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| **Lesson plan** for**CSE 3131 (Digital Signal Processing)** |
|  | **3rd year, 1st Semester 2022** |  |
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| **Course Instructor:** |  |
| Dr. Md. Ekramul HamidProfessorDept of CSEUniversity of RajshahiEmail: ekram\_hamid@ru.ac.bdPhone: 01726420004 |  |  |
| **Office**: 4th Science building, Room No. 121 |  |
| **Lectures:** Sun 10:20~ 11:20Tues 11:25 ~ 12:25Thu 12:30 ~ 1:30 |  |  |
| **Class:** 4th Science building, Room No. 219 |  |
|  **Topics included (Course description):**Digital signal processing (DSP) is concerned with the numerical manipulation of discrete signals/data. It has become an essential tool to many engineering and scientific areas, such as multimedia computing (for speech, audio, image, and video) and digital communications, for example. This course is designed to provide students the fundamentals of discrete-time signals, signal transforms, and digital filter design.**Course materials:**1. Text books:

 Digital Signal Processing, John G. Proakis1. Reference books:
2. Understanding Digital Signal Processing, by Lyon
3. Digital Signal Processing by David J. Defatta

 3. Digital Signal Processing, by Rasesh Babu |
| **Course outcome**: After completing the course the students1. Understand the fundamentals of Digital Signal Processing
2. Understand different types of signal and operation on DSP.
3. Understand the concept of discrete-time signals, including mathematical representations, properties, frequency content, and aliasing.
4. Understand the concepts of linear time-invariant discrete-time systems, including representations, properties, convolution relationship, and analysis techniques based on Fourier and Z transforms.
5. Knowledge of use of digital systems in real time applications
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| **Pre-requisite**: none |
| **Grading policy:**Individual component of the class will be weighted as follows |
| Class attendance: 10%Class test/ Assignment: 20%Final Exam: 70% |  |  |
| Grading will be done on a straight mark basis. |
| **Exams:**There will be three class test and a final exam in the course. The tentative dates of the exam are given below: |
| 1st CT--- 19/6/20222nd CT---07/08/20223rdCT --- 28/08/2022Final Exam--- Date will be announced by the Engineering faculty |
| **Assignment:**Assignments will be given periodically. The assignments are to be worked individually. Any work directly copied from the internet, other students, text etc. will result an automatic zero for the assignment. All late submission will have points subtracted from them. Assignment must be returned in hardcopy. However, an email containing your complete and finished assignments as document, JPEG or PDF will suffice until you can turn in the hardcopy. A week after the due date the assignments will no longer be accepted. |
| **Tentative class schedule:** |  |  |

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| week | **Lecture details** | **Duration** | **Page numbers (Books)** |
| 1 | Introduction: signals, systems and signal processing, classification of signals, the concept of frequency in continuous time and discrete time signals, analog to digital and digital to analog conversion, Sampling and quantization. |  |  |
| 2 | Discrete time signals and systems: Discrete time signals, discrete time systems, analysis of discrete time linear time invariant systems. |  |  |
| 3 | Discrete time systems described by difference equations, implementation of discrete time systems, correlation and convolution of discrete time signals. |  |  |
| 4 | The z-transform: Introduction, definition of the z-transform, z-transform and ROC of infinite duration sequence, properties of z-transform inversion of the z-transform, the one-sided z-transform. |  |  |
| 5-6 | Frequency analysis of signals and systems: Frequency analysis of continuous time signals, Frequency analysis of discrete time signals, Properties of Fourier transform of discrete time signals, Frequency domain characteristics of linear time invariant system, linear time invariant systems as frequency selective filters, Inverse systems and deconvolution. |  |  |
| 7-8 | The Discrete Fourier Transform: The DFT, Properties of the DFT, Filtering method based on the DFT, Frequency analysis of signals using the DFT. |  |  |
| 8-9 | Fast Fourier Transform Algorithms: FFT algorithms, applications of FFT algorithm. Digital Filters: Design of FIR and IIR filters. |  |  |
| 10 | Wavelet and multiresolution processing.  |  |  |
| 11-12 | Adaptive filters: Adaptive system, kalman filters, RLS adaptive filters, the steepest-descent method, the LMS filters. |  |  |
| 13 | Application of DSP: Speech processing, analysis and coding, Matlab application to DSP. |  |  |