# Associate Degree Program

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| **Specialty** | **Industrial Control Technology** |
| **Course Number** | **020301243** |
| **Course Title** | **Data Acquisition and Signal Conditioning** |
| **Credit Hours** | **2** |
| **Theoretical Hours** | **2** |
| **Practical Hours** | **0** |

**Brief Course Description:**

- The course covers important issues related to noise and guarding techniques, filtering, signal conversion and data acquisition and transmission.

**Course Objectives:**

The course objective is to make the student familiar with the different operations carried on the electrical signals to make them clean, without noise with an adequate characteristics for further implementation.

**Detailed Course Description:**

| Unit Number | Unit Name | Unit Content | Time Needed |
|---|---|---|---|
| **1.** | **Principles of analog signal conditioning** | ▪ Signal level changes, linearization, conversions and impedance matching | |
| **2.** | **Amplification of signals** | ▪ Operational amplifiers, differential amplifiers, instrumentation amplifiers, and isolation amplifiers<br>▪ Impedance matching | |
| **3.** | **Modulation and detection** | ▪ Amplitude, phase, and frequency modulation and demodulation<br>▪ F/V and V/F converters, detection of absolute value. Zero detector, peak detector and comparators | |
| **4.** | **Logarithmic amplifiers and analog multiplication** | ▪ Logarithmic amplifiers, multipliers, dividers and their applications | |
| **5.** | **Filtering and analog signal analysis** | ▪ LPF, HPF, PBF, PBR filters. Filters circuits and frequency characteristics. Introduction to active filters<br>▪ Signal analyzers. Frequency analysis methods of frequency analyzers | |
| **6.** | **RMS measurements and noise** | ▪ Meaning of RMS detector, RMS and true RMS values, examples<br>▪ Types of noise in electronic systems, ground loops, guarding techniques | |
| **7.** | **Data acquisition and conversion** | ▪ Introduction. Signal conditioning of inputs<br>▪ Single channel data acquisition | |

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| | | system<br>▪ Multichannel data acquisition system<br>▪ Data conversion<br>▪ A/D and D/A conversions<br>▪ Multiplexers and sample and hold circuits | |
| **8.** | **Introduction to digital signal transmission** | ▪ Introduction<br>▪ Data transmission systems<br>▪ Pulse code formats<br>▪ Modulation techniques for digital data transmission | |

**Text Books & References:**

1. Instrumentation. Devices and sysrems, CS Rangan, GR Sarma, VSV mani Tata McGraw hill-1995, India.
2. Principles of measurement and instrumentation; lan S. Morris, Prentice Hall, 1993, London.

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| **Specialty** | **Industrial Control Technology** |
| **Course Number** | **020301244** |
| **Course Title** | **Data Acquisition and Signal Conditioning** |
| **Credit Hours** | **1** |
| **Theoretical Hours** | **0** |
| **Practical Hours** | **3** |

**Brief Course Description:**

- The course covers the following topics: signal amplification, filtering, modulation and demodulation, conversion and detection and data acquisition.

**Course Objectives:**

The course objective is to give students practical skills related to signal conditioning and processing.

**Detailed Course Description:**

| Unit Number | Unit Name | Unit Content | Time Needed |
|---|---|---|---|
| **1.** | | ▪ Investigation of the characteristics of I/V converter and V/I converter by using op. amplifiers | |
| **2.** | | ▪ Investigation of the characteristics of instrumentation. Amplifiers (IC), or building an IA by using (3) operational amplifiers | |
| **3.** | | ▪ Investigation of the work of the comparator and window comparator in order to generate a square pulse wave with a given period | |
| **4.** | | ▪ Investigation of the characteristics of a logarithmic amplifier and to implement this amplifier to realize an analog multiplier | |
| **5.** | | ▪ Practical study of the frequency characteristic of passive and active LPF and HPF by using (EWB) software | |
| **6.** | | ▪ Practically determine the input/output characteristics of an exclusive-or phase detector<br>▪ Determine the I/O characteristics of the Motorola MC4044 integrated-circuit phase detector | |
| **7.** | | ▪ Demonstration of the operation of a simple 3-decade frequency synthesizer using MC4024, MC4044 and 74192 integrated circuits | |

**Evaluation Strategies:**

| Exams | | Percentage | Date |
|---|---|---|---|
| Exams | Reports Exam | 30% | |
| | Midterm Exam | 20% | |
| | Final Exam | 50% | |

**Teaching Methodology:**

- Lab. work

**Text Books & References:**

1. Design of OP-AMP Circuits with experiments, Howard M.Berlin Pernick Printing Corp, Manila, 1986.
2. Design of phase-locked loop circuits with experiments, Howard M. Berlin Howard W. Sams company, 1989, U.S.A.