MTH215e Further Mathematical Methods and Mechanics

Level: 2

Credit Units: 5 Credit Units

Language: ENGLISH

Presentation Pattern: EVERY JULY

E-Learning: BLENDED - Learning is done MAINLY online using interactive study materials in Canvas. Students receive guidance and support from online instructors via discussion forums and emails. This is supplemented with SOME face-to-face sessions. If the course has an exam component, this will be administered on-campus.

Synopsis:

MTH215 focuses on the use of matrix algebra and related structures to model complicated and coupled motions. The powerful techniques of linear algebra and calculus are fully exploited to solve a large class of problems arising from real-life senerios.

Topics:

- Matrices and Determinants.
- Eigenvalues and Eigenvectors.
- Simultaneous Differential Equations.
- Homogeneous and inhomogeneous systems and second-order systems.
- Non-linear Differential Equations.
- Analyze and interpret graphical solutions of the models.
- Damped Vibrations.
- Forced Vibrations.
- Normal Modes.
- Find the normal modes of simple oscillating mechanical systems.
- Systems of Particles.
- Apply Newton's law of restitution and conservation laws to solve collision problems.

Learning Outcome:

- Identify simultaneous equations and matrix algebra applications.
- Solve applications of eigenvalues and eigenvecors.
- Explain when systems of differential equations can be expressed in matrix form.
- Calculate solutions of differential equations.
- Express damped dynamical systems as second order coupled system.
- Describe when a coupled second order system of differential equations exhibits normal modes.
- Relate normal modes to initial conditions.
- Apply centre of mass, momentum and energy conservation of an interacting system of particles.
- Apply a range of mathematical techniques to solve a variety of quantitative problems.
- Analyze and solve problems individually and/or as part of a group.
- Solve a number of problem sets within strict deadlines.
- Solve problems related to mathematical methods and mechanics using Mathcad.

Assessment Strategies:

Continuous Assessment Component	Weightage (%)

COMPUTER MARKED ASSIGNMENT	8
COMPUTER MARKED ASSIGNMENT	8
COMPUTER MARKED ASSIGNMENT	8
PRE-CLASS QUIZ	2
PRE-CLASS QUIZ	2
PRE-CLASS QUIZ	2
Sub-Total	**30**

Examinable Component	**Weightage (%)**
Written Exam	70
Sub-Total	**70**

Weightage Total **100**