Lecture 1 [3.3] – Upper Triangular System and Matlab

– Ch.3 Solution of Linear Systems

– 3.3 Upper Triangular Systems

Lecture 2 [3.4] – Gaussian Elimination and Pivoting

– **Gaussian Elimination**

- no pivoting ex.1 pg.2
- partial pivoting ex.2 pg.5

Lecture 3 [3.5] – Triangular Factorization Matrix Factorization

-3.5 Triangular Factorization (Matrix Factorization)

- **LU decomposition**

-no pivoting ex.1 pg.2

-pivoting ex.2 pg.6

Lecture 4 [3.6] – Cholesky Factorization and Jacobi Method for Linear Systems

-Section 3.6

-**Cholesky Factorization**

-Iterative Methods for Linear Systems

-Jacobi Method

-ex.1

-ex.2

-Condition of Convergence

Lecture 5 [3.7] – Gauss-Seidel Method for Linear Systems and Eigenvalues

- Gauss-Seidel Iterative Method

-ex.1

-ex.2

-ex.3

-Eigenvalues and Eigenvectors 11.1 pg.6

-ex.1

Lecture 6 [11.1, 11.2] – Eigenvalues and Eigenvectors

-Matlab Eigenvalues and Eigenvectors

-Power Method 11.2

-ex.1

-ex.2, pg.6

-ex.3 pg.8 – two dominant eigen values, the dominant eigen value is not unique.

Lecture 7 [11.2, 2.2] – Eigenvalues and Eigenvectors and Fixed-Point Method

-Section 11.2 **Shifted Inverse Power Method**

-ex.1

-ex.2

-Section 2.1 Ch2 Solution of Non-Linear Equations f(x)=0

-Fixed-Point Method

-ex.1

-ex.2

-Matlab

Lecture 8 [2.1, 2.2] – Fixed Point Method, Bisection Method and Regula Falsi Method

-Section 2.1 Ch2 cont.

-Fixed-Point Method

-Matlab

-ex.2

-ex.3

- Bracketing Methods (Bisection & Regula Falsi) pg.5

-Bisection Method

-ex.1

-Regula Falsi Method (False Position) pg.8

-ex.1

Lecture 9 [2.4] – Newton's Method and Systems of Linear Equations

-Newton's Method

-ex.1

-ex.2

- Secant Method pg.4

-ex

- Convergence info pg.8

Lecture 10 [2.4, 3.7] – Modified Newton's Method and Systems of Linear Equations

- Convergence info

- Acceleration of Newton's Method

-System of Nonlinear Equations 3.7

-ex.1 Jacobi pg.4-part b

Gauss-Seidel pg.5-part c

- Conditions of Convergence

-ex

Lecture 11 [3.7, 4.1] – Systems of Linear Equations and Taylor Polynomials

-Section 3.7 **Systems of Linear Equations**

-ex.2

- Ch.4 Interpolation and Polynomial Approximation

- Section 4.1 **Taylor Polynomials**

-ex.1

Lecture 12 [4.2, 4.3] – Interpolation Polynomials, Lagrange Polynomials

- Section 4.2 **Interpolation Polynomials**

-ex.1

-Matlab

-Section 4.3 **Lagrange Polynomials**

-ex.1

Lecture 13 [4.3] – Lagrange Polynomials

-Section 4.3 **Lagrange Polynomials cont**.

-Matlab

-Ex.2

-Ex.3

Lecture 14 [4.4] – Newton Polynomials

-Section 4.4 **Newton Polynomials**

-

-

-

Lecture 15 [5.1] – Least Squares Lines

-Section 5.1 **Least Squares Lines**

-

-

-

Lecture 16 [5.1, 5.2] – Least Squares Curves

-

Lecture 17 [5.1, 6.1] – Least Squares Curves and Numerical Differentiation

-

Lecture 18 [6.1, 6.2, 7.1] – Numerical Differentiation and Numerical Integration

-

Lecture 19 [7.1, 7.2] – Numerical Integration

-

Lecture 20 [7.2, 7.4] – Composite Trapezoidal and Composite Simpson Rules and Adaptive Quadrature

-

Lecture 21 [8.1] – Minimization of Functions, Golden Ration Method

-

Lecture 22 [8.1] – Golden Ratio Search Method

-

Lecture 1 – Upper Triangular System and Matlab

– Part1 Section 3.3

– Part 2 Matlab

Ch3 Solution of Linear Systems

Upper Triangular Systems

Ex.1

Ex.2

Matlab

Lecture 2 – Gaussian Elimination and Pivoting

– Part1 Section 3.4

– Part2 Section 3.4

Gaussian Elimination

Ex.1

Ex.2

Matlab

Lecture 3 – Triangular Factorization (Matrix Factorization)

– Part1 Section 3.5

– Part2 Section 3.5

Triangular Factorization (Matrix Factorization)

Case 1 – without row interchange

Ex.1

Case 2- with row interchanged

Ex.2

Matlab

Lecture 4 – Cholesky Factorization and Jacobi Method for Linear Systems

– Part1 Cholesky Factorization

– Part2 Section 3.6

Cholesky Factorization

Iterative Methods for Linear Systems

Jacobi Method

Ex.1

Ex.2

Lecture 5 – Gauss-Seidel Method for Linear Systems and Eigenvalues

– Part1 Section 3.6

– Part2 Section 11.1

Gauss-Seidel Iterative Method

Ex.1

Ex.2

Ex.3

Eigenvalues and Eigenvectors

Lecture 6 – Eigenvalues and Eigenvectors

– Part1 Section 11.1 & 11.2

– Part2 Section 11.2

Matlab

Power Method

Ex.1

Ex.2

Ex.3

Lecture 7 – Eigenvalues and Eigenvectors and Fixed-Point Method

– Part1 Section 11.2

– Part2 Section 2.1

Shifted Inverse Power Method

Ex.1

Ex.2

Ch.2 Solution of Non-Linear Equations f(x)=0

Fixed Point Method

Theorem

Ex.1

Lecture 8 – Fixed Point Method, Bisection Method and Regula Falsi Method

– Part1 Section 2.1

– Part2 Section 2.2

Ex.2

Ex.3

Bracketing Methods

Bisection Method

Ex.1

The Method of False Position (Regula Falsi Method)

Ex.

Lecture 9 – Newton's Method and Systems of Linear Equations

– Part1 Section 2.4

– Part2 Section 2.4

Newton's Method

Ex.1

Ex.2

Secant Method

Ex.

Lecture 10 – Modified Newton's Method and Systems of Linear Equations

– Part1 Section 2.4

– Part2 Section 3.7

Speed of Convergence

Acceleration of Newton's Method

Ex.

3.7 System of Nonlinear Equations

Conditions of Convergence

Lecture 11 – Systems of Linear Equations and Taylor Polynomials

– Part1 Section 3.7

– Part2 Section 4.1

3.7 System of Nonlinear Equations

Ex.2

Ch.4 Interpolation and Polynomial Approximation

4.1 Taylor Polynomials

Ex.

Lecture 12 – Interpolation Polynomials, Lagrange Polynomials

– Part1 Section 4.2

– Part2 Section 4.3

Section 4.2 Interpolation Polynomials

Ex.

4.3 Lagrange Polynomials

Ex.1

Lecture 13 – Lagrange Polynomials

– Part1 Section 4.3

Ex.2

Ex.3

Lecture 14 – Newton Polynomials

– Part1 Section 4.4

– Part2 Section 4.4

Newton Polynomials

Ex.1

Ex.2

Lecture 15 – Least Squares Lines

– Part1 Section 5.1

– Part2 Section 5.1

Curve Fitting

Least Squares Line

Ex.1

Ex.2

Lecture 16 – Least Squares Curves

– Part1 Section 5.1

Power Fit

Ex.

– Part2 Section 5.2

5.2 Methods of Curve Fittings

Ex.

Lecture 17 – Least Squares Curves and Numerical Differentiation

– Part1 Section 5.2

Nonlinear Method for Least-Squared Curves

Ex.

– Part2 Section 6.1

Numerical Differentiation

Difference Formulas

Ex.1

Ex.2

Lecture 18 – Numerical Differentiation and Numerical Integration

– Part1 Section 6.1 & 6.2

Higher Order Derivatives

Ex.3

Ex.4

– Part2 Section 7.1

Numerical Integration

Lecture 19 – Numerical Integration

– Part1 Section 7.1

7.2 Composite Trapezoidal Rule

– Part2 Section 7.1 & 7.2

Ex.1

Ex.2

The Degree of Precision

Ex.

Lecture 20 – Composite Trapezoidal and Composite Simpson Rules and Adaptive Quadrature

– Part1 Section 7.2

7.2 Composite Simpson Rule

Ex.1

Ex.2

– Part2 Section 7.4

7.4 Adaptive Quadrature

watch lecture

Lecture 21 – Minimization of Functions, Golden Ration Method

– Part1 Section 8.1

Minimization of a Function of One Variable

Ex.1

– Part2 Section 8.1

Golden Ratio Method

Lecture 22 – Golden Ratio Search Method

– Part1 Section 8.1

Ex.1

Ex.2