

# Career in Instrumentation and Control Engineering – I

**W**hat is Instrumentation and Control Engineering?

Instrumentation and Control Engineering is a specialised branch of engineering which is concerned with the measurement of physical parameters and control of these parameters within the threshold limit in machines and processes. Instrumentation and Control play a significant role in both gathering information from the field and changing the field parameters, and as such, are a key part of control loops. Instrumentation Technology, being an interdisciplinary branch of engineering, is heading towards development of new and intelligent sensors, smart transducers, MEMS technology, bluetooth technology, etc.

The discipline of instrumentation engineering (or technology) branched out of the streams of electrical and electronic engineering sometime in the early part of 1970s. Earlier in the 70's, this course was known as MSc Tech Instrumentation, but today it is referred to by different names. According to the AICTE Approval Process Handbook (which can be downloaded from the AICTE website), the different names of Instrumentation Engineering at the undergraduate level (BE/ BTech) are: Instrumentation Engineering, Applied Electronics and Instrumentation Engineering, Electrical Instrumentation and Control Engineering, Electronics and Instrumentation Engineering, Electronics, Instrumentation and Control Engineering, Instrumentation and Control Engineering, Instrumentation and Electronics, Instrumentation Engineering, Instrumentation Technology, Biomedical Instrumentation, among others.

The post-graduate course of Instrumentation Engineering (ME/ MTech) consists of the following courses as listed in the AICTE Process Handbook: Applied Electronics and Instrumentation Engineering, Applied Instrumentation, Biomedical Instrumentation, Control and Instrumentation, Control and Instrumentation, Electrical Instrumentation and Control Engineering, Electronic Instrumentation and Control Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Instrumentation Engineering, among others.

Instrumentation and Control Engineering is one of the sub-branches of Instrumentation Engineering concerned with specialisation in Control system. Instrumentation and Control engineers



are responsible for designing, developing, installing, managing and maintaining equipment which is used to monitor and control engineering systems, machinery and processes.

Control system being an integral part of Instrumentation and Control Engineering, has an important role in industrial processes, as it provides the desired response by controlling the output of the system. As such, it is important to learn about different control mechanism in industries, with more emphasis on the theoretical or mathematical modelling of control system. In general, Instrumentation and Control Engineering is concerned with specific control disciplines such as:

- Advanced Process Control (APC)
- Distributed Control Systems (DCS)
- Programmable Logic Controllers (PLC)
- Supervisory Control and Data Acquisition (SCADA)

## Courses

To have an in-depth knowledge on different control system mechanism, many control system theory courses are included in the curriculum of Instrumentation and Control Engineering. Some of the courses are: Control System, Advanced Control System, Non-Linear Control System, Process Control, Advanced Process Control, Adaptive Control System, Optimal Control Theory, etc. There are other theoretical courses like Advanced Measurement Systems, Automation And Robotics, Embedded Systems, Virtual Systems, Remote Sensing, Mathematics And Industrial Communications, among others. Besides the theoretical courses, practical courses are taught in laboratories using both software and hardware. The most popular software for teaching and learning control system (or advanced courses of control system) is MATLAB, which stands for Matrix Laboratory. It is a multi-paradigm numerical computing environment. A proprietary programming language developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, C#, Java, and Python. Besides, Scilab which is free and open source software (FOSS) is also used for teaching and learning control system. National Instruments (NI) 'LabVIEW' is another popular system-designed platform and development environment for a visual programming language used for control system design and analysis. NI 'DAQ' (Data Acquisition) provide real time signal from and to a system. Thus, NI LabVIEW and DAQ provides an integral graphical environment to acquire signal from a system, using sensors and provide control signal to the system according to the control parameters, designed in the software environment.



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