Course Outline

Title: DATA ANALYSIS AND NUMERICAL TECHNIQUES

Code: ENCOR4040

Faculty / Portfolio: Faculty of Science and Technology

Level: Advanced

Pre-requisites: Nil

Co-requisites: Nil

Exclusions: Nil

Credit Points: 15

ASCED Code: 039999

Objectives:

After successfully completing this course, students should be able to:

Knowledge:

K1. Describe how data are acquired and processed;
K2. Understand the fundamentals of statistical analysis and probability;
K3. Learn the basics of regression models and simulation.
K4. Relate experimental findings to the analytical model and system variables.
K5. Observe how experiments are used for system optimisation and improvement;
K6. Appreciate the importance of inference and statistical analysis to engineering;
K7. Acquire an understanding of system of linear algebraic equations and different techniques to solve matrices;
K8. Develop an understanding of numerical modelling in engineering applications;
K9. Appreciate solution algorithm for non-linear algebraic equations;
K10. Learn how to perform numerical solution of partial differential equations.
K11. Understand computer based solution techniques to solve partial differential equations encountered in engineering applications.

Skills:

S1. Apply existing and developing knowledge and experience to experimental designs;
S2. Demonstrate the ability to use computers to solve engineering problems;
S3. Solve real engineering problems through experimental and numerical techniques;
S4. Improve system performance using statistical analysis and simulation;
S5. Work effectively, both independently and in teams;
S6. Formulate and implement algorithm for solution of non-linear algebraic equations;
S7. Implement tri-diagonal matrix solution algorithm;
S8. Demonstrate the ability to develop user-friendly computer applications to solve partial differential equations applied in engineering discipline.

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Values:

- **V1.** Recognise how the design of experiment is utilised in engineering applications;
- **V2.** Develop an understanding of system variables and their impact on the overall behaviour of engineering systems;
- **V3.** Appreciate the importance of understanding how integrated engineering systems behave, through modelling, simulation and testing;
- **V4.** Appreciate that an understanding of numerical modelling is essential in many engineering discipline
- **V5.** Appreciate learning as a lifelong process.

Content:

Topics may include:

- Data from simulated and computer-based models
- Statistics and probability
- Modelling and regression
- Parametric design of experiment (DoE)
- Process and empirical-based optimisation
- Non-linear algebraic equations;
- Matrix solution techniques: TDMA;
- Initial value problems; boundary value problems;
- Solution of partial differential equations by finite difference method.

Assessment:

Assessment Task	Assessment Type	Weighting
Statistical analysis	Assignment	20-30%
Optimisation and DoE	Assignment	20-30%
Approximation & matrix methods	Assignment	20-30%
Partial differential equation	Assignment	20-30%

Adopted Reference Style:

APA

Presentation of Academic Work: