

# 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. VI Semester

Paper- Discipline Specific Elective (DSE) Group-B,

Paper-II

Special Functions

### Course Outcomes

CO.No.	Course Outcomes	Cognitive Level
CO1	Apply power series method to solve differential equations.	Ap
CO2	Understand Hypergeometric function and their properties.	U
CO3	Gain the concept of Bessel differential equations along with the corresponding recurrence formulas of different functions.	U
CO4	Perform operations Legendre differential equations along with the corresponding recurrence formulas, orthogonal property of different functions.	Ap, U

### Credit and Marking Scheme

	Credits	Marks		Total Marks
		Internal	External	
Theory	4	30	70	100
<b>Total</b>	<b>4</b>		<b>100</b>	

### 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)

Khandu  
26/7/24



Arlaus

Rhinani

M. Anurag Narayana  
26/7/24

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Punit

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## Content of the Course

### Theory

No. of Lectures (in hours per week)  $\frac{60}{4}$  Hrs.perweek

Total No. of Lectures:60Hrs.

Maximum Marks: 60

Unit	Topics	No. Of Lectures
I	1.1 Power series solution 1.2 Ordinary points, Regular singular points. 1.3 A review of power series 1.4 Series solution of first order linear equations 1.5 Second order linear equations	20
II	2. Hypergeometric functions 2.1 Function ${}_2F_1(a,b;c;z)$ 2.2 Integral Representation of ${}_2F_1(a,b;c;z)$ 2.3 Contiguous function relations, 2.4 Hyper geometrical differential equation and its solutions 2.5 $F(a,b;c;z)$ as function of its parameters, 2.6 Simple transformation	20
III	3. Legendre polynomials : 3.1 Generating function for Legendre polynomials 3.2 Recurrence Relations 3.3 Rodrigues formula 3.4 Bateman's generating function 3.5 Hypergeometric forms of $P_n(x)$ 3.6 Laplace's first integral form	20

Mandvi  
26/7/24

R. M. S. Adhikari

M. P. S. Adhikari

Garhwal  
20/7/24  
Suniti

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	3.7 Orthogonality	
IV	4. Bessel function 4.1 Definition of $J_n(z)$ 4.2 Bessel's differential equation 4.3 Generating function for $J_n(z)$ 4.4 Recurrence Relations for $J_n(z)$ 4.5 Bessel's integral with index half and an odd integer 4.6 Orthogonality of Bessel Functions	20

## References

### Text Books:

1. Srivastava, H.M. Gupta, K.C. and Goyal, S.P.; The H-functions of One and Two Variables with applications, South Asian Publication, New Delhi.
2. Saran, N., Sharma S.D. and Trivedi, - Special Functions with application, Pragati prakashan, 1986.
3. B.P Parashar; Differential and Integral Equations, CBS publishers and Distributors Ltd. 1992
4. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तकें

### Reference Books:

1. Lebedev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New jersey, USA 1995.
2. Whittaker, E.T. and Watson, G.N., A Course of Modern Analysis Cambridge University Press, London, 1963.
3. H.T.H. Piaggio, An Elementary Treatise on differential Equations and Their Applications, Indian Reprint, 1966.
4. E.A. Coddington, An Introduction, The Solution of Ordinary Differential Equations, Indian reprint.

Mandus  
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