**A screenshot of a cell phone

Description generated with very high confidenceCOURSE PLAN**

|  |  |  |  |
| --- | --- | --- | --- |
| **Department :** | Instrumentation and Control Engineering | | |
| **Course Name & code :** | Digital Signal processing | | ICE 3251 |
| **Semester & branch :** | Enter semester. VI | Electronics & Instrumentation Engineering | |
| **Name of the faculty :** | **Dr. Anjan Gudigar & Dr.Vikas Singh** | | |
| |  |  |  |  | | --- | --- | --- | --- | | **L** | **T** | **P** | **C** | | **3** | **1** | **0** | **4** |   **No of contact hours/week:** | | | |

**COURSE OUTCOMES (COS)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **At the end of this course, the student should be able to:** | | |  | | --- | | **No. of**  **Contact**  **Hours** | | |  | | --- | | **Marks** | | **Program Outcomes (POs)** | **PSO** | **BL (Recommended)** |
| **CO1** | Evaluate Z-transform for analysis of LTI systems. | 12 | 22 | 1-3,5 | 1,2 | 2-5 |
| **CO2** | Evaluate discrete fourier tranaform and fast fourier transforms for discrete signals. | 10 | 24 | 1-3,5 | 1,2 | 2-5 |
| **CO3** | Understand the design of digital filters. | 16 | 34 | 1-3,5 | 1,2 | 2-5 |
| **CO4** | Understand the structures and implementation of digital filters | 6 | 12 | 1-3,5 | 1,2 | 2-5 |
| **CO5** | Apply the principles of digital signal processing to real world problems | 4 | 8 | 1-3,5 | 1,2 | 2-5 |
|  | **Total** | **48** | **100** |  |  |  |

**Assessment Plan**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***IN – SEMESTER ASSESSMENTS*** | | | | | | | | | |
| **S. No.** | **Assessment Mode** | | **Assessment Method** | **Time Duration** | **Marks** | **Weightage** | **Typology of Questions (Recommended)** | **Schedule** | **\*\*Topics Covered** |
| 1 | **MISAC** | **1** | **In-semester Exam 1** | **60 Mins** | **15** | **Objective:** 5M  10 MCQs × ½ = 5 marks  **Descriptive:** 10 M  (2 Questions of 2 marks +2 Questions of 3 marks) | Bloom’s taxonomy (B) level of the question should be L3 and above. | March 10-13, 2023 |  |
| **2** | **Quiz** | **15 Mins** | **5** | 10 MCQs × ½ = 5 | Bloom’s taxonomy (BT) level of the question should be L3 and above. | February 13-17,2023 |  |
| **3** | **Surprise Assignment** | **20 Mins** | **5** | 1 Question × 5M = 5 marks  (Minimum 5 questions to be given) | Bloom’s taxonomy (BT) level of the question should be L3 and above. | February 27 - March 4, 2023 |  |
| **4** | **In-semester Exam 2** | **60 Mins** | **15** | **Objective:** 5M  10 MCQs × ½ = 5 marks  **Descriptive:** 10 M  (2 Questions of 2 marks +2 Questions of 3 marks) | Bloom’s taxonomy (BT) level of the question should be L3 and above. | April 18-20,2023 |  |
|  |  |  |  |  |  |  |  |  |  |
| 2 | **FISAC** | **1** | **Surprise Assignment** | **20 Mins** | **5** | 1 Question × 5M = 5 marks  (Minimum 5 questions to be given) | Bloom’s taxonomy (BT) level of the question should be L3 and above. | March 27-April 01,2023 |  |
| **2** | **Take home assignment** | **\*\*\*** | **5** | **10 questions are to be given to each students** | Bloom’s taxonomy (BT) level of the question should be L3 and above. | May 02-08, 2023 |  |
| ***END – SEMESTER ASSESSMENT*** | | | | | | | | | |
| 1 | **Regular/Make–Up Exam** | | | 180 Mins | 50 | Answer all 5 full questions of 10 marks each. Each question can have 3 parts of 2/3/4/5/6 marks. | Bloom’s taxonomy (BT) level of the question should be L3 and above. | 17th week of the semester | Comprehensive examination covering full syllabus. |

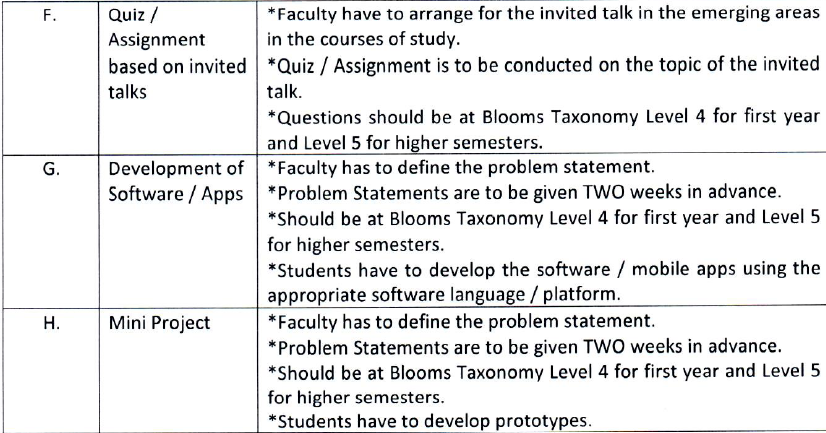
***\*\* Individual faculty will be entering the topics***

***\*\*\* Individual faculty must identify the assessment method from table 3 and fill in the details.***

***NOTE: Information provided in the table is as per the In-semester assessment plan and schedule of V and VII semester B. Tech provided from Academic Section.***

**Flexible In-semester Assessment Component (FISAC):**

1. The FISAC 1 & FISAC 2 may be any of the types given in Table 1. However, tne two components should be of different type.
2. The type of assessment should be informed to the students well in advance.
3. Syllabus for the last component of In-semester Assessment (ISAC) i.e. FISAC 2 should cover the topics mentioned for self-study if any / topics which are not covered till MISAC 4: In-Semester Exam 2.

**Table 1: Flexible In-semester Assessment Component (FISAC)**

**LESSON PLAN**

|  |  |  |  |
| --- | --- | --- | --- |
| **L No** | **TOPICS** | |  | | --- | | **Course Outcome Addressed** | |
| 1 | Introduction to the subject, Overview of systems – Introduction to signal processing, signals, systems, classification of signals, introduction to transforms | CO1 |
| 2 | Operations on signals, Digital signal Processing, advantages, limitations | CO1 |
| 3 | Discrete time fourier transform, convlution and correlation | CO1 |
| 4 | TUTORIAL-Convolution of different types of signals, correlation | CO1 |
| 5 | Relationship between Laplace transform and z transform | CO1 |
| 6 | Representation in Z plane , ROC and its significance | CO1 |
| 7 | Z transform of causal and anticausal sequences and the corresponding ROC | CO1 |
| 8 | TUTORIAL- Z Transform and ROC | CO1 |
| 9 | Z-transform and its properties | CO1 |
| 10 | Inverse Z transform | CO1 |
| 11 | Analysis of LTI systems using Z transform | CO1 |
| 12 | TUTORIAL- analysis of discrete time LTI systems using z transform | CO1 |
| 13 | Discrete Fourier Transform – relationship with Fourier Transform-frequency domain sampling and reconstruction | CO2 |
| 14 | DFT computation, Properties of DFT | CO2 |
| 15 | Relation between DFT and Z transform, Analysis using DFT | CO2 |
| 16 | TUTORIAL-discrete Fourier Transform computation | CO2 |
| 17 | Fast Fourier Transform - radix 2 decimation in time algorithm (DITFFT) | CO2 |
| 18 | Fast Fourier Transform - decimation in frequency algorithm (DIFFFT) | CO2 |
| 19 | properties of DFT, DFT computation using FFT algorithms | CO2 |
| 20 | TUTORIAL- Analysis of LTI systems using DFT | CO2 |
| 21 | Inverse DFT (IDFT), Computation of Inverse DFT | CO2 |
| 22 | Computation of DFT,IDFT,FFT | CO2 |
| 23 | IIR Filter Design –introduction to classical filter design | CO3 |
| 24 | TUTORIAL-Filter design using Butterworth. approximation | CO3 |
| 25 | Chebyshev and elliptic approximations | CO3 |
| 26 | transformations-impulse invariance method | CO3 |
| 27 | Bilinear Transformation method of filter design | CO3 |
| 28 | TUTORIAL-Impulse Invariant method of IIR filter design | CO3 |
| 29 | Design of IIR filters using above methods | CO3 |
| 30 | Design of lowpass, high pass filters | CO3 |
| 31 | Frequency transformations | CO3 |
| 32 | TUTORIAL-filter design using bilinear transformation | CO3 |
| 33 | FIR Filters – Introduction, Gibbs phenomenon | CO3 |
| 34 | Linear phase FIR filters- characteristics | CO3 |
| 35 | Linear phase FIR filters-frequency response, design | CO3 |
| 36 | TUTORIAL- Filter design using Windows-Rectangular, Bartlett, Hamming and Kaiser window. | CO3 |
| 37 | Filter designing using windows technique | CO3 |
| 38 | Filter design using frequency sampling method | CO3 |
| 39 | Implementation of discrete time systems-IIR filter structures | CO4 |
| 40 | TUTORIAL-DFI,DF-II for IIR filters | CO4 |
| 41 | CSOS and PSOS structures | CO4 |
| 42 | FIR filter realization-structures | CO4 |
| 43 | FIR filter sturctures | CO4 |
| 44 | TUTORIAL-filter structures | CO4 |
| 45 | Applications of DSP-dual tone multi frequency signal detection | CO5 |
| 46 | Signal compression, transmultiplexers | CO5 |
| 47 | Oversampling, digital signal processors introduction | CO5 |
| 48 | Review of applications of digital signal processing | CO5 |

**Course Articulation Matrix**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO 12** | **PSO1** | **PSO2** | **PSO3** |
| **CO1** | 2 | 2 |  |  | 2 |  | **2** |  | **2** |
| **CO2** | 2 | 2 |  |  | 2 |  | **2** |  | **2** |
| **CO3** | 2 | 2 | 2 |  | 2 |  | **2** |  | **2** |
| **CO4** | 2 | 2 | 2 |  | 2 |  | **2** |  | **2** |
| **CO5** | 2 | 2 | 2 | 2 | 2 |  | **2** |  | **2** |
| **Average Program Articulation Level** | **2** | **2** | **2** | **2** | **2** |  | **2** |  | **2** |

**FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):**

|  |  |  |  |
| --- | --- | --- | --- |
| **FACULTY** | **SECTION** | **FACULTY** | **SECTION** |
| **Dr.Anjan Gudigar** | **A** | **Dr.Vikas Singh** | **B** |
|  |  |  |  |
|  |  |  |  |

**References:**

1. Alan.V.Oppenheim and Ronald W Schafer - “Discrete time signal processing”, Pearson Education, 2010.
2. John.G Proakis and D.Manolakis - Digital signal processing, Prentice Hall Of India, 2007.
3. Johnson Johny R, “Introduction to digital signal processing”, Prentice Hall Of India, 2003
4. Wills J.Tompkins - “Biomedical digital signal processing” Prentice-Hall Of India, 2009.
5. Rabiner Lawrence R, Gold Bernard, “Theory and Applications of digital signal processing”, Prentice Hall Of India, 2002.

**Submitted by: Dr. Anjan Gudigar**

**(Signature of the faculty)**

**Date: 30-01-2022**

**Approved by:**

**(Signature of HOD)**