



Multi-Dimensional Mathematics

COURSE SYLLABUS

Course Code	Course Name	Credits	Contact Hours
0404205	Multi-Dimensional Mathematics	3	48

INSTRUCTOR/COORDINATOR

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TEXTBOOK

Course Materials: The material of this course will be in the form of handouts from the following references:

- **Textbook (TxB) : Murray Spiegel, Theory and problems of vector analysis, Schaum's outline series, McGraw Hill company, 1959.**
- **Instructor Handouts (IHOs): Mohammad Aliedeh, Group of Handouts in Tensor Analysis and Transport Phenomena, 2002.**

Reference: Bird, B. Stewart and Lightfoot, Transport Phenomena, John Wiley and sons, 1st and 2nd editions.

SPECIFIC COURSE INFORMATION

A. Brief Description of the Content of the Course (Catalog Description)

Studying multiple integrals, vector analysis, tensor analysis, surface and volume integrals with engineering and chemical engineering applications.

B. Pre-requisites (P) or Co-requisites (C)

(P): Calculus 2 (0301102)

C. Course Type (Required or Elective)

Required (Compulsory Department course)

SPECIFIC GOALS

A. Specific Outcomes of Instruction

By the end of this course, the student should be able to:

1. **Vectors and Scalars (SLO 1)**
2. **Dot and Cross Product (SLO 1)**
3. **Vector Differentiation**
4. **Gradient, Divergence and Curl (SLO 1)**
5. **Vector Integration (Linear, Surface and Volume Integral) (SLO 1)**
6. **Vector Operations (Algebra of Vectors) (SLO 1)**
7. **Tensor Operations (Algebra of Tensors) (SLO 1)**
8. **The vector and Tensor Differential Operations (Tensor Calculus) (SLO 1)**
9. **Curvilinear Coordinates (SLO 1)**
10. **Vector and Tensor Algebra in Curvilinear Coordinate (SLO 1)**
11. **Differential Operations in Orthogonal Curvilinear Coordinate (SLO 1)**
12. **Reinforcing the above topics by studying Engineering and Chemical Engineering Applications (SLO 1)**

B. Student Learning Outcomes (SLOs) Addressed by the Course

1	2	3	4	5	6	7				
✓										

BRIEF LIST OF TOPICS TO BE COVERED

List of Topics	No. of Weeks	Contact Hours
Vectors and Scalars	1	3
Dot and Cross Product	1	3
Vector Differentiation	2	6
Gradient, Divergence and Curl	2	6
Vector Integration (Linear, Surface and Volume Integral)	1	3
Vectors and Scalars		
Mid Term Exam	1	3
Vector Operations (Algebra of Vectors)	1	3

Tensor Operations (Algebra of Tensors)	1	3
The vector and Tensor Differential Operations (Tensor Calculus)	3	9
Curvilinear Coordinates	2	6
Vector and Tensor Algebra in Curvilinear Coordinate	1	3
Differential Operations In Orthogonal Curvilinear Coordinate	1	3
Reinforcing the above topics by studying Engineering and Chemical Engineering Applications	1	3
Final Exam	1	3
Total	16	48

METHODS OF ASSESSMENT			
No.	Method of assessment	Week and Date	%
1	1st Examination	5th week	20
2	2 nd Examination	10th week	20
3	Homeworks, projects and Activities	All over the Semester	10
3	Final examination	End of Semester	50
Total			100