

Sri Sathya Sai College for Women, Bhopal

(An Autonomous College affiliated to Barkatullah University, Bhopal)

(NAAC Accredited 'A' Grade)



SYLLABUS

UG

SESSION- 2023-24

CLASS: B.Sc. II YEAR

SUBJECT: Mathematics

Sri Sathya Sai College for Women, Bhopal

(An Autonomous College Affiliated to Barkatullah University Bhopal)

Department of Higher Education, Govt. of M.P.

Under Graduate Syllabus (Annual Pattern)

As recommended by Central Board of Studies and approved by the Governor of M. P.

wef 2022-2023

(Session 2023-24)

(NEP-2020)

Class/कक्षा	:	B.Sc. Second Year/ बी.एससी. द्वितीय वर्ष
Subject/विषय	:	Mathematics / गणित
Title of Paper/ प्रश्नपत्र का शीर्षक	:	Advanced Calculus and Partial Differential Equations /उच्च कलन एवं आंशिक अवकल समीकरण
Course Type/कोर्स टाइप	:	Major II /Minor/Elective
Paper/प्रश्नपत्र	:	II
Max Marks:अधिकतम अंक	:	70 + 30 Regular Students/ नियमित विद्यार्थी
Min. Marks : न्यूनतम अंक	:	35
Credit Value	:	06 (Theory)

Course

The course will enable the students to:

Learning outcomes

1. Understand many properties of the real line \mathbb{R} and sequences.
2. Calculate the limit superior, the limit inferior, and the limit of a bounded sequence.
3. Apply the mean value theorems and Taylor's theorem.
4. Apply the various tests to determine convergence and absolute convergence of an infinite series of real numbers.
5. Formulate, classify and transform partial differential equations into canonical form.

Contents

Unit- 1	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 biography of Bodhayana 1.2 Field structure and ordered structure of \mathbb{R} , intervals, bounded and unbounded sets, supremum and infimum, completeness in \mathbb{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
ईकाई - 1	1.1 ऐतिहासिक पृष्ठभूमि: 1.1.1 भारत और भारतीय धरोहर एवं संस्कृति के संदर्भ में कलन एवं आंशिक अवकल समीकरण की संक्षिप्त ऐतिहासिक पृष्ठभूमि 1.1.2 बोधायन की संक्षिप्त जीवनी 1.2. क्षेत्र संरचना और \mathbb{R} की क्रमबद्ध संरचना, अंतराल, परिबद्ध और अपरिबद्ध समुच्चय, उच्चक और निम्नक, \mathbb{R} में पूर्णता, वास्तविक संख्या का निरपेक्ष मान। 1.3. वास्तविक संख्याओं के अनुक्रम 1.4. अनुक्रम की सीमा 1.5. परिबद्ध एवं एकदिष्ट अनुक्रम 1.6. कौशी के अभिसरण का व्यापक सिद्धांत 1.7. अनुक्रम का बीजगणित एवं कुछ महत्वपूर्ण प्रमेय
Unit- 2	2.1 Series of non-negative terms 2.2 Convergence of positive term 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 their geometrical interpretations
ईकाई -2	2.1. ऋणोत्तर पदों की श्रेणी 2.2. धनात्मक पदों की श्रेणी का अभिसरण 2.3. एकान्तर श्रेणी और लेबनीज परीक्षण 2.4. वास्तविक पदों की श्रेणियों का निरपेक्ष एवं सप्रतिबंधी अभिसरण 2.5. एकसमान सांतत्य 2.6. अवकलनीयता का श्रृंखला नियम 2.7. माध्य मान प्रमेय एवं उसकी ज्यामितीय व्याख्या
Unit-3	3.1 Limit and continuity of functions of two variables 3.2 Change of variables 3.3 Euler's theorem on homogeneous functions 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

ईकाई -3	3.1. दो चरों के फलनों की सीमा एवं सांतत्य 3.2. चरों का परिवर्तन 3.3. समघात फलनों पर आयलर का प्रमेय 3.4. दो चरों के फलनों के लिए टेलर का प्रमेय 3.5. जैकोबियन 3.6. दो चरों के फलनों का उच्चिष्ठ एवं निम्निष्ठ 3.6. लेग्रांज गुणक की विधि 3.7. बीटा एवं गामा फलन
Unit-4	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
ईकाई -4	4.1. प्रथम कोटि के आंशिक अवकल समीकरण 4.2. लेग्रांज हल 4.3. कुछ विशेष प्रकार के समीकरण जिन्हें सामान्य विधि के अतिरिक्त अन्य विधियों द्वारा आसानी से हल किया जा सकता हो 4.4. चारपिट की व्यापक विधि 4.5. द्वितीय एवं उच्च कोटि के आंशिक अवकल समीकरण
Unit-5	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 5.4 Applications of PDE – an overview
ईकाई -5	5.1. द्वितीय कोटि के आंशिक अवकल समीकरणों का वर्गीकरण 5.2. अचर गुणांकों के समघात एवं असमघात आंशिक अवकल समीकरण 5.3. अचर गुणांकों में समानेय आंशिक अवकल समीकरण 5.4. PDE के अनुप्रयोग – एक अवलोकन
Keywords/Tags: Bodhayana, Sequence, Series, Jacobians, Maxima and Minima, Beta and Gamma, Functions, Partial differential equations सारबिन्दु – बोधायन, अनुक्रम, श्रेणी, जैकोबियन, उच्चिष्ठ एवं निम्निष्ठ, बीटा एवं गामा फलन, आंशिक अवकल समीकरण।	

Suggested Reading: 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 हिन्दी ग्रंथ अकादमी पुस्तकें।

Reference Books:

1. R.R. Goldbegg: 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
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 Equations: Theory and Applications, PHI Learning Private Limited Second editions, 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. Bibbutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House, 1962

Suggested Digital Platforms Web links:

<https://epgp.inflibnet.ac.in>
<https://www.highereducation.mp.gov.in/?page=xhzlQmpZwkyIQo2b%2Fy5G7w%3D%3D>
<http://www.bhojvirtualuniversity.com>

Suggested Equivalent Online Courses:

<https://nptel.ac.in/courses/111/104/111104125/>
<https://nptel.ac.in/courses/111/101/111101153/>

[Signature]

[Signature]

[Signature]

Scheme of Marks:

Suggested Continuous Evaluation Methods:

Maximum Marks: 100		
Continuous Comprehensive Evaluation 30 marks (CCE): Term End Exam Theory 70 marks		
Internal Assessment : Continuous Comprehensive Evaluation (CCE): 30 Marks	There shall be 4 class tests of 10 marks each, out of which the 3 best scores are to be taken into account.	10+10+10= 30
External Assessment: Term End Exam (Theory) 70 (Time : 03:00 Hrs.)	Section (A) 10 Marks (a) Objective questions – 5 (b) Very Short Answer type question – 5 (word limit 50 words) Section (B) 24 Marks: Short Answers Type Questions 1 question from each unit (word limit – 250 words) 4 to be attempted out of 7 given questions Section (C) 36 Marks: Long answer type questions (word limit 500 words) 4 to be attempted out of 7 given questions	10 question 01 marks each - 10 4 question 06 marks each - 24 4 questions 09 marks each - 36
		Total 70

Preston

Pin

Shaly