:
	    1.1.1 A brief historical background of Calculus and partial differential equations in the context of India and Indian heritage and culture
	    1.1.2 A brief bibiography of Bodhayana
	1.2 Field structure and ordered structure of R, intervals, bounded and unbounded sets, supremum and infimum, completeness in R, absolute value of a real number.
	1.3 Sequence of real numbers
	1.4 Limit of a sequence
	1.5 Bounded and monotonic sequences
	1.6 Cauchy's general principle of convergence
	1.7 Algebra of sequence and some important theorems
		28

II	2.1 Series of non-negative terms 2.2 Convergence of positive terms series 2.3 Alternating series and Leibnitz's test 2.4 Absolute and Conditional Convergence of Series of real terms 2.5 Uniform continuity 2.6 Chain rule of differentiability 2.7 Mean value theorems and the irgeometrical interpretations	28
III	3.1 Limit and continuity of functions of two variables 3.2 Change of variables 3.3 Euler's theorem on homogeneous functions	28

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	3.4 Taylor's theorem for functions of two variables 3.5 Jacobians 3.6 Maxima and Minima of functions of two variables 3.7 Lagrange's multiplier method 3.8 Beta and Gamma Functions		
IV	4.1 Partial differential equations of the first order 4.2 Lagrange's solution 4.3 Some special types of equations which can be solved easily by methods other than the general method 4.4 Charpit's general method 4.5 Partial differential equations of second and higher orders	28	
V	5.1 Classification of partial differential equations of second order 5.2 Homogeneous and non-homogeneous partial differential equations of constant coefficients 5.3 Partial differential equations reducible to equations with constant Coefficients	28	

References

Text Books:

1. Devi Prasad: Advanced Calculus, Prentice Hall India Learning Private Limited, 2009.
2. S.C. Malik and Savita Arora: Mathematical Analysis, New Age International Private Limited, 1st edition, 2017.
3. M.D. Raysinghania: Ordinary and Partial Differential Equations, S. Chand & Company, New Delhi, 2017.
4. Gerard G. Emch, R. Sridharan and M.D. Srinivas: Contributions to the History of Indian Mathematics. Hindustan Book Agency, Vol.3, 2005.
5. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके।

ReferenceBooks:

1. R.R. Goldbeg: Methods of Real Analysis, Oxford & I.B.H. Publishing co. New Delhi,2020.

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.

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4. Murray R. Spiegel: Theory and problems of advance Calculus, Schauma Publishing Co. New York, 1974.

5. Donald R. Sherbert, Robert G. Bartle: Introduction to Real Analysis, Wiley, 4th edition, 2011.

6. Shah Nita H.: Ordinary and Partial Differential Equation Theory and Applications, PHIL earning Private Limited, Second edition,2015.

7. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd. Allahabad, 2015.

8. K. Sankara Rao: Introduction to Partial Differential Equations, PHI, 3rd edition,2010.

9. Bibhutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House, 1962.