



## University of Kerala

Discipline	Mathematics				
Course Code	UK3DSCMAT204				
Course Title	Applications of Integration and Vector Calculus				
Type of Course	DSC				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical	Total Hours per week
	4	4	-	1	5
Pre-requisites	1. Integration 2. Differentiation 3. Vectors				
Course Summary	This course enable the students to get an idea about the applications of integration and vector calculus.				

## Detailed Syllabus

Module	Unit	Contents	Hrs
<b>I</b>	<b>Application of Integration</b>		<b>18</b>
	1	Area Between Two Curves, Volumes by Slicing; Disks and Washers ( <i>Chapter 5: Sections 5.1, 5.2 of Text[1]</i> )	
	2	Volumes by Cylindrical Shells ( <i>Chapter 5: Section 5.3 of Text[1]</i> )	
	3	Length of a Plane Curve, Area of revolution ( <i>Chapter 5: Sections 5.4, 5.5 of Text[1]</i> )	
<b>II</b>	<b>Work, Moments and Centroids</b>		<b>12</b>
	4	Work ( <i>Chapter 5: Section 5.6 of Text[1]</i> )	
	5	Moments, Centers of Gravity, and Centroids ( <i>Chapter 5 Section 5.7 of Text[1]</i> )	

Module	Unit	Contents	Hrs
<b>III</b>	<b>Vector Differentiation</b>		<b>12</b>
	6	Vector fields (Definition), inverse square fields, Gradient fields, Conservative Fields and potential functions, Divergence and Curl, the $\nabla$ operator ( <i>Chapter 15: Section 15.1 of Text[1]</i> )	
<b>IV</b>	<b>Vector Integration</b>		<b>18</b>
	7	Line integrals, Integrating a vector field along a curve - Exercise Set 15.2- problems 15-30, 33-36, 41-46. ( <i>Chapter 15 Section 15.2 of Text[1]</i> )	
	8	Independence of Path; Conservative Vector Fields, Green's Theorem( <i>Chapter 15: Sections 15.3, 15.4 of Text[1]</i> )	
	9	Surface integrals evaluating surface integrals, Flux, evaluation of flux integrals, The divergence theorem (without proof) using the divergence theorem to find flux. Stoke's the (all without proof) Relationships between Green's theorem and Stoke's theorem ( <i>Chapter 15: Sections 15.5 to 15.8 of Text[1]</i> )	
<b>Practical</b>	Practical sessions can be given using suitable software like sagemath (not meant for examination purpose)		<b>15</b>

## Textbook

1. H Anton, I Bivens, S Davis, *Calculus*, 10<sup>th</sup> Edition, John Wiley & Sons, 2012.

## References

1. Joel Hass, Maurice D. Weir, *Thomas' Calculus Early Transcendentals*, 12<sup>th</sup> Edition, Addison-Weseley Publishing Company, 2004.
2. J Stewart, *Calculus with Early Transcendental Functions*, 7<sup>th</sup> Edition, Cengage India Private Limited, 2008.
3. G B Thomas, R L Finney, *Calculus*, 9<sup>th</sup> Edition, Addison-Weseley Publishing Company, 2004.

## E-resources

1. <https://www.sagemath.org/help.html>
2. <https://www.geogebra.org/m/AzVR5uU7>
3. <https://www.geogebra.org/m/yyu2my9w>
4. <https://www.geogebra.org/m/zQzssykZ>
5. <https://www.geogebra.org/m/Bx8nFMNc>

## 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	Demonstrate various applications of integration	PSO 1, PO1, 6	U	F, C	L	
CO 2	Compute tangent lines to polar curves, arc length and area	PSO 2, 4, PO6	Ap, An	P	L	
CO 3	Describe the concepts Vector fields, Gradient fields, potential functions and vector integrals	PSO1, PO1, 6	U	F, C	L	
CO 4	Apply vector integrals to find areas	PSO 3, 4, PO1, 6	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	-	-	-	-	-	1	-	-	-	-	2	-	-
CO2	-	2	-	3	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	2	-	-
CO4	-	-	3	3	-	-	2	-	-	-	-	2	-	-

( - -Nil, 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	✓	✓		✓