University of Kerala

Discipline	ECONOMICS				
Course Code	UK4DSEECO201				
Course Title	FOUNDATIONS OF DATA SCIENCE				
Type of Course	DSE				
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	1. Knowledge of basic statistical and econometrics concepts for application				
Course Summary	Expected to explore the collection, manipulation, storage, retrieval, and computational analysis of data in various forms so that students emerge with a unique blend of skills, ready to tackle real-world challenges				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Data Science**	**10**
	1	Overview of data science	
	2	Importance of data-driven decision making in economics	
	3	Big Data and Data Science	
	4	Datafication - Current landscape of perspectives - Skill sets needed	
II		**Data Processing techniques- Software- Python**	**15**
	5	Data Science Methodology	
	6	Data pre-processing: Data cleaning - data integration - Data Reduction Data Transformation and Data Discretization.	
	7	Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves	
	8	Exploratory Data Analysis - Basic tools (plots, graphs, and summary statistics) of EDA	
III		**Machine Learning for Economic Prediction**	15
	9	Basic Machine Learning Algorithms- Association Rule Mining - Linear Regression- Logistic Regression	
	10	Classifiers - k-Nearest Neighbours (k-NN), k-means -Decision tree - Naive Bayes	
	11	Ensemble Methods - Random Forest	
	12	Feature Generation and Feature Selection - Feature Selection algorithms – Filters, Wrappers, Decision Trees	
IV		**Clustering and data visualization**	10
	13	Basic concepts and Partitioning methods	
	14	Clustering Methods-hierarchical- agglomerative clustering	
	15	Data Visualization: Basic principles, ideas and tools for data visualization	
V		**Case Studies and Projects- Software Python**	10
	16	Practical applications of data science techniques in economics	
	17	Hands-on projects using real-world economic datasets	
	18	Presentation and discussion of project findings	

Recommended Texts:

1. "Data Science for Economics" by Edward L. Melnick
2. "Python for Data Analysis" by Wes McKinney
3. "Introduction to Econometrics" by James H. Stock and Mark W. Watson

Additional Resources:

1. Online tutorials and documentation for Python/R programming languages
2. Online platforms for accessing economic datasets (e.g., World Bank, Federal Reserve Economic Data).

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understanding basic ideas in data science	R, U	PSO-1,2
CO-2	Applying data preprocessing and processing techniques in order to create graphs and make visualizations	R, U, Ap, An, E, C	PSO-1,3, 5
CO-3	Understand and explore machine learning concepts and algorithms and apply clustering and data visualization	R, U, Ap, An, E, C	PSO-1,3
CO-4	Make judgments and create models with the help of real-world economic data sets	R, U, Ap, An, E, C	PSO-1,3,5

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	Understanding and applying data collection, cleaning and preprocessing techniques	PO-1,3,7 PSO- 1,2	R, U	C, P		

2	Examining and evaluating data integration and transformation with the help of EDA	PO-2,3,6 PSO-1,3,5	R, U, Ap, An, E, C	C, P		
3	Understand and explore machine learning concepts and algorithms	PO- 1,3,7 PSO- 1,3	R, U, Ap, An, E, C	C, P		
4	Make judgments and create models with the help of real-world economic data sets	PO- 2,3,7 PSO-1,3,5	R, U, Ap, An, E, C	P, M		

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

CO No.	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	Average
CO-1	3	2	-	-	-	-	3	2	2	-	1	-	3	-	2.29
CO-2	2	-	3	-	3	-	2	3	3	-	1	2	3	1	2.3
CO-3	3	-	3	-	-	-	3	2	3	-	1	2	3	-	2.5
CO-4	3	-	3	-	3	-	3	3	3	2	1	2	3	2	2.55
Average	2.67	0	3	0	3	0	2.67	2.67	3	2	1	2	3	1.5	

Mapping of COs with PSOs and POs:

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	-	✓	✓	✓