Engineering Mathematics
25735
Winter-Spring 2016
Sharif University of Technology

INSTRUCTOR: Amir Borji, Room 211 (Ext. 4381, Email: aborji@sharif.edu)

SCHEDULE: **Lectures: Sat/Mon 10:30-12:00 in Alef 25 Tutorials: ?**

CLASS WEBSITE: **http://sharif.edu/~aborji/25735/**

TEXT and REFERENCES:

1 - ***Engineering Mathematics*** **(in Farsi)**, J. Rashed Mohassel, 1393, University of Tehran Publications

2 - *Advanced Engineering Mathematics*, 10th Ed., E. Kreyszig, 2011, John Wiley & Sons Inc. (Chapters 11 to 17)

3 - ***Complex Variables and Applications***, 8th Ed., J. W. Brown and R. V. Churchill, 2009, McGraw-Hill Inc. (Chapters 1 to 9)

4 - ***Fourier Series and Boundary Value Problems***, 5th Ed., J. W. Brown and R. V. Churchill, 1993, McGraw-Hill Inc. (Chapters 1 to 6)

5 - *Advanced Engineering Mathematics*, 6th Ed., C. R. Wylie and L. C. Barrett, 1995, McGraw-Hill Inc. (Chapters 8, 9, 11, 17 to 20)

6 - *Advanced Engineering Mathematics*, A. Jeffrey, 2002, Academic Press (Chapters 9, 10, 13 to 18)

"TENTATIVE" COURSE OUTLINE:

Fourier Analysis

- ◊ Fourier series (real and complex forms), approximation of periodic functions
- ◊ Even and odd functions, half range expansions
- ◊ Convergence of Fourier series, absolute and uniform convergence, integration and differentiation of Fourier series
- ◊ Bessel inequality, Parseval theorem
- ◊ (*) Double Fourier series
- ◊ Fourier transform, Sine and Cosine transforms, properties of Fourier transform

Partial Differential Equations

- ◊ Basic concepts of PDEs, classification of PDEs, transforming second order PDEs to canonical form (Elliptic, Hyperbolic, or Parabolic)
- ◊ Separation of variables, simple illustrative examples
- ◊ Sturm-Liouville problems, Orthogonality of eigenfunctions, generalized Fourier series
- ◊ Heat equation, Wave equation, and Laplace equation in rectangular and cylindrical coordinates
- ◊ Solutions in semi-infinite and infinite domains: applications of Fourier transform

Mid-term Exam: Thu 95/02/09 8:30AM

Complex Analysis

- ◊ Complex numbers, geometrical interpretation, polar representation
- ◊ Products, powers, and roots of complex variables
- ◊ Functions of a complex variable, continuity, limit, and derivative, *analytic functions*

- ◊ Cauchy-Riemann equations, harmonic functions
- ◊ Mappings by elementary complex functions: exponential function, trigonometric functions, hyperbolic functions, logarithmic function, complex exponents
- ◊ Branch cuts and branch points, Riemann sheets
- ◊ Line integrals (contour integrals) in complex plane, Cauchy-Goursat theorem, Cauchy integral formula, derivatives of analytic functions, Liouville theorem, Morera's theorem, maximum modulus theorem
- ◊ Infinite sequences and series, power series, Taylor series, Laurent series, uniform and absolute convergence of power series
- ◊ Singular points of complex functions, classification of singular points, residues, Cauchy residue theorem, applications of residue theorem in evaluation of proper and improper definite integrals, Jordan's lemma, integrals with branch cuts,
- ◊ (*) Argument principle, zeros of analytic functions
- ◊ (*) Inverse Laplace transform
- ◊ Conformal mapping and its applications in solving the Laplace equation

GRADING POLICY:

Mid-term exam: 40-50%
Final exam: 40-50%
Homework, quizzes, attendance: 10-15%

Quizzes: Four quizzes will be taken in tutorial classes (based on homeworks)

Attendance: If you are absent in 6 lectures, you fail the course with no exceptions. Students are not allowed in class 15 minutes after the lecture starts