

**Faculty of Engineering & Technology**  
**Functions of Several Variables and ODE (Math 3)**

**Information :**

**Course Code :** MTH 211      **Level :** Undergraduate      **Course Hours :** 3.00- Hours

**Department :** Department of Electrical Engineering

**Area Of Study :**

Develop the students' knowledge about several variables, multiple integrals, ordinary differential equations, and vector Analysis.  
Develop student skills to perform basic mathematical models on electrical engineering applications.

**Description :**

Functions of several variables: Limits, Continuity, partial derivatives, Extrema and Constrained Extrema. Multiple integrals in Cartesian and Polar coordinates. Jacobians, Vector analysis: Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Line integral, Green's theorem, Gauss's theorems, and Stoke theorem. Ordinary differential equations of the first and higher orders. Complementary and Particular solutions. Undetermined coefficients, and variation of parameters. Euler's equations and system of linear differential equations. Differential Operator method.

**Course outcomes :**

**a. Knowledge and Understanding: :**

1 -	Identify vector and scalar quantities in calculus.
2 -	Explain partial derivative for the functions of several variables.
3 -	Define the line integral for both scalar and vector fields.
4 -	Identify different types of first and higher order ordinary differential equations.

**b. Intellectual Skills: :**

1 -	Solve electromagnetic engineering problems using theories of vector analysis.
2 -	Solve the differential equations in electrical engineering problems.

**c. Professional and Practical Skills: :**

1 -	Solve the different types of line integral problems.
2 -	Apply the system of differential equations to solve electrical circuits problems.

**d. General and Transferable Skills: :**

1 -	Communicate effectively.
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**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Functions of several variables: Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema	10	6	4

### **Course Topic And Contents :**

<b>Topic</b>	<b>No. of hours</b>	<b>Lecture</b>	<b>Tutorial / Practical</b>
Multiple integrals: Double integral in Cartesian and Polar coordinates. Triple integrals, Surface integral of scalar functions. Jacobians, Cylindrical and spherical coordinates	10	6	4
Vector analysis: Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Line integral, Green's theorem, Gauss's theorems, Stokes's theorems	10	6	4
Line integrals, Green's theorem, Gauss's theorem, Stoker's theorem and triple integrals in Cartesian and Polar coordinates.	10	6	4
Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti	10	6	4
Higher order linear equations. Equations of the second order. Complementary and particular solutions. Undetermined coefficients, variation of parameters. Euler's equation, Equations reducible to the first order	10	6	4
System of linear differential equations. Differential Operator method.	5	3	2

### **Teaching And Learning Methodologies :**

Interactive Lecture

Discussion

Problem-based Learning

Report

### **Course Assessment :**

<b>Methods of assessment</b>	<b>Relative weight %</b>	<b>Week No</b>	<b>Assess What</b>
Assignment	5.00	1	
Final Exam	40.00		
Lab.Computer	5.00	15	To assess overall understandings, concepts, Knowledge, Problem solving, and mathematical skills delivered by the course
Mid- Exam I	15.00	7	To assess the levels of math skills needed for successful completion of the course, and to improve teaching and learning for all students
Mid- Exam II	25.00	12	To assess comprehension, Knowledge, Problem solving, and mathematical skills delivered by the course after 9 weeks of studying
Quizzes	10.00	1	

### **Course Notes :**

Course notes  
Handouts

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**Recommended books :**

WARREN S. WRIGHT, DENNIS G. ZILL, Advanced Engineering Mathematics  
Jones & Bartlett Learning Publisher Fifth Edition, 2009.

**Periodicals :**

[www.sosmath.com](http://www.sosmath.com), [www.math.hmc.edu](http://www.math.hmc.edu)

**Web Sites :**

[www.tutorial.math.lamar.edu](http://www.tutorial.math.lamar.edu),  
[www.web.mit.edu](http://www.web.mit.edu)