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|  |  | Ahsanullah University of Science and Technology (AUST)Bangladesh |

# COURSE OUTLINE

**1. Title**: Mathematics IV

**2. Code**: MATH 2203

**3. Credit hours**: 3.0

**4. Level**: 2nd year, 2nd semester

**5. Faculty**: Engineering

**6. Department**: Arts and Sciences

**7. Programme**: B. Sc. in Computer Science and Engineering

**8. Synopsis from the Approved Curriculum**:

**Matrices:**

Definition of Matrix, Different types of matrices, Algebra of Matrices, Adjoint and inverse of a matrix, Rank of elementary transformations of matrices; Normal and canonical forms; Solution of linear equations; Matrix polynomials, Eigen values and eigen vectors.

**Vector:**

Scalars and vectors, Equality of vectors, Addition and subtraction of Vectors, Multiplication of vectors by scalars, Scalar and Vector products and their geometrical interpretation, Triple product and multiple product, Linear dependence and independence of vectors, Differentiation and integration of vectors, Definition of Line, Surface and Volume integrals; Gradient, divergence and curl of a point function, Gauss’s theorem, Stoke’s theorem and Green’s theorem.

**Fourier Analysis:**

Fourier series, real and complex form of finite transform, Fourier Integral, Fourier Transforms and their uses in solving boundary value problems

**9. Type of course (core/elective)**: core

**10. Prerequisite(s) (if any)**: N/A

**11. Name of the instructor(s) with contact details and office hours**:

*Dr. Muhammad Saiful Islam Mallik*

Professor of Mathematics

Room: 5A01(8)

Phone: 01716-798078, Ext. 1820

E-mail: [saiful\_math.as@aust.edu](mailto:saiful_math.as@aust.edu)

**Counseling Hour(s):**

**12. Semester Offered**: **Spring 2020**

**13. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom’s**

**Taxonomy Level**

After completion of the course, students will be expected to:

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| Sl. No. | COs | POs | Bloom’s Taxonomy | | |
| C | A | P |
| 1. | 1. Comprehend the concepts of matrices, matrix algebra, elementary transformation of matrices, different vector operations and vector calculus. | 1 | 2 |  |  |
| 2. | 1. Solve system of linear equations, and find eigenvalues and eigenvectors by using the concept of matrices. | 1 | 3 |  |  |
| 3. | 1. Interpret general theorems in vector calculus for solving different problems. | 1 | 3 |  |  |
| 4. | 1. Express a function in real and complex form of the Fourier series, Fourier transforms and Fourier integrals | 1 | 2 |  |  |
| 5. | Apply Fourier transforms in solving boundary value problems | 1 | 3 |  |  |

**14. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom’s Taxonomy Level**

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| Course Outcome | Knowledge Profile | Complex Problem Solving | Complex Engineering Activities |
| ***CO1*** | ***K2*** |  |  |
| ***CO2*** | ***K2*** |  |  |
| ***CO3*** | ***K2*** |  |  |
| ***CO4*** | ***K2*** |  |  |
| ***CO5*** | ***K2*** |  |  |

**15. Percentages of Assessment Methods**

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| **Method** | **Percentage** |
| Class Performance | 10 |
| Quizzes | 20 |
| Final Examination | 70 |

**16. Week wise distribution of contents and assessment methods**

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| **Week** | **Topics** | **Assessment Method(s)** |
| 1 | Introduction: Discussion about course outline and objectives, Definition of matrix, different types of matrices, algebra of matrices, adjoint of a matrix |  |
| 2 | Inverse of a matrix, Rank and elementary transformations of matrices, normal and canonical forms |  |
| 3 | Solution of linear equations, Matrix polynomials, eigenvalues and eigenvectors of square matrices | Quiz 1 |
| 4 | Eigenvalues and eigenvectors of square matrices, Scalars and vectors, equality of vectors, addition and subtraction of vectors, multiplication of vectors by scalars |  |
| 5 | Scalar and vector products, their geometrical interpretation and application |  |
| 6 | Triple and multiple product of vectors, their application. Linear dependence and independence of vectors, their application | Quiz 2 |
| 7 | Differentiation and integration of vectors together with elementary application: line, surface and volume integral |  |
| 8 | Vector gradient, divergence and curl. Physical significance of gradient, divergence and curl, their application |  |
| 9 | Theorems: Green and Divergence, their application |  |
| 10 | Theorem: Stokes, it’s application. Fourier series: real form of finite Fourier series and application | Quiz 3 |
| 11 | Real and complex form of finite Fourier series and application |  |
| 12 | Fourier transforms |  |
| 13 | Inverse Fourier transforms and Fourier integral |  |
| 14 | Fourier transforms and their uses in solving boundary value problems. | Quiz 4 |

**17. References**

17.1. Required (if any)

* H. K. Dass*, Advanced Engineering Mathematics, 15th Edition*

17.2. Recommended (if any)

* Murry Frank Ayres, JR, *Matrices*, Schaum’s outline series
* Murry R Spiegel*, Vector Analysis*, Schaum’s outline series
* Glyn James*, Advanced Modern Engineering Mathematics, 3rd Edition*
* Murry R Spiegel, *Fourier Analysis,* Schaum’s outline series

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| **Prepared by:**  Signature:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name: Prof. Dr. Muhammad Saiful Islam Mallik  Department: Arts and Sciences  Date: | **Checked by:**  Signature:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name: Prof. Dr. Muhammad Saiful Islam Mallik, &  Dr. Mohammad Abdul Kader  Department: Arts and Sciences  Date: | **Approved by:**  Signature:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name: Prof. Dr. Sreebash Chandra Paul  Head  Department: Arts and Sciences  Date: |