University of Kerala

Discipline	Mathematics				
Course Code	UK3DSCMAT207				
Course Title	Applications of Integration, Special Functions and Fourier Series				
Type of Course	DSC				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours per week
	4	3	-	2	5
Pre-requisites	1. Differentiation 2. Integration				
Course Summary	This course provides applications of integration, beta and gamma functions and Fourier series				

Detailed Syllabus

Module	Unit	Contents	Hrs
I		**Applications of Integration**	**9**
	1	Area between two curves, Volume by Slicing (Exclude other axes of revolution). Chapter 5: Section 5.1, 5.2 of Text [1]	
	2	Length of the plane curve (exclude finding arc length by numerical methods) Area of surface of revolution Chapter 5: Section 5.4, 5.5 of Text [1]	
II		**Special Functions**	**9**
	3	The Factorial Function, Definition of the Gamma Function; Recursion Relation (Chapter 11: Sections 11.1, 11.2, 11.3 of Text [3])	
	4	The Gamma Function of Negative Numbers, Formulas Involving Gamma Functions (Chapter 11: Sections 11.4, 11.5 of Text [3])	

Module	Unit	Contents	Hrs
	5	Beta Functions, Beta Functions in Terms of Gamma Functions (Chapter 11: Sections 11.6, 11.7 of Text [3])	
III		**Fourier Series- Period 2π**	**9**
	6	Fourier Series, A Basic Example, Euler Formulas without derivation.	
	7	Convergence and Sum of a Fourier Series	
IV		**Fourier Series-Arbitrary Period**	**9**
	8	Arbitrary Period, Even and Odd Functions	
	9	Half-Range Expansions	
V		**Teacher designed module - suggested topics**	**9**
	10	Volume by cylindrical shells (Exclude variations of the method of cylindrical shells) Chapter 5: Section 5.3 of Text [1]	
	11	Calculating work from basic principles[Chapter 5, Section 5.6 of Text 1]	
	12	Fluid Pressure and Force[Chapter 5, Section 5.8 of Text [1]	

Practical sessions and examinations – 30 hours

All the topics mentioned above should be used for practical sessions using SageMath software. Some useful resources for solving these problems using the SageMath software are given against each problem/ type of problems.

1. SageMath – documentation
   https://doc.sagemath.org/html/en/tutorial/introduction.html
2. Online SageMath server https://sagecell.sagemath.org/

A record should be maintained with atleast 7 problems from the main topics/teacher designed topics. Each problem in the record must have a description of the problem, algorithm (step by step procedure), commands used, input given and output obtained accordingly. For the ESE, from the list of above 10 problems, the student should be able to answer two selected (from the 7 available in the record) by the examiner.

Textbook

1. H Anton, I Bivens, S Davis, Calculus, 10th Edition, John Wiley & Sons, 2012.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley Publishers, 2018.
3. Mary L Boas, Mathematical Methods in Physical Science, 3rd Edition, 2006.

References

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

2. Peter V. O. Neil, Advanced Engineering Mathematics, Thompson Publications, 2007.

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	Calculate the solution of algebraic and transcendental equation using numerical methods	PO 2, PSO1, 2,3	U, Ap	F,C	L	
CO 2	Apply numerical techniques to interpolate data points effectively	PO1, PSO1, 2,3	U, Ap	F,C	L	
CO 3	Apply numerical techniques for differentiation and integration	PO2, PSO1, 2,3	U, Ap	F,C	L	
CO 4	Calculate the solution of ordinary differential equations using numerical methods	PO2, PSO1, 2,3	U, Ap	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	3	3	2	-	-	-	-	3	-	-	-	-	-	-
CO2	3	3	2	-	-	-	3	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	3	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	3	-	-	-	-	-	-

(- -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	✓	✓		✓