University of Kerala

Discipline	ECONOMICS				
Course Code	UK4DSCECO201				
Course Title	MATHEMATICS FOR ECONOMICS - I				
Type of Course	DSC				
Semester	IV				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4
Pre-requisites	Students should have a fundamental understanding of algebraic operations, equations, and geometric concepts.				
Course Summary	This course provides a rigorous study of mathematical techniques essential for economic analysis. Topics include calculus, multivariable functions, and linear algebra, emphasizing their practical applications in economics, such as optimization and system solving. Through modules and real-world case studies, students develop problem-solving abilities, preparing them for success in diverse economic fields.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Elements of Linear Algebra**	**15**
	1	Vectors (Concept only) – Matrix – Types - Matrix Operations: Addition, Subtraction, Scalar Multiplication and Multiplication. Laws of Matrix Algebra: Commutative, Associative and Distributive	
	2	Determinants - Rank of a Matrix	
	3	Minors, Cofactors, Adjoint and Inverse Matrices	
	4	Solving a System of Linear Equations – Matrix Inversion Technique- Cramer's Rule- Gauss Elimination Method	
II		**Differential Calculus**	15
	5	Limits – Continuity- Slope of a Curvilinear Function	
	6	The Derivative – Rules of Differentiation: The Linear Function Rule, The Power Function Rule, The Rules for Sums and Differences, The Product Rule, The Quotient Rule, The Chain Rule, Implicit Function Rule- Higher Order Derivatives	
	7	Applications of Derivatives in Economics - Marginal Concepts: Marginal utility, Marginal Propensity to Consume, Marginal Propensity to Save, Marginal Product, Marginal Cost, Marginal Revenue, Marginal Rate of Substitution, Marginal Rate of Technical Substitution - Relationship among Total, Marginal and Average Concepts- Elasticities	
	8	Maxima and Minima of Economic Functions- Necessary and Sufficient Conditions.	
III		**Differential Calculus: Multivariable Functions**	8
	9	Multivariable Function - Partial Differentiation – Second Order Partial Differentiation- Total Differentiation	
	10	Maxima and Minima of Multivariable Functions	
IV		**Integral Calculus and its Applications**	**10**
	11	Integration- Rules of Integration: Integration by Substitution; Integration by Parts	
	12	Definite Integral – Properties of Definite Integral	
	13	Application of Integral Calculus in Economics: Revenue and Cost Curves, Consumers' and Producers' Surplus, Area between Curves.	
V		**Mathematical Analysis in Economics**	**12**

		This module aims to apply mathematical concepts learned in the previous modules to analyze real-world economic scenarios. Students will engage in various activities (Case Studies Analysis/ Problem-solving Sessions/ Interactive Quizzes/ Group Seminars etc.) designed to deepen their understanding of mathematical tools and their applications in economics**.**	

Reference

- Chiang, A.C. & Wainwright, K. (2013). Fundamental Methods of Mathematical Economics. (4th ed.). McGraw Hill Education (India) Private Limited.
- Sydsaeter, K. & Hammond, P. (2016). Mathematics for Economic Analysis. New Delhi: Pearson Education Inc
- Dowling, E. T. (2012). Schaum's Outlines-Introduction to Mathematical Economics. (3rd ed.)

Recommended Readings

- Roser, M. (2003). Basic Mathematics for Economists. (2nd ed.). New York: Routledge
- Renshaw, G. (2011). Maths for Economics. (4th ed.). Oxford. Oxford University Press
- Hoy, Michael, John Livernois, Chris McKenna, Ray Rees and Thanasis Stengos Mathematics for Economics, Third Edition. PHI Learning
- Black. J. and J.F Bradley: Essential Mathematics for Economic, John Wiley and Sons, .New Delhi

- Allen, R.G.D Mathematical Analysis for Economists, AITBS Publishers, Delhi**.**

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Evaluate different methods for solving systems of linear equations using matrices.	R, U, Ap, An, E	PSO 1,3
CO-2	Apply differential calculus to build economic functions and optimize outcomes.	R, U, Ap, An, E, C	PSO-1,3
CO-3	Apply multivariable calculus for creating complex economic functions and optimization in constrained scenarios.	R, U, Ap,An, E, C	PSO-1,2,3

CO-4	Evaluate economic quantities and interpret their significance using integral calculus.	R, U, Ap, An, E	PSO- 1,3.
CO-5	Analyse real-world economic issues using mathematical tools and communicate findings effectively.	R, U, Ap, An, E, C	PSO- 1,3.

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Note: 1 or 2 COs/module

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Apply differential calculus to analyze economic functions and optimize outcomes	1,3	R, U, Ap, An, E	C, F	L	-
2	Apply multivariable calculus for analyzing complex economic functions and optimization in constrained scenarios.	1,2,3	R, U, Ap, An, E, C	P, M	L	-
3	Apply multivariable calculus for creating complex economic functions and optimization in constrained scenarios.	1,3	R, U, Ap,An, E, C	C, F	L	
4	Evaluate economic quantities and interpret their significance using integral calculus.	1,3	R, U, Ap, An, E	C, P	L	
5	Analyze real-world economic issues using mathematical tools and communicate findings effectively.	1,3	R, U, Ap, An, E, C	C, F	L	

F-Factual, C- Conceptual, P-Procedural, M- Metacognitive

Mapping of COs with PSOs and POs:

CO No.	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	Average
CO-1	3	1	3	-	-	-	3	3	2	-	-	3	2.57
CO-2	3	2	3	-	-	-	3	3	3	1	-	3	2.625
CO-3	3	1	3	-	-	-	3	3	3	1	-	3	2.5
CO-4	2	-	2	-	-	-	2	2	2	-	-	2	2
CO-5	3	1	2	-	1	1	3	3	3	2	2	3	2.18
Average	2.8	1.25	2.6	0	1	1	2.8	2.8	2.6	1.33	2	2.8	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

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

Mapping of COs to Assessment Rubrics:

CO No.	Internal Exam	Assignment	Project Evaluation	End Semester Exam
CO-1	✓	✓	-	✓
CO-2	✓	✓	✓	✓
CO-3	✓	✓	✓	✓
CO-4	✓	✓	-	✓
CO-5	✓	✓	✓	✓