Semester : 5 - Section : A - CourseCode : EC301

| Course Outcomes | Internal Assessment (IA) | | Other Assessment (Other Assessment) | | UE | | Direct Attainment | | Feedback | | Indirect Attainment | | Total Attainment | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) | Attainment(out of 3) | Attainment(out of 100) |
| EC301.1 | 2.09 | 69.51 | 3 | 100 | 3 | 100 | 2.41 | 80.48 | 3 | 100 | 3 | 100 | 2.53 | 84.39 |
| EC301.2 | 3 | 100 | 0 | 0 | 3 | 100 | 2.52 | 84 | 3 | 100 | 3 | 100 | 2.62 | 87.2 |
| EC301.3 | 2.12 | 70.54 | 0 | 0 | 3 | 100 | 1.95 | 65.14 | 3 | 100 | 3 | 100 | 2.16 | 72.11 |
| EC301.4 | 3 | 100 | 0 | 0 | 3 | 100 | 2.52 | 84 | 3 | 100 | 3 | 100 | 2.62 | 87.2 |
| EC301.5 | 2.93 | 97.73 | 3 | 100 | 3 | 100 | 2.96 | 98.55 | 3 | 100 | 3 | 100 | 2.97 | 98.84 |
| EC301.6 | 2.59 | 86.44 | 0 | 0 | 3 | 100 | 2.26 | 75.32 | 3 | 100 | 3 | 100 | 2.41 | 80.26 |

**Step 1: CO Attainment for course EC301 is as follows (refer 3.2.2A)**

| Course Outcomes | Direct | Total |
|---|---|---|
| CO 1 | 2.41 | 2.53 |
| CO 2 | 2.52 | 2.62 |
| CO 3 | 1.95 | 2.16 |
| CO 4 | 2.52 | 2.62 |
| CO 5 | 2.96 | 2.97 |
| CO 6 | 2.26 | 2.41 |

**Step 2: CO-PO/PSO Mapping for the course EC301 is as followS**

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 2 | 3 | 3 | 1 | 2 | 1 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 3 | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 4 | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 5 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 1 | 2 |
| CO 6 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 2 | 2 |
| Average | 3 | 3 | 1.33 | 1.5 | 1.33 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2.5 | 2 |

**Step 3: PO Direct Attainment is calculated as follow,**

Note:- Attainment Configuration says to, consider CO total Attainment in direct part of PO Attainment

## CO-PO Attainment = (CO-PO Mapping/Highest Mapping Value)* CO Attainment

where CO Attainment is based on Attainment Configuration

| Course Outcomes | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO 1 | 3.00*2.53/3 = 2.53 | 3.00*2.53/3 = 2.53 | 1.00*2.53/3 = 0.84 | 1.00*2.53/3 = 0.84 | 1.00*2.53/3 = 0.84 | 0.00*2.53/3 = 0.00 | 0.00*2.53/3 = 0.00 | 0.00*2.53/3 = 0.00 | 1.00*2.53/3 = 0.84 | 1.00*2.53/3 = 0.84 | 1.00*2.53/3 = 0.84 | 2.00*2.53/3 = 1.69 | 3.00*2.53/3 = 2.53 | 2.00*2.53/3 = 1.69 |
| CO 2 | 3.00*2.62/3 = 2.62 | 3.00*2.62/3 = 2.62 | 1.00*2.62/3 = 0.87 | 2.00*2.62/3 = 1.74 | 1.00*2.62/3 = 0.87 | 0.00*2.62/3 = 0.00 | 0.00*2.62/3 = 0.00 | 0.00*2.62/3 = 0.00 | 1.00*2.62/3 = 0.87 | 1.00*2.62/3 = 0.87 | 1.00*2.62/3 = 0.87 | 2.00*2.62/3 = 1.74 | 3.00*2.62/3 = 2.62 | 2.00*2.62/3 = 1.74 |
| CO 3 | 3.00*2.16/3 = 2.16 | 3.00*2.16/3 = 2.16 | 2.00*2.16/3 = 1.44 | 2.00*2.16/3 = 1.44 | 2.00*2.16/3 = 1.44 | 0.00*2.16/3 = 0.00 | 0.00*2.16/3 = 0.00 | 0.00*2.16/3 = 0.00 | 1.00*2.16/3 = 0.72 | 1.00*2.16/3 = 0.72 | 1.00*2.16/3 = 0.72 | 2.00*2.16/3 = 1.44 | 3.00*2.16/3 = 2.16 | 2.00*2.16/3 = 1.44 |
| CO 4 | 3.00*2.62/3 = 2.62 | 3.00*2.62/3 = 2.62 | 2.00*2.62/3 = 1.74 | 2.00*2.62/3 = 1.74 | 2.00*2.62/3 = 1.74 | 0.00*2.62/3 = 0.00 | 0.00*2.62/3 = 0.00 | 0.00*2.62/3 = 0.00 | 1.00*2.62/3 = 0.87 | 1.00*2.62/3 = 0.87 | 1.00*2.62/3 = 0.87 | 2.00*2.62/3 = 1.74 | 3.00*2.62/3 = 2.62 | 2.00*2.62/3 = 1.74 |
| CO 5 | 3.00*2.97/3 = 2.97 | 3.00*2.97/3 = 2.97 | 1.00*2.97/3 = 0.99 | 1.00*2.97/3 = 0.99 | 1.00*2.97/3 = 0.99 | 0.00*2.97/3 = 0.00 | 0.00*2.97/3 = 0.00 | 0.00*2.97/3 = 0.00 | 1.00*2.97/3 = 0.99 | 1.00*2.97/3 = 0.99 | 1.00*2.97/3 = 0.99 | 2.00*2.97/3 = 1.98 | 1.00*2.97/3 = 0.99 | 2.00*2.97/3 = 1.98 |
| CO 6 | 3.00*2.41/3 = 2.41 | 3.00*2.41/3 = 2.41 | 1.00*2.41/3 = 0.80 | 1.00*2.41/3 = 0.80 | 1.00*2.41/3 = 0.80 | 0.00*2.41/3 = 0.00 | 0.00*2.41/3 = 0.00 | 0.00*2.41/3 = 0.00 | 1.00*2.41/3 = 0.80 | 1.00*2.41/3 = 0.80 | 1.00*2.41/3 = 0.80 | 2.00*2.41/3 = 1.61 | 2.00*2.41/3 = 1.61 | 2.00*2.41/3 = 1.61 |
| Average PO attainment | 2.55 | 2.55 | 1.12 | 1.26 | 1.12 | 0 | 0 | 0 | 0.85 | 0.85 | 0.85 | 1.7 | 2.09 | 1.7 |

**Observation**

1. PO3, PO4, PO5, PO9, PO10 and PO11 have low level PO attainment due to low level COPO mapping

**Action Point**

1.No action is required for low level mapping COPO  matrix

# CO –PO Mapping- EC301 – Digital Signal Processing

Expected outcome:

The student will be able to:

| CO1 | Acquire knowledge on Discrete Fourier Transform, its computation and various properties. |
|-----|-------------------------------------------------------------------------------------------|
| CO2 | Understand the Fast Fourier Transform (FFT) algorithms used in realizing DFTs. |
| CO3 | Understand the concept of digital FIR filters and various techniques used FIR filter design and apply those in designing filters according to the required specifications. |
| CO4 | Gain knowledge on various design techniques used in IIR filter design, and apply the same in designing IIR filters according to required specifications. |
| CO5 | Acquire knowledge on various filter structures used in realizing digital filters and learn the architecture of digital signal processor.. |
| CO6 | Gain a basic understanding on multirate signal processing and the impact of finite word length in DSP systems. |

## CO-PO Mapping matrices of course

## (S: Strong (3), M: Medium (2), L: Low (1))

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSPO1 | PSPO2 |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-------|-------|
| CO 1 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 2 | 3 | 3 | 1 | 2 | 1 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 3 | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 4 | 3 | 3 | 2 | 2 | 2 | - | - | - | 1 | 1 | 1 | 2 | 3 | 2 |
| CO 5 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 1 | 2 |
| CO 6 | 3 | 3 | 1 | 1 | 1 | - | - | - | 1 | 1 | 1 | 2 | 2 | 2 |
| Average | 3 | 3 | 1.33 | 3.00 1.5 | 1.33 | 0.00 0 | 0 | 1.33 1 | 1 | 1 | 2 1.50 2.5 | 2.5 | 2 | 1 |

# CO-PO Justification

| CO | After completing the course the student will be able to | PO | Justification |
|---|---|---|---|
| **EC30 1.1** | Acquire knowledge on Discrete Fourier Transform, its computation and various properties. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about DFT and its computation enhances his/her knowledge in science. PO2: Calculation of DFT improves problem analysis skills PO3:Knowledge in DFT is helpful for development of solutions. PO4: The problem analysis skill improves the experiment design capability PO5: Calculation of DFT using matlab tool PO9: Problem solving with classmates will helpful for team work. PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively. PO11:Knowledge in DFT is useful for DSP based project management. PO12: Recent development on DSP can be studied with basic DFT. PSO1: Use of DFT function in computer aided tool such as Matlab PSO2:Knowledge in DFT is useful for product design. |
| **EC30 1.2** | Understand the Fast Fourier Transform (FFT) algorithms used in realizing DFTs. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about FFT and its computation enhances his/her knowledge in science. PO2: Calculation of FFT improves problem analysis skills PO3: Knowledge in FFT is helpful for development of solutions PO4: The problem analysis skill improves the experiment design capability PO5:Knowledge in FFT is useful to apply in modern simulation tool. PO9: Problem solving with classmates will helpful for team work. PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively. PO11: Knowledge in FFT is useful for DSP based project management. PO12: Recent development on DSP can be studied with basic FFT. PSO1: Use of FFT function in computer aided tool such as Matlab PSO2: Knowledge in FFT is useful for product design. |
| **EC30 1.3** | Understand the concept of digital FIR filters and various techniques used FIR filter design and apply those in designing filters according to the required specifications. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about FIR filter enhances his/her knowledge in science. PO2: Analytical ability is improved due to the calculation of FIR coefficients  PO3: Design ability enhances with FIR design PO4: The FIR design problem analysis skill improves the experiment design capability |

| | | | |
|---|---|---|---|
| | | | PO5: FIR design using matlab function<br>PO9: Problem solving with classmates will helpful for team work.<br>PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively.<br>PO11: Knowledge in FIR FILTER is useful for DSP based project management.<br>PO12: Recent development on DSP can be studied using FIR filter design.<br>PSO1: Use of FIR filter design function in computer aided tool such as Matlab<br>PSO2: Knowledge in FIR is useful for product design. |
| **EC30 1.4** | Gain knowledge on various design techniques used in IIR filter design, and apply the same in designing IIR filters according to required specifications. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about IIR filter enhances his/her knowledge in science.<br>PO2: Analytical ability is improved due to the calculation of IIR coefficients<br>PO3: Design ability enhances with IIR design<br>PO4: The IIR design problem analysis skill improves the experiment design capability<br>PO5: IIR design using matlab function<br>PO9: Problem solving with classmates will helpful for team work.<br>PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively.<br>PO11: Knowledge in iir is useful for DSP based project management.<br>PO12: Recent development on DSP can be studied using IIR filter design.<br>PSO1: Use of IIR filter design function in computer aided tool such as Matlab<br>PSO2: Knowledge in IIR is useful for product design. |
| **EC30 1.5** | Acquire knowledge on various filter structures used in realizing digital filters and learn the architecture of digital signal processor.. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about filter realization enhances his/her knowledge in science.<br>PO2: Analytical ability is improved due to the realization of IIR and FIR filters.<br>PO3: Knowledge in filter realisation is helpful for development of solutions<br>PO4: The realisation skill improves the experiment design capability<br>PO5: Knowledge in filter realisation is useful to apply in modern simulation tool.<br>PO9: Problem solving with classmates will helpful for team work.<br>PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively.<br>PO11: Real time realization of FIR and IIR filters<br>PO12: Recent development on DSP can be studied with filter realization<br>PSO1: Realization of filters will increase the ability to use computer aided tools to provide communication related problems.<br>PSO2: Knowledge in filter realisation is useful for product design. |

| EC30 1.6 | Gain a basic understanding on multirate signal processing and the impact of finite word length in DSP systems. | 1, 2, 3, 4, 5, 9,10, 11, 12 PSO 1, 2 | PO1: The imparted knowledge about multi rate signal processing enhances his/her knowledge in science.<br>PO2: Analytical ability is improved due to the basic idea of multi rate signal processing imparted.<br>PO3: Knowledge in multirate signal processing is helpful for development of solutions<br>PO4: The problem analysis skill improves the experiment design capability<br>PO5: Knowledge in multirate signal processing is useful to apply in modern simulation tool.<br>PO9: Problem solving with classmates will helpful for team work.<br>PO10: Problem solving with classmates, home works and assignment will be helpful for communicate effectively.<br>PO11: Knowledge in multirate signal processing is useful for DSP based project management.<br>PO12: Recent development on DSP can be studied using multi rate dsp.<br>PSO1: The idea of multi rate dsp will increase the ability to use computer aided tools to provide communication related problems.<br>PSO2: Knowledge in multirate signal processing is useful for product design. |