



Yogoda Satsanga Mahavidyalaya

JAGANNATHPUR, DHURWA, RANCHI – 834004

Email address: ysmranchi4@gmail.com

(NAAC Accredited, Grade: B++, CGPA: 2.89)

COURSE PLAN

NAME OF THE DEPARTMENT	: MATHEMATICS
NAME OF THE FACULTY	: Dr. R.C.L Das Prof Shekhar Suman Dr. Kandarp Vidyasagar
ACADEMIC SESSION	: 2023-2027
YEAR	: 2024
PROGRAMME	: B.Sc.
SEMESTER	: 3
COURSE TYPE	: Major
COURSE	: Abstract Algebra - 1
COURSE CODE	: MJ-5
TOTAL CREDIT	: 4



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PROGRAMME OUTCOMES (POs):

Student will be able:

PO1: Develop in-depth knowledge of algebra, analysis, calculus, geometry, differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and statistics.

PO2: Analyze intrinsic beauty which can be utilized for solving real life problems through the use of mathematical modeling, cryptography and coding.

PO3: Apply knowledge of mathematical science in understanding and skills to identify the difficult/unsolved problems in mathematics. Realize the given scientific data critically and systematically and to do research so that to get the ability to draw the objective conclusions.

PO4: Understand logically question assertions, to recognize patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

PO5: This program will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

PO6: Design solutions for complex scientific problems and design processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, legal, constitutional and environmental considerations.

PO7: Demonstrate fundamental systematic knowledge of mathematics and its applications in engineering, science, technology and mathematical sciences. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

PO8: Demonstrate knowledge and understanding of the scientific principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9: Communicate effectively on complex science activities with the science community and the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.



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PO10: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of scientific development, technological advancement and global changes.

PO11: Use research-based knowledge and research-based methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO12: To value and foster physical, physiological and psychological well-being by staying committed through personal practice and conduct. Apply the learning for life-long committing to ethics, to fulfill professional and social obligations.

PO13: Apply academic learning for a sustainable living, initiation of entrepreneurial adventures through innovation to create opportunities and wealth for self and society.

PO14: Value and support social causes and rural development through service and philanthropic activities.

PROGRAMME SPECIFIC OUTCOMES (PSO):

PSO1: Understand the requirements in mathematics, drawing from a range of contemporary research works and their applications in diverse areas of mathematical sciences and demonstrate educational skills in the areas of analysis, geometry, algebra, mechanics, differential equations etc.

PSO2: Apply skills and knowledge through on-the-job training, research projects and internships to use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion and creating Mathematical models, algorithms, etc. to facilitate application of mathematics in different professions and knowledge domains.

PSO3: Analyze the applications of Mathematics and computing methods using MATLAB, PYTHON, MATHEMATICA etc. to solve the problems of Science in general and Mathematics in particular.



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COURSE OUTCOMES (COs):

Semester-3

Paper: Abstract Algebra - 1 (MJ-5)

This course will enable the students to:

CO1: Remember - Define and recall fundamental concepts and terminology related to groups, subgroups, cyclic groups, eigenvalues, and eigenvectors.

CO2: Understand - Explain the properties of normal subgroups, cyclic groups, and eigenvalues, and describe the significance of theorems such as Lagrange's theorem, Euler's theorem, and the Cayley-Hamilton theorem.

CO3: Apply - Utilize techniques to solve problems involving group homomorphisms, isomorphisms, and the classification of subgroups, and apply methods to compute eigenvalues and eigenvectors of matrices.

CO4: Analyze - Differentiate between various types of groups, such as dihedral, permutation, and quaternion groups, and analyze the properties of eigenvalues and eigenvectors in the context of linear transformations.

CO5: Evaluate/Create - Develop proofs for group theory concepts, construct mathematical models using eigenvalues and eigenvectors, and create comprehensive solutions to complex problems involving groups and matrices, effectively communicating findings through written and oral presentations.

1. CORRELATION BETWEEN POs AND COs

POs Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PSO 1	PSO 2	PSO 3
CO1	3	-	3	-	2	2	2	-	1	-	2	2	2	2	3	-	3
CO2	-	2	2	-	2	3	3	2	-	2	3	3	-	3	3	3	-
CO3	3	-	2	2	-	2	2	-	1	-	2	2	2	2	3	2	-
CO4	3	-	1	2	1	-	2	1	-	1	2	2	-	-	3	3	2
CO5	3	2	-	1	2	-	2	-	1	1	2	2	2	-	2	3	2



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COURSE TEACHING AND LEARNING ACTIVITIES

A. PEDAGOGY

- i. Whiteboard
- ii. PPT
- iii. Zoom, Google meet

A. COURSE DELIVERY PLAN:

UNIT	TOPIC/SUBTOPIC	LECTURE REQUIRED	CO ADDRESSED
1	Introduction: -Groups and symmetry	5	CO1, CO2
2	Examples of important Groups	5	CO1, CO2
3	Subgroups	5	CO2, CO1
4	Cyclic groups and generators	6	CO2
5	Lagrange's theorem	7	CO3, CO4
6	Normal subgroups and Homomorphism	5	CO3, CO2
7	Permutation, Symmetric and Alternating groups	5	CO4
8	Group homomorphism	5	CO5
9	Properties of homomorphism	5	CO5
10	Group isomorphism, Properties of isomorphism	6	CO5
11	First, second and third isomorphism theorems for groups	6	CO5



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B. SUGGESTED READINGS

a. TEXT BOOKS:

1. P.B .Bhattacharya, S.K.Jain & S.R.Nagpaul(2003). *Basic Abstract Algebra*(2ndedition). Cambridge University Press.
2. S.Singh & Q.Zamiruddin(2022). *Modern Algebra.*, Vikas Publishing House.
3. John B.Fraleigh(2007). *A First Course in Abstract Algebra*(7thedition). Pearson

b. REFERENCE BOOKS

1. Joseph A.Gallian(2017). *Contemporary Abstract Algebra*(9thedition) .Cengage.
2. N.S. Gopalakrishnan(1986). *University Algebra*. New Age International Publishers.
3. N.Herstein(2006). *Topics in Algebra*(2ndedition). WileyIndia.

c. VIDEO RESOURCE

1. <https://nptel.ac.in/courses/111106113>

WEB RESOURCES:-

1. <https://ocw.mit.edu/courses/18-703-modern-algebra-spring-2013/pages/lecture-notes/>

E-RESOURCES

1. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF