AEN 1302Workshop Practice (5 CU)

Lecturers: Students are supervised by Lecturers/Technicians in workshop practice during the recess term

Course Type: CORE (B.Sc. Agric. Eng I)

Course Credits (CU): 5 CU i.e. 10 LH, 130 PH, 75 CH

Course Duration: 10 weeks

Brief Course Description

This course gives the students hands-on experience in workshop practice and management

Course objectives/learning outcomes

By the end of the course the students will have acquired practical engineering skills

Detailed course description and outline

Manual practice (20 Hours)

Tools, marking off, measurement and fitting

Machine shop processes (20 Hours)

Turning, milling, drilling, grinding, drilling

Fabrication practice (20 Hours)

Joining processes and fabrication of items

Electrical installations (20 Hours)

House wiring, consumer circuits and wiring accessories

Diagnosis and repair of electric appliances

Repair of electronic equipment: radios and TVs

Building and construction (20 Hours)

Brick work, concrete work, trusses and plumbing

Building finishing processes: painting, varnishing and decorating

Mode of delivery:demonstrations, hands-on and production of usable products.

Mode of assessment

- Practical assignments (80%)
- Written technical reports (20%)

Resources

- Well equipped workshops, workshop gear and real life activity.

YEAR 2: SEMESTER 1 (ALL CORE COURSES)

Course Name Engineering Mathematics III

Course Code: AEN 2104

Course Level: Level 2

Course Credit: 4 CU

Instructor: Mr. Thomas Makumbi, BSc. Agric. Eng (Mak)

Teaching Assistant

Brief Course Description

Drawing from the concepts covered in Engineering Mathematics I and II, this course is designed to consolidate and advance analytical techniques for solution of ordinary differential equations; and introduces concepts fundamental to the study of other courses in Computer Engineering. The major themes covered include integral transforms, series solutions to ordinary differential equations and special functions.

Course Objective

The objectives of this course are to:

- Introduce the student to Integral Transforms and their application to the solution of Ordinary Differential Equations
- Introduce the Power Series solution technique to Ordinary Differential Equations
- Expose the student to some special functions fundamental to engineering specifically Gamma, Beta, Bessel and Legendre An important emphasis of the course is to develop problem solving skills and proof skills by working on specific problems in which it is natural to look at special or simpler cases in order to try to discover patterns. An integral part of the process of mathematical thinking is to wander into blind alleys, sometimes being frustrated, before ultimately obtaining a solution or proof. In this process mathematical scientists often work together with colleagues, and this group work and sharing of ideas often adds great value to a mathematical investigation.
- A major goal of the course is to give a balanced introductory treatment of the area of PDE so that a student appreciates the power of PDE modeling; and is aware of major techniques for their solution. The focus of the course is on analytical techniques for the classical linear PDE of physics and engineering (heat, wave and Laplace equations), and their frequent occurrence in applications.

Course content

Lecture	Topic	Content	Methods	Tools/ equipment
1.	Fourier and Laplace transformations	Direct and Inverse Fourier Transformation and Their Applications, Direct and Inverse Laplace Transforms, Some Properties of Fourier and Laplace Transforms	Lecture (2 hrs)	Chalk/ Blackboard, LCD
2.	Fourier and Laplace transformations	Solutions of Ordinary Differential Equations by Transform Techniques, Transforms of Partial Fractions, Derivatives, and products of Functions,	Lecture (2 hrs)	Chalk/ Blackboard, LCD

		Transforms of Quadratic Factors,		
3.	Fourier and Laplace transformations	The Unit Step Function, the Impulse Function, Translation and Periodic Functions.	Lecture (2 hrs)	Chalk/ Blackboard, LCD
4.	Fourier and Laplace transformations	Solutions of Simultaneous Ordinary Differential Equations. Applications of Transform Methods to Solutions of Mechanical Engineering Problems:- Oscillatory Motion, Plane Motion	Lecture (2 hrs)	Chalk/ Blackboard, LCD
5	Fourier and Laplace transformations	Differentiation and integration of Transforms, Transforms of Periodic Functions and Convolutions, Complex Inverse Transforms	Lecture (2 hrs)	Chalk/ Blackboard, LCD
6	Tutorial 1	Examples on Fourier and Laplace transformations	Interactive lecture (4hrs)	Chalk/ Blackboard
7	Series Solutions of Ordinary DifferentialEquations	Motivation for use of Series, review of Fourier series	Lecture (2 hrs)	Chalk/ Blackboard, LCD
8	Series Solutions of Ordinary DifferentialEquations	Series Solutions about Ordinary Points	Lecture (2 hrs)	Chalk/ Blackboard, LCD
9.	Series Solutions of Ordinary DifferentialEquations	Series Solution about Singular Points	Lecture (2 hrs))	Laptop, LCD
10.	Series Solutions of Ordinary DifferentialEquations	Frobenius Method.	Lecture (2 hrs)	Chalk/ Blackboard, LCD
11.	Tutorial 2	Examples on series solutions of ordinary differential	Interactive lecture (4 hrs)	Chalk/ Blackboard

		equations		
12.	Gamma and Beta Functions	Integral Definition of Gamma and Beta Functions, Properties of Gamma and Beta Functions	Lecture (2 hrs)	Chalk/ Blackboard, LCD
13.	Gamma and Beta Functions	Definition of Gamma Function for Negative Values of Argument, Generalization of the Laplace Transform by Means of the Gamma function.	Lecture (2hrs)	Chalk/ Blackboard, LCD
14.	Gamma and Beta Functions	Applications of Gamma Function	Lecture (2 hrs)	Chalk/ Blackboard, LCD
15.	Tutorial 3	Examples on Gamma and Beta functions	Lecture (2 hrs)	Chalk/ Blackboard
16.	Bessel Functions	Brief Introduction to Bessel Functions and their applications in Mechanical Engineering	Lecture (2 hrs)	Chalk/ Blackboard, LCD
17.	Tutorial 4	Examples on Bessel functions	Interactive lecture (2 hrs)	Chalk/ Blackboard
18.	Legendre Functions	Brief Introduction to Legendre Functions and their applications in Mechanical Engineering.	Lecture (2 hrs)	Chalk/ Blackboard, LCD
19.	Tutorial 5	Examples on Legendre functions	Interactive Lecture (4 hrs)	Chalk/ Blackboard
20.	Test 1	Fourier and Laplace transformations, series solutions to ordinary differential equations, Gamma and Beta	Written exam (2 hrs)	Chalk/ Blackboard

		functions, Bessel and Legendre functions		
20.	Applied Probability and Statistics	Introduction and Data Description, Field of Probability and Statistics, Descriptive Statistics, Inferential Statistics and statistical modeling	Lecture (2 hrs)	Chalk/ Blackboard, LCD
21.	Tutorial 6	Examples on descriptive statistics, inferential statistics and statistical modeling	Interactive Lecture (2 hrs)	Chalk/ Blackboard, LCD
22.	Applied Probability and Statistics	Graphical Presentation and numerical Characterization and Summarization of Data, Introduction to Probability, Review of Set Theory, Experiments and Sample Spaces	Lecture (2 hrs)	Chalk/ Blackboard, LCD
23.	Applied Probability and Statistics	Definition and Assignment of Probabilities, Finite Sample Spaces and Enumeration, Conditional Probability, Partitions, Total Probability, Baye's Theorem	Lecture (2 hrs)	Chalk/ Blackboard
24.	Tutorial 7	Examples on probability theory	Interactive Lecture (2 hrs)	Chalk/ Blackboard, LCD
25.	Applied Probability and Statistics	Random Variables, one-dimensional and Multi-dimensional Random Variables, Classification of Random Variables,	Lecture (2 hrs)	Chalk/ Blackboard, LCD

		Distributions of Random Variables, Functions of Random Variables and Equivalent Events; Expectations of Functions of Random Variables		
26.	Tutorial 8	Examples on random variables	Lecture (2 hrs)	Chalk/ Blackboard, LCD
27.	Applied Probability and Statistics	Moment-generating Functions, Joint Probability Distributions; Law of Large Numbers	Lecture (2 hrs)	Chalk/ Blackboard, LCD
28.	Tutorial 9	Examples on moment generating functions and joint probability distributions	Interactive Lecture (2 hrs)	Chalk/ Blackboard
29.	Applied Probability and Statistics	Some Important Discrete and Continuous Distributions – Bernoulli and Binomial, Geometric, Negative binomial, Hypergeometric, Poisson's Uniform, Exponential, Gamma and Beta, Weibull, Normal; Approximations of other distributions by Normal Distribution; Random Sampling and Sampling Distributions, Parameter Estimation	Lecture (2 hrs)	Chalk/ Blackboard, LCD
30.	Applied Probability and Statistics	Tests of Hypothesis; Simple linear regression and Correlation.	Lecture (2 hrs)	Chalk/ Blackboard, LCD

31.	Tutorial 10	Examples on hypothesis testing, simple linear regression and correlation and random sampling	Interactive Lecture (2 hrs)	Chalk/ Blackboard, LCD
32.	Test 2	Applied probability and statistics	Written exam (2 hrs)	Chalk/ Blackboard

Assessment:

- Assignments (10%)
- Projects (10%)
- Tests (20%)
- Final university examination (60%)

References

- Erwin Kreyszig (1993). “Advanced Engineering Mathematics”. 7th Edition. John Wiley and sons.
- Walpole, Myers (1998). “Probability and Statistics for Engineers and Scientists”. 6th Edition, Prentice Hall.

Other Resources

- Computer laboratory connected to internet
- University library
- Faculty and department book banks