University of Kerala

Discipline	Mathematics				
Course Code	UK2DSCMAT110				
Course Title	Partial Differentiation and Analytic functions				
Type of Course	DSC				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	-	4
Pre-requisites	1. Integration 2. Differentiation				
Course Summary	Integration and applications of Differentiation				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Multivariate Calculus**	**16**
	1	Functions of Two or More Variables, Limits and Continuity *(Chapter13: Sections 13.1, 13.2 of Text[1])*	
	2	Partial Derivatives, The Chain Rule *(Chapter 13: Section 13.3, 13.5 of Text [1])*	
	3	Directional derivatives, Maxima and Minima of Functions of Two Variables *(Chapter 13: Sections 13.6, 13.7 of Text [1])*	
II		**Analytic functions**	**12**
	4	Complex Numbers and Their Geometric Representation *(Chapter 13: Section 13.1 of Text [2] (review only))*	
	5	Polar Form of Complex Numbers-Powers and Roots *(Chapter 13: Section 13.2 of Text [2]*	
	6	Derivative-Analytic Function, Cauchy–Riemann Equations Laplace's Equation *(Chapter 13: Section 13.3, 13.4 of Text [2])*	

Module	Unit	Contents	Hrs
III	**Cauchy's Integral Theorem**		**12**
	7	Line Integral in the Complex Plane and is properties (Except Existence of Complex Line integrals & ML Inequality) *(Chapter 14: Section 14.1 of Text [2])*	
	8	Cauchys Integral Theorems (without proof) Caucy's Integral Formula (without proof) Derivative of Analytic Functions *(Chapter 14: Sections 14.2, 14.3 of Text [2])*	
IV	**Derivatives of Analytic Functions**		**8**
	9	Derivatives of Analytic Functions, Lioville's Theorem and Morreras theorem *(Chapter 14: Section 14.4 of Text [2])*	
V	**Suggestions for teacher designed module**		**12**
	For internal assessment examinations only.		
	10	Geometry of Analytic Functions, Conformal Mapping, Principle of Inverse Mapping *(Chapter 17: Section 17.1 of Text [2] all theorems without proof)* Möbius Transformations, Extended Complex Plane, Fixed Points *(Chapter 17: Section 17.2 of Text [2] all theorems without proof)* Special Linear Fractional Transformations, Mapping of Standard Domains *(Chapter 17: Section 17.3 of Text [2] all theorems without proof)*	

Textbooks

1. H Anton, I Bivens, S Davis, *Calculus*, 10th Edition, John Wiley and Sons, 2012.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley Publishers, 10th Edition, 2018.

References

1. Anant R Shastri, *Basic Complex Analysis of One Variable*, Macmillan, 2010.
2. Edward B. Saff, Arthur David Snider, *Fundamentals of Complex Analysis with Applications to Engineering and Science*, 3rd Edition, Pearson Education India, 2017.
3. James Ward Brown and Ruel V Churchill, *Complex Variables And Applications*, Eighth Edition, McGraw Hill International Edition, 2001.
4. Joel Hass, Maurice D. Weir, *Thomas' Calculus Early Transcendentals*, 12th Edition, Addison-Weseley Publishing Company, 2004.
5. John H Mathews and Russel W Howell, *Complex Analysis for Mathematics and Engineering*, Sixth Edition, Jones and Bartlett Publishers, 2012.
6. J Stewart, *Calculus with Early Transcendental Functions*, 7th Edition, Cengage India Private Limited, 2018.

7. G B Thomas, R L Finney, *Calculus*, 9th Edition, Addison-Weseley Publishing Company, 2004.

8. B S Tyagi, *Functions of A Complex Variable*, Kedar Nath Ram Nath, 2021.

E-resources

1. https://www.geogebra.org/m/VMa4z2RU

2. https://www.geogebra.org/m/wcjfy77h

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 the concept of functions of two or more variables	PSO 1	U	F, C	L	
CO 2	Illustrate derivatives of multivariate functions	PSO 2, 4	Ap, An	P	L	
CO 3	Understand the algebraic operations of complex numbers, complex functions, limits, continuity, differentiablilty of complex functions and conformal mapping.	PSO 1	U	F, C	L	
CO 4	Able to find line integrals, integrals using Cauchy's integral formula	PSO 2, 4	Ap, An	P	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	3	-	-	-	-	-	2	1	-	-	-	3	-	-
CO2	-	-	3	3	-	-	2	1	-	-	-	3	-	-
CO3	3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	3	3	-	-	-	-	3	2	-	-	-	-	-

(- -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	✓	✓		✓