The University Of Sheffield.

Electronic & Electrical Engineering.

EEE112 ENGINEERING APPLICATIONS OF MATHEMATICS

Credits: 10

Course Description including Aims

The course is intended to provide additional support for students whose mathematics is weak. Some of the content will revise topics met earlier or in a parallel course, MAS156. The material will be presented in a form directly applicable to, and illustrated with examples from Electronic and Electrical Engineering. The aims are

1. To review the mathematics needed for Year I mainstream courses in Electronic and Electrical Engineering and to reinforce understanding.
2. To relate and apply this mathematics to engineering problems.
3. To strengthen skills in manipulation and application.

Outline Syllabus

Engineering notation, algebraic expressions, manipulating equations. Simple functions, their graphs, integrals and derivatives. Sine and cosine signals, complex notation, electrical response in R, L and C. Trigonometric identities, $\sin(A \pm B)$, $\sin(A)\cos(B)$, signal mixing, $A\sin(x) + B\cos(x)$. Differentiation and integration. Periodic functions, RMS, decibels and log plots. Phasors and AC circuits, complex representation, complex impedance. Circuit transients and first order differential equations. Linear simultaneous equations, applications to linear circuits.

Time Allocation

18 hours lectures and 18 hours problems classes, mixed, in Semesters 1 and 2.

Recommended Previous Courses

Entry requirements.

Assessment

Continuous assessment through 3 formal tests over the course duration. Students who are able to demonstrate a suitable level of proficiency in the tests will be exempt from the final examination. All other students will sit a 2-hour examination on all the material from EEE112, answering all questions in Section A and 2 out of 3 in Section B.

Recommended Books

D.W. Jordan and P. Smith	*Mathematical Techniques*	OUP 1995
K.A. Stroud,	*Engineering Mathematics* (5th ed)	Palgrave 2001
Croft, R. Davison, M. Hargreaves, J. Flint	*Engineering Mathematics: A Foundation for Electrical, Electronic, Communication & Systems Engineers (4th Ed)*	Pearson 2012

Year 1 lecture notes and texts for parallel mainstream EEE courses.

Objectives

By the end of the module, successful students will be able to apply of the following mathematical techniques to mainstream year one EEE courses:

1. algebraic expressions, manipulating equations, engineering notation.
2. the behaviour of simple functions, including sines and cosines.
3. simple trigonometric identities.
4. the principles and techniques of differentiation and integration.
5. the behaviour, representation and manipulation of periodic functions.
6. phasors, complex numbers and complex impedance.
7. the solution of first order differential equations.
8. the solution of simultaneous linear equations.

Detailed Syllabus

1. Algebraic expressions, manipulating equations, engineering notation.
2. Standard functions, graphs, differentials and integrals: slopes and areas.
3. Sines and cosines in periodic signals, trigonometric definitions, degrees and radians, amplitude, period, phase, frequency, angular frequency, phase lead and lag.
4. Response of R, L and C to sinusoidal signals, impedance, CIVIL, phase shifts.
5. Trigonometric identities, complex notation, sine and cosine representations, $\sin(A \pm B)$.
6. $\sin(A)\cos(B)$, signal mixing.
7. $A\sin(x) + B\cos(x)$.
8. Differentiation, definition: product, quotient and function of a function rules.
9. Phasors and AC circuits, response of R, L and C and of combinations.
9. Periodic functions: mean, square, RMS, mean power.
10. Complex numbers, Argand diagram, a + jb and $r\exp(j\theta)$ representations and transformations between them.
11. Complex representation of phasors, complex impedances.
12. Integration, definition: by parts, by substitution, products of sines and cosines.
13. Decibels and log plots.
14. First order differential equations and circuit transients for RL and RC circuits.
15. Linear simultaneous equations, analysing linear circuits.

16-18. Revision and problems.

UK-SPEC/IET Learning Outcomes

Outcome Code	Supporting Statement
SM2p/SM2m	Contributes by developing and reinforcing the necessary mathematical skills needed for circuit and signal analysis by applying those skills to engineering problems. Assessed by examination.