



Department of Mathematics

Numerical Methods – MATH 330

Course Outline – Second Semester 2022/2023

Textbook: John H. Mathews & Kurtis D. Fink. *Numerical Methods Using Matlab*. Pearson Education Inc., 4th Edition, 2004.

Reference: Richard L. Burden & J. Douglas Faires. *Numerical Analysis*. Brooks/Cole, Cengage Learning, 9th Edition, 2010.

Course Content:

Chapter	Title	Section
Ch1	Preliminaries	1.1, 1.3
Ch2	Solution of Nonlinear Equations $f(x) = 0$	2.1, 2.2, 2.3, 2.4
Ch3	Solution of Linear Systems $Ax = b$	3.3, 3.4, 3.5, 3.6, 3.7
Ch4	Interpolation and Polynomial Approximation	4.1, 4.2, 4.3, 4.4
Ch5	Curve Fitting	5.1, 5.2, 5.3
Ch6	Numerical Differentiation	6.1, 6.2
Ch7	Numerical Integration	7.1, 7.2, 7.5
Ch9	Solution of Differential Equations	9.2, 9.3, 9.4, 9.5

Grading Policy¹:

Quizzes	10 %
First Exam	25 %
Second Exam	25 %
Final Exam	40 %

¹If we could not make two hour exams, then we go for Midterm (35%), Quizzes (15%) and Final (50%).

Topics to be Covered together with Assigned Problems & Number of Lectures			
Sec.	Section Title	Problems	Lecture
1.1	Review of Calculus	Part (a) of the 1 – 12	1
1.3	Error Analysis	2, 3, 5(b), 8, 9	2 + 3
2.1	Iteration for Solving $x = g(x)$	1, 2, 3, 4, 5, 8, 9	4+5+6
2.2	Bracketing Methods for Locating a Root	1, 3(a+b), 5, 8, 12	7+8
2.3	Initial Approximation and Convergence Criteria	1 – 6	9
2.4	Newton-Raphson and Secant Methods	1, 3, 5, 8, 10, 12, 13, 18, 21, 23	10+11+12
3.3	Upper-Triangular Linear Systems	4, 5, 7	13
3.4	Gaussian Elimination and Pivoting	1, 5, 11, 14(a), 15	14+15
3.5	Triangular Factorization	3(a), 6	16
3.6	Iterative Methods for Linear Systems	5, 7	17
3.7	Iteration for Nonlinear Systems ²	2(a+b), 5, 10	18+19
4.1	Taylor Series and Calculation of Functions	1, 3, 4, 12	20
4.2	Introduction to Interpolation	1, 3	20
4.3	Lagrange Approximation	2, 5, 6, 7, 8, 9, 10, 11, 12, 13	21+22
4.4	Newton Polynomials	5, 7, 9, 11	23
5.1	Least-Squares Line	1(a), 3(a), 4, 8, 10(c)	24
5.2	Methods of Curve Fitting	1(a), 5, 11, 17	25
5.3	Interpolation by Spline Functions	1, 3, 4, 5, 15	26
6.1	Approximating the Derivative	1, 4, 6, 10, 11	27+28
6.2	Numerical Differentiation Formulas	1, 3, 7, 9, 10, 11	29 + 30
7.1	Introduction to Quadrature	1(b), 3, 6, 8, 9	31 + 32
7.2	Composite Trapezoidal and Simpsons Rule	1(a), 2, 4, 5, 6, 8	33
7.5	Gauss-Legendre Integration (Optional)	4, 9, 11	34
9.2	Eulers Method	1, 3, 8	35
9.3	Heuns Method	1, 3, 7	36
9.4	Taylor Series Method	1, 3	37
9.5	Runge-Kutta Methods	1, 3	38

Remarks:

- Attendance is extremely necessary. If a student misses a class, he/she will be responsible for the material covered in that class.
- If a student cheats other students' ideas, this results in immediate course fail with final expulsion possibility.
- Make up exam is only for the final exam conditioned with an acceptable excuse via Ritaj portal within 48 hours. Otherwise, the absentee gets **Fail Absent**.
- In case of missing one of the other two exams with an acceptable excuses, the formula in the student guide for grades will be used. Otherwise, the absentee gets zero.

²Seidel and Newtons Methods (Optional)

- Exams instructions: Mobiles must be set off; and personal BZU ID is mandatory.
- The student should check his/her personal Ritaj account daily.
- The student has to bring his/her own scientific calculator to each class.