MAT2110 – Engineering Mathematics I

Course Content

1. **Analytic Geometry**
   Conic sections: Translation of coordinates; rotations of axes about the origin; Parameterisation of curves; Polar equations for conics; tangents and normals to conic sections.

2. **Differential Calculus**
   Higher order derivatives; application of derivatives; optimisation problems.

3. **Integration**
   Methods of integration; applications of integration to areas between two curves, volumes of solids of revolution, length of an arc, surface area, centres of mass and moments of inertia.

4. **Infinite Series**
   Infinite sequences; infinite series; convergence; comparison, ratio, nth root and integral tests; interval of convergence; power series; Maclaurin's series; convergence of Taylor series and error estimation; .

5. **Vectors in Three Dimensional Space**
   Three dimensional Cartesian coordinate system; Lines and planes in space; vector valued functions of a single variable; plane curves; space curves; differentiation of vector functions.

6. **Functions of Several Variables**
   Limits and continuity; partial derivatives; geometric implications of first and second order derivatives; tangent planes and normal lines to a surface; chain rules; total differentials; increment of a function of real variables and applications to error estimation; maxima and minima for a function of several variables; Lagrange multipliers.

7. **Ordinary Differential Equations**
   First order differential equations; solution by separation of variables; exact equations; first order linear differential equations; second order linear differential equations; Homogeneous equations with constant coefficients; non-homogeneous linear

differential equations; method of variation of parameters ; higher order linear differential equations with constant coefficients; applications.

8. **Matrices and Linear Systems of Equations**
   Consistent system of equations; elementary row operations; solutions of systems of linear equations.

9. **Vector Spaces**
   Linear independence; linear combination and span; basis and dimension; rank of a matrix; eigenvalues and eigenvectors.

Mode of delivery: 4 lectures and 1 tutorial per week.

Assessment

1.	Continuous Assessment	30%
	1.1 Assignments/Quizzes	10%
	1.2 Tests	20%
2.	Final Examination	70%
	Total	100%

Prescribed Readings

1. Goodman, A.W., (1980) Analytic Geometry and the Calculus. 4th Ed. Prentice Hall ISBN: 0 023 44960 4
2. Finney R. L and Thomas G. B., (1995).Calculus and Analytic Geometry, 9th Ed. Addison Wesley. ISBN: 0 201 53174 9

Recommended Readings

1. Grossman S. T, (1996) Multivariable Calculus, Linear Algebra and Differential Equations, 3rd Ed. 1996. Academic Press. ISBN: 0 030 03038 3
2. Kreyszig E, John Advanced Engineering Mathematics, 10th Edition, Wiley and Sons. ISBN: 0 470 45836 5