

**DEPARTMENT OF ELECTRICAL ENGINEERING
UNIVERSITI TENAGA NASIONAL**

Kajang, Selangor D.E., Malaysia

EEEB 233/334 SIGNALS AND SYSTEMS

Academic Year 2005/2006 Semester 1

Handout #1 - Syllabus and General Information

Objective

On the successful completion of this course, the student should be able to

- identify signals and systems, both continuous and discrete-time,
- describe and represent signals, both in the time and frequency domains,
- analyze LTI continuous and discrete-time systems, both in the time and frequency-domains,
- apply (at an introductory level) the above techniques to simple dynamic systems,
- use software tools, such as MATLAB, for the above applications.

Synopsis

Signal and System Modeling Concepts, Time-Domain Analysis, Frequency-Domain Analysis using Fourier Series, Fourier Transform, Laplace Transform, and Z-Transform Techniques.

Mathematical Background Required

The following topics that you have studied in earlier courses will play an important part in the understanding of this course.

1. Complex numbers
2. Geometric Series
3. Differentiation and Integration
4. Differential Equations

Hence, please review them *before* beginning the course.

Syllabus

1. Introduction (Chapter 1) [9+3]
 - Mathematical Preliminaries
 - Signals: Definition, Basic Signals, Classification, Properties, Transformations
 - Systems: Definition, Classification, Properties, Interconnections.
2. Time-Domain Analysis (Chapter 2) [9+3]
 - Representation of Signals: Using Impulses,
 - Properties of LTI systems,
 - Response of LTI Systems: (Convolution Sum and Integral),
 - Causal LTI systems described by difference and differential equations.
3. Frequency-Domain Analysis (Chapters 3, 4, 5, 7.0-7.1, 8.1-8.2) [14+4]
 - Representation of Signals: Fourier Series, Fourier Transforms
 - Response of LTI Systems: Complex Exponential as an eigenfunction, Frequency-response.
 - Sampling Theorem
4. The Laplace Transform (Chapter 9.0-9.3, 9.5, 9.6, 9.9) [5+2]
 - Generalization of the Continuous-Time Fourier Transform
 - Applications
5. The Z Transform (Chapter 10.0-10.3, 10.9) [5+2]
 - Generalization of the Discrete-Time Fourier Transform
 - Applications

Text

The primary text used will be [9].

References

- [1] R. Ellis and D. Gulick. *Calculus with Analytic Geometry*. Saunders College Pub., 5th edition.
- [2] R. L. Finney, M. D. Weir, F. R. Giordano, and G. B. Thomas. *Thomas' Calculus*. Addison-Wesley, 10th edition.

- [3] R. A. Gabel and R. A. Roberts. *Signals and Linear Systems*. John Wiley and Sons, Inc., 2nd edition.
- [4] S. Haykin and B. V. Veen. *Signals and Systems*. John Wiley & Sons, Inc., 1999.
- [5] W. J. Palm III. *Introduction to MATLAB 6 for Engineers*. McGraw Hill, 1st edition, 2001.
- [6] The Mathworks Inc. *Student version MATLAB*. Prentice Hall.
- [7] E. W. Kamen and B. S. Heck. *Fundamentals of Signals and Systems using the Web and MATLAB*. Prentice Hall, Singapore, 2nd edition.
- [8] C. D. McGillem and G. R. Cooper. *Continuous and Discrete Signals and Systems Analysis*. Holt, Rinehart and Winston, Inc.
- [9] A. V. Oppenheim, A. S. Willsky, and H. S. Nawab. *Signals and Systems*. Prentice Hall, 2nd edition.
- [10] G. L. Peterson. *Algebra and Trigonometry*. Wadsworth Pub. Co., 1984.
- [11] A. D. Poularkis and S. Seely. *Signals and Systems*. PWS-Kent Publishing Company, 2nd edition.
- [12] M. J. Roberts. *Signals and Systems*. McGraw Hill, 1st edition, 2004.
- [13] S. L. Salas, E. Hille, and G. J. Etgen. *Salas and Hille's Calculus : One and Several Variables*. Wiley, 7th edition.
- [14] E. W. Swokowski and J. A. Cole. *Fundamentals of Algebra and Trigonometry*. PWS-Kent Pub. Co., 8th edition.
- [15] R. L. Ziemer, W. H. Tranter, and D. R. Fannin. *Signals and Systems: Continuous and Discrete*. Macmillan Publishing Company, 3rd edition.

Computer Usage

MATLAB

Assignments

Assignments will be given from time to time. You *MUST DO ALL* assignments. You will be *REQUIRED* to hand in certain assignments. Assignments *MUST BE HANDED-IN* by the *STIPULATED TIME and DAY*. Otherwise you will be given zero marks.

Coursework Assessment

1. Four tests 30%
 - Test 1 (Week 5)
Topics: Introduction to Signals and Systems
 - Test 2 (Week 8)
Topics: Time Domain Analysis
 - Test 3 (Week 11)
Topics: Frequency Domain Analysis - The Fourier Series
 - Test 4 (Week 13)
Topics: Frequency Domain Analysis - The Fourier Transform
2. Assignments including MATLAB 10%
3. Final Examination 60%

Week 1: Monday July 04, 2005 – Friday July 08, 2005
Week 5: Monday August 01, 2005 – Friday August 05, 2005
Week 8: Monday August 22, 2005 – Friday August 26, 2005
Week 11: Monday September 12, 2005 – Friday September 16, 2005
Week 13: Monday September 26, 2005 – Friday September 30, 2005

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Most handouts, tutorials, solutions to selected problems will be placed here. This is a work in progress. Hence, I will try to update as much as my schedule permits.

Good luck and enjoy the course!