MTH208e Advanced Linear Algebra

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:

MTH208e Advanced Linear Algebra introduces the abstract notion of field while providing concrete examples of linear algebra over the field of real numbers and the field of complex numbers. The course proceeds to focus on the Jordan canonical form. The main results on the existence and uniqueness of Jordan canonical form will be presented without proof. The course also defines the adjoint of a linear operator and normal operators and establishes the main results on normal operators, specialising to the cases of self-adjoint operators, orthogonal operators and unitary operators. Finally, the course ends with a discussion of symmetric bilinear forms and alternating bilinear forms.

Topics:

- Change of basis
- Direct sum of vector spaces
- Cayley-Hamilton Theorem
- Minimal polynomial
- Jordan canonical form
- The adjoint of a linear operator
- Normal operators
- Self-adjoint operators
- Orthogonal and unitary operators
- Singular value decomposition
- Symmetric bilinear forms
- Alternating bilinear forms

Textbooks:

Gilbert Strang: Linear Algebra and Its Applications 4th edition Thomson Brooks/Cole
ISBN-13: 9780030105678-AA

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ISBN-13: 9780030105678

Learning Outcome:

- Determine whether two given square matrices are similar.
- Demonstrate properties of normal operators.
- Employ properties of positive definite matrices.
- Calculate Jordan canonical form of a given square matrix with complex entries over the complex numbers.
- Compute matrix representation of a given linear operator with respect to a fixed basis or the change of basis matrix from one basis to another basis.
- Show how to prove a mathematical statement in linear algebra.

Assessment Strategies:

Continuous Assessment Component	Weightage (%)
PRE-CLASS QUIZ	2
PRE-CLASS QUIZ	2
PRE-CLASS QUIZ	2
COMPUTER MARKED ASSIGNMENT	8
TUTOR-MARKED ASSIGNMENT	16
Sub-Total	**30**

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

Weightage Total   **100**