

Course Syllabus

Course: *CM5100 Applied Mathematics for Chemical Engineers*

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References:

1. V.G. Jenson and G. V. Jeffreys, *Mathematical Methods in Chemical Engineering*, Academic Press, 1977
2. G. Strang, *Introduction to Applied Mathematics*, Wellesley-Cambridge Press, 1986
3. N. Amundson and R. Aris, *Mathematical Methods in Chemical Engineering*, Prentice Hall, 1966
4. J. Friedly, *Dynamic Behavior of Processes*, Prentice Hall, 1972
5. H. Mickley, T. Sherwood and C. Reed, *Applied Mathematics in Chemical Engineering*, McGraw Hill, 1957
6. D. Zwillinger, *Handbook of Differential Equations*, Academic Press, 1998
7. C.R. Wylie and L.C. Barnett, *Advanced Engineering Mathematics*, McGraw Hill, 1995
8. R.L. Burden and J.D. Faires, *Numerical Analysis*, Prindle, Weber & Smith, 1985

Requirements:

1. Assignments: 60 pts
2. Exams: 40 pts

Grades:

100	- 90	A
89.99	- 80	AB
79.99	- 70	B
69.99	- 65	BC
64.99	- 60	C
59.99	- 55	CD
54.99	- 50	D
49.99	- 0	F

Course Outline

	Week No.
I. Matrix and Vector Theory	
a. Review of Matrices	
- Matrix Operations	1
- Solution of $Ax=b$	
- Least Squares Method	2
- Eigenvalues and Eigenvectors	3
b. Vector and Tensor Analysis	
- Notations and Operations	4
- Curvilinear Coordinates	5
- Integral Theorems	
II. Ordinary Differential Equations	
a. Review of Solutions of ODEs	
- First Order	6
- Higher Order	
- Symmetry (Similarity) Methods	
b. Systems of Linear Differential Equations	
- Stability	7
- Diagonalization	
c. Numerical Methods	
- Euler and Runge-Kutta Methods	8
- Multistep Methods	
- Boundary Value Problems	
d. Nonlinear Differential Equations	
- Qualitative Analysis	9
- Stability and Limit Cycles	
e. Series Solutions	
- Frobenius Methods	10
- Bessel and Legendre Equations	
III. Partial Differential Equations	
a. Classification and Boundary Conditions	
b. First Order and the Method of Characteristics	11
c. Higher Order PDEs	
- Similarity Transformations	12
- Orthogonal Functions	
- Separation of Variables	13
- Laplace Transform Methods	14
d. Numerical Methods	
- Finite difference methods	15