Don’t miss this great networking and learning opportunity - presented by some of the world’s finest instrumentation and control engineers.

Who Should Attend
This Master Series course is for you if you are from a control and instrumentation background. It has been developed for those whose time is limited and who work in a critical role or situations where a lengthy time away for study is impossible. Job titles of those who would benefit most include:

- control and instrumentation engineers
- superintendents
- electrical engineers
- automation engineers
- process control engineers
- chief engineers
- engineering managers
- senior technologists and technicians

Sessions will cover the following key areas:

- Setting the Scene
- Industrial Data Communications and Wireless
- Safety Instrumentation and Machinery Safety
- Process Control
- Advanced Process Control
- HAZOPs
- Budgetting, ROI and Finance of I&C Projects
- Industrial Network Security
- Hazardous Areas and Intrinsic Safety
- SCADA and PLC Systems
- Project Management of I&C Projects
- Preparation for Presentations
- Latest Instrumentation Developments
- Case Study of Design of a Real Process Plant
- Forecasts and Predictions
In bringing the elite of the control and instrumentation industry together for four hard hitting days of intensive training, the Instrumentation and Control Master Series has proved an outstanding success. It delivers a critical blend of knowledge and skills, covering technology in control and instrumentation, industry analysis and forecasts, leadership and management - everything that is relevant to a modern control and instrumentation engineer. You will be exposed to four high impact days where you will not only hear from outstanding experts in each of the key areas but undertake practical hands-on sessions and exercises. A key element of the Master Series is the ongoing case study conducted throughout the four days that pitches the delegates (in teams of four each) against each other in the design costing of a state-of-the-art control and instrumentation engineer. You will be required to come up with control and instrumentation solutions appropriate to the design of this process plant.

Day One

Module 1

Setting the Scene
This initial module sets the tone for the four days and defines project objectives, administrative issues, timing, instructors and protocols to be followed during the exercises. Participants will be introduced to each other and their assigned team.

Module 2

Best Practice I&C Standards and Drawings/Documentation
As built plant documentation is at best 90% accurate on handover, from this point it degrades rapidly to 50 to 75% accuracy in two years. This session will reinforce why it is so important to keep looking at the plant documentation as a whole in order to solve a problem and to adhere to best practice drawing standards and documentation. This will hopefully create the awareness that an engineer's greatest resource is not only his toolbox, but rather his drawing office, databases and plant documentation.
- Introduction to Plant Design
- Process Diagrams
- Instrumentation Documentation
- Electrical Documentation
- Vendor Packages
- Change Control

Module 3

Process Control
This session reviews the essentials of process control and tools to optimise the operation of your plant or process, including the ability to perform effective loop tuning. You will be able to identify and apply the essential building blocks in automatic control with a focus on PID control.
- Basic control concepts
- Principles of control systems
- Stability and control modes
- Tuning of closed loop control
- Cascade control
- Feedforward control
- Long dead time in closed loop systems

Module 4

Advanced Process Control
In today's competitive environment, every plant manager is looking for the best quality products at minimum operating and investment costs. Advanced Process Control (APC) is essential in this race. Small differences have large effects on profitability, get it right and profits continue to grow; get it wrong and red ink appears everywhere. Most applications of APC have pay out time well below one year, but this cannot be totally outsourced. It requires good knowledge of the plant to design it and some follow up along the life or modification of the plant.
- Economic justification of advanced control
- An overview of control problems
- Internal model control
- Model Predictive Control (MPC)
  - Model representations
  - Model identification
  - Observers
  - Control
- Control formulation problem
- MPC steady state optimisation
- Application to the control of two different units on a process simulator

Case Study

Deciding on the overall strategy: Considering all the factors involved when deciding upon overall technology strategy.

The I&C Master Series is split into three focused areas of learning which are all linked together through the case study of Hi-Tech Inc's plant.

1. Market and Industry Intelligence
A review of where control and instrumentation engineering is heading with forecasts on trends in equipment, technologies employed and personnel.

2. Management and Business
Good management, financial and business skills are provided in these modules. These highly practical interactive sessions provide you with solid skills in this often neglected area for control and instrumentation engineers.

3. Technology and Engineering
A solid overview of the latest trends in instrumentation and control technology and what you need to do to take advantage of these.

Expert Speaker Faculty

Your team of presenters and facilitators are all experts in their fields - technical specialists, management consultants and practicing consultants. The facilitators will work with you to ensure understanding throughout the four days.

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- Process Control
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HiTech Inc.

This unique case study is a common thread running through the four intensive days serving to unify the materials studied in the modules. You will have the opportunity to test out the ideas in a simulated environment and make real decisions. You will work in small teams, assess, propose, develop and design an effective process plant. You will go one step further and ensure that your financial proposal is acceptable to your board of your company so that the plant makes a real contribution to the profitability of your company. Peer reviews, feedback and discussions ensure that you achieve maximum benefit in terms of learning value.

Why You Should Attend
- Gain a clear picture of the latest developments and future directions in control and instrumentation from experts in the field
- Make reliable, well grounded and commercially viable technical, financial and management decisions in the control and instrumentation business
- Understand how successful control and instrumentation engineers communicate their vision and values to build up a super effective team
Day Two

Module 5
Industrial Data Communications and Wireless
Best practice in designing, installing, commissioning and troubleshooting industrial data communications systems. With so many differing communication standards on the market today, the debate is not about what is the best - be it Foundation Fieldbus, Profibus, DeviceNet or Industrial Ethernet - but rather in selecting the most appropriate technology for the application and to take advantage of the newer technologies such as Wireless in a low risk way.

- Introduction
- Fundamentals
- Copper/Fibre
- Physical layer standards - RS-232/RS-485/IEC 61158-2
- Industrial networks - industrial Ethernet; ASi; Foundation Fieldbus; HART; Profinet; HSE
- Industrial protocols - TCP/IP, Modbus, Modbus/TCP
- Wireless fundamentals
- Radio telemetry
- Selection methodologies
- Installation methodologies
- Commissioning/testing and troubleshooting
- Industrial network security

Module 6
Safety Instrumentation and Machinery Safety
For project managers and engineers involved with hazardous processes, this session focuses on the management, planning and execution of automatic safety systems in accordance with IEC 61511 and IEC 61508. Safety authorities are now expecting companies to work to established international standards and often insist on compliance with them. This session will provide the essential grounding in these safety standards.

- Overview of safety instrumented systems
- Introduction to IEC 61508
- Overview of IEC 61511
- Principles of risk reduction and safety allocation
- Practical SIS configurations
- Selection of sensors and actuators for safety duties
- Reliability analysis
- Selection of safety controllers
- System integration and application software
- Machinery safety principles
- Guide to regulations with machinery safety

What You Take Away
Not only do you take away detailed notes for all the modules covered but you will also receive a comprehensive collection of three Instrumentation and Control manuals with over 1500 pages covering such subjects as industrial data communications, process control and safety instrumentation.

Module 7
HAZOPs
This session encourages a multi-discipline approach to the design and ongoing operation of safe process plants. It seeks to give practical experience to those who may be required to participate in a HAZOP and to those who need practice in HAZOP team leadership. It gives managers an appreciation of the strengths and capabilities of HAZOPs as a safety management tool. HAZOP is widely used for identifying hazards in an industrial process and for assessing the potential consequences where there are risks of harm to persons, the environment or to assets. The HAZOP technique is fully recognised and recommended throughout industry by professional engineering institutions, government regulators and insurance companies. It is one of the principle risk management tools required by most government regulators for industrial processes worldwide.

- Preparations for and conduct of a HAZOP workshop
- Team member responsibilities
- Good HAZOP workshop records
- Hazard identification and risk management
- Quality HAZOP reports and action files
- Cost considerations
- Alternatives to HAZOPs

Module 8
Budgeting, ROI and Finance of I&C Projects
Management approval for your next automation project depends unfortunately not merely on its technical merits but it has to pay for itself. There is a range of financial criteria to consider once you have completed the engineering part of your proposal. This will enable you to put strong financial submissions in for an automation project and communicate more effectively with financial managers and understand how your work affects the profitability of a project and your firm.

- Introduction
- Basic accounting concepts
- Budget preparation and control
- Understanding cash flow
- Estimation and costing
- Time value of money and discount rates
- Investment appraisal methods (DCF/Payback/NPV/IRR)
- Capital budgeting
- Decision making
- Tax
- Risk and uncertainty

Case Study 2: Process Plant
Participants will continue with the design process for the Process Plant using the materials they have gathered during the day.

Day Three

Module 9
Hazardous Areas and Intrinsic Safety
This session provides you with an understanding of the hazards involved in using electrical equipment in potentially explosive atmospheres. It is based on the newly adopted IEC79 series of standards that are now slowly replacing the older national standards.

- Background to hazardous areas
- Zones and definitions
- Flameproof concept Ex D
- Intrinsic safety concept Ex E
- Increased safety concept Ex E
- Non sparking concept Ex N
- Purge and pressurisation
- Concept Ex P
- Combined and other methods of protection
- Electrical hazards, earthing and bonding
- Standards and codes of practice
- Maintenance, fault finding and repairs

Module 10
SCADA, PLC and DCS Systems
A SCADA system has traditionally meant a window into the process and gathering of data and then control of the plant. However the focus is now on integrating this process data into the actual business and using it in real time. The emphasis is on using open standards and off the shelf technology rather than the proprietary standards as in the past. Programmable Logic Controllers have also evolved significantly into being tightly integrated in the plant in terms of industrial communications, improved analogue control capability and with unified tagging architectures. Distributed Control Systems (DCS) systems have also opened up significantly in terms of communications and taking advantage of the new fieldbus systems. Alarm management is an often neglected area in the use of these systems and this will be examined in detail in this session.

- Fundamentals
- SCADA software
- Distributed Control Systems
- Distributed vs localised I/O
- PLCs and PACs - the battle of acronyms
- OPC a bridge between PLCs, DCSs and SCADA systems
- Optimal alarm management
- Integration with business systems
Module 13
**Latest Instrumentation and Valve Developments**
This reviews the latest developments in instrumentation and valve technology to ensure that you are applying the hottest technologies to your plant. Instrumentation and valve selection is one of the core skills of all instrumentation and control specialists and proficiency in this area needs to be jealously maintained.
- Pressure measurement
- Level measurement
- Temperature measurement
- Flow measurement
- Analytical instrumentation
- Control valves
- Integration of the system

Module 14
**Delegate Presentations**
Throughout the technical modules, participants operating in small teams, complete a series of exercises based on constructing a new plant. Time will be set aside to collate the exercises into a presentation. During this session, each team will present its plans to the other teams.

Module 15
**Review of Exercises and Case Study**
A review will be made on the exercises and submissions and builds on previous sessions. The instructors will participate here.

Module 16
**Forecasts and Predictions**
With the swift technical developments in MES/wireless and SCADA systems and the higher risk business environment there is no doubt that enormous pressures are being placed on instrumentation and control technical personnel. This session will endeavour to make sense of the conflicting data and information from so many different sources and provide some clear signposts of the way ahead. This will enable you to make more considered decisions.
- Main technology trends
- Conflicting data
- How to resolve
- Technical skills squeeze
- Outsourcing
- The China Challenge
- Market predictions

### SUMMARY OF THE 4-DAY COURSE

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### About IDC Technologies
IDC Technologies is internationally recognised as the premier provider of practical, technical training for engineers and technicians. We specialise in the fields of instrumentation, automation and process control, data communications and networking, electrical and mechanical engineering, project and financial management, and are continually adding to our portfolio of over 120 different workshops. Our instructors are highly respected in their fields of expertise and in the last 14 years have trained over 100,000 engineers, scientists and technicians worldwide.