



Engineering Mathematics I – ENG 201

Department of Electrical & Electronics Engineering Faculty of Engineering

1. Basic Details

Programme: B.ENG

Year: 2014/2015

Total Units: 3

Level: 200L

Taught Semester: First Semester

Instructor:

Ijemaru Gerald Kelechi, MSc.

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Office Hours:

Mondays (12 – 4pm); and **Thursdays** (11am – 1pm, 5 – 6pm); or By Appointment

Reading Materials:

Department: All Engineering Students

Prerequisites: MTH 101 (Elementary Mathematics I), MTH 102 (Elementary Mathematics II)

OR Equiv. Prior Knowledge:

- Basic understanding of Algebra and Trigonometry
- Basic understanding of Sequences and Series
- Fundamental knowledge of theory of quadratic equations
- Basic understanding of differential and integral calculus
- Basic knowledge of Binomial theorem, algebra of complex numbers, etc.

Lecture Time: Mon: 8 – 10am & Thurs: 10 – 11am

Total Learning Hours: 30

Course Delivery: Blended/Face-to-Face

Lecturers: Dr. (Engr.) A.M. Zungeru & Engr. G.K. Ijemaru

2. Course Overview

Engineering Mathematics I (ENG 201) provides the basic analytical, sound and underpinning knowledge required at undergraduate level appropriate to studies leading to B.ENG. The emphasis is on techniques and applications supported by sufficient formal proofs for the successful completion of scientific and engineering principles. Topics covered are: Algebra, Calculus, Applications of Sequences & Series, and First & Second Order Differential Equations.

3. Course Objectives

This course is taught to achieve the following aims:

- To provide the basic analytical knowledge and understanding of mathematical/computational techniques needed in the analysis, modeling and solution of realistic engineering problems.
- To provide the necessary mathematical tools and techniques to solve real life problems and provide limitations of such techniques and the validity of the results.
- To provide students with the ability to formulate and analyze mathematical problems, precisely define the key terms, and draw clear and reasonable conclusions.

4. Intended Learning Outcomes (ILO)

On successful completion of the course, the student will be able to:

- Read, understand and construct correct mathematical proofs and be able to use the electronic data-bases to locate information on mathematical problems.
- Use mathematical techniques to solve well-defined problems and present their mathematical work, both in oral and written format.
- Explain the importance of mathematics and its techniques to solve real life problems and provide limitations of such techniques and the validity of the results.
- Formulate, analyze and model engineering situations using a range of mathematical methods.
- Select and evaluate the appropriate mathematical techniques for a range engineering problems.
- Analyze and resolve realistic engineering problems and propose new mathematical questions with software packages to find solutions to the questions.
- Continue to acquire mathematical knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematics.

5. Course Content

Algebra: Equations involving one, two & three variables and applications:

- Reduction to simpler Factors, Change of Variable, Reciprocal Equations, The method of Rationalization, Method of Proportional, Homogenous expressions, Symmetrical Equations in the two Variables, Linear Equations, Equations involving products.

Calculus –Elementary Differentiation & Integration

- Standard differential coefficients, Rules of differentiation, Trigonometric, Logarithmic, Implicit and parametric functions; Integration of algebraic and composite functions, Integration by partial fractions and by parts.

Applications of Sequences and Series:

- Comparison tests, Alembert's Ratio test, Cauchy's Root Test, Absolute and Conditional Convergence, Alternating Series, Binomial, Exponential and Logarithmic Series, Convergent & Divergent Series, Limiting Values, Power Series, McLaren's Series, Standard series.

First & Second Order Differential Equations

- Formation of differential equations, Solution by: Direct Integration, Separation of variables, Homogeneous Equations, Exact Equations, Linear Equations (Use of Integrating Factor), Bernoulli Equation. Homogeneous second order differential equations with constant coefficients, Non-homogeneous Linear differential equations, Method of undetermined coefficients, Linear second order equation, Solution of differential equations by operator D methods.

6. Course Schedule

Week	Topics	Reading Assignment
1.	▪ Topic 1: Equations in one & two variables and applications	1.1
2.	▪ Topic 1: Equations in one & two variables and applications	1.2
3.	▪ Topic 2: Equations in three variables and applications	1.3
4.	▪ Topic 3: Calculus –Elementary Differentiation	2.1-2.5
5.	▪ Topic 4: Calculus –Elementary Integration	3.1-3.3
6.	▪ Quiz 1	

7.	▪ Topic 5: Tests for Convergence & Divergence	4.2-4.3
8.	▪ Topic 6: Series Expansion of Functions	10.1
9.	▪ Topic 7: Solutions of First Order Differential Equations	5.3-5.5
10.	▪ Topic 8: Exact & Inexact Differential Equations; Bernoulli's Equations; Second Order Differential Equations	6.1-7.2; 8.3
11.	▪ Topic 9: Solution of Differential Equations by D-Operator Method.	9.1
12.	▪ Quiz 2	
13.	▪ Revision	

7. Course Learning & Teaching Methods

- Lectures: 2hrs (Mon: 8:00am); 1hr (Thurs:10:00am)
- Formative phase tests and Group tutorials/discussions

8. Learning & Teaching Activities

Activity Type	Percentage	Hours
Lectures & Class Exercises	26%	30
Group Tutorials/Discussions	9%	10
Guided independent study	65%	75
Total	100%	115

9. Course Assessment Method

Requirement:	3 Hours Exam
Status:	Core/Mandatory Course
Written Examination:	60%
Quiz/Test:	20% (two quizzes)
Homework:	10%
Attendance:	10%

Level of Performance	Grade	Rating (credit points per unit)
70-100%	A = Excellent	5.0
60-69%	B = Very Good	4.0
50-59%	C = Good	3.0
45-49%	D = Satisfactory	2.0
40-44%	E = Poor	1.0
0-39%	F = Failure	0.0

10. Industry Relevance

- Bridge construction
- Defense
- Aeronautics
- Nuclear Research, etc.

11. Required Text

1. Fundamentals of Engineering Analysis, By G.K. Ijamaru., et al. (2014).
Published By: VITAL PRINTS A. VENTURES, 2014. ISBN: 978-6471-02-4

12. Recommended Texts

1. Engineering Mathematics (5th Edn.) by K.A. Stroud. Published by Industrial Press, INC, 2001, New York. ISBN: 0-8311-3152-7
2. Higher Engineering Mathematics (3rd Edn.) by John Bird. Published by Elsevier Ltd Oxford, 2006. ISBN: 13: 9-78-0-75-068152-0
3. Advanced Engineering Mathematics by Peter V. O'Neil (2007). Published by Chris Carson. ISBN: 0-495-08237-6
4. Advanced Engineering Mathematics (3rd Edn.) by H.K. DASS (2007).
5. Engineering Mathematics by K.A. Stroud (1995). Published by Macmillan Press Ltd. ISBN: 0-333-62022-4.

13. Attendance Policy

Attendance is strictly mandatory. The University policy stipulates that in order to be eligible for a course examination, a student shall be expected to attend a minimum of 65% of the lecture, tutorials, practical and classes for the course in which he/she is registered [**Ref. Students' Handbook of Information, pg. 52**]. Any student, therefore, whose attendance rating falls below the required 65% shall not be eligible to write the course exam. In this regard, students will be notified of their eligibility status for a course examination prior to the exam.

14. Calculator Policy

Programmable calculators will not be allowed in the quizzes or final exam. The University policy prohibits the use of mobile phone, electronic programmable calculator, information storage devices, etc. in the quizzes or final exam [**Ref. Students' Handbook of Information, Pg. 49**]. A "programmable calculator" is one that can store program steps or text at any level of sophistication and the rule applies irrespective of whether or not there appears to be anything stored. If you are in any doubt as to the eligibility of your calculator, please see me well before the quiz/exam.

15. Exemption from Quizzes/Exam

Dated medical documentation is required for exemption from a quiz; in this case the weighting will be moved to the final. Makeup quizzes will not be offered under any circumstances. The University policy prohibits a student from absenting from exam except on acceptable medical grounds, and in consultation with the HOD and the Dean of the faculty. Any student absent on the ground of illness must produce a certified medical report, and students who absent from quizzes/exams for reasons other than illness, accident or some exceptional circumstances shall be deemed to have failed the course [**Ref. Students' Handbook of Information, Pg. 52**].

16. Ethical and Unethical Conduct

The preliminary purpose of Homework is to help students learn and gain practical experience in the subject matter. Allowing and encouraging collaborations with fellow students best serves this purpose. Modern engineering is, after all, almost exclusively a team effort. However, fairness requires us to be able to assess your *own* contribution. Therefore, the written material that you hand in *must* be your *own work*, and any discussions or collaborations with fellow students must be identified in writing on your solution (e.g. noting "the solution to problem #5 was worked out together with Mark Davison", or "the solution to problem #2 was benefited from discussions with Ruth Peters"). Nearly identical solutions from different students who do not cross-reference each other will be viewed as statistically "unlikely", thus worthy of further examination.

This policy is intended to help you make the most out of the course by allowing you to freely work with your classmates. If you are in any doubt as to what constitutes ethical or unethical conduct, please see any member of staff for assistance. Violations of this policy will be handled with maximum severity.