Department of Mathematical Sciences
MATH191
SYLLABUS 2010-11
Mathematics 1 for Electrical Engineers

Lectures

9   FUNCTIONS and GRAPHS: Graphs of simple functions including examples of polynomial and rational functions. Asymptotes and zeroes. Monotonicity, inverse functions. Even, odd and periodic functions. Trigonometric functions of angles of arbitrary magnitude, inverse trigonometric functions. Solution of trigonometric equations. Polar coordinates, simple polar plots. Limits and continuity. Examples involving sums, products and quotients - including $\lim(\sin x)/x$.

12   DIFFERENTIATION: Differentiation as a limit using simple examples. Rules for other common functions. Product, quotient and chain rules. Tangent to $y = f(x)$. Location of roots of $f(x) = 0$ by Newton's method. Differentiability and higher derivatives. Maclaurin and Taylor series expansions. LHpitals rule. Properties of exponential, logarithmic, and hyperbolic functions. Implicit differentiation. Stationary points and extrema. Curve sketching.

3   INTEGRATION: Definite integral as the area under a curve. Basic properties. The Fundamental Theorem of Calculus (relation to differentiation). Indefinite integrals. Integrals of common functions.

3   VECTORS: Linear properties: addition, subtraction, scalar multiplication. Unit vectors. Displacement and position vectors. Angles, lengths and scalar product.

6   COMPLEX NUMBERS: Historical motivation. Definition of complex numbers: real and imaginary parts. Complex conjugate. The Argand diagram. Arithmetic with complex numbers. Polar form: modulus and argument, Eulers formula and de Moivres theorem. Application of de Moivres theorem to trigonometric identities. Roots of complex numbers.

3   SERIES: Convergence and divergence of series (heuristic treatment). Examples of geometric and harmonic series. Comparison, ratio, and alternating series tests. Power series and radius of convergence.

36   lectures in total

Recommended course text: Glyn James: Modern Engineering Mathematics, 3rd edition, Prentice Hall (2001).

Prof S.M. Rees