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| **logoUniversity of Management & Technology**  School of Engineering  Department of Electrical Engineering | | | |
| EE 315 Signals and Systems | | | |
| **Lecture Schedule** | See EED Timetable | **Semester** | Fall 2013 |
| **Pre-requisite** | None | **Credit Hours** | 3 |
| **Instructor(s)** | Saleem Ata (B and C)  Muhammad Asim Butt (D and E)  Muhammad Ilyas Khan (Sec A) | **Contact** | [saleemata@umt.edu.pk](mailto:saleemata@umt.edu.pk)  [asim.butt@umt.edu.pk](mailto:asim.butt@umt.edu.pk)  [ilyas.khan@umt.edu.pk](mailto:ilyas.khan@umt.edu.pk) |
| **Office** | 2nd floor, 3s\_33 | **Office Hours** | See office window |
| **Teaching Assistant** | None | **Contact** | N/A |
| **Office** | N/A | **Office Hours** | N/A |
| **Course Description** | This is a backbone course for many engineering programs and leads to a foundation in analyzing engineering problems. The course begins with classification of signals and systems and then proceeds to provide analytical tools in time-domain and frequency domain for both continuous and discrete environment. Specifically, the students are trained in using convolution, Fourier series and Fourier transforms. MATALB is extensively used as a visualization and analytical tool as part of the course. | | |
| **Learning Outcomes** | Refer the attached sheet. | | |
| **Textbook(s)** | **Required:**  Signals & Systems by Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley & Sons  **Reference:**  Signals & Systems by Alan V. Oppenheim and Alan S Willisky, 2nd Edition, Pearson Education Inc. | | |
| **Grading Policy** | Quizzes: 15%  Home works : 10%  Midterm : 25%  Final : 50% (Comprehensive) | | |

**Course Schedule**

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| **Lecture** | **Topics** | **Textbook (TB) / Reference Book (RB) Reading** |
| 1 | Introduction | 1.1-3 |
| 2 | Introduction to Complex Numbers |  |
| 3 | Classification of Signals; Basic Operations on Signals | 1.4-5 |
| 4 | Elementary Signals | 1.6 |
| 5 | Interconnection of Systems; Properties of Systems | 1.7-8 |
| 6 | Properties continued | 1.8 |
| 7-8 | The Convolution Sum and its evaluation | 2.2-3 |
| 9-10 | Convolution Integral and its evaluation | 2.4-5 |
| 11 | LTI System Properties and Impulse Response/Step Response | 2.7-8 |
| 12 | LTI Systems as Differential and Difference Equations | 2.9 |
| 13 | Complex Sinusoids and Frequency Response | 3.2 |
| 14 | Fourier Representation of Four Classes of Signals | 3.3 |
|  | **Midterm** |  |
| 15-16 | Discrete-Time Fourier Series | 3.4 |
| 17-18 | Continuous-Time Fourier Series | 3.5 |
| 19-20 | Discrete-Time Fourier Transform (DTFT) | 3.6 |
| 21-22 | Continuous-Time Fourier Transform | 3.7 |
| 23-24 | Properties of Fourier Representation | 3.8-16 |
| 25-26 | Fourier Transform of Periodic Signals; Sampling, aliasing | 4.2-5 |
| 27-28 | Introduction to Laplace transform |  |
| 29-30 | Introduction to Z-transform |  |

Learning Outcomes:

1. Understand analytical environment of signals and systems.
2. Appreciate few examples of physical systems.
3. Able to define various classes of signals and understand their relevance to analysis.
4. Able to perform time-shifting, flipping, and scaling of signals, in any combination, graphically and analytically, and on both discrete and continuous signals.
5. Demonstrate mathematical and graphical representation and properties of impulse function, step function, sinusoids and complex sinusoid, rectangular pulse and Sinc functions.
6. Evaluate equivalent system of inter-connected systems.
7. Understanding of Impulse-response.
8. Be able to identify whether a system is linear, time-invariant, memoryless, causal, stable and invertible from a mathematical representation of the system..
9. Be able to determine system’s properties (memory, causality, invertibility, stability) of LTI systems from a given impulse response.
10. Evaluate convolution-sum of two discrete expressions or graphs.
11. Evaluate convolution-integral of two continuous expressions or graphs.
12. Be able to evaluate impulse and step response from a given differential and difference equations.
13. Be able to evaluate discrete-time Fourier series of discrete periodic signal and plot line spectrum.
14. Be able to evaluate Fourier series of continuous periodic signal and plot line spectrum.
15. Be able to apply properties of Fourier series to evaluate Fourier coefficients.
16. Be able to evaluate Discrete-Time Fourier Transform (DTFT) and plot the resulting spectrum.
17. Be able to evaluate Fourier Transform (FT) and plot the resulting spectrum.
18. Be able to apply properties of Fourier transform and DTFT with the understanding of the basic differences.
19. Be able to evaluate FT and DTFT of periodic signals.
20. Be able to define and describe sampling operation in time and frequency-domain, mathematically and graphically, with a view to Nyquist sampling theorem.
21. Be able to determine whether a sampled signal will alias.
22. Be able to mathematically demonstrate the reconstruction of a sampled signal.