To be prepared for course handbook (Departmental Undergraduate/Postgraduate booklet)

COURSE OUTLINE

Course No: MATH 237

Course Title: Laplace Transform and Vector Analysis

Credit hours: 3.0 Contact hours: Office Time

Level/Term: L-2, T-1

Course Contents:

Laplace Transforms: Definition of Laplace transforms. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorems on Laplace transforms. Partial fraction. Solution of differential equations by Laplace transforms.

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Scalar and vector product of two vectors and their geometrical interpretation. Triple and 12 multiple product of vectors. Linear dependence and independence of vectors. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

Learning Outcomes/Objectives:

At the end this course, students will be able to:

i. understand the properties of Laplace transform.
ii. perform operations on Laplace transform and inverse Laplace transform.
iii. solve linear differential equations with constant coefficients as well as discontinuous input functions using the Laplace transform.
iv. solve a basic integral and difference equations using the Laplace transform.
v. compute sums, differences, dot products and cross products of vectors.
vi. solve various problems relating to the algebra of vectors.
vii. carryout multiple product of vectors.
viii. apply techniques in solving problems relating to the algebra of vectors.
ix. deal with the techniques of differentiation and integration of vector functions.
x. define concepts of lines, curves, planes, surfaces and solid body.
xi. evaluate line, surface and volume integrals with elementary applications.
xii. interprete the physical significance of gradient, divergence and curl.
xiii. apply various vector integral theorems (Green's, Stokes' and Divergence) to solve problems in fluid flow and heat transfer in vector analysis.

Assessment

Class Participation/Attendance: 10%

Homework Assignment and Quizzes: 20%

Term Final Exam: 70%

Text Book:

i. Theory and Problems of Laplace Transforms, Schaum's outline Series, Murray R. Spiegel.
ii. Vector Analysis with Applications by Md. Ali Ashraf and Md. Abdul Khaleq Hazra.
iii. Advanced Engineering Mathematics by Peter V. O'Neil.
iv. Advanced Engineering Mathematics by Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton.

Reference Books:

i. Schaum's Outline of Theory and Problems of Vector Analysis *by* Murray R. Spiegel.
ii. Vector Analysis by M. D. Raisinghania.
iii. Advanced Engineering Mathematics, S. Chand Publishing,H. K. Dass.
iv. Elementary Differential Equations, Prentice Hall, Earl D. Rainville, Phillip E. Bedient, 8th Edition.

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Academic Session: 2018-2019

Course Teacher(s):

Name:	**Office/Room**	**E-mail and Telephone:** *(optional)*	**Class routine**
Dr. Md. Mustafa Kamal Chowdhury	Department of Mathematics, BUET.		Collect from respective department.
Dr. M. A. Alim	Department of Mathematics, BUET.		Collect from respective department.
Dr. Salma Parvin	Department of Mathematics, BUET.	salpar@math.buet.ac.bd	Collect from respective department.

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At the end this course, students will be able to:

xiv. understand the properties of Laplace transform.
xv. perform operations on Laplace transform and inverse Laplace transform.
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xix. solve various problems relating to the algebra of vectors.
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Weekly schedule: For Laplace Transform (Teacher: Prof. Dr. Md. Mustafa Kamal Chowdhury)

Week	Topics	Teacher's Initials/Remarks
Week- 1-4	Definition of the Laplace Transform, Laplace transforms of some elementary functions, Some important properties of Laplace transforms.	
Week-5-6	Laplace transforms of special functions: The gamma function. Bessel functions. The error function. Unit step function. Dirac delta function.	
Week-7	**Class Test**	
Week- 8	Definition of inverse Laplace transform, important properties of inverse Laplace transforms.	
Week-9-10	Methods of finding inverse Laplace transforms: Partial fractionsmethod. The Heaviside expansion formula.	
Week-11-12	Evaluation of integrals.	
Week-13-14	Applications to differential equations.	

Weekly schedule: For Vector Analysis (Teacher: Prof. Dr. Salma parvin)

Week	Topics	Teacher's Initial/Remarks
Week-1-2	Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars.	
Week-3-4	Linear dependence and Independence of vectors.	
Week-5-7	Scalar and vector product of two vectors and their geometrical interpretation.	
Week-8	**Class Test**	
Week-9-11	Triple and multiple product of vectors.	
Week-12	Gauss's theorem and solving problems related to this theorem.	
Week-13	Stokes theorem and solving problems related to this theorem	
Week-14	Review Class	

Weekly schedule: For Vector Analysis (Teacher: Prof. Dr. M. A. Alim)

Week	Topics	Teacher's Initial/Remarks
Week-1	Differentiation and integration of vectors.	
Week-2	Solving problems related to differentiation and integration of vector functions.	
Week-3-5	Gradient of scalar functions, divergence and curl of vector functions.	
Week-6	Integral forms of gradient, divergence and curl.	
Week-7	**Class Test**	
Week-8-10	Line integrals, Surface and volume integrals.	
Week-11-12	Green's theorem and solving problems related to this theorem.	
Week-13	**Class Test**	
Week-14	Review Class	