

Subject Code	EX001
Subject Title	Engineering Mathematics
Objectives This unit aims to assess the students' fundamental understanding in the use of mathematical concepts in the design, analysis and application of engineering systems.	
Syllabus	
<p>1. Vectors and Matrices Vector algebra, vector product, scalar product, scalar triple product, vector triple product; Matrix operations, transpose, eigenvalues and eigenvectors.</p> <p>2. Complex Numbers Complex Numbers and their Geometric Representation, Polar Form of Complex Numbers. Powers and Roots, Derivative, Analytic Function, Cauchy–Riemann Equations. Euler's Formula</p> <p>3. Ordinary Differential Equations First order differential equations: Variable separable, homogeneous and exact equations. Second order differential equations and systems: Reducible forms; Functions of several variables.</p> <p>4. Laplace Transform Laplace transforms of elementary functions and basic theorems on Laplace transform, Application of Laplace transforms to solution of differential equations and system of differential equations, Transfer functions, convolution theorem, concepts of stability and controllability.</p> <p>5. Fourier Series and Fourier Transform Fourier coefficients, Odd and Even functions, Fourier Transform and Applications.</p> <p>6. Partial Differential Equations Linear first order PDE, Wave propagation equation</p> <p>7. Probability and Statistics Estimating parameters, Regression, Bayes' theorem and its applications</p> <p>8. Mechanics of Rigid Bodies (Statics) Introduction, Systems of coplanar forces, Static equilibrium of particles and rigid bodies, forces in space, Simple frameworks, Potential energy, Principle of virtual work, Friction, Hydrostatics, Vector analysis to solve problems</p> <p>9. Mechanics of Rigid Bodies (Dynamics) Kinematics Planar motion of particles and rigid bodies, Graphs of displacement, Velocity and acceleration based on time axis. Relative velocity and acceleration, Vector analysis to solve problems Kinetics Mass moments of inertia of bodies, radius of gyration, Newton's law of motion, Conservation of momentum, Kinetic energy, Principle of Conservation of Energy, De Alembert's principle, Simple harmonic motion, Mechanical vibrations of engineering systems and analysis of system responses.</p>	
Assessments	<p>Exam Duration : 3 hours Nature of questions: Questions which evaluates the analytical capability and application of mathematical tools to solve engineering problems with particular reference to fundamentals learned in GCE A/L Two sections</p> <ul style="list-style-type: none"> ○ Section 1 - compulsory 3 main questions ○ Section 2 – 3 out of 6 field specific questions <p>Mark allocation – 100 marks for each question Pass mark is 50 out of 100</p>
References	
<ol style="list-style-type: none"> 1. Advanced Engineering Mathematics, Alan Jeffrey, Academic Press, ISBN-13: 978-0123825926, 1st Edition, 2001 (Part 2, 3, 4 and 7) 2. Engineering Mechanics Statics and Dynamics, 2012, by Dubey 3. Engineering Mechanics: Statics & Dynamics (14th Edition) 14th Edition, by Russell C. Hibbeler 	

