(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03MAMTH01	Title of the Course	Ordinary Differential Equations
Total Credits of the Course	4	Hours per Week	4 hours

Course Objectives:	1. To teach Ordinary Differential Equations in more depth. 2. To make practice of Ordinary Differential Equations 3. To apply Ordinary Differential Equations in real life problem. 4. To teach Laplace Transform and their properties.

Course Content		
Unit	Description	Weightage* (%)
1.	Differential Equations. Exact Differential Equations, Integrating Factors, Differential Equations of the First Order and of Higher Degree, Differential Equation Solvable for p, for y and for x, Clairaut's Equation	25%
2.	Linear Differential Equations with Constant Coefficients, Complimentary Function and Particular Integral, Operators, Products of Operators, Determination of Complimentary Function, Inverse Operators, Determination of Particular Integral and Working rules for f(D)y=X where, $X = e^{mx}, \sin mx, \cos mx, x^m, e^{ax}V, xV$ (V is a function of x only). Homogeneous Linear Differential Equations.	25%
3.	Laplace Transform, Properties of Laplace Transform, Laplace Transform of Derivatives, Laplace Transform of Integrals, Inverse Laplace Transforms, and Properties of Inverse Laplace Transforms, Solution of ODE with Constant Coefficients, Solution of ODE with Variable Coefficients.	25%
4	Application of Differential Equations: Newton's law of cooling, Rate of growth or decay, Chemical solution, Motion of particle falling under gravity, Electric Circuits, Orthogonal Trajectories.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use ofICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	realize the importance of Ordinary Differential Equations
2.	solve the problems of Ordinary Differential Equations.
3.	apply the knowledge of Ordinary Differential Equations in real life problem.
4.	to learn Laplace Transforms and their properties.

Suggested References:	
Sr. No.	References
1.	Shanti Narayan, Integral Calculus, 14th Edition, S. Chand & Company Ltd., New Delhi, 1996 Chapter: 11(11.8,11.9 Only), 12,13,14
2.	Nita Shah, Ordinary and Partial Differential Equations – Theory and Applications, PHI Learning Pvt. Ltd., New Delhi Chapter : 16 (Except 16.10,16.11)
3.	Zafar Ahsan, Differential Equations and Their Applications, 2nd Ed., Prentice – Hall of India Pvt. Ltd., New Delhi
4.	B. S. Grewal, Higher Engineering Mathematics, 35th Edition, Khanna Publications
5.	D J Karia, N Y Patel, B P Patel, M L Patel, Introduction to calculus and differential equations, Roopal Prakashan.
On-line resources to be used if available as reference material	
On-line Resources	

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (III)

Course Code	US03MAMTH02	Title of the Course	MULTIVARIATE CALCULUS
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. To teach Multivariate Calculus. 2. To teach Applications of various results of Multivariate Calculus.

Course Content		
Unit	Description	Weightage* (%)
1.	Beta and Gamma Functions and Their Properties, Relation Between Beta and Gamma functions and Examples, Graphical representation of functions of two variables: cone, cylinder, conicoids, etc. Vector Calculus: Gradient of scalar field, Directional derivatives, Tangent Plane and Normal Vector to a Surface, Divergence and Curl of a Vector Field.	25%
2.	Line integral, Evaluation of Line Integrals, Double Integral, Change of Variables in Double Integral, Application of Double integral, Change of Order of Integration in Cartesian Form	25%
3.	Line Integral Independent of Path, Green's Theorem and its Application with Examples, Area of Plane Region, Vector Form of Green's Theorem, Surfaces, Tangent Plane and Normal Line to the Surface, First Fundamental Form, Area of a Surface, Surface Integrals	25%
4.	Triple Integrals, Divergence Theorem of Gauss and its Applications With Examples, First and Second Form of Green's Theorem, Application of Triple Integral (Total Mass, Moment of Inertia, Volume), Stoke's Theorem.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand Beta and Gamma functions and their properties.
2.	Understand elementary Vector Calculus.
3.	Understand line, double and triple integrals.
4.	Apply the results understood above to physics and mechanics.

Suggested References:	
Sr. No.	References
1.	E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997. Chapter : 9
2.	Shanti Narayan, A course of Mathematical Analysis, S.Chand & Company Ltd. Appendix I (A.4, A.5, A.6)
3.	B.S.Grewal, Higher Engineering Mathematics, Thirty-fifth edition,Khanna Publ
4.	Dr.Dinesh Karia, M.L.Patel, N.Y.Patel, B.P.Patel, A Textbook of Calculus with an Introduction to Differential Equations.

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03MAMTH03	Title of the Course	Problems and Exercises in Ordinary Differential Equation & Multi-Variate Calculus
Total Credits of the Course	4	Hours per Week	4 hours

Course Objectives:	1. To develop problem solving skills of students through interactive teaching and supervised practice. 2. To teach students various methods of solving and applying results of Ordinary Differential Equations. 3. To teach students various methods of solving and applying results of Multivariate Calculus.

Course Content		
PART-I(ORDINARYDIFFERENTIALEQUATIONS)		
Unit	Description	Weightage* (%)
1.	Differential Equations, Exact Differential Equations; Integrating Factors, Differential Equations of the First Order and of Higher Degree	10%
2.	Differential Equation Solvable for p, for x and for y; Clairaut's Equation, Linear Differential Equations with Constant Coefficients, Complimentary Function and Particular Integral, Determination of Particular Integral and Working rules for f(D)y = X where X=e^{mx}, sinmx, cosmx, x^m	10%
3.	Determination of Particular Integral and Working rules for f(D)y = X, where X = $e^{ax}V$, xV(where V is a function of x only). Homogeneous Linear Differential Equations	10%
4	Laplace Transform, Properties of Laplace Transform, Laplace Transform of Derivatives, Laplace Transform of Integrals, Inverse Laplace Transforms, Properties of Inverse Laplace Transforms, Solution of ODE with Constant Coefficients, Solution of ODE with Variable Coefficients	10%
5.	Application of Differential Equations, Orthogonal Trajectories in Cartesian Co-ordinates	10%

PART- II (MULTI-VARIATE CALCULUS)		
Unit	Description	Weightage* (%)
1.	Improper integrals, Beta Functions, Gamma Functions, Relation Between Beta and Gamma functions	10%
2.	Vector Calculus: Gradient, Divergence and Curl, Directional derivatives, Tangent Plane and Normal Vector to a Surface	10%
3.	Line integral, Double Integral, Change of Variables in Double Integral, Application of Double integral, Change of Order of Integration in Cartesian Form.	10%
4.	Area of a Surface, Surface Integrals, Moment of Inertia of Surface, Verify Green's Theorem, Triple Integrals	10%
5.	Application of Divergence Theorem of Gauss, Application of Triple Integral (Total Mass, Moment of Inertia, Volume)	10%

Teaching- Learning Methodology	Class room teaching,Presentationbystudents,UseofICTwhenever required.
NOTE:	1. Use of the standard textbooks may be permitted at the time of Practical Examination. 2. Use of non-programmable Scientific Calculator is Allowed. 3. There would be a batch of problem solving session of eight hours per weekandtheywillbeconductedinbatchesofstudentsofsize20to25 per batch. 4. The candidate shall have to produce at the time practical Examination the record of their prescribed Laboratory work, certified by the Head of the Department.

Evaluation Pattern		
Sr.No.	Details of the Evaluation	Weightage
1.	Internal Written/Practical Examination (AsperCBCSR.6.8.3)	---
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	---

3.	**University Examination: Practical Examination of each PART will be conducted separately, each of 50% weightage.**	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Identify and classify an Ordinary Differential Equation.
2.	Solve Ordinary Differential Equations.
3.	applyknowledgeofOrdinaryDifferentialEquationtosolvecertainproblemsin Science 4. solve Laplace transformation problems.
4.	Solve problems of Beta and Gamma Functions; andevaluate Line, Double and Triple Integrals.
5.	Solve problems in Vector Calculus.
6.	applyresultsofMultivariateCalculustosolvecertainproblemsinScience.

SuggestedReferences:	
Sr.No.	References
1.	S.S.Sastry,IntroductorymethodsofNumericalanalysis,PrenticeHallOfIndia, 2010
2.	Brain Bradie, AFriendly Introduction to Numerical analysis, Pearson Education, India,2007.
3.	G. Sankar Rao, Numerical analysis.
4.	B.S. Grawal, Numerical Analysis.
5.	Bajpai, Calus and Farly, Numerical Analysis for scientists and Engineers, John Wiely.
6.	E. Kreyszing, Advanced Engineering Mathematics, Fifth edition, New Age International (P)Ltd., NewDelhi,1997.
7.	Shanti Narayan, A course of Mathematical Analysis, S. Chand & Company Ltd.
8.	B.S.Grewal,HigherEngineeringMathematics,Thirty-fifthedition,KhannaPubl.

On-line resources to be used if available as reference material

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (3)

Course Code	US03IDMTH01	Title of the Course	Graph Theory
Total Credits of the Course	2	Hours per Week	2 hours
Note: This course is same as US04MIMTH01. The students opting for this course shall not be offered US04MIMTH01.			

Course Objectives:	1. To teach students Introductory Graph Theory. 2. To teach students various types of operations on graphs. 3. To teach students fundamental properties of various types of graphs.

Course Content		
Unit	Description	Weightage* (%)
1.	Graph, Applications of graph, Finite and infinite graph, Incidence and Degree, Isolated vertex, Pendant vertex and null graph, Isomorphism, Sub graphs, Walks, Paths and circuits.	25%
2.	Connected and disconnected Graphs, Components, Euler graphs, Operation on graph, More on Euler graphs, Arbitrary Traceable graph Hamiltonian paths and circuits.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand basic concepts of Graph Theory.
2.	identify types of graphs and use various operations on graphs to solve problems.
3.	take up an Elementary to Intermediate course in Graph Theory

Suggested References:	
Sr. No.	References
1.	Narsingh Deo, Graph theory with application to engineering and Computer science, Fourth printing, prentice Hall of India, 1987. Chapter 1 (except 1.6), Chapter 2 (except 2.3,2.10), Chapter 3 (except 3.5,3.10), Chapter 4 (except4.6,4.7,4.8)
2.	J. Clark and A. D. Holton, A first look at Graph Theory, First Indian Reprint. Allied Publishers,1995.
3.	D. B. West, Introduction to graph theory, Prentice Hall of India, New Delhi, 1999.

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (3)

Course Code	US03IDMTH02	Title of the Course	Problems and Exercises in Graph Theory
Total Credits of the Course	2	Hours per Week	4 hours
Note: This course is same as US04MIMTH02. The students opting for this course shall not be offered US04MIMTH02.			

Course Objectives:	1. To develop problem solving skills of students through interactive teaching and supervised practice. 2. To teach students various methods of solving and applying results of Graph Theory. 3. To teach students various types of subgraphs and their methods.

List of Practicals		
Sr. No.	Description	Weightage* (%)
1.	Finite and infinite graph, Incidence and Degree, Isolated vertex, pendant vertex and null graph,	20%
2.	Subgraphs – vertex disjoint and edge disjoint, subgraphs induced by some vertices, Walks, Paths and circuits, Four cube problem.	20%
3.	Connected and disconnected Graphs, Components, distance, diameter, eccentricity, center of a connected graph.	20%
4	Construction of new graphs by different operations on graphs, union, intersection and ring sum.	20%
5.	Euler graphs, Konisberg's seven bridge problem, traceble graphs, Hamiltonian graph and traveling salesman problem.	20%

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	---
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	---
3.	**University Practical Examination**	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	identify and categorize Graph Theory.
2.	solve problems of Graph Theory.
3.	apply knowledge of Graph Theory to solve certain problems in real life.

Suggested References:	
Sr. No.	References
1.	Narsingh Deo, Graph theory with application to engineering and Computer science, Fourth printing, prentice Hall of India, 1987. Chapter 1 (except 1.6), Chapter 2 (except 2.3,2.10), Chapter 3 (except 3.5,3.10), Chapter 4 (except4.6,4.7,4.8)
2.	J. Clark and A. D. Holton, A first look at Graph Theory, First Indian Reprint. Allied Publishers,1995.
8.	B. S. Grewal, Higher Engineering Mathematics, Thirty-fifth edition, Khanna Publ.

On-line resources to be used if available as reference material

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03IDMTH03	Title of the Course	Number Theory
Total Credits of the Course	2	Hours per Week	2 hours
Note: This course is same as US04MIMTH03. The students opting for this course shall not be offered US04MIMTH03.			

Course Objectives:	1. To teach students Introductory Number Theory. 2. To teach students types of fundamental operations and functions in Number Theory. 3.To teach students various properties of Prime Numbers.

Course Content		
Unit	Description	Weightage* (%)
1.	Divisibility: definition and properties, Common Divisors, Greatest Common Divisor (GCD): definition and examples, Properties of GCD, Division Algorithm, Euclidean Algorithm, LCM: definition and examples, Properties of LCM, Relation between GCD and LCM.	25%
2.	Prime Numbers, Properties of Primes, Fundamental Theorem of Arithmetic, Linear Congruences: definition and properties, Statement and interpretation of the Chinese Remainder Theorem, Definition of Euler's function, Statement and interpretation of Euler's theorem, Statement and interpretation of Fermat's theorem.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand basic concepts of Number Theory.
2.	use various operations and functions in Number Theory to solve problems.
3.	take up an Elementary to Intermediate course in Number Theory

Suggested References:	
Sr. No.	References
1.	D. Burton , elementary Number Theory, 6th Ed , Tata McGraw-Hill Edition, Indian reprint.
2.	I. Niven And H. Zuckermar , An Introduction to the theory of Numbers, Wiley-Eastern Publication.
3.	S. Barnard and J. N. Child , Higher Algebra, Mc Millan and Co. Ltd.
4.	Neville Robinns, Beginning Number Theory, 2nd Ed.,Narosa Publishing House Pvt.Ltd. Delhi,2007

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03IDMTH04	Title of the Course	Problems and Exercises in Number Theory
Total Credits of the Course	2	Hours per Week	4 hours
Note: This course is same as US04MIMTH04. The students opting for this course shall not be offered US04MIMTH04.			

Course Objectives:	4. To develop problem solving skills of students through interactive teaching and supervised practice. 5. To teach students various methods of solving and applying results of Number Theory.

List of Practicals		
Sr. No.	Description	Weightage* (%)
1.	Examples based on the following topics. 1. Divisibility and Division Algorithm. 2. Properties of divisors and GCD. 3. Finding GCD by Euclidean Algorithm.	20%
2.	Examples based on the following topics. 1. Finding LCM and problems related to properties of LCM. 2. Relation between GCD and LCM.	20%
3.	Examples based on the following topics. 1. Primes and divisibility. 2. Properties of primes. 3. Fundamental theorem of arithmetic.	20%
4	Examples based on the following topics. 1. Solving Linear Congruences. 2. Chinese Remainder Theorem.	20%
5.	Examples based on the following topics. 1. Properties of Euler's function. 2. Numericals on Euler's theorem and Fermat's theorem.	20%

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	---
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	---
3.	**University Practical Examination**	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	identify and categorize Number Theory.
2.	solve problems of Number Theory.
3.	apply knowledge of Number Theory to solve certain problems in real life.

Suggested References:	
Sr. No.	References
1.	D. Burton , elementary Number Theory, 6th Ed , Tata McGraw-Hill Edition, Indian reprint.
2.	I. Niven And H. Zuckermar , An Introduction to the theory of Numbers, Wiley- Eastern Publication.
3.	S. Barnard and J. N. Child , Higher Algebra, Mc Millan and Co. Ltd.
4.	Neville Robinns, Beginning Number Theory, 2nd Ed.,Narosa Publishing House Pvt.Ltd. Delhi,2007

On-line resources to be used if available as reference material

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03IDMTH05	Title of the Course	Mechanics
Total Credits of the Course	2	Hours per Week	2 hours
Note: This course is same as US04MIMTH05. The students opting for this course shall not be offered US04MIMTH05.			

Course Objectives:	1. To introduce students to mechanics. 2. To teach students fundamental laws and results in mechanics. 3.To teach students how to study how to apply laws and results of mechanics in specific situations in science and real life..

Course Content		
Unit	Description	Weightage* (%)
1.	Ingredients of mechanics, Position vector, Velocity vector, Acceleration vector, Gradient vector, Fundamental laws of Newtonian mechanics, Theory of dimensions.	25%
2.	Plane statics, Equilibrium of a particle, Equilibrium of systems of particles, Moment of force about a line, Necessary and sufficient condition for equilibrium.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	understand basic concepts of Mechanics.
2.	apply results of mechanics in specific situations.
3.	take up an Elementary to Intermediate course in Mechanics.

Suggested References:	
Sr. No.	References
1.	J. L. Synge and B. A. Griffith, Principles of Mechanics. Chapter 1, Chapter 2(2.2,2.3,2.4), Chapter 3(3.1 , 3.4), Chapter 4(4.1,4.2)
2.	P. N. Chatterjee, Statics and Dynamics

On-line resources to be used if available as reference material
On-line Resources

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics)Semester (3)

Course Code	US03IDMTH06	Title of the Course	Problems and Exercises in Mechanics
Total Credits of the Course	2	Hours per Week	4 hours
Note: This course is same as US04MIMTH06. The students opting for this course shall not be offered US04MIMTH06.			

Course Objectives:	1. To develop problem solving skills of students through interactive teaching and supervised practice. 2. To teach students various methods of solving and applying results of Mechanics.

List of Practicals		
Sr. No.	Description	Weightage* (%)
1.	Problems on: Position vector, Velocity vector, Acceleration vector, Gradient vector. Interpretation of gradient.	20%
2.	Fundamental laws of Newtonian mechanics, Dimensions of physical quantities. Equilibrium of a particle.	20%
3.	Notion of force, equations of motion. Solution of equations of motion in simple situations.	20%
4	Equilibrium of systems of particles, Moment of force about a line.	20%
5.	Necessary and sufficient condition for equilibrium, Examples on equilibrium system. Application in plane statics.	20%

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	---
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	---
3.	**University Practical Examination**	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	identify and categorize Mechanics.
2.	solve problems of Mechanics.
3.	apply knowledge of Mechanics to solve certain problems in real life.

Suggested References:	
Sr. No.	References
1.	J. L. Synge and B. A. Griffith, Principles of Mechanics. Chapter 1, Chapter 2(2.2,2.3,2.4), Chapter 3(3.1, 3.4), Chapter 4(4.1,4.2)
2.	P. N. Chatterjee, Statics and Dynamics

On-line resources to be used if available as reference material

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (3)

Course Code	US03IDMTH07	Title of the Course	Advanced Calculus
Total Credits of the Course	2	Hours per Week	2 hours
Note: This course is same as US04MIMTH07. The students opting for this course shall not be offered US04MIMTH07.			

Course Objectives:	• Understand the concept of double & triple integrations and its applications. • Understand the fundamental theorem of vector calculus, including, Green's theorem, Stokes' theorem, and the divergence theorem. • Develop critical thinking skills to solve problems in Physics and Engineering.

Course Content		
Unit	Description	Weightage* (%)
1.	Double Integrals and its applications, Double integrals in polar coordinates, Change of Variables in Double Integrals, Change of Order of Integration, plane area using double integrals, Triple Integrals and its applications.	25%
2.	Vector Calculus: Gradient of scalar fields, Directional derivatives, Tangent Plane and Normal Vector to the Surface, Divergence and Curl of a Vector Field, Line integrals, Evaluation of Line Integrals, Line Integral Independent of Path, Green's Theorem (without proof) and its Application with Examples, Surface area, Surface Integrals, Divergence Theorem of Gauss (without proof) and its Applications with Examples, Stoke's Theorem (without proof) and its Applications with Example.	25%

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Course Outcomes: Upon completion of the course, the student will be able to….	
1.	understand double and triple integrals.
2.	find area and volume.
3.	understand line integral, surface integrals.
4.	apply the result in Physics.

Suggested References:	
Sr. No.	References
1.	E. Kreyszing, Advanced Engineering Mathematics, Fifth edition, New Age International (P) LTD, New Delhi, 1997.
2.	R. K. Jain, S.R.K. Iyenger, Advanced Engineering Mathematics, Fifth Edition, Narosa publishing House, New Delhi, 2017.
3.	B.S. Grewal, Higher Engineering Mathematics, 42th Edition, Khanna Publishers, Nai Sarak, Delhi, 2012.
4.	Shanti Narayan, A course of Mathematics Analysis, 29th edition, S. Chand & company Ltd, New Delhi, 2005.

On-line resources to be used if available as reference material

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(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (3)

Course Code	US03IDMTH08	Title of the Course	Problems and Exercises in Advanced Calculus
Total Credits of the Course	2	Hours per Week	4 hours
Note: This course is same as US04MIMTH08. The students opting for this course shall not be offered US04MIMTH08.			

Course Objectives:	• To develop problem solving skills of students through interactive teaching and supervised practice • To teach students various methods of solving and applying results of advanced Calculus. • Develop skills required to solve problems in Physics and Engineering.

Sr. No.	List of Practicals
1.	Fundamentals of domain and range of functions of two variables
2.	Graphical representation of functions of two variables
3.	Double integrals using Cartesian and polar co-ordinates system.
4.	Change of order of integration of double integrals.
5.	Application of double integrals to evaluate area.
6.	Application of triple integrals
7.	Gradient of a scalar function, directional derivatives, Tangent plane & Normal line.
8.	Curl and divergence of a vector fields and its application.
9.	Line integrals
10.	Example based on Green's, Gauss's and Stoke's theorem

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Course Outcomes: Upon completion of the course, the student will be able to….	
1.	Obtain area and volume.
2.	Solve problems in vector calculus
3.	Apply results of advanced calculus to solve certain problems in science.

Suggested References:

Sr. No.	References
1.	E. Kreyszing, Advanced Engineering Mathematics, Fifth edition, New Age International (P) LTD, New Delhi, 1997.
2.	R. K. Jain, S.R.K. Iyenger, Advanced Engineering Mathematics, Fifth Edition, Narosa publishing House, New Delhi, 2017.
3.	B.S. Grewal, Higher Engineering Mathematics, 42th Edition, Khanna Publishers, Nai Sarak, Delhi, 2012.

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