Discrete Mathematics EEE.3.6

This course aims at introducing students to the fundamental concepts of Discrete Mathematics that is essential to an electrician and electronic engineer. One of the main course objectives is the student to develop the ability to compose mathematical proofs in a abstract field, such as the Discrete Mathematics, which however have very important applications in his studies field.

On successful completion of this course students will be able to:

- understand the principles of set theory.
- apply the mathematical induction proof technique to prove propositions.
- compose simple or complex propositions of propositional and categorical logic and use them in applications.
- possess the ideas related to the maximum common divisor, the minimum common multiple and the utility of Euclid's algorithm.
- comprehend the concept of the modulo divisibility and its application in Cryptography.
- understand the basic elements of graph and tree theory and their usefulness in various applications.
- solve homogeneous and non homogeneous and systems of linear difference equations.

Part 1 Introduction
Discrete Mathematics and their Applications.

Part 2 Introduction to Set Theory
Sets definitions and operations, Cardinality of sets. Relationships and functions
Elements of propositional and categorical logic, Boolean Algebra, Circuits, Minimal Boolean Expressions, Quine-McCluskey Method

Part 3 Mathematical Proofing
Methods of Mathematical Proofing, Mathematical Induction, Applications.

Part 4 Combinatorics
Combinatorial Analysis, Enumerations, Partitions, Combinations. Combinatorial Problems in applications.

Part 5 Elements of Number Theory
Divisibility, Modular Arithmetic, Maximum Common Divisor, Minimum Common Multiple.
Euclid's algorithm, Prime Numbers. Applications in Cryptography.

Part 6 Graph and Trees
Elements of Graph and Tree Theory. Graph Isomorphism , Hamilton Graph, Euler circuit, Rooted Trees, The Kruskal algorithm for minimal trees produced in weight graphs. The Dijkstra algorithm for finding shortest path.

Part 7 Difference Equations
Introduction to difference equations. Linear Difference equations with constant coefficients. The solutions of homogeneous and nonhomogeneous problem.

Part 8 Summary and Revision.
Review of the basic course concepts.