**University of Management and Technology**

**Course Outline**

Course code………EE415……...... Course title……Digital Signal Processing…

|  |  |
| --- | --- |
| Program | BSEE |
| Credit Hours | 3 |
| Duration | One semester |
| Prerequisites | Applied Calculus (MA111)  Signals and Systems (EE315) |
| Resource Person | Muhammad Asim Butt |
| Counseling Timing  (Room# SEN 503 ) | 10:00 AM to 12:30 PM. Monday to Thursday |
| Contact | [asim.butt@umt.edu.pk](mailto:asim.butt@umt.edu.pk) |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

This course provides an introduction to the theory and application of DSP based on the knowledge gained in pre-requisite course “Signals and Systems”. The course covers discrete-time signals and systems and their analysis in time domain and frequency domain. The learning carrier is the structure, analysis and design of typical FIR and IIR systems. The effect of finite precision machines on the quantized discrete values will also be discussed. Use of Matlab DSP toolbox is an integral part of the course. This course directly contributes to **objectives** a, d, e, and f of the HEC Electrical Engineering Curriculum.

**Learning Methodology:**

Lectures: Whiteboard will be used as normal instruction medium. Multimedia will be used where necessary. Class sessions will be interactive.

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 10%

Assignments 10%

Mid Term 30%

Attendance & Class Participation NA

Term Project NA

Presentations NA

Final exam 50%

Total 100%

**Recommended Text Books:**

Digital Signal Processing Principles, Algorithms, and Applications (Fourth edition) by John G. Proakis and Dimitris G. Manolakis

**Reference Books:**

Discrete‐Time Signal Processing, 2nd /3rd Edition, by Alan V. Oppenheim, Ronald W. Schafer, Published by Pearson Press.

**Calendar of Course contents to be covered during semester**

**Course code………EE415……...... Course title…Digital Signal Processing**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lecture** | **Course Contents** | | **Reference Chapter(s)** |
| 1 | **Introduction**  DSP Syllabus, class administration, Motivation for DSP, few real life examples. Component of a DSP system (ADC/DAC, Filters, DSP Processors), Applications of DSP. | | Chap-1 |
| 2 | 1.2 Classification of Signals  1.3 The concept of frequency in Continuous-time and Discrete-time signals | | Chap-1 |
| 3 | **Discrete time Signals and Systems**  2.1 Discrete-Time Signals  2.2 Discrete-Time Systems | | Chap 2 |
| 4 | 2.3 Analysis of Discrete-Time Systems | | Chap 2 |
| 5 | 2.4 Discrete-Time Systems described by Difference equations | | Chap-2 |
| 6 | 2.4 Discrete-Time Systems described by Difference equations | | Chap-2 |
| 7 | **Z-Transform**  3.1 The Z-Transforms | | Chap-3 |
| 8 | 3.2 Properties of Z-transform  3.3 Rational Z-Transform | | Chap-3 |
| 9 | 3.4 Inversion of the Z-transform | | Chap-3 |
| 10 | **Frequency Analysis of Signals**  DTFT | | Chap-4 |
| 11 | Properties of DTFT | | Chap-4 |
| 12 | **Frequency Domain Analysis of LTI Systems**  5.1 Frequency Response characteristics of LTI Systems  5.2 Frequency Response of LTI Systems | | Chap-5 |
| 13 | 5.4 LTI Systems as Frequency –Selective Filters | | Chap-5 |
| 14 | 5.5 Inverse Systems and Deconvolution | | Chap-5 |
| 15-16 | **Mid-Term Exams** | |  |
| 17 | **Sampling and Reconstruction signals**  6.1 Ideal Sampling and Reconstruction of Continuous-Time Signals | | Chap-6 |
| 18 | 6.2 Discrete-Time Processing of Contiguous-Time signals | | Chap-6 |
| 19 | | 6.2 Discrete-Time Processing of Contiguous-Time signals | Chap-6 |
| 20 | | 6.4 Sampling and Reconstruction of Continuous Time Bandpass Signals | Chap-6 |
| 21 | | **Implementation of Discrete-Time Systems**  9.1 Structures for Realization of Discrete-Time Systems | Chap-9 |
| 22 | | 9.2 Structures for FIR Systems | Chap-9 |
| 23 | | 9.3 Structures for IIR Systems | Chap-9 |
| 24 | | **Design of Digital Filters**  10.1 General Considerations | Chap-10 |
| 25 | | 10.2 Design of FIR Filters | Chap-10 |
| 26 | | 10.2 Design of FIR Filters | Chap-10 |
| 27 | | 10.3 Design of IIR Filters | Chap-10 |
| 28 | | 10.3 Design of IIR Filters | Chap-10 |
| 29 | | **The Discrete Fourier Transform: Its properties and Applications**  7.1 Frequency –Domain Sampling and Reconstruction of Discrete-Time Signals | Chap-7 |
| 30 | | 7.2 Properties of DFT | Chap-7 |