THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Mathematical Sciences

MTS 316 – Engineering Mathematics II

COURSE PARTICULARS

Course Code: MTS 316
Course Title: Engineering Mathematics II
No. of Units: 3
Course Duration: Two hours of theory and One hour of Tutorial per week for 15 weeks.
Status: Compulsory
Course Email Address: mts316@gmail.com
Course Webpage: http://www.mts.futa.edu.ng/courseschedule.php?coursecode=MTS%20204
Prerequisite: NIL

COURSE INSTRUCTORS

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COURSE DESCRIPTION

This course is the second course for all engineering students designed for 300 level and allied disciplines to introduce them to some mathematical methods to solve engineering problems whose resulting models are differential equations.

However, this course also meets the need of students in other fields of physics, earth sciences, e.t.c, as a course that provides methods of solution to solve integral calculus.
Topics to be covered include, Gamma and beta functions; Stirling's formula. Strum-Liouville's equations. Examples of Sturm-Liouville equations - Lengendre polynomials and Bessel functions.
Orthogonal polynomial and functions. Fourier series and integrals: Fourier transforms.
Partial Differential Equations (PDE): general and particular solutions, linear equations with constant coefficients; first and second order equations, solutions of the heat, wave and laplace equations by method of separation of variables; eigenfunction expansions; fourier transformation.

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to the integral calculus and special functions of various engineering problem and
- provide students with opportunities to known the application of some basic mathematical methods via all these special functions. That is, use of

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- explain the applications and the usefulness of these special functions.
- classify and explain the functions of different types of differential equations (ordinary and partial)
- understand purpose and functions of the gamma and beta functions, Sturm-Liouville problem, Fourier series and Transformation.

(Skills)

- use the gamma function, beta function and special functions to:
    - evaluate different types of integral calculus problems.
    - use the Fourier series to solve differential equations

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	10%
Assignments	10%
Test(s)	20%
Final Examination	60%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as sending text messages, watching videos, *etc*.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST

Riley, K.F., Hobson M.P. and Bence S.J. (1998). *Mathematical Methods for physics and engineering*. Cambridge University Press.

Stroud, K.A. (1996). *Further Engineering mathematics*. Third Edition. Macmillan Press ltd, London.

Sean Mauch (2001) *Introduction to Methods of Applied Mathematics or Advanced Mathematical Methods for Scientists and Engineers*. Mauch Publishing Company, un-Incorporated. http://www.its.caltech.edu/~sean.

RILEY, K. F. and HOBSON, M. P. (2006). *Mathematical Methods for Physics and Engineering*. Third Edition, Cambridge University Press, UK

1- Available in the University Library
2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Concept and the use of Gamma Functions: Illustration of gamma function, evaluation of gamma functions.	During this first class, the expectation of the students from the course will also be documented.
2	Concept and use of Beta Functions: Illustration of beta function, evaluation of gamma functions	Students shall be introduced to how to express differential equations in functions
3 & 4	Relationship between gamma and beta functions: Stirling's formula. Examples on evaluation of gamma and beta functions	Students shall be introduced to how beta and gamma functions can be used to evaluate improper integrals.
5 to 6	Concept of Sturm-Liouville problem, example of Sturm-Liouville problems and their solutions	
7 & 8	Basic properties and the use of orthogonal and polynomial functions: Fourier series and integrals. Fourier transformations and Application of Fourier series and transformation	- MID-SEMESTER TEST
9 & 10	Concepts and the derivation of Partial Differential Equations PDE); Types an and Examples of PDE. General and particular solution of linear equations with constant coefficients; First and second order equations	Students will be requested to prepare a well formatted document as assignment.
13	Solutions of the Heat, Wave and Laplace equations by method of variable separable.	
14	Solutions of the Heat, Wave and Laplace equations by method of eigenfunction expansions; fourier transformation.	
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.