Course Outline

ULAB UNIVERSITY OF LIBERAL ARTS BANGLADESH

Basic Information

Faculty	Tangila Islam Tanni						
Office Hour	Note: Also available by appointment (e.g. email, phone) at other hours						
Contact Details	**E-mail:** tangila.islam@ulab.edu.bd **Office:** Faculty Room-PC-310 (Permanent Campus)						
Course Pre-requisites	MAT 101						
Department offering the course	Computer Science and Engineering(CSE)						
Course Title	Co-ordinate Geometry and Linear Algebra						
Course type (Core/ Elective)	Core						
Course Code	MAT 102	Credit	03	Term	Spring 2019		
Number of Lectures	24	Number of Tutorials		Number of Practical		Total	24

Course Details

1. Course Description

The subject of Co-ordinate Geometry and Linear Algebra is a very important branch of applied mathematics. Many phenomena from physics, biology and engineering may be described using Co-ordinate Geometry and Linear Algebra. To understand the underlying processes, we must learn and interpret the geometry of complex systems and relate with the algebra to find the solutions of these problems. vector analysis and linear algebra are mostly used in the different engineering fields. The emphasis will be on understanding the concepts of vectors and matrices to describe the physics of engineering problems and to solve numerically for various problems. Some plotting software and MATLAB, excel will be used as tools to visualize and solve various problems.

2. Course Objective

1. To **provide** a thorough understanding the meaning of coordinate geometry, vector calculus and linear algebra with real-life applications and the resource requirements.
2. To **introduce** the various methods of coordinate geometry, vector calculus and linear algebra.
3. To **enable** students to apply the techniques of coordinate geometry, vector calculus and linear algebra.
4. To **emphasize** on efficient for solving practical problems through various formulae to be used in the implementations of technical problems.
5. To **expose** the students to a variety of techniques that have practical applications, while conducting detailed analysis of the requirements.

3. Intended learning outcomes of the course (ILOs)

	1. **Describe** the fundamental theory of Co-ordinate Geometry, Vector Calculus and Linear Algebra.
	2. **Explain** the understanding and application of Vector Calculus and Linear Algebra to the real-life problems i.e. will be experienced on mathematical modeling of physical applications.
	3. **Understand** a practical problem; **apply** techniques and appropriate formulation to implement method to solve the problem.

4. Mapping of Course LO and PLO:

Learning Outcome (LO) of the Course	Program Learning Outcome (PLO)											
	1	2	3	4	5	6	7	8	9	10	11	12
ILO 1	MJ											
ILO 2	MJ	MJ										
ILO 3	MJ	MJ										

5. Contents

SL. NO.	ILO	Topic	Teaching Strategy	Assessment Strategy	Number of Sessions
1	1-3	Coordinate Geometry: Coordinates, polar coordinates, straight lines, Changes of axes, Pair of straight lines and conic sections.	Lecture Exercise	Q/A Test	4
2	3	Vector Analysis: Vector components, vector components in spherical and cylindrical system, vector operators, scalar and dot product. application of vector geometry, Derivative of vector, del, gradient, divergence and curl, physical significance, integration of vector. Line, surface and volume integration, Theorems (Green's, Gauss's, Liouville's, Stoke's) and their applications.	Lecture Exercise	Q/A Test	8
3	1-3	Linear Algebra: Systems of Linear Equations (SLE): introduction to SLE, solution of a SLE, solution of a system of homogeneous LE, Gaussian and Gauss-Jordan elimination, Determinants: factorization, determinant, fundamental properties of determinants, minors and cofactors, Cramer's rules for solving a SLE.	Lecture Exercise	Q/A Test	4
4	1-3	Algebra of Matrices: Matrix, some special types of matrices, transpose, adjoint and inverse of a matrix, algebraic operation on matrices, quadratic	Lecture	Q/A Test	4

		forms solution of a LE by applying matrices, Vector Space: space and subspace, Euclidean n-space, basis and dimension, rank and nullity, Linear Transformations (LT) and its Matrix			
5	3	Representations: LT from to , properties of LT, matrix representation of a LT, diagonalization of LT, Eigen Values and Eigen Vectors: polynomials of matrices and linear operators, eigen values and vectors, diagonalizability, Cayley-Hamilton theorem, characteristic and minimum polynomial Inner Product Spaces: inner product spaces, Cauchy-Schwarz inequality, orthogonality, Gram-Schmidt orthogonalization process, linear functional and adjoint operators, Some Applications of LA.	Lecture Exercise	Q/A Test	4
				Total	24

6. A. Assessment Schedule

Assessment 1	Quiz	Session	Week 5 & Week 11
Assessment 2	Assignment	Session	Week 5, 8 & Week 11
Assessment 3	Mid-term Examination	Session	As per ULAB schedule
Assessment 4	Final Term Examination	Session	As per ULAB schedule

B. Weights of Assessments

Assessments	**%**
Mid-term Examination	25
Final Term Examination	25
Attendance and class performance	15
Assignments	15
Quizzes	20
Total	**100**

C. Grading Policy

Policy	Letter Grade	Grade Point	Assessments
95% and above	A+	4.00	Outstanding
85% to below 94%	A	4.00	Superlative
80% to below 84%	A-	3.80	Excellent
75% to below 79%	B+	3.30	Very Good
70% to below 74%	B	3.00	Good
65% to below 69%	B-	2.80	Average
60% to below 64%	C+	2.50	Below Average
55% to below 59%	C	2.20	Passing
50% to below 54%	D	1.50	Probationary
below 50%	F	0.00	Fail
--	I	0.00	Incomplete
--	W	0.00	Withdrawn
--	AW	0.00	Administrative Withdrawal

7. List of References

Course Notes	Please be regular in the lectures and check the ULAB moodle repository and the facebook group page to access course notes.
Essential Books (Text Books)	1. Elementary Linear Algebra – Applications Vrsion, 11th edition by Howard Anton 2. Differential and Integral Calculus-F.Ayres (Schaum's Outline Series) 3. Calculus – Early Transcendentals, 7th edition by James Stewart 4. Vector Analysis By Murray R. Spiegel (Schaum's Outline Series) 5. Linear Algebra- Lipschutz, (Schaum's Outline Series)
Recommended Reference Books	1. Calculus by Thomas Finney 2. Advanced Calculus- M. Spiegel (Schaum's Outline Series) 3. Linear Algebra – Gilbert Strang
Periodicals	N/A
Online Resources	

Facilities Required for Teaching and Learning

Multimedia Projector, Whiteboard, Internet access from classroom computer, Audio/Visual equipments.

Course Policies and Procedures

1. **Class attendance:** Regular attendances of classes are mandatory and students will be assigned F automatically if he/she misses 6 consecutive classes with no proper reason.
2. **Late submission of work:** Late submission will be followed by penalty, please maintain deadlines.

3. **Make up procedures:** ULAB guidelines will be followed for the makeup of the Midterm and Final Examination.
4. **Unfair means /plagiarism:** Plagiarism is a form of cheating so will not be accepted. Original work is encouraged as they will carry value marks.

Appendix-1: Program Learning Outcome (PLO)

No.	PLO
1.	Engineering Knowledge
2.	Problem Analysis
3.	Design/Development of Solutions
4.	Investigation
5.	Modern Tool Usage
6.	The Engineer and Society
7.	Environment and Sustainability
8.	Ethics
9.	Communication
10.	Individual and Team Work
11.	Life Long Learning
12.	Project Management and Finance

Generic Skills (Detailed):

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development;
8. **Ethics (ESSE)** –Apply professional ethics with Islamic values and commit to responsibilities and norms of professional engineering code of practices.
9. **Communication (S)** -Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

Tangila Islam Tanni

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Course Coordinator/ Teacher

Date: 1.7.2020

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Head of the Department

Date: 1.7.2020