FOUR YEAR UNDERGRADUATE PROGRAMME

SUBJECT: MATHEMATICS

SEMESTER-I
Classical Algebra
Total Marks: 100 (Theory 80, Internal Assessment 20)
No. of Credits: 4

Base syllabus: MAT-HG-2016/MAT-RC-2016: Algebra (UG CBCS)

Course Level: 100-199

No. of Contact classes: 60

No. of Non-Contact classes: 0

Prerequisites: Mathematics in 10+2 or equivalent standard.

Course Objectives: The primary objective of this course is to introduce the basic tools of complex numbers, theory of equations, matrices and matrix method of solution of homogeneous linear equations up to four variables.

Course Learning Outcomes: This course will enable the students to:

- Employ De Moivre's theorem in a number of applications to solve numerical problems.
- Learn the basic concepts of exponential, logarithmic and hyperbolic functions of complex numbers.
- Learn how to find the nature of the roots of a given polynomial equation by Descartes' rule , also learn about symmetric functions of the roots for cubic and biquadratic equations.
- Learn how to solve cubic and biquadratic equations.
- Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix. Finding inverse and rank of a matrix.

Unit 1:

Polar representation of complex number, De Moivre's theorem (both integral and rational index), Roots of complex numbers, n^{th} roots of unity, Application of De Moivre's Theorem, Exponential and logarithmic functions of complex numbers, Hyperbolic functions.

[1] Chapter 2 (Sections 2.7-2.13, 2.16)

(No. of classes: 20, Marks: 25)

Unit 2:

Algebraic equations: Deduction from Fundamental Theorem of Classical Algebra, Descartes' rule of signs, relation between roots and coefficients of a polynomial equation of degree n,

symmetric functions of roots, Transformation of equations, Cardon's method of solution of a cubic equation, Euler's method of solution of a biquadratic equation.

[1] Chapter 5; Theorem 5.1.1, Theorem 5.2.1, Section 5.3 - 5.6, 5.11,5.12.

(No. of classes: 20, Marks: 30)

Unit 3:

Matrix Algebra, Addition, Transposition, Symmetry, Multiplication of matrices and their properties, Matrix inversion and properties, Row Echelon form and Rank of a matrix, Reduced row Echelon form, Consistency of linear systems, Solutions of system of homogeneous linear equations with number of equations and unknowns up to four.

[2] Chapter 3 (Sections 3.2, 3.5, and 3.7) Chapter 2 (Sections 2.1 to 2.4)

(No. of classes: 20, Marks: 25)

Text Books:

1. Mappa, S.K., Higher Algebra (Classical), Revised 8th Edition, 2011, Levant Books.

2. Meyer, Carl D. (2000). Matrix Analysis and Applied Linear Algebra. Society for Industrial and Applied Mathematics (Siam).

Reference Books:

1. Dickson, Leonard Eugene (2009). First Course in The Theory of Equations. The Project Gutenberg eBook (http://www.gutenberg.org/ebooks/29785)

2. Gilbert, William J., & Vanstone, Scott A. (1993). Classical Algebra (3rd ed.). Waterloo Mathematics Foundation, Canada.

3. Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser,2006.

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