

Liverpool John Moores University

Title: ANALYTICAL MATHEMATICS
Status: Definitive
Code: **5500ICBTEG** (127009)
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering
Teaching School/Faculty: ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level: FHEQ5
Credit Value: 15
Total Delivered Hours: 62
Total Learning Hours: 150
Private Study: 88

Delivery Options

Course typically offered: Semester 1 and Summer

Component	Contact Hours
Lecture	45
Practical	9
Tutorial	6

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	70	2
Practice	AS2	Coursework (1500 words)	30	

Aims

The module is designed to extend the student's expertise in engineering mathematics to analyse the scientific and engineering problems. Specially, statistics, numerical methods matrix methods and series are studied.

Learning Outcomes

After completing the module the student should be able to:

- 1 Examine complex numbers, infinite series and solve related problems
- 2 Demonstrate ability to perform matrix manipulations which arise in engineering problems
- 3 Identify the role of probability and statistics.
- 4 Demonstrate the knowledge of SPSS software for statistical analysis.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3
Coursework	4		

Outline Syllabus

1. *Matrices, Determinants and vectors*
 - 1.1. *Cramer's rule*
 - 1.2. *Gaussian elimination*
 - 1.3. *Eigen vectors and Eigen values.*
2. *Complex Algebra*
 - 1.1. *De Moivres theorem*
 - 1.2. *Nth root theorem*
 - 1.3. *Locus of complex numbers*
3. *Numerical methods*
 - 3.1. *Method of variation of parameters and Applications*
 - 3.2. *Numerical solutions of 1st order ODEs: (Euler, Improved Euler and Runge-Kutta Methods.*
4. *Statistics*
 - 4.1. *Random variables and Probability distributions*
 - 4.2. *Discrete random variables, Binomial, Poisson distributions and their application.*
 - 4.3. *Continuous random variables, Exponential and Normal distributions*
 - 4.4. *Basic statistical indicators in data analysis*
 - 4.5. *Introduction of SPSS statistical software*
 - 4.6. *Confidence intervals and Goodness-of-fit tests*
 - 4.7. *Sampling distributions and central limit theorem*
 - 4.8. *Confidence intervals from mean and variance*
 - 4.9. *Chi-squared test for goodness of fit*
5. *Infinite sequence and series.*
 - 5.1. *Definition of a sequence, Monotonic sequences, Bounded sequences, Convergent sequences.*
 - 5.2. *Definition of an infinite series Geometric series convergence/Divergence of series, Algebra of convergent series*
 - 5.3. *Convergence/Divergence test.*
 - 5.4. *Comparison Test, Limit Comparison Test, Cauchy Criterion for Convergent Series, Cauchy Condensation Test, The Ratio Test, The Root Test.*
 - 5.5. *Alternating series, Power series, Taylor series, Absolutely Convergent Series,*

Rearrangement of series, Conditionally Convergent Series
6. Statistical analysis using SPSS.

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

Mathematical and analytical skills are acquired through lectures, seminars, tutorials and group work.

Lecture notes and module guide in the form of comprehensive guidance notes; include theory examples and Q&A will guide to achieve the outcome.

SPSS computer simulation used to simulate statistical functions.

Notes

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