University of Kerala

Discipline	Mathematics				
Course Code	UK4DSCMAT201				
Course Title	Partial Differentiation and Introduction to Abstract Algebra				
Type of Course	DSC				
Semester	IV				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4		1	5
Pre-requisites	Awareness of Differential Calculus and Set theory				
Course Summary	This course includes Partial differentiation and basic Abstract Algebra				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Partial Differentiation I**	**12**
	1	Functions of two or more variables, Limits And Continuity, Partial Derivatives, Differentiability, Differentials, And Local Linearity, The Chain Rule.	
	Chapter 13: Section 13.1, 13.2, 13.3, 13.4, 13.5 of Text [2]		
II		**Partial Differentiation II**	**12**
	2	Directional Derivatives And Gradients, Tangent Planes And Normal Vectors, Maxima And Minima Of Functions Of Two Variables, Lagrange Multipliers.	
	Chapter 13: Section 13.6, 13.7, 13.8, 13.9 of Text [2]		
III		**Groups**	**18**
	3	Binary Operations, Groups, Abelian Examples, Subgroups, Cyclic Groups.	

Module	Unit	Contents	Hrs
	Chapter 1 : Sections 1, 2, 3, 5, 6 of Text [1]		
IV	**Cosets**		**18**
	4	Non-abelian Examples, Groups of Permutations, Cosets and Theorem of Lagrange.	
	Chapter 1 : Section 4, Chapter 2 : Sections 8 and 10 of Text[1]		
	Assignments can be given using Sagemath for solving the problems in the above modules. Chapters 3, 4, 5, 6 of Text [3] (not meant for examination)		

Textbooks

1. J. B. Fraleigh, Neal.E.Brand A First Course in Abstract Algebra, Eighth Edition, Pearson Education Inc, 2022
2. Howard Anton, I Bivens, S Davis. Calculus, 10th Edition, John Wiley & Sons, 2012.
3. Thomas. W. Judson, Stephen. F. Austin *Abstract Algebra Theory and Applications*, State University, Robert A Beezer, *Sage Exercises for Abstract Algebra* , University of Puget Sound, 2020.

References

1. I. N. Herstein, Topics in Algebra, Second Edition, Wiley, 2006.
2. Joel Hass, Maurice D. Weir, Thomas' Calculus Early Transcendentals, 12th Edition, Addison-Weseley Publishing Company, 2004.
3. Joseph. A. Gallian, Contemporary Abstract Algebra, Eighth Edition, Brooks Cole Cengage Learning, 2012.
4. Michael Artin, *Algebra*, Second Edition, Pearson Education, 2023.
5. J Stewart, Calculus with Early Transcendental Functions, 7th Edition, Cengage India Private Limited, 2008.
6. G B Thomas, R L Finney, Calculus, 9th Edition, Addison-Weseley Publishing Company, 2004.

Course Outcomes

CO No.	Upon completion of the course the graduate will be able to	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) Tutorial (T)	Practical (P)
CO 1	Define multivariable functions and relate it to single variable functions	PSO5, PO1, 2, 3, 4, 5, 6, 7	R, U	F,C	L	
CO 2	Describe limits, continuity and partial derivatives	PSO1, PO1, 2, 3, 4, 5, 6, 7	U,E	P	L	
CO 3	Solve maximization and minimization problems using partial derivatives	PSO2, PO1, 2, 3, 4, 5, 6, 7	Ap	P	L	
CO 4	Explain the concepts of binary operations and groups and classify the groups as abelian, non-abelian and cycle groups	PSO4, PO1, 2, 3, 4, 5, 6, 7	U,An	F,C	L	

(R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create)
(F-Factual, C-Conceptual, P-Procedural, M-Metacognitive)

Mapping of CO with PSOs and POs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	1	1	3	1	2	2	1	3	1	2	2	
CO2	3	2	2	2	2	1	2	3	2	2	1	2	1	
CO3	2	3	2	2	2	1	2	3	2	2	1	2	1	
CO4	2	2	2	3	2	1	3	2	2	2	1	2	1	

(- -Nill, 1-Slightly/Low, 2-Moderate/Medium, 3-Substantial/High)

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics

	Internal Examination	Assignment	Project Evaluation	End Semester Exam
CO1	✓	✓		
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓