

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

Instructor Information :

Title	Name	Office hours
Lecturer	Wael Sayed Abdel Rahman Hassanein	6
Teaching Assistant	Basma Magdy Ahmed Mohamed	

Area Of Study :

Overall aims of the course are:
 • 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 and partial derivatives, Chain rule, Tangent planes and normal lines, Extrema and constrained extrema, Ordinary differential equations: equations of first order (separable, homogenous, exact, linear and Bernoulli), Orthogonal trajectories, Equations reducible to first order, High order linear equations, The variation of parameters and operation method, Euler's equation, System of linear differential equations, Series and tests of convergence, Taylor and Maclaurin expansion, Multiple integrals: double integral in Cartesian and Polar coordinates, Triple integrals and Jacobians, Line integral, Green's theorem,

Course outcomes :

a.Knowledge and Understanding: :

1 -	By the end of this course the student should be able to: a1. Define the behavior of the function of several variables, multiple integrals, Vector analysis, and Ordinary differential equations.
2 -	a2. Recognize the Limits, Continuity, and partial derivatives, extrema and constrained extrema of functions of 2 variables, double and triple integrals in Cartesian and Polar coordinates.
3 -	a3. Illustrate the surface integral of scalar and vector fields, Divergence and Stock theorems, Jacobians, line integrals, cylindrical and spherical coordinates and its application,
4 -	a4. Describe Ordinary differential equations, distinguish between the degree and the order, and know various methods of the solution,
5 -	a5. Identify the general and particular solutions of O.D.E of the first order, second order, higher order.

b.Intellectual Skills: :

1 -	By the end of this course the student should be able to:
2 -	b1. Apply theories, techniques of Vector analysis, Ordinary differential equations to solve electrical engineering problems

3 -	b2. Think creatively in solving problems related to electrical engineering.
c. Professional and Practical Skills: :	
1 -	Develop a professional attitude and approach to gain conceptual and practical knowledge and understanding Functions of several variables and Ordinary differential equations
2 -	Understand. Limits, Continuity, and partial derivatives, Chain rule. Tangent planes and normal lines, Extrema and Constrained Extrema
3 -	Understand Multiple integrals: Double integral in Cartesian and Polar coordinates, Triple integrals, Surface integral of scalar functions , Jacobians, Cylindrical and spherical coordinates
4 -	Understand Scalar and vector fields, Gradient, Divergence, Curl and Directional derivative. Line integral, Green's theorem, Gauss's theorems, Stokes's theorems
5 -	Understand Ordinary differential equations: Equations of the first order: Separable, Homogenous, nearly Homogenous, Exact, Linear, Bernoulli. Ricatti. And Develop skills related to how to distinguish between them and determine the convenient method
6 -	Understand 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
7 -	Understand System of linear differential equations. differential Operator method
8 -	Gain the principle of quality control
9 -	• Develop skills related to creative thinking, and problem solving
d. General and Transferable Skills: :	
1 -	Gain the principle of quality control
2 -	Develop skills related to creative thinking, and problem solving

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 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
First-Exam			
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
Second Exam			
System of linear differential equations. Differential Operator method.	10	6	4
Final Exam			

Teaching And Learning Methodologies :

Lectures

Tutorial

Class discussions and activities

Homework and self-study

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments and Quizzes	20.00	1	
Attendance and Participation	10.00	1	
Final-term Exam	40.00	15	To assess overall understandings, concepts, Knowledge, Problem solving, and mathematical skills delivered by the course
First Mid Exam	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
Second Mid Exam	15.00	12	To assess comprehension, Knowledge, Problem solving, and mathematical skills delivered by the course after 9 weeks of studying

Books :

Book	Author	Publisher
Advanced Engineering Mathematics	Warren S. Wright, Dennis G. Zill	Jones & Bartlett Learning

Course Notes :

Course notes

Handouts

Recommended books :

(1) Larson, R, Edwards, B & Falvo, D 2004, Elementary linear algebra, 5th edn, Houghton Mufflin, Boston, Massachusetts.

(2) Stewart, J 2005, Calculus: concepts & contexts, 3rd edn, Thomson/Brooks/Cole, Australia.

Periodicals :

www.sosmath.com, www.math.hmc.edu

Web Sites :

www.tutorial.math.lamar.edu,
www.web.mit.edu

