METROPOLITAN UNIVERSITY, SYLHET

DEPARTMENT OF Computer Science & Engineering

COURSE OUTLINE

Program	:	Bachelor of Computer Science & Engineering(CSE)
Course Title	:	Matrices, Complex Variable and Fourier Analysis
Course Code	:	MAT 135
Semester	:	Summer 2021
Credit Hour	:	3
Level	:	2.2
Course Teacher	:	Suhel Ahmed, Assistant Professor
Class Hours	:	
Consultation Hours	:	
e-mail	:	suhel@ metrouni.edu.bd
Mobile	:	+880-01723976961
Pre-requisite(if any)	:	Differential and Integral Calculus
Course Objectives	:	1. To illustrate the concept of algebra of Matrices and its basic operations. 2. To facilitate students how to formulate a physical problem into a mathematical model in the form of linear equation and then solving by using Matrices. 3. To enable the students to the concept of difference between real and complex number systems and planes. 4. To introduce De Moivre's and other relevant theorems and their applications 5. To overview about the Fourier series analysis and its application to signal processing.
Course Learning Outcomes		Upon successful completion of this course, student will be able to: 1. Ability to use matrix operations to solve the Assignment Problems, Decision Analysis, Equipment Replacement Problems, Theory of Competitive Games, and Queuing Models. 2. Ability to apply matrix method to solve a physical (Life oriented) problem. 3. Ability to differentiate between real and complex number systems and planes. 4. Applying De Moivre's and other theorems to get the roots of equations. 5. Ability to implement Fourier series in signal processing.

Teaching-learning and Assessment Strategy:

Marking Scheme		
Attendance & performance	: 10 marks	
CT/Assignment	: 20 marks	
Mid term	: 30 marks	
Final	: 40 marks	

Tentative Class Schedule and Lesson Outcomes:

Lecture Schedule: Lectures	Topics
1-2	Algebra of Matrices: Matrices Transpose of a matrix, Square matrices, Powers of matrices, Polynomials in matrices, Invertible (Nonsingular) matrices, special types of square matrices, Complex matrices.
2-3	Basic Operations: Matrix addition and Scalar multiplication, Matrix multiplication, Calculation of Inverse, Row-echelon form, Elementary row and column operations.
Quiz Test	
4-8	Simultaneous Linear Equations: Augmented matrix, Gaussian elimination method, Pivoting strategies, Gauss-Jordan elimination.
1st Tutorial Examination	
9-10	Determinants: Determinant of a square matrix, Minor, Cofactor, Inverse of a matrix using determinant.
Mid Term Examination	
Assignment	
9-15	Complex Numbers: The complex number system, Fundamental operations with complex numbers, Absolute value, axiomatic foundation of the complex number system, Graphical representation of complex numbers, Polar form of complex numbers, De Moivre's theorem, Roots of complex numbers, Euler's formula, Polynomial equations, The nth roots of unity, Vector interpretation of complex numbers, Dot and cross product, Complex conjugate coordinates.
2nd Tutorial Examination	
16-18	Complex Differentiation: The Cauchy–Riemann equations, Harmonic Functions, Singular points.
19-21	Complex Integration: Cauchy's theorem, Some consequences of Cauchy's theorem, Cauchy's integral formulas, The Residue theorem, Evaluation of integrals and series.
20-24	Fourier Series and its Applications: The need for Fourier series, Periodic functions, Piecewise continuous functions, Definition of Fourier series,Odd and even functions, Half-range Fourier sine or cosine series, Parseval's identity, Integration and differentiation of Fourier series, Complex notation for Fourier series, Double Fourier series, Applications of Fourier series.
Semester Final Examination	

Reference Books:

1. Theory and Problems of Matrix Operations by R. Bronson (Schaum's Outline Series).
2. Linear Algebra by S. Lipschutz and M. Lipson (Schaum's Outline Series).
3. Complex Variables by M. R. Spiegel, S. Lipschutz, J. J. Schiller and D. Spellman (Schaum's Outline Series).
4. Fourier Analysis with Applications to Boundary Value Problems by M. R. Spiegel (Schaum's Outline Series).

Grading System: As per the Approved Grading Scale of Metropolitan University

Numeric Grade	Marks Range	Letter Grade	Grade Point	Remarks
80% and above	80 – 100	A+	4	Outstanding
75% to less than 80%	75 – 79	A	3.75	Excellent
70% to less than 75%	70 – 74	A-	3.5	Very Good
65% to less than 70%	65 – 69	B+	3.25	Good
60% to less than 65%	60 – 64	B	3	Above Average
55% to less than 60%	55 – 59	B-	2.75	Average
50% to less than 55%	50 – 54	C+	2.5	Below Average
45% to less than 50%	45 – 49	C	2.25	Poor
40% to less than 45%	40 – 44	D	2.00	Pass
Less than 40%	00 – 39	F	0.00	Fail