THE EXPRESS HANDBOOK

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Course Title: **Mathematics I (3 Cr.)**
Course Code: **CACS104**
Year/Semester: **I/I**
Class Load: **5 Hrs. / Week (Theory: 3 Hrs., Tutorial: 1 Hr., Practical: 1 Hr.)**

Course Description

This course includes several topics from algebra and analytical geometry such as set theory and real & complex number; relation, functions and graphs; sequence and series; matrices and determinants; permutation & combination; conic section and vector in space which are essential as mathematical foundation for computing.

Course Objectives

The general objective of this course is to provide the students with basic mathematical skills required to understand Computer Application Courses.

Course Contents

Unit 1 Set Theory and Real & Complex Number — 7 Hrs.

Concept, Notation and Specification of Sets, Types of Sets, Operations on Sets (Union, Intersection, Difference, Complement) and their Venn diagrams, Laws of Algebra of Sets (without proof), Cardinal Number of Set and Problems Related to Sets. Real Number System, Intervals, Absolute Value of Real Number. Introduction of Complex Number, Geometrical Representation of Complex Number, Simple Algebraic Properties of Complex Numbers (Addition, Multiplication, Inverse, Absolute Value)

Unit 2 Relation, Functions and Graphs — 8 Hrs.

Ordered pairs, Cartesian product, Relation, Domain and Range of a relation, Inverse of a relation; Types of relations: reflective, symmetric, transitive, and equivalence relations. Definition of function, Domain and Range of a function, Inverse function, Special functions (Identity, Constant), Algebraic (linear, Quadratic, Cubic), Trigonometric and their graphs. Definition of exponential and logarithmic functions, Composite function.(Mathematica)

Unit 3 Sequence and Series — 7 Hrs.

Sequence and Series (Arithmetic, Geometric, Harmonic), Properties of Arithmetic, Geometric, Harmonic sequences, A. M., G. M., and H. M. and relation among them. Sum of Infinite Geometric Series. Taylor's Theorem (without proof), Taylor's series, Exponential series.

Unit 4 Matrices and Determinants — 8 Hrs.

Introductions of Matrices, Types of Matrices, Equality of Matrices, Algebra of Matrices, Determinant, Transpose, Minors and Cofactors of Matrix. Properties of determinants (with out proof), Singular and non-singular matrix, adjoin and

inverse of matrices.Linear transformations, orthogonal transformations; rank of matrices. (Matlab)

Unit 5 Analytical Geometry **8 Hrs.**

Conic Sections: Definitions (Circle, Parabola, Ellipse, Hyperbola and Related Terms), Examples to Explain The Defined Terms, Equations and Graphs of The Conic Sections Defined Above, Classifying The Defined Conic Sections by Eccentricity and Related Problems, Polar Equations of Lines, Circles, Ellipse, Parabolas, and Hyperbolas. (Mathematica / Matlab)

Vectors in Space: Vectors in Space, Algebra of Vectors in Space, Length, Distance Between Two Points, Unit Vector, Null Vector. Scalar Product, Cross Product of Two and Three Vectors and Their Geometrical Interpretations and Related Examples. (Matlab)

Unit 6 Permutation and Combination **7 Hrs.**

Basic Principle of Counting, Permutation of a. Set of Objects All Different b. Set of Objects Not All Different c. Circular Arrangement d. Repeated Use of The Same Object. Combination of Things All Different, Properties of Combination.

Laboratory Works

Mathematica and/ or Matlab should be used for above mentioned topics.

Teaching Methods

The general teaching pedagogy includes class lectures, group works, case studies, guest lectures, research work, project work, assignments (theoretical and practical), tutorials and examinations (written and verbal). The teaching faculty will determine the choice of teaching pedagogy as per the need of the topics.

Evaluation

Examination Scheme				
Internal Assessment		External Assessment		
Theory	Practical	Theory	Practical	Total
20	20 (3 Hrs.)	60 (3 Hrs.)	-	100

Text Book

1. Thomas, G. B, Finney, R. S., *"Calculus with Analytic Geometry"*, Addison - Wesley, 9th Edition.