CSE6011 : Mathematical Structures for Engineers

Programme: PG Program (ECE/CCE/CSE)	Year: 4th/PG	Semester: 1st
Course: Core	Credits: 04	Hours: 40

Course Context and Overview (100 words):

Students admitted to PG program usually have inadequate mathematical foundation to pursue research for their thesis. To achieve the required level of mathematical maturity entirely through self-study could be time consuming and to certain extent difficult. This course is designed with an objective to provide the essential knowledge required to remove this inadequacy. The content of the course is designed keeping in mind the heterogeneous audience with background from electronics and communication engineering, computer science and engineering disciplines. At the conclusion of the course, students are expected to have acquired a good level of mathematics which hopefully will enable them to see its relevance in their own domain of knowledge.

Prerequisites Courses: None

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: To explain the basic concept of mathematics and its usefulness for solving engineering problems.
CO2: To apply the mathematical knowledge for solving some engineering problems.
CO3: To analyze and implement various concepts of matrix algebra.
CO4: To explain the role played by the mathematical structures to build and construct algorithmic solution to the computational problems.
CO5: To write a term paper on mathematical structures.

Course Topics:

Topics	**Lecture Hours**	
UNIT - I 1. **Topic**		
1.1 Sets, Relations and Functions [1]	03	11
1.2 Elements of Group, Ring and Field Theory [2]	08	

UNIT - II **2. Topic**		
1. Introduction to Graphs, Applications of Graphs, Paths, Connectedness and Euler Graphs [3,4]	04	09
2. Hamiltonians Path, Tree and Circuit and some applications. [3,4]	03	
3. Applications like: Google page ranking, Image Processing and others. These case studies will be taken up along with the associated topics. [3,4]	02	
UNIT - III **3. Topic**		
1. Vector Space: Linear Dependence and Independence [5-6]	03	10
2. Basis, Dimension, Change of Basis [5-6]	03	
3. Finite Dimensional Vector Space, Linear transformations, Matrix, Determinant [5,6]	04	
UNIT - IV **4. Topic**		
4.1 Eigen Values, Eigen Vectors, Diagonalization and other advanced forms, applications	04	10
4.2 Inner Product Spaces, Gram-Schmidt Process, Least Square approximation	03	
4.3 Adjoint Operator & Its Applications	03	

Textbook references (IEEE format):

Text Books:

1. Chung Laung Liu, *"Elements of Discrete Mathematics"* (2nd edition) McGraw Hill Publication
2. I.N. Herstein, *"Topics in Algebra",* Wiley Eastern Limited
3. J.A. Bondy and U.S.R. Murty, *"Graph Theory with Applications",* North-Holland
4. Harary, *"Graph Theory",* Narosa Publishing
5. G. Strang, "*Introduction to Linear Algebra",* Wellsley-Cambrige Press, 2003.
6. S. Kumaresan, *"Linear Algebra": A Geometric Approach,* Prentice Hall India, 2008.

Reference Books:

1. C.D. Cantrell, *"Modern Mathematical Methods for Physicists and Engineers",* Cambridge University Press, 2000.
2. Peter J., *"Cameron. Sets, Logic and Categories*", Springer.

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):

Some books can be added for the study of Linear Algebra

Evaluation Methods: Evaluation criteria will be shared by the concerned course instructor.

Prepared By:
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