AMBEDKAR COLLEGE OF ARTS & SCIENCE, WANDOOR
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Wandoor (PO), Pin 679328, Ph: 04931-249666
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COURSE PLAN			
Course code and title	**MTS6 B12 CALCULUS OF MULTI VARIABLE**		
Class	**BSc Mathematics**	**Semester**	6th Semester
Regulation	2019	**Academic year**	2024-25
Course prerequisites	Single variable Calculus, Trigonometry.		
Course objectives	• Analyze and interpret functions of several variables		
	• Apply multivariable differentiation and integration techniques		
	• Understand and use vector calculus		

COURSE OUTCOMES

At the end of the course the student would be able to...

CO1	Understand and analyze functions of several variables
CO2	Compute and apply partial derivatives and gradients
CO3	Evaluate multiple integrals in various coordinate systems
CO4	Apply vector calculus theorems to vector fields
CO5	Solve real-world problems using multivariable calculus concepts

MAPPING OF PROGRAM OUTCOMES

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓				✓		✓			
CO2	✓		✓		✓				✓	
CO3	✓						✓			
CO4	✓		✓							
CO5	✓				✓		✓	✓		✓

PO1	Knowledge Acquisition	PO6	Ethics & Social Responsibility
PO2	Communication & Leadership	PO7	Research, Innovation & Entrepreneurship

PO4	Digital Intelligence	PO9	Global Perspective
PO5	Scientific awareness & Critical Thinking	PO10	Democratic Co-existence

PROGRAM SPECIFIC OUTCOMES

PSO1	Theoretical and Applied Mathematics Competency
PSO2	Advanced Analytical and Computational Techniques
PSO3	Mathematical Modeling and Problem-Solving

MAPPING OF COURSE OUTCOMES TO PROGRAM EDUCATIONAL OUTCOMES

PROGRAM EDUCATIONAL OUTCOMES	COURSE OUTCOMES				
	CO1	CO2	CO3	CO4	CO5
PEO1					✓
PEO2	✓		✓		✓
PEO3		✓			✓

TEXT BOOKS:

1. Calculus: Soo T Tan *Brooks/Cole, Cengage Learning (2010) ISBN 0-534-46579-X)*

REFERENCES:

1. JoelHass, Christopher Heil & Maurice D. Weir : Thomas' Calculus(14/e) *Pearson(2018) ISBN 0134438981*
2. Robert A Adams & Christopher Essex : Calculus: *A complete Course (8/e) Pearson Education Canada (2013) ISBN:* 032187742X
3. Jon Rogawski: Multivariable Calculus *Early Transcendentals* (2/e) W. H. Freeman and Company(2012) *ISBN: 1-4292-3187-4*
4. Anton, Bivens & Davis : Calculus *Early Transcendentals* (10/e) John Wiley & Sons, Inc.(2012) ISBN: 978-0-470-64769-1
5. James Stewart : Calculus (8/e) *Brooks/Cole Cengage Learning(2016) ISBN: 978-1-285-74062-1*
6. Jerrold E. Marsden & Anthony Tromba :Vector Calculus (6/e) *W.H. Freeman and Company ,New York(2012) ISBN: 978-1-4292-1508-4*

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7.Arnold Ostebee & Paul Zorn: Multivariable Calculus (2/e) *W. H. Freeman Custom Publishing, N.Y.(2008)ISBN: 978-1-4292-3033-9*	
e-learning resources	**https://ocw.mit.edu/courses/18-02-multivariable-calculus-fall-2007/**
Mode of Evaluation	Internal Examination (20%) End Semester Examination (80%)
Faculty	**Shamna Sherin P, Assistant Professor (on contract)** / Department of Mathematics
e-mail id	shamnasherinpwdr@gmail.com

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COURSE PLAN BCM4C04 QUANTITATIVE TECHNIQUES FOR BUSINESS

No of lecture hours	Planned Date	Topics to be covered		Reference/ Teaching aids and methods	Actual date	Weekly review
		MODULE I				
1	18/11/24	Functions of Two Variables, Graphs of Functions of Two Variables		R1/WB	18/11/24	
2	20/11/24	Curves, Functions of Three Variables and Level Surfaces		T1/WB	20/11/24	
3	21/11/24	An Intuitive Definition of a Limit, *existence and non existence of limit,* Continuity of a Function of Two Variables		T1/WB	21/11/24	
4	25/11/24	Continuity on a Set, *continuity of polynomial and rational functions, continuity of composite functions,* Functions of Three or More Variables, The $\varepsilon - \delta$ Definition of a Limit		T1/WB	27/11/24	
5	27/11/24	Partial Derivatives of Functions of Two Variables, *geometric interpretation*, Computing Partial Derivatives		T1/PPT	28/11/24	
6	28/11/24	Implicit Differentiation, Partial Derivatives of Functions of More Than Two Variables		T1/PPT	2/12/24	
7	02/12/24	Higher-Order Derivatives, *clairaut theorem, harmonic functions*		T1 WB	5/12/24	
8	04/12/24	Increments, The Total Differential, *interpretation,* Error in Approximating Δz by dz		T1/WB	9/12/24	
9	05/12/24	Differentiability of a Function of Two Variables, *criteria,* Differentiability and Continuity, Functions of Three or More		T1 WB	11/12/24	

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		Variables			T1/WB	16/12/24	
10	09/12/24	The Chain Rule for Functions Involving One Independent Variable, The Chain Rule for Functions Involving Two Independent Variables,			T1/WB	18/12/24	
11	11/12/24	The General Chain Rule, Implicit Differentiation			T1/WB	23/12/24	
Planned hours	**Actual hours**	**Date**	**Sign of Faculty**	**Review by HoD**		**Review by Principal**	
		MODULE II					
12	19/11/24	The Directional Derivative, The Gradient of a Function of Two Variables			R2/WB	26/11/24	
13	26/11/24	Properties of the Gradient, Functions of Three Variables			R2/WB	3/12/24	
14	03/12/24	Geometric Interpretation of the Gradient			T1/WB	10/12/24	
15	10/12/24	Tangent Planes and Normal Lines, Using the Tangent Plane of f to approximate the Surface $z = f(x, y)$			R2/PPT	17/12/24	
16	17/12/24	Relative and Absolute Extrema, Critical Points—Candidates for Relative Extrema			R2/WB	7/1/25	
17	07/01/25	The Second Derivative Test for Relative Extrema,			R1/WB	14/1/25	
18	14/01/25	Finding the Absolute Extremum Values of a Continuous Function on a Closed Set			T1/PPT	21/1/25	
19	21/01/25	Constrained Maxima and Minima, The Method of Lagrange Multipliers,			R2/PPT	4/2/25	
20	28/01/25	*Lagrange theorem*			R1/WB	11/2/25	
21	04/02/25	Optimizing a Function Subject to Two Constraints			R2/PPT	18/2/25	

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Planned hours	Actual hours	Date	Sign of Faculty	Review by HoD		Review by Principal		
			MODULE III					
22		12/12/24	An Introductory Example, Volume of a Solid Between a Surface and a Rectangle, The Double Integral Over a Rectangular Region			T1/WB	6/1/25	
23		16/12/24	Double Integrals Over General Regions, Properties of Double Integrals			T1/WB	8/1/25	
24		18/12/24	Iterated Integrals Over Rectangular Regions, Fubini's Theorem for Rectangular Regions			T1/WB	9/1/25	
25		19/12/24	Iterated Integrals Over Nonrectangular Regions, *y- simple and x- simple regions, advantage of changing the order of integration*			T1/PPT	13/1/25	
26		23/12/24	Polar Rectangles, Double Integrals Over Polar Rectangles,			T1/PPT	15/1/25	
27		06/01/25	Double Integrals Over General Regions, rsimple region, method of evaluation			T1/WB	16/1/25	
28		08/01/25	Mass of a Lamina, Moments and Center of Mass of a Lamina			T1/WB	20/1/25	
29		09/01/25	Moments of Inertia, Radius of Gyration of a Lamina			T1/PPT	22/1/25	
30		13/01/25	Area of a Surface $z = f(x, y)$, Area of Surfaces with Equations $y = g(x, z)$ and $x = h(y, z)$			T1/PPT	25/1/25	
28		15/01/25	Triple Integrals Over a Rectangular Box, *definition, method of evaluation as iterated integrals,* Triple Integrals Over General Bounded Regions in Space,			T1/WB	27/1/25	

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29	16/01/25	Evaluating Triple Integrals Over General Regions, *evaluation technique,*			T1/WB	29/1/25	
30	20/01/25	Volume, Mass, Center of Mass, and Moments of Inertia			T1/WB	30/1/25	
31	22/01/25	*evaluation of integrals in* Cylindrical Coordinates, Spherical Coordinates			T2/WB	5/2/25	
32	23/01/25	Transformations, Change of Variables in Double Integrals, *illustrations*, Change of Variables in Triple Integrals			T2/PPT	6/2/25	
Planned hours	**Actual hours**	**Date**	**Sign of Faculty**	**Review by HoD**		**Review by Principal**	
MODULE IV							
33	27/01/25	*V.F. in two and three dimensional space,* Conservative Vector Fields			R1/WB	10/2/25	
34	29/01/25	*Divergence- idea and definition,* Curl- *idea and Definition*			R2/WB	12/2/25	
35	30/01/25	*Line integral w.r.t. arc length- motivation, basic idea and definition*, Line Integrals with Respect to Coordinate Variables, *orientation of curve*			R2/WB	13/2/25	
36	03/02/25	Line Integrals in Space, Line Integrals of Vector Fields			R2/WB	17/2/25	
37	05/02/25	*Path independence through example, definition, fundamental theorem for line integral,* Line Integrals Along Closed Paths			R2/WB	19/2/25	
38	06/02/25	*work done by conservative vector field* Independence of Path and Conservative Vector Fields, Determining Whether a Vector Field Is Conservative			T1/WB	20/2/25	
39	10/02/25	*test for conservative vector field* Finding a Potential Function, Conservation of Energy			T1/WB	24/2/25	

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40	12/02/25	Green's Theorem for Simple Regions, *proof of theorem for simple regions, finding area using line integral*			T1/WB	27/2/25	
41	13/02/25	Green's Theorem for More General Regions, Vector Form of Green's Theorem			T1/WB	3/3/25	
42	17/02/25	Why We Use Parametric Surfaces, Finding Parametric Representations of Surfaces			T1/PPT	5/3/25	
43	19/02/25	Tangent Planes to Parametric Surfaces, Area of a Parametric Surface			T1/PPT	10/3/25	
44	20/02/25	Surface Integrals of Scalar Fields, *evaluation of surface integral for surfaces that are graphs* Parametric Surfaces, *evaluation of surface integral for parametric surface,* Oriented Surfaces			T1/PPT	12/3/25	
45	24/02/25	Surface Integrals of Vector Fields *definition, flux integral, evaluation of surface integral for graph* Parametric Surfaces, *evaluation of surface integral of a vector field for parametric surface*			T1/PPT	17/3/25	
46	27/02/25	*divergence theorem for simple solid regions, illustrations,* Interpretation of Divergence			T1/WB	19/3/25	
47	03/03/25	*generalization of Green's theorem – Stokes Theorem,illustrations*			T1/WB	20/3/25	
48	05/03/25	Interpretation of Curl			T1/WB	24/3/25	
Planned hours	**Actual hours**	**Date**	**Sign of Faculty**	**Review by HoD**		**Review by Principal**	

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Course outcome –Program outcome Mapping Table

BCM4C04 QUANTITATIVE TECHNIQUES FOR BUSINESS		Cognitive level	Program outcomes 1- Low correlation 2-Moderate Correlation 3- IIigh correlation									
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
DIRECT METHOD												
CO1	Understand and analyze functions of several variables	Remember	3				1		2			
CO2	Compute and apply partial derivatives and gradients	Apply	3		2		1				2	
CO3	Evaluate multiple integrals in various coordinate systems	Apply & Analyze	1						2			
CO4	Apply vector calculus theorems to vector fields	Create	2		1							
CO5	Solve real-world problems using multivariable calculus concepts	Innovate	2				3		2	2		1
INDIRECT METHOD												
Class Room contests		Analyze & Create	1					1	2			

Course Faculty IQAC Member HoD

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COURSE PRE-ANALYSIS

Dear Students,

Welcome back to class, I would like to thank all of you for sparing your time in filling up this Course Pre-Analysis survey for the effective conduct of Computer Aided Design and Manufacturing Course. As you know that this survey is meant for knowing the knowledge level of the students with respect to this course, please fill it very carefully. At this juncture, I am glad to welcome the suggestions from you all (if any).

Rate your prior knowledge about the topics mentioned below

Course Outcomes	Description	Rate your prior knowledge about the topics			
		Excellent (4)	Good (3)	Moderate (2)	Fair (1)
CO1	Understand and analyze functions of several variables			✓	
CO2	Compute and apply partial derivatives and gradients		✓		
CO3	Evaluate multiple integrals in various coordinate systems	✓			
CO4	Apply vector calculus theorems to vector fields			✓	
CO5	Solve real-world problems using multivariable calculus concepts		✓		

Name of the student: Signature of the student

Muhammed Sinan S.V

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Syllabus

SIXTH SEMESTER

MTS6 B12 CALCULUS OF MULTI VARIABLE

5 hours/week **4 Credits** **100 Marks [Int:20+Ext:80]**

Aims, Objectives and Outcomes

The intention of the course is to extend the immensely useful ideas and notions such as limit, continuity, derivative and integral seen in the context of function of single variable to function of several variables. The corresponding results will be the higher dimensional analogues of what we learned in the case of single variable functions. The results we develop in the course of calculus of multivariable is extremely useful in several areas of science and technology as many functions that arise in real life situations are functions of multivariable.

The successful completion of the course will enable the student to

- Understand several contexts of appearance of multivariable functions and their representation using graph and contour diagrams.
- Formulate and work on the idea of limit and continuity for functions of several
- variables. Understand the notion of *partial derivative*, their computation and interpretation.
- Understand chain rule for calculating partial derivatives.
- Get the idea of *directional derivative,* its evaluation, interpretation, *and* relationship with partial derivatives.
- Understand the concept of *gradient*, a few of its properties, application and
- interpretation. Understand the use of partial derivatives in getting information of tangent plane and normal line.
- Calculate the maximum and minimum values of a multivariable function using second derivative test and Lagrange multiplier method.

- Find a few real life applications of Lagrange multiplier method in optimization
- problems. Extend the notion of integral of a function of single variable to integral of functions of two and three variables.
- Address the practical problem of evaluation of double and triple integral using Fubini's theorem and change of variable formula.
- Realise the advantage of choosing other coordinate systems such as polar, spherical, cylindrical etc. in the evaluation of double and triple integrals .
- See a few applications of double and triple integral in the problem of finding out surface area ,mass of lamina, volume, centre of mass and so on.
- Understand the notion of a vector field, the idea of curl and divergence of a vector field, their evaluation and interpretation.
- Understand the idea of line integral and surface integral and their evaluations.
- Learn three major results viz. Green's theorem, Gauss's theorem and Stokes' theorem of multivariable calculus and their use in several areas and directions.

Syllabus

Text	Calculus: Soo T Tan *Brooks/Cole, Cengage Learning (2010) ISBN 0-534-46579-X)*

Module-I (18 hrs)

13.1 : Functions of two or more variables- Functions of Two Variables, Graphs of Functions of Two Variables, Level Curves, Functions of Three Variables and Level Surfaces

13.2 : Limits and continuity-An Intuitive Definition of a Limit, *existence and non existence of limit,* Continuity of a Function of Two Variables, Continuity on a Set, *continuity of polynomial and rational functions, continuity of composite functions,* Functions of Three or More Variables, The $\varepsilon - \delta$ Definition of a Limit

13.3 : Partial Derivatives- Partial Derivatives of Functions of Two Variables, *geometric interpretation,* Computing Partial Derivatives, Implicit Differentiation, Partial Derivatives of Functions of More Than Two Variables, Higher-Order Derivatives, *clairaut theorem, harmonic functions*

13.4 : Differentials- Increments, The Total Differential, *interpretation,* Error in Approximating Δz by dz *[only statement of theorem1 required ; proof omitted]* Differentiability of a Function of Two Variables, *criteria*, Differentiability and Continuity, Functions of Three or More Variables

13.5 : The Chain rule- The Chain Rule for Functions Involving One Independent Variable, The Chain Rule for Functions Involving Two Independent Variables, The General Chain Rule, Implicit Differentiation

Module-II (16 hrs)

13.6 : Directional Derivatives and Gradient vectors - The Directional Derivative, The Gradient of a Function of Two Variables, Properties of the Gradient, Functions of Three Variables

13.7 : Tangent Planes and Normal Lines- Geometric Interpretation of the Gradient, Tangent Planes and Normal Lines, Using the Tangent Plane of f to approximate the Surface $z = f(x, y)$

13.8 : Extrema of Functions of two variables - Relative and Absolute Extrema, Critical Points Candidates for Relative Extrema, The Second

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Derivative Test for Relative Extrema, Finding the Absolute Extremum Values of a Continuous Function on a Closed Set

13.9 : Lagrange Multipliers- Constrained Maxima and Minima, The Method of Lagrange Multipliers, *Lagrange theorem,* Optimizing a Function Subject to Two Constraints

Module-III (21 hrs)

14.1 : Double integrals- An Introductory Example, Volume of a Solid Between a Surface and a Rectangle, The Double Integral Over a Rectangular Region, Double Integrals Over General Regions, Properties of Double Integrals

14.2 : Iterated Integrals-Iterated Integrals Over Rectangular Regions, Fubini's Theorem for Rectangular Regions, Iterated Integrals Over Nonrectangular Regions, *y - simple and x - simple regions, advantage of changing the order of integration*

14.3 :Double integrals in polar coordinates- Polar Rectangles, Double Integrals Over Polar Rectangles, Double Integrals Over General Regions, r- simple region, method of evaluation

14.4 : Applications of Double integral- Mass of a Lamina, Moments and Center of Mass of a Lamina, Moments of Inertia, Radius of Gyration of a Lamina

14.5 : Surface Area- Area of a Surface $z = f(x, y)$, Area of Surfaces with Equations $y = g(x, z)$ and $x = h(y, z)$

14.6 : Triple integrals- Triple Integrals Over a Rectangular Box, *definition, method of evaluation as iterated integrals,* Triple Integrals Over General Bounded Regions in Space, Evaluating Triple Integrals Over General Regions, *evaluation technique,* Volume, Mass, Center of Mass, and Moments of Inertia

14.7 : Triple Integrals in cylindrical and spherical coordinates- *evaluation of integrals in* Cylindrical Coordinates, Spherical Coordinates

14.8 : Change of variables in multiple integrals- Transformations, Change of Variables in Double Integrals *[only the method is required; derivation omitted]*, *illustrations*, Change of Variables in Triple Integrals

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Module-IV (25 hrs)

15.1 : Vector Fields- *V.F. in two and three dimensional space,* Conservative Vector Fields

15.2 : Divergence and Curl- *Divergence- idea and definition*, Curl- *idea and definition*

15.3 : Line Integrals- *Line integral w.r.t. arc length-motivation, basic idea and definition*, Line Integrals with Respect to Coordinate Variables, *orientation of curve* Line Integrals in Space, Line Integrals of Vector Fields

15.4 : Independence of Path and Conservative Vector Fields-*path independence through example, definition, fundamental theorem for line integral,* Line Integrals Along Closed Paths, *work done by conservative vector field,* Independence of Path and Conservative Vector Fields, Determining Whether a Vector Field Is Conservative, *test for conservative vector field* Finding a Potential Function, Conservation of Energy

15.5: Green's Theorem- Green's Theorem for Simple Regions, *proof of theorem for simple regions, finding area using line integral,* Green's Theorem for More General Regions, Vector Form of Green's Theorem

15.6 : Parametric Surfaces-Why We Use Parametric Surfaces, Finding Parametric Representations of Surfaces, Tangent Planes to Parametric Surfaces, Area of a Parametric Surface *[derivation of formula omitted]*

15.7 : Surface Integrals-Surface Integrals of Scalar Fields, *evaluation of surface integral for surfaces that are graphs , [derivation of formula omitted; only method required]* Parametric Surfaces, *evaluation of surface integral for parametric surface*, Oriented Surfaces, Surface Integrals of Vector Fields- *definition, flux integral, evaluation of surface integral for graph[method only],* Parametric Surfaces, *evaluation of surface integral of a vector field for parametric surface [method only]*

15.8 : The Divergence Theorem-*divergence theorem for simple solid regions (statement only), illustrations*, Interpretation of Divergence

15.9 : Stokes Theorem- *generalization of Green's theorem – Stokes Theorem, illustrations*, Interpretation of Curl

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References:

1	JoelHass, Christopher Heil & Maurice D Weir : Thomas' Calculus(14/e) *Pearson(2018) ISBN 0134439981*
2	Robert A Adams & Christopher Essex : Calculus: *A complete Course (8/e) Pearson Education Canada (2013) ISBN:* 032187742X
3	Jon Rogawski: Multivariable Calculus *Early Transcendentals* (2/e) W. H. Freeman and Company(2012) *ISBN: 1-4292-3187-4*
4	Anton, Bivens & Davis : Calculus *Early Transcendentals* (10/e) John Wiley & Sons, Inc.(2012) ISBN: 978-0-470-64769-1
5	James Stewart : Calculus (8/e) *Brooks/Cole Cengage Learning(2016) ISBN: 978-1-285-74062-1*
6	Jerrold E. Marsden & Anthony Tromba :Vector Calculus (6/e) *W. H. Freeman and Company ,New York(2012) ISBN: 978-1-4292-1508-4*
7	Arnold Ostebee & Paul Zorn: Multivariable Calculus (2/e) *W. H. Freeman Custom Publishing, N.Y.(2008)ISBN: 978-1-4292-3033-9*

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Course outcome –Program Specific outcome Mapping Table

Course outcomes	Program Specific outcomes		
	PSO1	PSO2	PSO3
CO1			✓
CO2	✓		
CO3		✓	✓
CO4	✓		
CO5			✓

Course Faculty **IQAC Member** **HoD**

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DIRECT ASSESSMENT OF COURSE OUTCOMES

INTERNAL ASSESSMENT TEST 20 MARKS				
Objective	To Identify What Students Have Learned and also to identify students strength and weakness			
To file	Answer scripts	**Frequency**	1 times in a semester on dates specified by University	
Format	.			
Evaluation	Based on answer given in the scripts			
ASSIG NMENT:4 MARKS				
Objective	To enhance students understanding of a complex structural problems			
Product	Hand written assignment sheets			
Frequency	Monthly or after completing improvement test			
Format	Questions from both question papers			
Evaluation	Based on rubrics			
Criteria	No. of assignments: 1, Submit on or before the date of submission			
END SEMESTER EXAMINATION 100 MARKS (Reduced to 80Marks)				
Objective	**To assess the each student's knowledge of the course**			
Product	Result analysis			
Frequency	Semester			
Format	Part –A 15 x 2 =25 marks, Part –B 5 x 8= 35 marks, Part C-10x2=20 marks, Total marks = 100, Duration : 2.5 hours			
Evaluation	Based on answer given in the scripts			
Marks out of 100	30-50	50- 70	71-100	0-50
Levels of attainment	1	2	3	Counseling / Coaching classes.

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DEPARTMENT OF MATHEMATICS

COURSE EXIT SURVEY RESPONSES (ODD SEM . 2024-2025)

Semester: V

Course:MTS6B12 - CALCULUS OF MULTIVARIABLE

Name of the faculty member: SHAMNA SHERIN P

Sl. No.	NAME OF THE STUDENT	REG NO	Are you able to Understand Linear Programming Basics	Are you able to Formulate Linear Programming Problems	Are you able to Implement the Simplex Method	Are you able to Apply Duality Theory	Are you able to Evaluate and Apply Transportation & Assignment Problems
COURSE OUTCOMES			CO1	CO2	CO3	CO4	CO5
1	ADLA P	UFAWSMT001	5 (EXCELLENT)	5 (EXCELLENT)	5 (EXCELLENT)	4 (Very Good)	5 (Excellent)
2	DILSHA A P	UFAWSMT003	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (Excellent)	4 (Very Good)
3	HIBA SHERIN M K	UFAWSMT005	4 (Very Good)	4 (Very Good)	3 (Good)	1 (Fair)	3 (Good)
4	HUSNA SHERIN K	UFAWSMT006	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (EXCELLENT)	4 (Very Good)
5	MUFEEDA	UFAWSMT007	4 (Very Good)	3 (Good)	4 (Very Good)	5 (EXCELLENT)	3 (Good)
6	RINSHA T P	UFAWSMT008	3 (Good)	3 (Good)	3 (Good)	3 (Good)	3 (Good)
7	SAHANA MUMTHAZ	UFAWSMT010	3 (Good)	4 (Very Good)	3 (Good)	5 (EXCELLENT)	5 (EXCELLENT)
8	SANA M T	UFAWSMT011	5 (EXCELLENT)	3 (Good)	4 (Very Good)	3 (Good)	5 (EXCELLENT)
9	SANA V K	UFAWSMT012	5 (EXCELLENT)	5 (EXCELLENT)	5 (EXCELLENT)	4 (Very Good)	5 (EXCELLENT)
10	SANEEBA K	UFAWSMT013	5 (EXCELLENT)	4 (Very Good)	4 (Very Good)	4 (Very Good)	4 (Very Good)
11	SHAHMA G H	UFAWSMT014	.	.	.	.	.
12	SHIFNA SHARIN	UFAWSMT016	4 (Very Good)	4 (Very Good)	4 (Very Good)	4 (Very Good)	4 (Very Good)

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13	FAYIZ C	UFAWSMT017	4 (Very Good)	3 (Good)	5 (EXCELLENT)	3 (Good)	3 (Good)
14	MOHAMMED SWALIH C	UFAWSMT018	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (EXCELLENT)	5 (EXCELLENT)
15	MUHAMMED SINAN S V	UFAWSMT019	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (EXCELLENT)	4 (Very Good)
16	SHAHID IRFAN T P	UFAWSMT020	5 (EXCELLENT)	4 (Very Good)	3 (Good)	3 (Good)	1 (Fair)
17	ARYA V R	UFAWSMT021	4 (Very Good)	3 (Good)	4 (Very Good)	4 (Very Good)	4 (Very Good)
18	ASNA RUBA K	UFAWSMT022	3 (Good)	3 (Good)	4 (Very Good)	3 (Good)	3 (Good)
19	FATHIMA RANNA T	UFAWSMT024	3 (Good)	4 (Very Good)	5 (EXCELLENT)	4 (Very Good)	4 (Very Good)
20	HANNA MOL	UFAWSMT025	4 (Very Good)	4 (Very Good)	3 (Good)	3 (Good)	4 (Very Good)
21	HARSHA MOHANDAS C M	UFAWSMT026	4 (Very Good)	5 (EXCELLENT)	5 (EXCELLENT)	4 (Very Good)	5 (EXCELLENT)
22	MANYA P	UFAWSMT028	4 (Very Good)	2 (Very Fair)	4 (Very Good)	4 (Very Good)	4 (Very Good)
23	MINNA P	UFAWSMT029	4 (Very Good)	4 (Very Good)	3 (Good)	3 (Good)	5 (EXCELLENT)
24	RINSHA V	UFAWSMT030	3 (Good)	4 (Very Good)	4 (Very Good)	3 (Good)	5 (EXCELLENT)
25	RISHIKA P K	UFAWSMT031	5 (EXCELLENT)	5 (EXCELLENT)	5 (EXCELLENT)	5 (EXCELLENT)	3 (Good)
26	SARANYA K N	UFAWSMT032	3 (Good)	3 (Good)	4 (Very Good)	3 (Good)	5 (EXCELLENT)
27	SHIFNA SHERI K	UFAWSMT033	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (EXCELLENT)	4 (Very Good)
28	ABHINAV P	UFAWSMT034	5 (EXCELLENT)	4 (Very Good)	5 (EXCELLENT)	3 (Good)	3 (Good)
29	AKSHAY RAJ K	UFAWSMT035	4 (Very Good)	4 (Very Good)	3 (Good)	4 (Very Good)	4 (Very Good)
30	MAQBOOL RAASI P M	UFAWSMT037	5 (EXCELLENT)	5 (EXCELLENT)	5 (EXCELLENT)	4 (Very Good)	5 (EXCELLENT)
31	SIBIL V	UFAWSMT038	4 (Very Good)	4 (Very Good)	4 (Very Good)	4 (Very Good)	5 (EXCELLENT)
32	VISHNU C	UFAWSMT039	3 (Good)	4 (Very Good)	3 (Good)	4 (Very Good)	3 (Good)
33	MASHBOOBA S V	UFAWSMT040	4 (Very Good)	5 (EXCELLENT)	3 (Good)	3 (Good)	4 (Very Good)
34	SAFA SHERIN P T	UFAWSMT041	5 (EXCELLENT)	3 (Good)	4 (Very Good)	5 (EXCELLENT)	3 (Good)
35	MUHAMMED FATHAH K	UFAWSMT042	3 (Good)	5 (EXCELLENT)	4 (Very Good)	4 (Very Good)	3 (Good)
No. of graded "0"			0	0	0	0	0
No. of graded "1"			0	0	0	1	1
No. of graded "2"			0	1	0	0	0

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No. of graded "3"	8	8	9	11	10
No. of graded "4"	17	18	17	13	12
No. of graded "5"	9	7	8	9	11

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DEPARTMENT OF MATHEMATICS

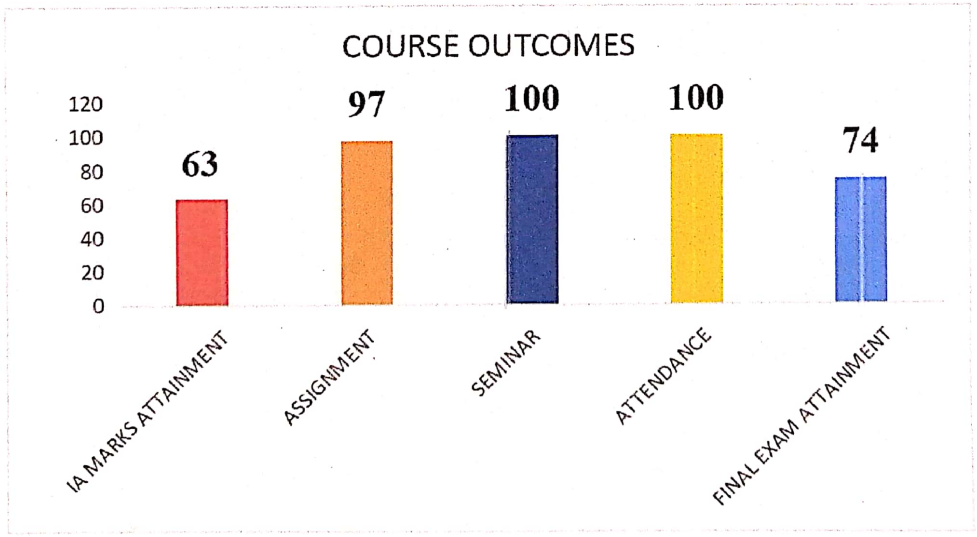
DIRECT ASSESSMENT METHOD - CO ATTAINMENT (ODD SEM . 2024-2025)

Semester: V Course:MTS6B12 - CALCULUS OF MULTIVARIABLE

Name of the faculty member: SHAMNA SHERIN P

TARGET: 60% ATTAINMENT

COs	CO1 to CO5
IA MARKS ATTAINMENT	63
ASSIGNMENT	97
SEMINAR	100
ATTENDANCE	100
FINAL EXAM ATTAINMENT	74
AVERAGE	**87**



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DEPARTMENT OF MATHEMATICS

CO-PO-PSO MAPPING (EVEN SEM . 2024-2025)

Semester: V

Course:MTS6B12 - CALCULUS OF MULTIVARIABLE

Name of the faculty member: SHAMNA SHERIN P

(I) CO Attainment

A: Direct assessment (80%)-Tests, Assignment, Examination

B: Indirect assessment (20%)-Course end survey

COs	Mapping of POs	Mapping of PSOs	Direct Assessment (a)	Indirect Assessment (b)	Overall Attainment 0.8 (a) + 0.2(b)	Target (%)	Attainment
CO1	PO1, PO3, PO4 & PO9	PSO1, PSO2 & PSO3	87	72.11	84	75	YES
CO2	PO1, PO3, PO5 & PO7	PSO1, PSO2 & PSO3	87	70.00	83		
CO3	PO1, PO2, PO3, PO5 & PO9	PSO1, PSO2 & PSO3	87	71.05	84		
CO4	PO1, PO3, PO4, PO5& PO8	PSO1, PSO2 & PSO3	87	68.95	83		
CO5	PO1, PO4, PO5, PO7 & PO8	PSO1, PSO2 & PSO3	87	70.53	84		

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Attainment Levels of COs

Course Name: ENG5B09- Language and Linguistics			
Assessment Methods	Target-Attainment Levels		Attainement
Internal Assessment	Level 1	50% of students scoring more than 35% marks in internal assessment tools	**LEVEL 03**
	Level 2	60% of students scoring more than 35% marks in internal assessment tools	
	Level 3	70% of students scoring more than 35% marks in internal assessment tools	
Assessment Methods	**Target-Attainment Levels**		Attainement
University Assessment	Level 1	50% of students scoring more than 35% marks in UE assessment tools	**LEVEL 03**
	Level 2	60% of students scoring more than 35% marks in UE assessment tools	
	Level 3	70% of students scoring more than 35% marks in UE assessment tools	

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CO ATTAINMENT - ASSIGNEMENT(EVEN SEM. 2024-2025)

Sem.: V

Course:MTS6B12 - CALCULUS OF MULTIVARIABLE

Name of the faculty member: SHAMNA SHERIN P

Sl. No.	Name of the student	REG NO	ASSIGNMENT	SEMINAR	ATTENDANCE	COURSE OUTCOMES				ATTENDANCE	
			CO1 to CO5	CO4 to CO5		CO1 - 5		CO4 - 5			
		Max. Marks	4	4	4	%age	Y/N	%age	Y/N	%age	Y/N
1	ADLA P	UFAWSMT001	4	4	4	100	Y	100	Y	100	Y
2	DILSHA A P	UFAWSMT003	4	4	4	100	Y	100	Y	100	Y
3	HIBA SHERIN M K	UFAWSMT005	4	4	4	100	Y	100	Y	100	Y
4	HUSNA SHERIN K	UFAWSMT006	4	4	4	100	Y	100	Y	100	Y
5	MUFEEDA	UFAWSMT007	4	4	4	100	Y	100	Y	100	Y
6	RINSHA T P	UFAWSMT008	4	4	4	100	Y	100	Y	100	Y
7	SAHANA MUMTHAZ	UFAWSMT010	4	4	4	100	Y	100	Y	100	Y
8	SANA M T	UFAWSMT011	4	4	4	100	Y	100	Y	100	Y
9	SANA V K	UFAWSMT012	4	4	4	100	Y	100	Y	100	Y
10	SANEEBA K	UFAWSMT013	4	4	4	100	Y	100	Y	100	Y
11	SHAHMA C H	UFAWSMT014	4	4	4	100	Y	100	Y	100	Y
12	SHIFNA SHARIN	UFAWSMT016	4	4	4	100	Y	100	Y	100	Y
13	FAYIZ C	UFAWSMT017	4	4	4	100	Y	100	Y	100	Y
14	MOHAMMED SWALIH C	UFAWSMT018	4	4	4	100	Y	100	Y	100	Y
15	MUHAMMED SINAN S V	UFAWSMT019	4	4	4	100	Y	100	Y	100	Y
16	SHAHID IRFAN T P	UFAWSMT020	4	4	2	100	Y	100	Y	50	Y

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17	ARYA V R	UFAWSMT021	4	4	4	100	Y	100	Y	100	Y
18	ASNA RUBA K	UFAWSMT022	4	4	1	100	Y	100	Y	25	Y
19	FATHIMA RANNA T	UFAWSMT024	4	4	4	100	Y	100	Y	100	Y
20	HANNA MOL	UFAWSMT025	4	4	4	100	Y	100	Y	100	Y
21	HARSHA MOHANDAS C M	UFAWSMT026	4	4	4	100	Y	100	Y	100	Y
22	MANYA P	UFAWSMT028	4	4	4	100	Y	100	Y	100	Y
23	MINNA P	UFAWSMT029	4	4	1	100	Y	100	Y	25	Y
24	RINSHA V	UFAWSMT030	4	4	4	100	Y	100	Y	100	Y
25	RISHIKA P K	UFAWSMT031	4	4	4	100	Y	100	Y	100	Y
26	SARANYA K N	UFAWSMT032	4	4	4	100	Y	100	Y	100	Y
27	SHIFNA SHERI K	UFAWSMT033	4	4	4	100	Y	100	Y	100	Y
28	ABHINAV P	UFAWSMT034	4	4	4	100	Y	100	Y	100	Y
29	AKSHAY RAJ K	UFAWSMT035	4	4	4	100	Y	100	Y	100	Y
30	MAQBOOL RAASI P M	UFAWSMT037	4	4	2	100	Y	100	Y	50	Y
31	SIBIL V	UFAWSMT038	4	4	4	100	Y	100	Y	100	Y
32	VISHNU C	UFAWSMT039	1	4	1	25	N	100	Y	25	Y
33	MASHBOOBA S V	UFAWSMT040	4	4	4	100	Y	100	Y	100	Y
34	SAFA SHERIN P T	UFAWSMT041	4	4	4	100	Y	100	Y	100	Y
35	MUHAMMED FATHAH K	UFAWSMT042	4	4	2	100	Y	100	Y	50	Y
						34		35		35	
						97.14		**100.00**		**100.00**	

FOR LAL (MTS6B12)	CO1 TO 3	CO4 TO 5	ATTENDANCE
	97.14	**100.00**	**100.00**

TARGET: 1) 90% OF STUDENTS WILL SCORE 35% OF MARKS IN ASSIGNMENT

AMBEDKAR COLLEGE OF ARTS & SCIENCE Date

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DEPARTMENT OF MATHEMATICS

CO ATTAINMENT - IA TEST MARKS (EVEN SEM. 2024-2025)

Sem.: V Course:MTS6B12 - CALCULUS OF MULTIVARIABL

Name of the faculty member: SHAMNA SHERIN P

Sl. No.	Name of the student	REG NO	IA TEST Q1 TO Q14 CO1 TO CO5	COURSE OUTCOMES IA TEST CO1 TO CO5	
		Max. Marks	30	%age	Y/N
1	ADLA P	UFAWSMT001	30	100	Y
2	DILSHA A P	UFAWSMT003	3.75	12	N
3	HIBA SHERIN M K	UFAWSMT005	22.5	75	Y
4	HUSNA SHERIN K	UFAWSMT006	15	50	Y
5	MUFEEDA	UFAWSMT007	11.25	37	Y
6	RINSHA T P	UFAWSMT008	30	100	Y
7	SAHANA MUMTHAZ	UFAWSMT010	15	50	Y
8	SANA M T	UFAWSMT011	15	50	Y
9	SANA V K	UFAWSMT012	22.5	75	Y
10	SANEEBA K	UFAWSMT013	22.5	75	Y
11	SHAHMA C H	UFAWSMT014	11.25	37	Y
12	SHIFNA SHARIN	UFAWSMT016	30	100	Y

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13	FAYIZ C	UFAWSMT017	3.75	12	N
14	MOHAMMED SWALIH C	UFAWSMT018	3.75	12	N
15	MUHAMMED SINAN S V	UFAWSMT019	11.25	37	Y
16	SHAHID IRFAN T P	UFAWSMT020	3.75	12	N
17	ARYA V R	UFAWSMT021	22.5	75	Y
18	ASNA RUBA K	UFAWSMT022	3.75	12	N
19	FATHIMA RANNA T	UFAWSMT024	11.25	37	Y
20	HANNA MOL	UFAWSMT025	15	50	Y
21	HARSHA MOHANDAS C M	UFAWSMT026	3.75	12	N
22	MANYA P	UFAWSMT028	22.5	75	Y
23	MINNA P	UFAWSMT029	11.25	37	Y
24	RINSHA V	UFAWSMT030	3.75	12	N
25	RISHIKA P K	UFAWSMT031	3.75	12	N
26	SARANYA K N	UFAWSMT032	22.5	75	Y
27	SHIFNA SHERI K	UFAWSMT033	11.25	37	Y
28	ABHINAV P	UFAWSMT034	AB	0	N
29	AKSHAY RAJ K	UFAWSMT035	3.75	12	N
30	MAQBOOL RAASI P M	UFAWSMT037	22.5	75	Y

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31	SIBIL V	UFAWSMT038	3.75	12	N
32	VISHNU C	UFAWSMT039	AB	0	N
33	MASHBOOBA S V	UFAWSMT040	22.5	75	Y
34	SAFA SHERIN P T	UFAWSMT041	11.25	37	Y
35	MUHAMMED FATHAH K	UFAWSMT042	3.75	12	N
				22	
				62.85	

	CO1 to CO5
TARGET: 50% C	**62.9**

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DEPARTMENT OF MATHEMATICS

CO ATTAINMENT - FINAL EXAM MARKS (EVEN SEM . 2024-2025)

Sem.: V Course:MTS6B12 - CALCULUS OF MULTIVARIABLE

S+A 9+A 6:F+	Name of the student	REG NO	COURSE OUTCOM O 1 TO CO	CO ATTAINMENT CO 1 TO CO5	
		Max. Marks	80	%age	Y/N
1	ADLA P	UFAWSMT001	48	60	Y
2	DILSHA A P	UFAWSMT003	0	0	N
3	HIBA SHERIN M K	UFAWSMT005	40	50	Y
4	HUSNA SHERIN K	UFAWSMT006	32	40	Y
5	MUFEEDA	UFAWSMT007	40	50	Y
6	RINSHA T P	UFAWSMT008	48	60	Y
7	SAHANA MUMTHAZ	UFAWSMT010	40	50	Y
8	SANA M T	UFAWSMT011	48	60	Y
9	SANA V K	UFAWSMT012	40	50	Y
10	SANEEBA K	UFAWSMT013	32	40	Y
11	SHAHMA C H	UFAWSMT014	32	40	Y
12	SHIFNA SHARIN	UFAWSMT016	56	70	Y
13	FAYIZ C	UFAWSMT017	0	0	N
14	MOHAMMED SWALIH C	UFAWSMT018	0	0	N
15	MUHAMMED SINAN S V	UFAWSMT019	56	70	Y
16	SHAHID IRFAN T P	UFAWSMT020	32	40	Y

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17	ARYA V R	UFAWSMT021	32	40	Y
18	ASNA RUBA K	UFAWSMT022	32	40	Y
19	FATHIMA RANNA T	UFAWSMT024	32	40	Y
20	HANNA MOL	UFAWSMT025	0	0	N
21	HARSHA MOHANDAS C M	UFAWSMT026	0	0	N
22	MANYA P	UFAWSMT028	32	40	Y
23	MINNA P	UFAWSMT029	32	40	Y
24	RINSHA V	UFAWSMT030	32	40	Y
25	RISHIKA P K	UFAWSMT031	0	0	N
26	SARANYA K N	UFAWSMT032	40	50	Y
27	SHIFNA SHERI K	UFAWSMT033	0	0	N
28	ABHINAV P	UFAWSMT034	0	0	N
29	AKSHAY RAJ K	UFAWSMT035	0	0	N
30	MAQBOOL RAASI P M	UFAWSMT037	32	40	Y
31	SIBIL V	UFAWSMT038	0	0	N
32	VISHNU C	UFAWSMT039	0	0	N
33	MASHBOOBA S V	UFAWSMT040	32	40	Y
34	SAFA SHERIN P T	UFAWSMT041	32	40	Y
35	MUHAMMED FATHAH K	UFAWSMT042	0	0	N
				23	
				74.19	
		FOR L&L (MTS5B08)	CO1 to CO5		
			74.19		
		TARGET: 75% OF STUDENTS WILL SCORE 35% OF MARKS			

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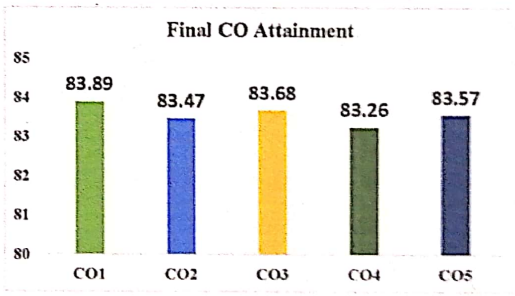
DEPARTMENT OF ENGLISH

COURSE EXIT SURVEY RESPONSES (EVEN SEM . 2024-2025)

Semester: V		Course:MTS6B12 - CALCULUS OF MULTIVARIABLE									
Name of the faculty member: SHAMNA SHERIN P											
CO No.	CO description	Course Exit Survey Questions	No. of students given the ratings						Total Responses	Weighted Average	CO Max. Count	%age CO attainment
			0	1	2	3	4	5				
CO1	Understanding Linear Programming Basics	Are you able to Understand Linear Programming Basics	0	0	0	8	17	9	34	3.61	5	72.11
CO2	Formulation of Linear Programming Problems	Are you able to Formulate Linear Programming Problems	0	0	1	8	18	7	34	3.50	5	70.00
CO3	Implementation of the Simplex Method	Are you able to Implement the Simplex Method	0	0	0	9	17	8	34	3.55	5	71.05
CO4	Application of Duality Theory	Are you able to Apply Duality Theory	0	1	0	11	13	9	34	3.45	5	68.95
CO5	Evaluation and Application of Transportation & Assignment Problems	Are you able to Evaluate and Apply Transportation & Assignment Problems	0	1	0	10	12	11	34	3.53	5	70.53

CO Assessment method	CO1	CO2	CO3	CO4	CO5
Direct method (IA Test, Assignment/quiz and exam)	87	87	87	87	87
Weightage (80%)	69	69	69	69	69
Indirect method (Course Exit Survey)	72.11	70.00	71.05	68.95	70.53
Weightage (20%)	14.42	14.00	14.21	13.79	14.11
Final CO Attainment	83.89	83.47	83.68	83.26	83.57



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