Industrial I&C
for Non-Instrument Personnel

5 DAY BOOTCAMP

A thorough introduction to the fundamentals of instrumentation, measurement, process control, PLCs, SCADA and P&ID

Melbourne
22, 23, 24, 25 & 26 February

This BOOTCAMP represents a tremendous opportunity to grab expertise in all the key areas of the fast growing area of industrial automation in five days. Presented by an expert in the area but who is obsessed with getting the key chunks of know-how and expertise across to you in simple understandable bits which you can immediately apply to your job.

What You Will Gain

- A fundamental understanding of industrial automation
- An introduction to instrumentation and measurement
- The key know-how to work with control valves
- An ability to configure simple PLC and SCADA systems
- An ability to work with plant documentation such as P&ID's

INCLUDES FOUR eBOOKS

Who Should Attend

Anybody with an interest in gaining know-how in a full range of fundamentals of measurement, instrumentation, process control, PLC's, SCADA and P&ID, ranging from the plant secretary, to operators, trades personnel (artisans), technicians and engineers from other backgrounds – such mechanical, electrical and civil. Indeed this is an excellent course for managers from a wide variety of disciplines who are keen to understand the key workings and the future of their plants.

IDC TECHNOLOGIES
Technology Training that Works

Institute of Measurement and Control Companion Company

EIT Engineering Institute of Technology

AUSTRALIA • CANADA • INDIA • IRELAND MALAYSIA • NEW ZEALAND • SINGAPORE • SOUTH AFRICA • UNITED KINGDOM • UNITED STATES • VIETNAM

www.idc-online.com

The Bootcamp

Have you ever wondered about getting a thorough introduction to the fundamentals of instrumentation, automation and control; thus allowing you to do work and perform simple tasks in the area?

This BOOTCAMP represents a tremendous opportunity. Presented by an expert in the area but who is obsessed with getting the key chunks of know-how and expertise across to you in simple understandable bits which you can immediately apply to your job.

This is most definitely not a boring lecture style presentation but an intensive learning experience where you will walk away with real skills as a result of the hands-on practical exercises, calculations, case studies and group sessions to ensure across the board take up and understanding of the theoretical concepts and ideas discussed.

Delegates are provided with these practical sessions at approximately 20 to 30 minute intervals to maximise the absorption rate.

Grab expertise in all the key areas of the fast growing area of industrial automation in just five days!

Presented by
Graham Jefferson

Graham has 38 years of experience in management of multi-disciplinary teams in various process control applications in the minerals processing, food, boiler/burner management systems and delivery of training material on the subject of process control systems world wide.

Graham is regarded as the foremost leader in the area of design, implementation and tuning of all aspects of regulatory process control systems. Graham has experience in modelling and simulation of various process control applications such as Evaporator plants, HVAC systems, multiboiler firing sequences and multiple pump station simulation. He is also a TUV certified Functional Safety Engineer.

Topics Covered

The topics covered commence with a solid introduction to instrumentation and measurement ranging from pressure, level, temperature and flow devices. There is a formal review of process control including the all important topic of PID loop tuning and good practice in setting up your own system. This is followed by a review of the different valves and operating characteristics. SCADA and PLC systems are also covered with an examination of both hardware and software, supplemented by writing your own PLC program. The all important topic of industrial data communication networks are also examined. Finally, the course is rounded off with a hands-on review of reading and interpreting simple plant documentation such as P&ID's so that you can see and understand the operation of the plant in your mind through the documentation.

It is not an in-depth BOOTCAMP but one covering a wide range of topics in industrial automation to give you an overview and practical understanding of the key concepts. Nevertheless, a lot of material is covered, with the intent to give you an overview and practical understanding of the concepts and equipment, and how they all come together to create an efficient and safe control environment in instrumentation, process control, SCADA, PLC's and control valves.

Practicals

TOPICS

- Pressure, Level and Temperature
- Process Control (Sim and Tuning)
- Control valve sizing
- Pneumatic circuits
- SCADA HMI
- PLC Traffic light
- Industrial communication
- P&ID drawing

HARDWARE

- IP, DC and TCP kits
- AW papers

SOFTWARE VIA eLABS

- IP Kit (Press, temp, level)
- VPLabs (Temp + Pressure)
- PC ControLab3 (Control tuning)
- CVSizing (valve sizing)
- Fluidsim (Pneumatic)
- CitectSCADA (SCADA)
- RSLogix (PLC)
- RS232 (Communication)
- SmartDRAW (P&ID)

WALK AWAY WITH REAL SKILLS

The current challenges presented by the world economy mean that automation is more critical than ever before.

DAY ONE

INSTRUMENTATION/PROCESS MEASUREMENT

INTRODUCTION TO INSTRUMENTATION/PROCESS MEASUREMENT

- Basic measurement concepts
- Definition of terminology
- Measuring instruments and control valves as part of the overall control system
- Pressure, level, temperature and flow overview
- Overview of control valves

PRESSURE MEASUREMENT

- Principle of pressure measurement
- Pressure sources
- Pressure transducers and elements
- Specifications

Practical session

- Installation considerations
- Impact on the overall control loop
- Future technologies

LEVEL MEASUREMENT

- Principles of level measurement
- Simple sight glasses
- Buoyancy tape systems
- Hydrostatic pressure
- Ultrasonic measurement, radiation measurement, electrical measurement, density measurement
- Installation considerations
- Impact on the overall control loop
- Future technologies

Practical session

TEMPERATURE MEASUREMENT

- Principles
- Thermocouples
- Resistance Temperature Detectors (RTDs)
- Thermistors
- Liquid in Glass, filled, bimetallic
- Pyrometers
- Installation considerations
- Impact on the overall control loop
- Future technologies

FLOW MEASUREMENT

- Principles of flow measurement
- Open channel flow measurement, oscillatory flow measurement, magnetic flow measurement

Practical session

- Positive displacement
- Ultrasonic flow measurement, mass flow measurement
- Installation considerations, impact on the overall control loop, future technologies

Practical session

PROCESS CONSIDERATIONS

- Transmitters, noise, materials of construction

INTEGRATION OF THE SYSTEM

- Calculation of individual instrument error and total error for the system
- Integration of the pressure, level, temperature and flow systems
- Integration of new smart subsystems with data communication links
- Testing and commissioning of the subsystems

PROCESS CONTROL

FUNDAMENTALS OF LOOP TUNING

- Processes, controllers and tuning
- PID controllers - P, I and D modes of operation
- Load disturbances and offset
- Speed, stability and robustness
- Gain, dead time and time constants
- Process noise, feedback controllers, how to select feedback controller modes

Practical Session

FUNDAMENTALS OF TUNING

- Open loop characterisation of process dynamics
- Default and typical settings
- General purpose closed loop tuning method
- Quick and easy open loop method
- Fine tuning for different process types
- Simplified lambda tuning

Practical Session

THE DIFFERENT TUNING RULES

- Ten different rules compared
- Tables of typical tuning settings
- When to use them/when not to use them
- 28 rules of thumb in tuning

Practical Session

An intensive learning experience packed with hands-on practical exercises, calculations, case studies and group sessions

UPSKILL OR CROSS SKILL IN A HIGH DEMAND FIELD

DAY TWO

PROCESS CONTROL CONTINUED

TUNING OF VALVES
- Hysteresis
- Stiction

Practical Session

AUTOMATED TUNING
- Self tuning loops
- Adaptive control

Practical Session

SIMPLE TUNING OF MORE COMPLEX SYSTEMS
- Cascade systems – tuning of them
- Feedforward, ratio, multivariable systems
- Interactive loops tuning
- Dead time compensation
- Practical limitations

Practical Session

GOOD PRACTICE
- 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

Practical Session

CONTROL VALVES

INTRODUCTION TO CONTROL VALVE THEORY
- Introduction
- Definition of a control valve
- Energy types
- What is happening inside a control valve
- Cavitation
- Flashing
- Choked Flow
- Valve Coefficient Cv

DIFFERENT TYPES OF CONTROL VALVES
- Globe valves
- Butterfly
- Eccentric disk
- Ball
- Rotary plug
- Diaphragm and pinch

CHARACTERISTICS
- Equal percent
- Linear
- Quick opening
- Selection method

HIGH PRESSURE DROP APPLICATIONS
- Cavitation control
- Cavitation elimination
- Low noise
- Diffuser plates
- Chokes
- Disk stack technology
- Pressure balanced trim

USE OF COMPUTER PROGRAM FOR VALVE SIZING

EXAMPLES OF HIGH PRESSURE DROP APPLICATIONS
- Water – pump bypass
- Steam – turbine bypass
- Gas – pressure reducing
- Oil – choke valve

ACTUATORS
- Pneumatic
- Hydraulic
- Electric
- Sizing on rotary valves
- Sizing on linear valves
- Mounting considerations
- Manual overrides
- Accessories

POSITIONERS
- Basic principles
- Conventional pneumatic
- Conventional electro-pneumatic
- Smart positioners
- Feedback options

PNEUMATIC CIRCUITS
- Volume tank fail system
- Fail fix
- Volume boosters

DAY THREE

CONTROL VALVES CONTINUED

MATERIALS
- Body materials and pressure ratings
- Trim
- Packing
- Guides and gaskets

QUALITY STANDARDS
- ASME
- NACE
- ISO 9000/2000
- PED
- NAMUR

INSTALLATION/MAINTENANCE
- Installation
- Commissioning
- Routine maintenance
- Fault finding
- Modes of failure

SCADA AND PLCs

BACKGROUND TO SCADA
- Fundamentals
- Comparison of SCADA, DCS, PLC and smart instruments
- Typical SCADA installations
- Definition of terms

SCADA SYSTEMS HARDWARE
- Fundamentals
- Comparison of SCADA, DCS, PLC and smart instruments
- Typical SCADA installations
- Definition of terms
- Remote Terminal Unit (RTU) structure
- Analog and digital input/output modules
- Application programs
- PLCs used as RTUs
- Master site structure
- Communications architectures

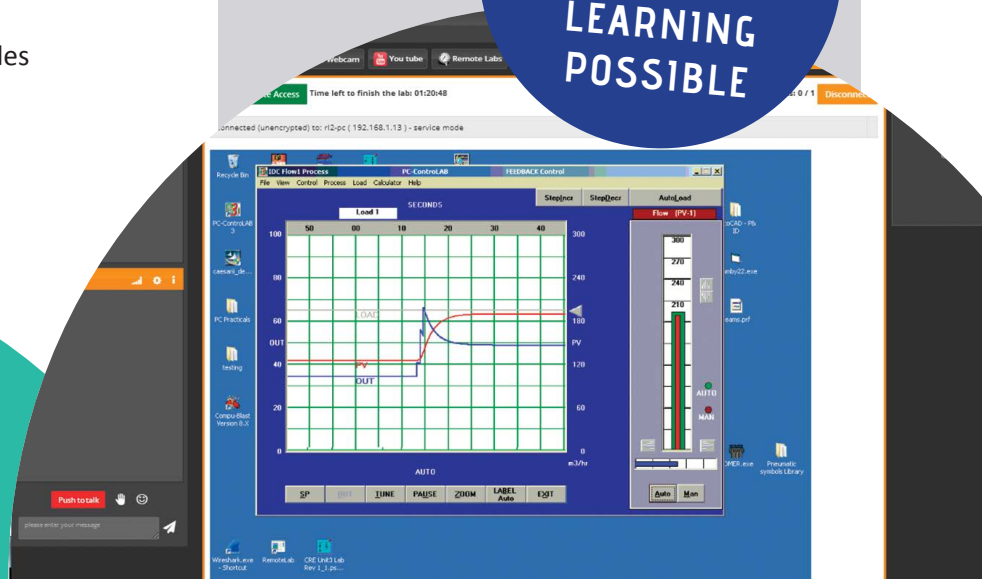
SCADA SYSTEMS SOFTWARE
- Fundamentals
- Components of a SCADA system
- Software – design of SCADA packages
- Configuration of SCADA systems
- Building the user interface
- Connecting to PLCs and other hardware
- SCADA system design
- The twelve golden rules

HUMAN MACHINE INTERFACES (HMIs)
- Human and ergonomic factors
- HMI configuration
- Design and layout
- Alarming and reporting philosophies
- Alarm system design

The BOOTCAMP is all presented in easy to understand practical English. All you need to benefit from this course is a basic understanding of mathematics and electrical theory.

Contact us for comprehensive pre-course reading and preparation if you are unsure about your level of understanding.

eLABS MAKE PRACTICAL CLASSROOM LEARNING POSSIBLE



This is not an in-depth BOOTCAMP but one covering a wide range of topics in industrial automation

DAY FOUR

SCADA AND PLCs CONTINUED

INTRODUCTION TO PLCs
- Introduction to PLCs
- A brief history of PLCs
- Alternative control systems – where do PLCs fit in
- Why PLCs have become so widely accepted
- Lingering concerns about PLCs

FUNDAMENTALS OF PLC HARDWARE
- Block diagram of typical PLC
- PLC processor module – memory organisation
- Input / output section – module types
- Power supplies

FUNDAMENTALS OF PLC SOFTWARE
- Methods of representing logic
  - Boolean algebra
  - Instruction code
  - Graphical presentation
  Functional logic diagrams
  Ladder logic
- Fundamental ladder logic instruction set

USING LADDERLOGIC FOR SIMPLE DIGITAL FUNCTIONS
- The basic rules
- Comparison with relay ladder diagrams
- The concept of the “scan” and how to apply it
- Infinite fan-out
- Contact “normal” states
- Positive and negative logic
- Basic Boolean functions
- The usefulness of De Morgan’s law

GOOD INSTALLATION PRACTICE
- Recommended installation practice
- Ergonomic considerations

LANDLINE MEDIA
- Background to cables
- Noise and interference on cables
- Twisted pair cables
- Fibre optic cables
- Public network provided services

WIDE AREA NETWORK (WAN) TECHNOLOGIES
- Digital hierarchies, T1 and E1
- Packet switching
- Frame relay

LOCAL AREA NETWORKS (LANs)
- Ethernet networks
- Industrial Ethernet
- TCP/IP
- LAN connectivity: bridges, routers and switches
- Redundancy options
- Web based industrial SCADA
- Wireless
- OPC

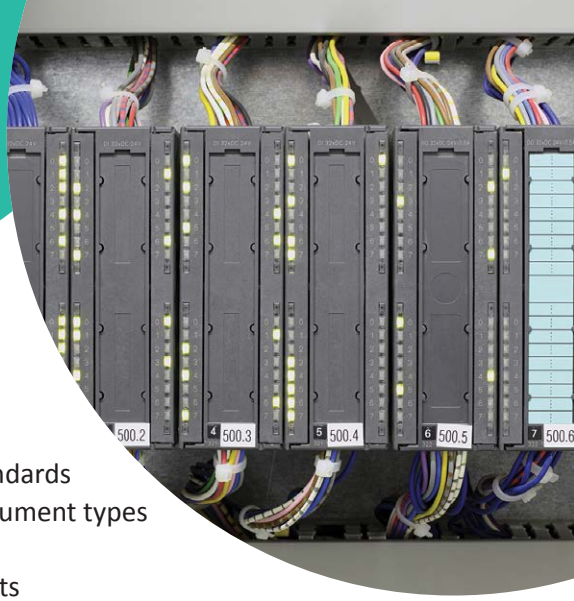
INDUSTRIAL COMMUNICATIONS PROTOCOLS
- RS-232 interface standard
- RS-485 interface standard
- Fieldbus
- Modbus

SCADA NETWORK SECURITY
- Introduction
- Authentication
- Encryption
- SCADA firewalls
- Firewall architectures
- Firewall guidelines

TROUBLESHOOTING AND MAINTENANCE
- Troubleshooting SCADA systems
- Maintenance tasks

PROJECT MANAGEMENT OF SCADA SYSTEMS
- Phases of a SCADA project
- Specification of systems
- Implementation and commissioning

REGISTER NOW TO AVOID MISSING OUT



DAY FIVE

PLANT DOCUMENTATION, STANDARDS AND SPECIFICATIONS

DRAWING TYPES AND STANDARDS

- Who sets the standards (ISA, IEC, ISO)?
- Understanding diagram layouts and formats.
- Cross references
- ISO 9002 and document control

FUNDAMENTALS

- Relays
- Transducers
- Switches
- Gate logic
- Fail safe design

PIPING AND INSTRUMENT DIAGRAMS (P&ID)

- Process Flow Diagrams (PFD)
- An introduction to the PFD, P&ID, UFD,MFD
- Control Loops on the P&ID
- HAZOP
- Mass balance
- Functional spec

INSTRUMENTATION

- Document types
- Instrument lists
- Logic diagrams
- Wiring diagrams
- Indexes
- Schedules and lists
- Block diagrams
- Data sheets
- Loop diagrams
- Hands on circuit function
- Fault finding
- Standards and symbols
- Nomenclature

ELECTRICAL

- Electrical standards
- Electrical document types
- Main circuits
- Control circuits
- Symbols
- Nomenclature
- Hands on determine function, fault-finding

PNEUMATICS AND HYDRAULICS

- Introduction
- Standards
- Layout and symbols
- Basic circuits
- Deducing principle of operation

LADDER LOGIC

- Introduction and overview
- Standards and layout
- Power supply circuits
- Hands on circuit design

ELECTRO PNEUMATIC CIRCUITS

- Overview
- Truth tables
- Fault finding
- Principle of operation

PRACTICAL EXERCISES

- Develop basic hydraulic, electrical and pneumatic drawings
- Develop P&ID Drawings for pressure, temperature, flow and level loops
- Detail the documentation for typical instruments
- Proceed through development of a full plant set of drawings from flow diagrams and process description to P&ID, electrical, hydraulic and pneumatic symbols
- Use software to undertake these typical tasks

EXPLANATION OF ACRONYMS

- P&ID means piping and instrumentation diagrams etc.

SUMMARY, OPEN FORUM AND CLOSING

INCLUDES FOUR eBOOKS

- Practical Instrumentation for Automation and Process Control
- Practical Programmable Logic Controllers (PLCs) for Automation and Process Control
- Practical Control Valve Sizing, Selection and Maintenance
- Practical Analytical Instrumentation in On-Line Applications

TOTAL VALUE TO YOU - $835

www.idc-online.com

About IDC Technologies

With a portfolio of over 300 workshops specialising in the fields of industrial data communications, electrical and mechanical engineering, automation and control, we have trained over 500,000 engineers, technicians and technologists over the last 20 years.

We have an enthusiastic team of professionals in offices conveniently located around the world, who are committed to providing the highest quality of engineering and technical training.

REGISTER NOW:

Fax: 1300 138 533

Mail: IDC Technologies, PO Box 1093, West Perth WA 6872

Email: idc@idc-online.com

Web Site: www.idc-online.com

ENQUIRIES:

Phone: 1300 138 522

REGISTRATION FORM:

INDUSTRIAL I&C FOR NON-INSTRUMENT PERSONNEL

DELEGATE DETAILS

Contact: Company Name:

Company Address:

Suburb: State: Post Code:

Phone: Fax: Email:

ATTENDEES:

Mr/Ms: Job Title: Email:

Mr/Ms: Job Title: Email:

Mr/Ms: Job Title: Email:

Mr/Ms: Job Title: Email:

Should you have more people interested in attending this workshop, please contact us via email: idc@idc-online.com

HOW DID YOU HEAR ABOUT THIS WORKSHOP? (PLEASE TICK)

☐ Received a brochure in the mail ☐ Received an email from IDC ☐ Searched online (Google, Yahoo etc)

☐ Recommended by a friend/colleague ☐ Other (please specify) _____

WORKSHOP DETAILS

☐ MELBOURNE – 22, 23, 24, 25 & 26 February 2016

PAYMENT DETAILS

Please Note: Full payment is required prior to the commencement of the workshop.

☐ BOOKING FOR **up to three** DELEGATES: $1995 x _____ delegates = $ _____

☐ BOOKING FOR **FOUR** DELEGATES: The fourth participant is FREE $1995 x 3 delegates = $ _____

TOTAL = $ _____

I wish to pay by ☐ Cheque, made payable to IDC Technologies

☐ Company Order Number: _____

Please charge my ☐ Mastercard ☐ Visa _____ Expiry Date: ____/____

Cardholder's Name: Cardholder's Signature

On the reverse of your card, near the signature, is a security number.
In order to authorise your card transaction, we require the last 3 digits: ____

If the Cardholder's address is not the same as shown above please tick this box: ☐

BILLING INFORMATION (PLEASE INVOICE TO)

☐ My billing information is the same as above in 'DELEGATE DETAILS'

☐ Please send invoice to: Company Name:

Company Address: Suburb: State: Post Code:

WORKSHOP DETAILS

- Workshops start at 8:30am and finish at 5:00pm daily.
- Registration is from 8:00am on the first day.
- The workshop fees are per delegate and include a reference manual, handouts, lunches and all refreshments.
- Full payment is required prior to the commencement of the workshop.

CONFIRMATION

Confirmation of receiving your egistration will be sent within 48 hours. Official confirmation and details of the workshop will be sent to you prior to the workshop date. Please wait for official confirmation before making accommodation and/or travel arrangements.

CANCELLATION

A fee of 20% will apply for written cancellations received 7-14 days prior to the commencement of the workshop. Cancellations received less than 7 days prior to the workshop are not refundable however substitutes are welcome.

100% MONEY BACK GUARANTEE

IDC Technologies' engineers have put considerable time and experience into ensuring that you derive the maximum value from each workshop. If you feel by lunch time of the first day that the workshop is not appropriate, please let us know so that we can arrange a 100% refund of your fee.

PRIVACY INFORMATION

If your address details are incorrect, or you wish to remove your name from our mailing list, please contact us by phone, fax or email. At times we make use of lists that cannot be cross-checked against our own database and you may receive a duplicate. If so, please pass this on to an interested colleague.

PLEASE NOTE

Venues to be confirmed upon registration. Venues are subject to change. Instructors may change without notice.

IDC Technologies has no affiliation with suppliers or manufacturers and therefore presents a completely unbiased factual view of the industry.

CONTINUING PROFESSIONAL DEVELOPMENT (CPD)

This program is designed to meet your continuing professional development requirements. A certificate documenting your attendance will be awarded at the end of the workshop. This serves as important evidence of your continuing professional commitment to your career. This workshop may count towards fulfilling your Engineers Australia CPD obligations – Engineers Australia's CPD Policy can be found at their website: http://www.engineersaustralia.org.au/