



## PROFESSIONAL CERTIFICATE OF COMPETENCY IN **PROCESS CONTROL**

INCORPORATING LOOP TUNING AND  
ADVANCED CONTROL STRATEGIES

**12 MODULES OVER 3 MONTHS**

For upcoming start dates, please view our program schedule at:  
<http://www.eit.edu.au/schedule>

### WHAT YOU WILL LEARN

- Basic control concepts
- Fundamentals of sensors and transmitters
- Different types of processes you may encounter
- Different types of control
- Optimum amount of filtering or dampening to apply to the measurement
- Impact of control valves on control loop performance
- PID controller behaviours
- How to troubleshoot and identify problems
- When to use derivative control for the best tuned loop
- Differences between ideal/real/ interacting/ non-interacting controllers
- Combination of control modes to use
- Cascade control
- Feed forward control
- Significance of dead time and transfer lags
- Expert systems
- Justification for advanced control
- Internal Model Control (IMC)
- Model Predictive Control (MPC)
- MPC representation, identification and observation

Presented by  
**Hashemi  
Ford**

BE (Hons)(Elec) ME(Elec)  
Principal Engineer



**SECURE YOUR PLACE NOW!**

Contact [enquiries@eit.edu.au](mailto:enquiries@eit.edu.au) for an enrolment form or more information.

# BENEFITS OF LIVE E-LEARNING

- Attend lessons in an online classroom with your lecturer and fellow students
- Upgrade your skills and refresh your knowledge without having to take valuable time away from work
- Receive information and materials in small, easy to digest sections
- Learn while you travel - all you need is an Internet connection
- Have constant support from your program lecturer and coordinator for the duration of the program
- Interact and network with participants from around the globe and gain valuable insight into international practice
- Learn from international industry experts, based around the globe
- Live interactive webinars, not just a 'book on the web'
- Receive a certificate of completion for professional development purposes

## PRESENTATION FORMAT

The certificate program features real-world applications and uses a multi-pronged approach involving self-study, interactive online webinars and homework assignments with a mentor on call. The program consists of 12 modules, over a period of 3 months.

Some modules may involve a practical component or group activity. For each module there will be an initial reading assignment along with coursework or problems to be handed in and in some cases practical exercises. Participants will have ongoing support from their lecturer and program coordinator.

Program reading material will be delivered in electronic (PDF) format in advance of online presentations. Presentations and group discussions will be conducted using a live interactive software system. Assignments will be submitted electronically and wherever possible, practical exercises will be conducted using simulation software and remote labs.

## LIVE WEBINARS

During the program you will participate in 6 live interactive sessions with the lecturer and other participants from around the world. Each webinar will last approximately 90 minutes, and we take student availability into consideration wherever possible before scheduling webinar times. Contact us for details of webinar session scheduling. All you need to participate is an adequate Internet connection, speakers and a microphone. The software package and setup details will be sent to you prior to the first webinar.

*Please note: Webinars may last up to 2 hours depending on student interaction and level of content.*

## PRESENTED BY HASHEMI FORD

BE (Honrs)(Elec) ME(Elec) *Principal Engineer*

Hashemi has over 20 years international experience in electrical power industry with a focus on modelling, analysis, planning and operation of power systems including distribution, sub-transmission and transmission networks. He has been involved in modelling and analysis of major projects including HVDC interconnectors and wind farms. Currently Hashemi is working as a Principal Engineer for a power utility in Australia as well as teaching as a part time lecturer for EIT.



*Please note: Lecturers are subject to change.*

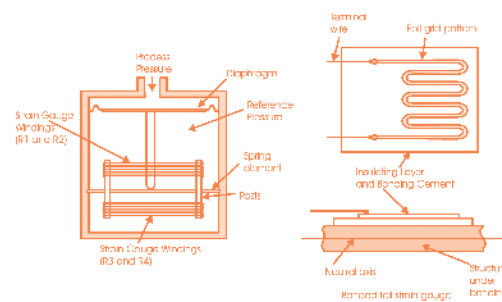
# 12 MODULES OVER 3 MONTHS

## OVERVIEW

This practical program covers all the essentials of process control and tools to optimize the operation of your plant and process, and regards the process, from the primary measuring device, through the controller, right down to the final control element as a chain with important links. Controllers need to be carefully matched to the process to work optimally; this matching procedure is called tuning. Controllers that are not correctly configured and tuned will not perform optimally and will not reduce variability in the process as they should.

It is aimed at engineers and technicians who wish to have a clear, practical understanding of the essentials of instrumentation and final control elements typically found in common loops. It incorporates loop tuning, as well as how to optimize the operation of their particular plant or process. Mathematical theory has been kept to a minimum with the emphasis throughout on practical applications and useful information.

But it does not stop there. Advanced Process Control (APC) is an essential part of the modern plant. Small differences in process parameters can have large effects on profitability; get it right and profits continue to grow; get it wrong and there are major losses. Many applications of APC have pay back times well below one year. APC does require a detailed knowledge of the plant to design a working system and continual follow up along the life of the plant to ensure it is working optimally. Cascade Control, Feedforward control, control with long dead times, IMC and MPC are all considered, with respect to different applications. At the end of this program you will have the skills to troubleshoot / tune / deal with / understand a wide variety of process loops.



## INCLUDES 4 FREE REFERENCE MANUALS

VALUED AT OVER US\$400

YOU WILL RECEIVE 4 OF OUR UP-TO-DATE TECHNICAL eBOOKS TO ADD TO YOUR LIBRARY.

- Practical Process Control
  - Practical Tuning of Industrial Control Loops
  - Practical Control Valve Sizing Selection and Maintenance
  - Practical Instrumentation for Automation and Process Control
- Received upon completion.

All materials required for the program will be provided electronically, in smaller, easy-to-read sections.

*Please Note: eBooks are available in hard copy at 50% of the recommended retail price. Contact us for pricing details.*



Over 1400 pages of tables, charts, figures and handy hints

# PROGRAM OUTLINE

## MODULE 1: PROCESS CONTROL INTRODUCTION, BASIC TERMS AND DEFINITIONS

- Definitions of process variable, controlled variable and manipulated variable
- Process gain, dead time and time constants
- Speed, stability and robustness
- Process noise

## MODULE 2: BASIC CONTROL CONCEPTS

- Typical manual control
- Processes, controllers and tuning
- First, second and third order processes
- Resistive, capacitive and inertia aspects of a process

## MODULE 3: LOOP TUNING PRINCIPLES: BASIC PRINCIPLES OF CONTROL SYSTEMS

- Open loop control
- Feedback control
- On and off control
- Modulation control

## MODULE 4: STABILITY AND CONTROL MODES OF CLOSED LOOPS

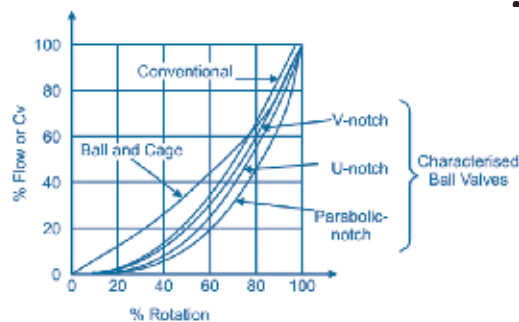
- Cause of instability in control loops
- Change of stability through PID control modes
- Methods to improve stability
- Principles of closed loop control tuning
- Different rules compared
- Rules of thumb in tuning

## MODULE 5: INTRODUCTION TO SENSORS AND TRANSMITTERS

- Selection and specification of devices
- Pressure transmitters
- Flow meters
- Level transmitter
- Temperature sensors

## MODULE 6: INTRODUCTION TO CONTROL VALVES

- Basic principles
- Rotary and linear control valves
- Control valve characteristics and specifications
- Hysteresis
- Stiction



## MODULE 7: SPECIALIZED CONTROLLER SETTINGS AND GOOD PRACTICE: IDEAL PID VS REAL PID

- Non-field-interactive or ideal PID
- Field-interactive or real PID
- Selection of ideal or real PID
- Choice of saturated vs non-saturated output limits

## MODULE 8: GOOD PRACTICE FOR TUNING OF CLOSED LOOP CONTROL

- Good practice for common loop problems
- Flow control loop characteristics
- Level control loop characteristics
- Temperature control loop characteristics
- Pressure control loop characteristics
- Other less common loops

## MODULE 9: LOOP TUNING PRINCIPLES AND STABILITY: CASCADE CONTROL

- Equation types for cascade control
- Initialisation and PV-tracking
- Use of multiple outputs in cascade control
- Tuning procedure for cascade control

## MODULE 10: FEEDFORWARD CONTROL

- Feed forward balance - a control concept
- Ratio control
- Combined feedforward and feedback Control
- The problem of long dead-time in closed loops

## MODULE 11: EXPERT SYSTEMS AND MODEL BASED SELF TUNING CONTROLLERS

- Self tuning loops
- Adaptive control
- Fuzzy logic control
- Gain scheduling

## JUSTIFICATION OF ADVANCED CONTROL

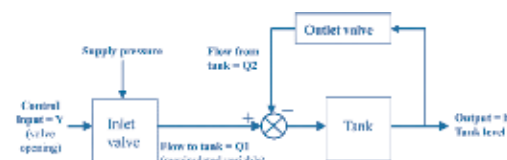
- Advanced vs classical control
- Advanced on-line control vs statistical process control
- Comparison of pay back time on real examples

## INTERNAL MODEL CONTROL (IMC)

- Open loop model in parallel with the process
- Control system in two blocks
- Equivalence with a classical controller
- Disturbances rejection and control
- IMC and delays and feed forward

## MODULE 12: MODEL PREDICTIVE CONTROL (MPC)

- Single input/output vs multivariable control
- Example on a binary column causality graph
- Constraints and planning ahead
- Different models



# HARDWARE AND SOFTWARE REQUIREMENTS

All you need to participate is an adequate Internet connection, PC, speakers and a microphone. The software package and setup details will be sent to on the program start date.

# ENTRANCE REQUIREMENTS

Some practical work experience in some of these topics would obviously be advantageous.

# PRACTICAL EXERCISES

Where possible, throughout the program you will participate in hands-on exercises using simulation software or remote labs, which will help you put theory to practice immediately!

## CERTIFICATION

Participants completing and achieving at least 50% or more in each assignment, as well as attending 65% of the live webinars, will receive the Engineering Institute of Technology Professional Certificate of Competency in Control Valve Sizing, Selection and Maintenance.



# ON-SITE TRAINING

We can provide our training at the venue of your choice. On-site training can be customised and by bringing the trainer to site the dates can be set to suit you!

“The Customer is Always Right” – so tell us what you need and we will design a training solution at your own site.

For a FREE detailed proposal please contact Kevin Baker via email: [training@idc-online.com](mailto:training@idc-online.com)