

**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 Structural Engineering & Construction Management

**Instructor Information :**

Title	Name	Office hours
Lecturer	Hany Abd El Ghaffar Abd El Aty El Deeb	
Assistant Lecturer	TAREK ALI ABDALLAH TEAMA	

**Area Of Study :**

Enrich students knowledge about several variables, multiple integrals, ordinary differential equations, and vector Analysis.  
Develop students skills to apply differential equations on applications related to electrical engineering.

**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 -	a1- Define the main terms of functions of several variables
2 -	a2- Explain the principals of multiple integrals
3 -	a3- Describe the main concept of vector analysis
4 -	a4- List the main items of line integrals

**b. Intellectual Skills: :**

1 -	b1- Calculate the values of functions of several variables
2 -	b2- Analyze the system of multiple integrals
3 -	b3- Solve problems regarding vector analysis
4 -	b4- Assess issues of line integrals
5 -	b5- Calculate the values of ordinary differential equations
6 -	b6- Solve problems regarding higher order linear equations
7 -	b7- Calculate the values of undetermined coeff.'s & parameters variation

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

1 - c1- Prepare technical reports for ordinary differential equations

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

1 - d1- Cooperate and communicate effectively

**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
Multiple integrals: Double integrals in Cartesian and Polar coordinates, Jacobians, Cylindrical and spherical coordinates.	10	6	4
Vector analysis: Scalar and vector fields, Surface integrals of scalar and vector functions, gradient, divergence, curl, directional derivative, Line integrals.	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. Equations reducible to the first order. Complementary, and particular solutions.	10	6	4
Methods of Undetermined coefficients, and variation of parameters. Euler's equation	10	6	4
System of linear differential equations. Differential Operator method	5	3	2

**Teaching And Learning Methodologies :**

Interactive Lecturing

Discussion

Problem solving

Lab Exper

Project

Report / Present

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Assignments and Quizzes	10.00		
Final-term Exam	40.00		
First Mid Exam	20.00		
Participation and performance	10.00		
Second Mid Exam	20.00		

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**Course Notes :**

Course notes  
Handouts

**Recommended books :**

- o Earl W. Swokowski, "Calculus with Analytic Geometry  
Peter V. O'Neil, "Advanced Engineering Mathematics"
- o Larson, R, Edwards, B & Falvo, D 2004, Elementary linear algebra, 5th edn,  
Houghton Mufflin, Boston, Massachusetts.
- o Stewart, J 2005, Calculus: concepts & contexts, 3rd edn, Thomson/Brooks/Cole, Australia.