

ST. ALOYSIUS COLLEGE (AUTO), JABALPUR
 Reaccredited 'A+' by NAAC with CGPA (3.68/4.0)
 College with Potential for Excellence by UGC
 DST-FIST supported

BACHELOR IN SCIENCE (B.Sc. I Sem.)

Part A Introduction		
Session 2022	Class: B.A./B.Sc. I Sem.	Elective
Course Code	S1-MATH 1T	
Course Title	Algebra, Vector Analysis and Geometry	
Course Type	Core Course	
Pre-requisite (if any)	To study this course a student must have had the subject Mathematics in class 12 th	
Course Learning Outcomes	The course will enable the student to: 1. Know the development of Indian Mathematics (500-1250) BC 2. Determine the Rank of a matrix, Eigen values, Eigen Vectors & Inverse of a matrix 3. Recognize consistent and inconsistent systems of linear equation. 4. Solving System of linear Equations (3 unknowns) 5. Using the knowledge of vector calculus in geometry 6. Enhance the knowledge of three dimensional geometrical figure(eg. Cone and cylinder)	
Credit Value	Theory : 4	
Total Marks	Max. Marks 40+60	

Unit	Topics	No. of Lectures
I	1.1 Historical Background : 1.1.1. Development of Indian Mathematics: Later Classical Period(500-1250) 1.1.2. A brief biography of Varahamihira and Aryabhatta 1.2 Rank of a Matrix 1.3 Echelon and Normal Form of Matrix 1.4 Characteristic Equations of a Matrix 1.4.1 Eigen values 1.4.2 Eigen vectors	20

M.D.

Adang.
An

Sjan

Dr. Mandira Kar
 H.O.D.
 Deptt. of Maths
 St. Aloysius (Auto) College
 Jabalpur

II	2.1	Cayley's Hamilton Theorem	20
	2.2	Application of Cayley's Hamilton Theorem to find the inverse of a matrix	
	2.3	Application of Matrix to solve a System of linear equations	
	2.4	Theorems on consistency and inconsistency of a system of linear equations	
	2.5	Solving linear equations up to three unknowns	
III	3.1	Scalar and Vector product of three and four vectors	13
	3.2	Reciprocal vectors	
	3.3	Vector differentiation	
	3.3.1	Rules of differentiation	
	3.3.2	Derivative of triple products	
	3.4	Gradient, Divergence and Curl	
	3.5	Directional derivatives	
IV	3.6	Vector identities	13
	3.7	Vector equations	
	4.1	Vector Integration	
	4.2	Gauss theorem (without proof) and problems based on it.	
	4.3	Green theorem (without proof) and problems based on it.	
	4.4	Stoke theorem (without proof) and problems based on it.	
Text Books, Reference Books, Other Resources			

Suggested Reading

Text Books:

1. K.B. Datta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd. New Delhi 2000
2. Shanti Narayan- A Text Book of Vector Calculus, S. Chand & Co., New Delhi. 1987.
3. S.L. Loney- The Elements of Coordinate Geometry Part -I New Age International (P) Ltd. Publishers, New Delhi 2016
4. P. K. Jain and Khalil Ahmad- A Text Book of Analytical Geometry of Three Dimensions Willey Eastern Ltd., 1999.
5. Gerard G. Emch. R. Sridharan M.D. Srinivas: Contributions to the History of Indian Mathematics, Hindustan Book Agency Vol. 3, 2005
6. मध्यप्रदेश हिंदी ग्रंथ अकादमी की पुस्तके ।

Reference Books:

1. Chandrika Prasad: A Text Book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad, 2017
2. N. Jacobson : Basic Algebra Vol. I and II, W.H. Freeman. 2009.
3. I.S. Luther and I.B.S. Passi: Algebra Vo. I and II, Narosa Publishing House 1997.
4. N. Saran and S.N. Nigam- Introduction to Vector Analysis, Pothishala Pvt. Ltd. Allahabad 1990.

Mandira
Dr. Mandira Kar
 H.O.D.
 Deptt. of Maths
 St. Aloysius (Auto) College
 Jabalpur

5. Murray R. Spiegel- Vector Analysis, Schaum Publishing Company.,New York,2017
6. Gorakh Prasad and H.C. Gupta- Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad 2000
7. P. K. Jain and Khalil Ahmad- A Text Book of Analytical Geometry of Two Dimensions Macmillan India Ltd.,1994.
8. S.L.Loney- The Elements of Coordinate Geometry,Part-2 Macmillan,1923.
9. N.Saran and R.S. Gupta- Analytical Geometry of Three Dimension, Pothishala Pvt. Ltd. Allahabad .1994.
10. R.J.T. Bell- Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd.,1994
11. Bibhutibhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House 1962

Assessment and Evaluation		
Continuous Evaluation Methods:		
Maximum Marks:		100
Continuous Comprehensive Evaluation (CCE):		40 Marks
External Exam:		60 Marks
Internal Assessment:		
Continuous Comprehensive Evaluation (CCE)	1. Class Test	20
	2. Class Test	20
	3. Assignment/Presentation	20
	(Best 2 of 3)	Total Marks: 40
External Assessment:	Section (A): Five Very Short Questions	$01 \times 04 = 04$
Time: 03.00 Hours	Section (B): Five Short Questions	$05 \times 04 = 20$
	Section (C): Five Long Questions	$09 \times 04 = 36$
		Total Marks: 60

MS

Jabir

Spar

Am

Mandir
Dr. Mandira Kar
 H.O.D.
 Deptt. of Maths
 St. Aloysius (Auto) College
 Jabalpur

ST. ALOYSIUS' COLLEGE (AUTONOMOUS)
JABALPUR, M. P., INDIA
 Reaccredited 'A+' by NAAC with CGPA (3.68/4.0)
 College with Potential for Excellence by UGC
 DST-FIST supported
BACHELOR IN SCIENCE (B.Sc. II Sem.)

Session 2022-23	Class: B.A./B.Sc. I Sem.	Elective
Course Title	Calculus and Differential equations	
Course Type	Core Course	
Pre- requisite (if any)	To study this course a student must have had the subject Mathematics in class 12 th	
Course Learning Outcomes	The course will enable the student to: <ol style="list-style-type: none"> 1. Sketch curves in a plane using its mathematical in the different coordinate system of reference. 2. Using the derivatives in Optimization Social sciences, Physics and Life sciences etc. 3. Formulate the Differential equations for various Mathematical models. 4. Using techniques to solve and analyze various Mathematical models. 	
Credit Value	Theory : 4	
Total Marks	Max. Marks 40+60	

Unit	Topics	No. of Lectures
I	1.1 Historical Background : <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 1.2.1 Leibnitz theorem 1.2.2 Maclaurin's series expansions 1.2.3 Taylor's series expansions 1.3 Partial Differentiation <ul style="list-style-type: none"> 1.3.1 Partial derivative of higher order 1.3.2 Euler's theorem on homogeneous functions 1.4 Asymptotes <ul style="list-style-type: none"> 1.4.1 Asymptotes of algebraic curves 1.4.2 Conditions for existence of Asymptotes 1.4.3 Parallel Asymptotes 	15

Mandira
Dr. Mandira K
 H.O.D.
 Deptt. of Maths
 St. Aloysius (Auto) College
 Jabalpur

	1.4.4 Asymptotes of polar curves	
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	18
III	3.1 Linear differential equations 3.1.1 Linear equations 3.1.2 Equations reducible to the linear form 3.1.3 Change of variables 3.2 Exact differential equations 3.3 first order and higher degree equations 3.3.1 Equation solvable for x, y and p 3.3.2 Equations homogeneous in x and y 3.3.3 Clairaut's equation 3.3.4 singular solutions 3.3.5 geometrical meaning of a differential equation 3.3.6 Orthogonal trajectories	18
IV	4.1 Linear differential equation with constant coefficients 4.2 Homogeneous linear ordinary differential equations 4.3 Linear differential equations of second order 4.4 Transformation of equations by changing the dependent variable/ independent variable 4.5 Method of variation of parameters.	18
	Text Books, Reference Books, Other Resources	

Suggested Reading

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.
3. E.A. Coddington- An Introduction to ordinary differential Equation, Prentice Hall of India, 1961.

Handwritten signature: *Mandira Kar*
Dr. Mandira Kar
H.O.D.
Deptt. of Maths
St. Aloysius (Auto) College
Jabalpur

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

Assessment and Evaluation		
Continuous Evaluation Methods:		
Maximum Marks:	100	
Continuous Comprehensive Evaluation (CCE):	40 Marks	
External Exam:	60 Marks	
Internal Assessment:	4. Class Test	20
Continuous Comprehensive Evaluation (CCE)	5. Class Test	20
	6. Assignment/Presentation	20
	(Best 2 of 3)	Total Marks: 40
External Assessment:	Section (A): Five Very Short Questions	$01 \times 04 = 04$
	Section (B): Five Short Questions	$05 \times 04 = 20$
Time: 03.00 Hours	Section (C): Five Long Questions	$09 \times 04 = 36$
		Total Marks: 60

110

Arslan
Spain

Mandira
Dr. Mandira Kar
H.O.D.
Deptt. of Maths
St. Aloysius (Auto) College
Jabalpur