SYLLABUS

FACULTY OF ENGINEERING

SEPTEMBER 2024-FEBRUARY 2025

COURSE NAME	CODE:	17976

DIFFERENTIAL EQUATIONS - GROUP: 1			
PROGRAM	ELECTRICITY		
SEMESTER	LEVEL 2	**INSTRUCTION TIER**	BASIC, THEORICAL FUNDAMENTS,
COURSE CREDITS	3	**DEILVERY MODE:**	PRESENTIAL

COORDINATOR(S):

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COURSE DESCRIPTION:

Descriptive summary regarding the purpose, methodological strategy, and fundamental content of the course.

A differential equation is the mathematical relationship between a set of derivatives of a function. It contains the derivatives of one or more dependent variables with respect to one or more independent variables. Thus, differential equations arise from the analysis of mathematical models in different areas of science such as: engineering, economics, physics, geometry, among others. The subject is divided into three sections of knowledge and segmentation in turn into four chapters of study:•E n the first and second chapters are indicated the basic concepts, mathematical models, the origin of differential equations and their different ordinary forms of representation (first order, second order and higher order). In addition the different ways of solution and application of differential equations in geometric, physical problems (basic electrical circuits RLC and their mechanical equivalents) are described. Then the solutions of the first order differential equations are analyzed. higher degree. It is also studied the forms of solution of the differential equations of higher order that have constant and variable coefficients (reducible to constant coefficients).Thus finishing, chapter two with the systems of linear differential equations simultaneous•In the third chapter is studied the method of the Laplace transform (using several theorems) and its inverse, to solve the ordinary differential equations with continuant coefficients, thus extending, and the study of the differential equations indicated in the first and second chapter•In the fourth chapter the solution of the differential equations (with variable coefficients) is studied by means of the method of power series (normal and extended form), also the Legendre equation (Legendre polynomials) and Bessel functions (first and second class) in their basic forms, in addition to the Sturm-Liouville problem

COURSE REQUIREMENTS

This course has no co-requisites

PREREQUISITES	
Course	**Code**
CALCULATION IN A VARIABLE	17969

COURSE OBJECTIVE(S):

General and specific objectives of the course in relation to the program's outcome profile.

General Objective: Give the student the ability to apply the fundamentals of differential equations to identify, interpret and solve problems related to basic physical phenomena that will characterize the dynamics of conventional and non-conventional electrical energy systems, in the control and automation of processes and the efficient use of energy.

Specific objectives:

1. Train the student with the most important concepts and tools of the ordinary differential equations of first order, second order and higher order, in addition to the solution of the differential equations through the Laplace Transform and Power Series

2. Provide the student with the necessary tools to achieve greater reasoning capacity and intellectual development with mathematical criteria, enabling integration with other disciplines

3. Encourage consultation and research on the different aspects of the subject so that the student has a proactive attitude in his or her learning process

ACHIEVEMENT OF COURSE LEARNING OUTCOMES, INDICATOR(S), AND EVALUATION STRATEGY(IES)

Course Learning Outcomes (CLOs) of the corresponding Curricular Organization Unit (COU), Indicators and Evaluation Strategies of the Course, referencing the Student Outcomes (SO) and Curricular Organization (CO) of the Program.

COURSE LEARNING OUTCOMES	INDICATORS	EVALUATION STRATEGIES
RdA1. Solves first-order and second-order linear ordinary differential equations, as well as higher-order differential equations, by using acquired theorems and testing tools	• It obtains the solution and deduces its most important properties, from ordinary first-order first-degree differential equations, first-order superior and linear grade with constant coefficients of higher order, as well as, linear differential equation systems with constant coefficients • He knows ordinary differential equations that represent mathematical models of geometric problems and physical phenomena presented in engineering.	• Plants ordinary differential equations representing mathematical models of geometric problems and physical phenomena (basic electrical circuits RLC and its mechanical equivalents) presented in engineering • It obtains the solution and deduces its most important properties, from ordinary first-order-first-degree differential equations, first-order superior and linear grade with constant coefficients of higher order • Know the solution of constant linear differential equations systems
RdA2. Solve nonhomogeneous linear differential equations with constant coefficients using Laplace Transform	• It uses Laplace Transform (T.L) to change an ordinary differential equation expressed with Leibniz nomenclature, premiums, among others, to its algebraic equivalent • Performs the inverse transformation of Laplace to bring continuous functions to the plane of the original variable • Identifies the transient and permanent component of responses for differential equations sectionally continuous confunctions, such as the square wave or triangular wave • Solve basic electrical circuit problems RLC, by means of Laplace Transform • Solve problems related to continuous functions, Unity Step function and Unit Drive function, using Laplace Transform (T.L) and/or its inverse (I.T.L.)	• Transforms continuous functions by transforming the Laplace • Performs the inverse transformation of Laplace to carry continuous functions to the plane of the original variable • Know and apply the Unit Step function and the Impulse function to apply the Laplace Transform and its inverse with sequentially continuous functions • It solves problems of basic electrical circuits RLC and its mechanical equivalents by means of Laplace Transformed • Identifies the transient and permanent part of the responses for differential equationscontinuous sectional functions, such as square wave or triangular wave
RdA3. Solve linear differential equations with variable coefficients using the Power Series method	• Identify and check the functions that are Analytical • Solve second-order linear differential equations that have analytical functions as coefficients • Identify and solve differential equations, which require the extended power series method • Use the Sturm-Liouville problem as a solution to a differential equation	• Identify and check the functions that are Analytic • Solve second order linear differential equations that have analytical functions such as coefficients • Identify and solve differential equations, which require the extended method of the power series • Gets sets of orthogonal functions in a certain interval as a solution to theSturm-Liouville problem

CONTENTS

Module Title.

1. DIFFERENTIAL EQUIPMENT OF FIRST ORDER
2. DIFFERENTIAL LINEAL EQUIVALUATIONS OF SECOND ORDER AND HIGHER ORDER
3. LAPLACE TRANSFORMED
4. SOLUTION OF DIFFERENTIAL ECUATIONS BY THE POTENCE SERIES METHOD

RESOURCES OR OTHER REFERENCES REQUIRED FOR THE COURSE LEARNING

Books, journals, digital databases, newspapers, internet addresses, and other relevant and current information sources.

MAIN

1. AYRES, FRANK JR.(1996). Ecuaciones Diferenciales. Primera edición. McGraw-Hill. Serie Schaum.
2. KREYSZIG, ERWIN, 2003. Matemáticas Avanzadas para Ingeniería. Volumen 1 y 2, 3ra edición. Mexico: Limusa Wiley, 2003
3. KREYSZIG, ERWIN, 1973. Matemáticas Avanzadas para Ingeniería. Volumen 1 y 2. Limusa, S. A.

ADDITIONAL

1. PERELLO, M, Ecuaciones Diferenciales. Teoría y Práctica, Edicions UPC, 2002
2. BOYCE, DIPRIMA, C, Ecuaciones Diferenciales y Problemas con Valores en la Frontera, 4ª.Edición, Limusa-Wiley, 2003
3. SPIEGEL, MURRAY R. Transformadas de Laplace. 1970. México. Libros McGraw-Hill. Colección Schaum
4. EDMINISTER, JOSEPH A. Circuitos Eléctricos teoría y 50 problemas resueltos. McGraw-Hill 1969. Colección Schaum