**CE3007 Digital Signal Processing**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>CE3007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Title</td>
<td>Digital Signal Processing</td>
</tr>
<tr>
<td>Pre-requisites</td>
<td>CE 2004: Circuits and Signal Analysis</td>
</tr>
<tr>
<td>No of AUs</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Aims**

Digital Signal Processing (DSP) has extensive applications as the building block of feature extractions for any data analytics work regarding signals. The aim of this course is to provide you with a strong understanding of digital signal processing fundamentals so that you can:

i) apply its concepts to relevant field of interest.
ii) grasp technical literature of this field,
iii) be prepared for the study of more advanced topics and applications.

**Intended Learning Outcomes (ILO)**

Upon completion of the course, the students should be able to:

1. Describe and analyse various important discrete time signals, e.g, delta, unit step, complex exponential, etc.
2. Discuss characteristics of discrete-time signals and systems, describe the various relationships between the input and output via convolution, frequency response, transfer function, difference equation, block realization of the system. How to generate the impulse response from a given system description.
3. Interpret frequency representation by Fourier Analysis and review continuous time Fourier Analysis, compute, analyse and understand the representation of signal spectra using DTFS, DTFT and DFT.
4. Interpret and analyse Z-Transform, its relationship to DTFT, and apply it to get transfer function and frequency response, as well as pole-zero plots, and its relationship to stability of the system.
5. Determine sampling rate requirements and interpret effects of aliasing.
6. Design Finite Impulse Response (FIR) and IIR (Infinite Impulse Response) filters and implement FIR and IIR digital filters using different structures such as direct and cascade forms in DSP processors.
Course Content

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Discrete-time Signals</td>
</tr>
<tr>
<td>2</td>
<td>Discrete-time Systems</td>
</tr>
<tr>
<td>3, 4</td>
<td>Frequency Analysis of Signals and Systems</td>
</tr>
<tr>
<td>5, 6</td>
<td>Discrete Time Fourier Analysis</td>
</tr>
<tr>
<td>6, 7</td>
<td>Z-Transform</td>
</tr>
<tr>
<td>8 and 9</td>
<td>Sampling and Reconstruction</td>
</tr>
<tr>
<td>10 to 12</td>
<td>FIR and IIR Filter Design</td>
</tr>
<tr>
<td>13</td>
<td>Digital Filter Structure</td>
</tr>
</tbody>
</table>

Assessment (includes both continuous and summative assessment)

a) Final Examination: 55%
b) Class Quiz: 20%
c) Lab: 25%

Note:
School reserves the right that content and assessment criteria may be adjusted during a given semester possibly because of circumstantial reasons. Any such changes will be discussed with the students enrolled in a given semester.

Reading and References