University of Kerala

Discipline	Mathematics				
Course Code	UK4VACMAT200				
Course Title	Introduction to Mathematical Modeling				
Type of Course	VAC				
Semester	IV				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	3	3	-	-	3
Pre-requisites	Basic School Mathematics and Basic Calculus				
Course Summary	This course is designed for enhancing students to work with data from the real world by formulating mathematical questions and drawing conclusions based on the analysis of that data using different mathematical tools				

Detailed Syllabus

Module	Contents	Hrs
I	A basic introduction to data, along with problems on mean, median, and quartiles, Representing functions with graphs, formulas, and tables, the Behavior of functions such as increasing, decreasing, concavity, inflection points, representing functions symbolically, Domain and Range of a function with example, Proportionality. The topics can be found in sections 1.1, 2.1, 2.2, and 2.3 of text[1].(Topics only prescribed above).	9
II	Mathematical Models, Parameters and Mathematical models, Fundamental concepts of Linear functions, Slope, Point-Slope Formula, Modeling with Linear functions, Linear Regression, least square criterion, additional example, Correlation Coefficient. The topics can be found in section 2.4, 3.1(Not included for examination), 3.2, 3.4 of text[1].(Topics only prescribed above).	9

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Module	Contents	Hrs
III	Exponential growth functions, Applications, Domain and Range, Exponential decay functions, Half-Life, Radioactive decay, Determining whether a set of data is exponential, comparing linear and exponential function. The topics can be found in Sections 5.1, 5.2 (Topics only prescribed above) of text[1].	9
IV	Fitting Exponential Functions to Data,the base e. Modeling with Logarithmic functions, Fitting Logarithmic functions to Data, Polynomial functions. The topics can be found in Sections 5.3, 5.5, 6.1. (Topics only prescribed above) of text[1].	9
	Suggestions for teacher designed module	
V	Virtual Laboratory Bradford Analysis for Protein Concentrations and Hooke's Law on the Elongation of a Spring. Behaviour and Applications of Power function, Fitting Power functions to data. Modeling with polynomial functions, Path of a Projectile, Fitting polynomials to data. Topics can be found in chapter 3, Chapter 5 and Chapter 6 of text[1]. [Desmos graphing calculator has to be used to describe the models given in this module by using 3 lab hours]. Mini Project(Students analyse one real dataset and choose the best model) has to be given as one component of formative assessment.	9

Textbook

1. Sheldon P. Gordon and Florence S. Gordon. Functions, Data and Models , The Mathematical Association of America, 2010.

References

1. Edward A Bender, An Introduction to Mathematical Modeling, Dover Books, 1978.

2. Majid Jaberi, Douraki, Seyed M Moghadas, Mathematical modeling - a graduate text book, Wiely, 2018.

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)	Assignment(As)
CO 1	Understand the concept of mathematical modeling	PSO1, PSO2, PO1	U	F, C	L ,T	
CO 2	Analyse various data using mathemtical models	PSO2, PO3, PO4	An	F	L, T	
CO 3	Apply various mathematical functions for modeling	PSO1, PSO3, PO2, PO3	Ap	C	L, T	

(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	1	-	-	-	-	3	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	1	3	-	-	-	-
CO3	2	-	3	-	-	-	-	2	2	-	-	-	-	-

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

Assessment Rubrics

- Quiz/Assignment/Discussion/Seminar/Programming Assignments

- Midterm Exam

- Mini Project

- Final Exam

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Mapping of COs to Assessment Rubrics

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

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