First Year First Semester

Course Title	Fundamentals of Mathematics	**ISCED Code**	0541-111
		Course Code	MTH 111
Course Type	Core	**Course Status**	Theory
Course Hour	3.0 Hr./Week	**Credit Value**	3.0
Prerequisite	None	**Total Marks**	100

Course Description

Fundamentals of Mathematics is a major, compulsory and core course for the undergraduate students of the B. Sc. (Honors) program, which carries **3.0 credits** and **42 hours** of effective teaching in **14 weeks.** The course grades will be assessed through participation, class presentations, quiz, assignments, two midterms, and comprehensive examinations. This is an elementary-level course for the understanding of Fundamentals of Mathematics.

Rationale

Fundamentals of Mathematics are the foundations of all mathematics courses. Understanding this course will precede everyone to learn other areas of mathematics. After completing this course, students will get some useful and applicable ideas on set theory, relations and functions with graphs, inequalities, theory of equations algebraic series, complex number system, plane trigonometry.

Course Objectives

Fundamental of Mathematics is a partially non-calculator introductory mathematics course which covers mathematical skills relevant to degrees requiring a basic level of mathematical knowledge and ability. The course learning includes but is not limited to an understanding of basic concepts, set theory, relations, functions. The students will also learn about arithmetic and geometric series, mathematical induction, the concept of the Complex Number System, inequalities, the theory of equations and trigonometry.

Course Learning Outcomes (CLOs)

On satisfying the requirements and successful completion of this course, students will have the knowledge and skills to-

CLO1	Know the basic properties of the natural numbers, rational numbers and real numbers.
CLO2	Develop knowledge about the set theory in real world andmake comparison between sets.
CLO3	Illustrate the various types relations and functions.
CLO4	Be familiar with different types ofinequalities and Demonstrate and apply the theory of mathematical induction.
CLO5	Explain the De Mover's theorem tosolve several equations and Evalute trigonometric series and hyperbolic functions.

Course Contents

	Course Contents	Hours	CLOs
1.	**Basic Concepts:** Sets, Subsets, Set operations, Family of sets, De Morgan's laws, Venn diagram, Empty set and Universal set, Relations and Functions.	8 Hrs.	CLO1, CLO2,CLO4
2.	**Inequalities:** Number systems, Field and order properties of real numbers, Average mean, Arithmetic mean, Geometric mean, Weierstras's Inequality, Cauchy-Schwarz Inequality, Tchebychef's and Holder's inequality.	8Hrs.	CLO1, CLO2, CLO3, CLO5
3.	**Theory of Equations:** Equations and identities, Basic ideas of solution of equations with graphical representations, Relation	9 Hrs.	CLO2, CLO3, CLO4, CLO5

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	between roots and coefficients of the nth degree equations, Synthetic division, Descarte's rule of signs, Newton's method, Reciprocal equations and Sturm's theorem, Position of roots, Multiplicity of roots, symmetricity of roots, Transformation of equation.		
4.	**Series:** Basic definition of series, Techniques of summing up series, Tests for convergence and divergence of series (with less emphasis on proofs of theorems), Method of difference, Successive difference method.	9 Hrs.	CLO4, CLO5,
5.	**Plane Trigonometry**: Complex number system, Argand's diagram, Forms of complex numbers, De Moiver's theorem and its applications, Complex variable, Circular functions and inverse circular functions of complex quantities. Exponential series for complex quantity, Euler's exponential values, Hyperbolic functions, Summation of trigonometric series: method of difference, *C+iS* method. Power series, Logarithmic series, Gregory's series, Expansion of series.	8 Hrs.	CL04, CLO5

Alignment of CLOs VS PLOs

Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs)

PLOs/ CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	♦	-	♦	-	-	-	-	-	-	-	-	-
CLO2	♦		♦	-	-	-	-	-	-	-	-	-
CLO3	-	-	-	-	-	♦	-	-	-	-	-	-
CLO4	♦	-	♦	♦	-	♦	♦	-	-	-	-	-
CLO5	♦	♦	♦	-	-	♦	-	-	-	-	-	-

♦: Aligned -: Not-aligned

Learning Materials

Recommended Readings

i.	**Barnard. S, Child, J. M.**, Higher Algebra, *Macmillan And Company Limited*, 1936.
ii.	**Loney S. L.**, Plane Trigonometry, *Arihant Publication India Limited*, 2018.

Supplementary Readings

i.	**Swokowski E. W.,** Calculus with Analytic Geometry, *Prindle, Weber & Schmidt*, 1983.
ii.	**Lipschutz S.**, Set Theory and Related Topic, *McGRAW-HillPublishing Company*, 1964.

Teaching-Learning and Assessment Strategy

Mapping of Course Learning Outcomes (CLOs) with the Teaching-Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Lecturing and Student Activity	Quiz/ Homework (Formative)
CLO2	Lecturing and Discussion	Midterm (Summative)
CLO3	Lecturing and Visual Presentation	Assignment (Formative) and Midterm (Summative)
CLO4	Lecturing, Student Activity and Discussion	Midterm (Summative)
CLO5	Lecturing and Discussion	Presentation and Final Exam (Summative)

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