

BA323 – MATHEMATICS 5

CREDIT HOURS

3 Hours

CONTACT HOURS (Hours/week)

Lecture: 2; Tutorial: 2

TEXT BOOK

Cooper, Electronic instrumentation and measurement techniques, 1990 by Prentice-Hall, Inc.

COURSE DESCRIPTION

In the first of this course we discuss the solution of ordinary differential equations with variable coefficients using Taylor's, power series and Frobenius methods, then we go into some special differential equations, as Legendre and Bessel differential equations which lead us to some special functions, as Legendre, Bessel, Gamma and Beta functions. After that we study the method of separation of variables to solve partial differential equations that help us to study some applications like heat transfer in a bar, vibrating of a string and potential fields. In the last of this course we discuss some special complex transformations, conformal mappings, such as bilinear and Schwarz Christoffel transformations.

PREREQUISITE:

BA 224

RELATION OF COURSE TO PROGRAM

Required

COURSE INSTRUCTION OUTCOMES

The student will be able to:

- Solve ordinary differential equations with variable coefficients.
- Solve partial differential equations with the method of separation of variables.
- Deal with some special functions.
- Construct some special complex functions.

TOPICS COVERED

- Taylor's and Power series methods for solving ordinary differential equations.
- Differential equation with variable coefficients, ordinary and singular points, solution about ordinary points.
- Solution about singular points: Regular singular points, the method of Frobenius - Case I.
- The method of Frobenius - Case II and Case III.
- Gamma and Beta functions.
- Legendre differential equation and Legendre polynomials.
- Bessel differential equation.
- Bessel function of the 1st kind.

- Boundary value problems, partial differential equations and the method of separation of variables.
- Heat equation - heat transfer in a bar.
- Wave equation - vibration of a string.
- Laplace equation and potential fields.
- Conformal mappings - Complex functions as mappings.
- Bilinear transformations – linear fraction transformation.
- Schwarz Christoffel transformation.

CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:

Professional component Content			
Math and Basic Sciences	Engineering Topics	General Education	Other
✓			

RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:

Student Outcomes		Course aspects
A	An ability to apply knowledge of mathematics, science, and engineering	a ₁ a ₂
B	An ability to design and conduct experiments, analyze and interpret data.	
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e ₁ e ₂ e ₃
F	An understanding of professional and ethical responsibility	
G	An ability to communicate effectively	
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	