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## *Semester: Fall 2017*

***Course No: MAT 216 (Section: 06)***

### *Course Title: Linear Algebra & Fourier Analysis (Mathematics IV)*

***Course Contents:***

***Linear Algebra*:** System of linear equations, Solution of linear equations, Matrices, Inverse matrix, Method of finding Inverse matrix, Vector spaces and subspaces, Linear independence and dependence, Basis and dimension, Rank and nullity, Normal and canonical forms, linear transformation, Eigen values and eigenvectors and Diagonalization.

***Vector Calculus* :** Scalars and vectors , Transformation of coordinates, Jacobian, Multiple Integrals, Line Integral, Surface Integral, Volume Integral, Gradient, Divergence and Curl of a point Function, Greens theorem, Gauss’s theorem, Stroke’s theorem .

***Fourier Analysis*:** Real and Complex form, Finite Fourier transform, Fourier integral, Fourier transforms and their uses in solving boundary value problems.

***Learning Outcomes:***

Upon successful completion of this course, students should be able to perform the following:

* + - * Solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion.
* Carry out matrix operations, including inverses and determinants.
* Demonstrate understanding of the concepts of vector space and subspace, linear independence, span, and basis.
* Determine eigenvalues and eigenvectors and solve eigenvalue problems.
* Apply principles of matrix algebra to linear transformations.
* Evaluate and apply double and triple integrals over regions in two and three dimensions using rectangular, polar, cylindrical and spherical coordinates.
* Calculate and apply line and surface integrals using the Fundamental theorem, Green’s theorem, Stokes’ theorem and Divergence theorem.
* Find Fourier series of periodic functions.
* Find the Fourier sine and cosine series for functions defined on an interval.

***Instructor Information***:

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Background: B. Sc. (Hons) in Mathematics, University of Dhaka, Bangladesh

M.S. in Pure Mathematics, University of Dhaka, Bangladesh

***Reference Books***:

1. Elementary Linear Algebra (**Howard Anton and Chris Rorres , 9th ed.)**

2. Calculus: (**Howard Anton, 10th ed. )**

3. Fourier Analysis with application to boundary value Problems: (**M. R. Spiegel, Schaum’s Outline Series)**

***Course procedure:***

Course activities will include lectures and discussion of examples, quizzes, an assignment, a midterm and a comprehensive final examination. **Four quizzes** will be taken and **best three** will be counted out of them. **There will be no makeup quizzes.**

***Class schedule and counseling hour:***

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| --- | --- | --- |
| ***Course ID*** | ***Class schedule*** | ***Counseling Hour*** |
| *MAT 216 (Section: 06)*  *Room# UB21103* | *Sunday: 12:30 pm - 1:50 pm* | *Thursday: 9:30 am - 12:30 pm*  *Room: UB 21506* |
| *Tuesday: 12:30 pm - 1:50 pm* |

***Attendance:***

Attending class is an important component to do well in this course. 5% of the total marks are allocated for attendance. If one does not attend at least 70% of the total classes, s/he will not be allowed to take the final exam.

***Marks distribution:*** Attendance : 5% Attendance Marks

Quiz : 25%

Assignment : 5% 90% & above 5

Midterm : 20% 85% to less than 90% 4

Final : 45% 80% to less than 85% 3

Total : 100% 75% to less than 80% 2

70% to less than 75% 1

Less than 70% 0

***Lecture Delivery Plan:***

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| --- | --- |
| **Lecture No.** | Topics |
| 1 | System of linear equations, Gaussian elimination method. |
| 2 | Matrices, Matrix operations, Gaussian elimination using matrices. |
| 3 | Inverse matrix, Method of finding inverse matrix. |
| 4 | Geometric vector, Vector spaces and subspaces. **Quiz # 01** |
| 5 | Linear combination, Linear independence and dependence |
| 6 | Basis and dimension, Rank and nullity |
| 7 | Linear transformation |
| 8 | Kernel and Nullity of transformation, Eigen values and eigenvectors |
| 9 | Continuation of previous lecture, Diagonalization |
| 10 | Double integrals **Quiz # 02** |
| 11 | Double integrals over nonrectangular regions |
| 12 | **Mid term examination (tentative)** |
| 13 | Double integrals in polar coordinates. |
| 14 | Surface area from double integral. |
| 15 | Triple integrals |
| 16 | Volume integrals |
| 17 | Line integral **Quiz # 03** |
| 18 | surface integral |
| 19 | Problems related to line and surface integrals. |
| 20 | Transformation of coordinates, Jacobian. |
| 21 | Gradient, Divergence and curl of a point function. **Quiz # 04** |
| 22 | Fourier Analysis: Real and complex form, Fourier integrals. |
| 23 | Continuation of Fourier Integral |
| 24 | Fourier transforms |
| 25 | Fourier transforms and their application in solving boundary value problems. |

* Lecture plans can be changed, if necessary, according to the progress of the students.
* You will practice sheets and related materials at [\\tsr\Falll\MNS\SAN\MAT](file:///\\tsr\Falll\MNS\SAN\MAT)216