

IAAE[®]
International Academy of
Automation Engineering[®]

Course Catalog

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Introduction

“IAAE[®] has a clear vision for the future of education and training on automation in the life sciences industry. They are actively working with universities, consortia, and life sciences companies to make things happen.

As a member of the Life Sciences Advisory Board, I’m always challenged to help find ways to bring relevant automation education to university students, as well as online and hands-on training to industry professionals.

There’s a real need for life sciences companies to be able to hire new graduates with the right skills and/or provide external training. The current model of on-the-job training isn’t efficient for anyone.”

- Rick Lawless, Manager, Training & Development, KBI Biopharma and IAAE[®] Life Sciences Advisory Board member




 Introduction

 Overview

 Course 1: Essentials of automation for Life Sciences manufacturing

 Context of Automation


 Measurements, Sensors, and Actuation


 Control


 Communication, Integration, and Software


 Automation System Safety and Reliability

 Industrial Control Systems Cybersecurity

 Course 2: Digital technology enabling data acquisition, visualization, and analytics

 Course 3: Advancing the adoption of digital technologies in the Life Sciences

 Course 4: A path to model based biomanufacturing

 Course 5: Electronic data integrity for Life Sciences manufacturing

 Course 6: Cybersecurity

 Closing Summary



Overview

What is the purpose of this course catalog?

This course catalog serves to outline the educational materials currently offered by the IAAE[®]. The IAAE[®] offer educational materials that are product agnostic and not training materials that have a focus on specific products and platforms. Courses shown do not need to be taken in a specific sequence, and it is highly unlikely that any one individual would benefit from taking all materials offered. The IAAE[®] recommend an individual development plan be created for each participant and that a group of participants engage in a coordinated program over either eight or twelve months.

At the moment, there are six IAAE[®] courses available, containing various modules within each that cover a wide range of topics.

Every module has specific aims and learning objectives, described in detail in this catalog, which shed light on the overall content within each and help one understand the target audience.

 click on a course title on the diagram to quickly navigate this catalog

Essentials of automation for
Life Sciences manufacturing

01

Course 1
3 hours/module

Course 2
4 hours total

02

Digital technology enabling data
acquisition, visualization, and analytics

Advancing the adoption of digital
technologies in the Life Sciences

03

Course 3
2.5 hours total

Course 4
4 hours total

04

A path to model based biomanufacturing

Electronic data integrity for
Life Sciences manufacturing

05

Course 5
4 hours total

Course 6
4.5 hours total

06

OT Cybersecurity

Course 1

Essentials of automation for Life Sciences manufacturing (37 modules, ~3 hours/module)

The modules developed by the IAAE[®] within this online course fully align to Tier 5 – Industry-Sector Technical Competencies within the Automation Competency Model (pictured and described in the next two pages) developed by the US Dept. of Labor, Employment and Training Administration, with input from the Automation Federation.

The 37 online modules within the course (approximately 3 hours seat time each) cover the topics within the Tier 5 subject areas as pictured on the next page.

These online materials have already been reviewed by senior automation SMEs within Merck and Genentech and have also received very positive feedback from many of the participants at GSK, Takeda, Biogen, and other organizations.



IAAE[®] Essentials of Automation for Life Sciences Manufacturing (online)

Context of Automation

010. Introduction to Automation for Life Sciences Manufacturing

Control

080. Continuous and Process Control

090. Discrete and Sequencing Control

100. Batch Control

110. Building Automation Systems and HVAC

120. Motion Control

130. Control System Types and Architectures

140. Documentation for Automation Engineering

150. Industrial Robotics

160. Programming Languages for Automation Systems

170. Visualization and Display

Automation System Safety and Reliability

250. Alarm Management

260. Reliability

270. Machine and Process Guarding

280. Manufacturing Safety

290. Safety Controller Equipment and Safety Standards

300. Good Automated Manufacturing Practice

Measurement, Sensors, and Actuation

020. Basic Process Instrumentation

030. Analytical Instrumentation

040. High Performance Sensors

050. Valve Actuation

060. Motor and Drive Control

070. Electrical Planning and Installation

Communication, Integration, and Software

180. Network Configuration Principles

190. Introduction to Industrial Digital Field Protocols

200. Overview of Industrial Communication Protocols

210. Introduction to Manufacturing Operations Management

220. Introduction to Manufacturing Execution Systems

230. Database Management

240. Introduction to Historian Software Platforms

Industrial Control Systems Cybersecurity

310. Introduction to Manufacturing Cybersecurity

320. Operational Technology Architecture

330. Networks

340. Operating Systems

350. Telecommunications

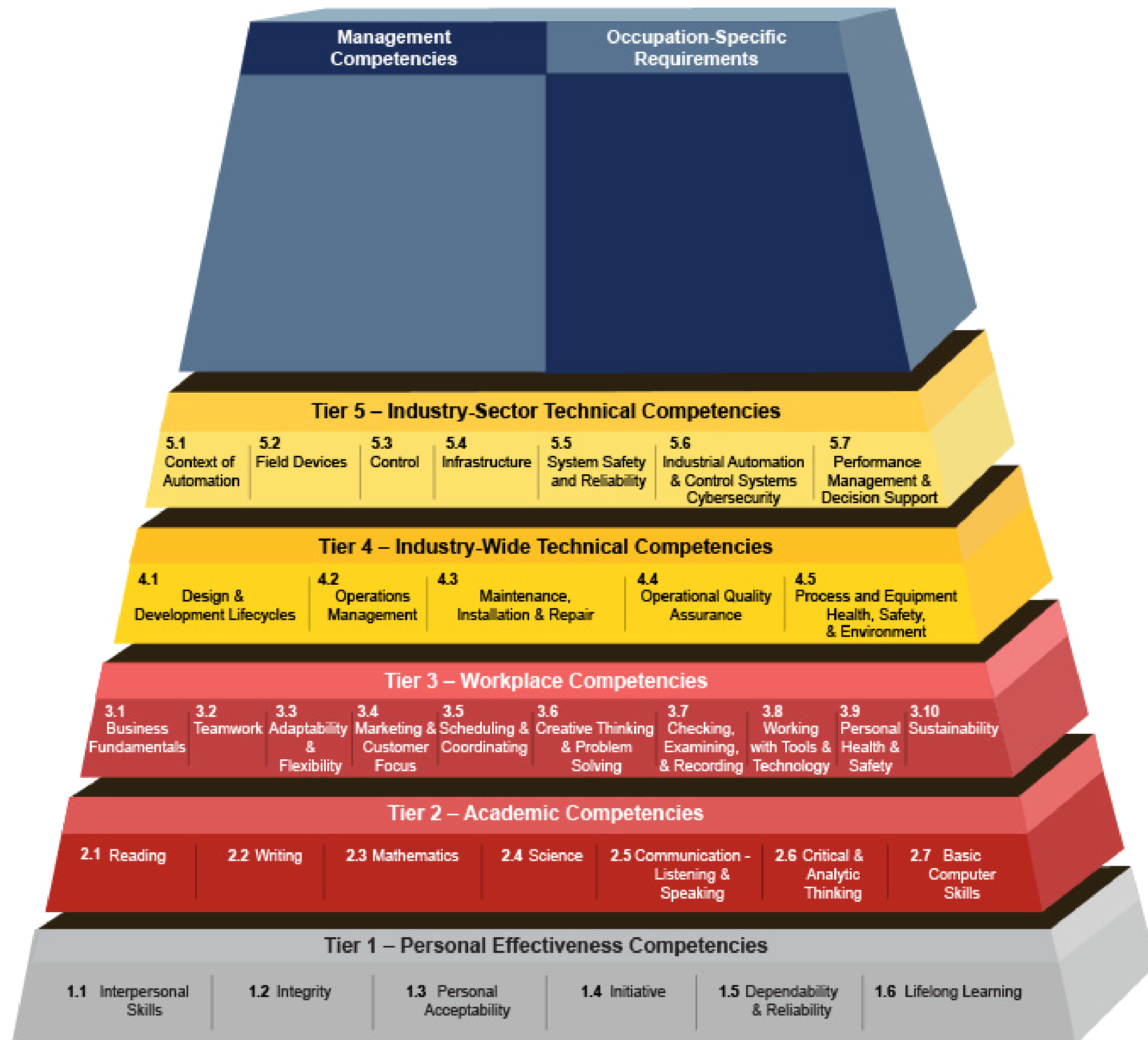
360. Information Assurance

370. The Security Lifecycle



Automation Competency Model

Focus is on Tier 5 - Life Sciences Industry Sector



[Learn more about this competency model](#)

Automation Competency Model in more detail

The Automation Competency Model is a resource that provides a comprehensive collection of the competencies - the knowledge, skills, and abilities - required in the automation industry. The competencies are described using examples of the critical work functions and the technical content common to the industry. A competency describes a behavior but does not describe a level of performance, as different workers will need different levels of competence to complete their job functions.

The model is depicted in a graphic consisting of several tiers. Each tier is comprised of blocks that group the knowledge, skills, and abilities essential for successful performance in the industry. At the base of the model, the competencies apply to a large number of occupations and industries. As a user moves up the model, the competencies become industry- and occupation-specific. The pyramid shape does not imply that competencies at the top are at a higher level of skill. Instead, the model's shape represents the increasing specialization and specificity in the application of skills.

Tiers 1 through 3, called Foundation Competencies, form the foundation needed to be ready to enter the workplace.

Tier 1 – Personal Effectiveness Competencies represent personal attributes or “soft skills”. Essential for all life roles, personal effectiveness competencies are generally learned in the home or community and reinforced at school and in the workplace.

Tier 2 – Academic Competencies are critical competencies primarily learned in a school setting. They include cognitive functions and thinking styles, and are likely to apply to most industries and occupations.

Tier 3 – Workplace Competencies represent motives and traits, as well as interpersonal and self-management styles honed in the workplace. They are generally applicable to a large number of occupations and industries.

Tiers 4 and 5 show the cross-cutting industry-wide technical competencies needed within an industry wherein a worker can move easily across industry sub-sectors. Rather than narrowly defining a single occupational career ladder, this model supports the development of an agile workforce.

Tier 4 – General Technical Competencies represent the basic knowledge and skills that are common across automation sectors.

Tier 5 – Specific Technical Competencies represent advanced competencies that are specific to automation.

The upper tiers represent the occupational specialization within the industry.



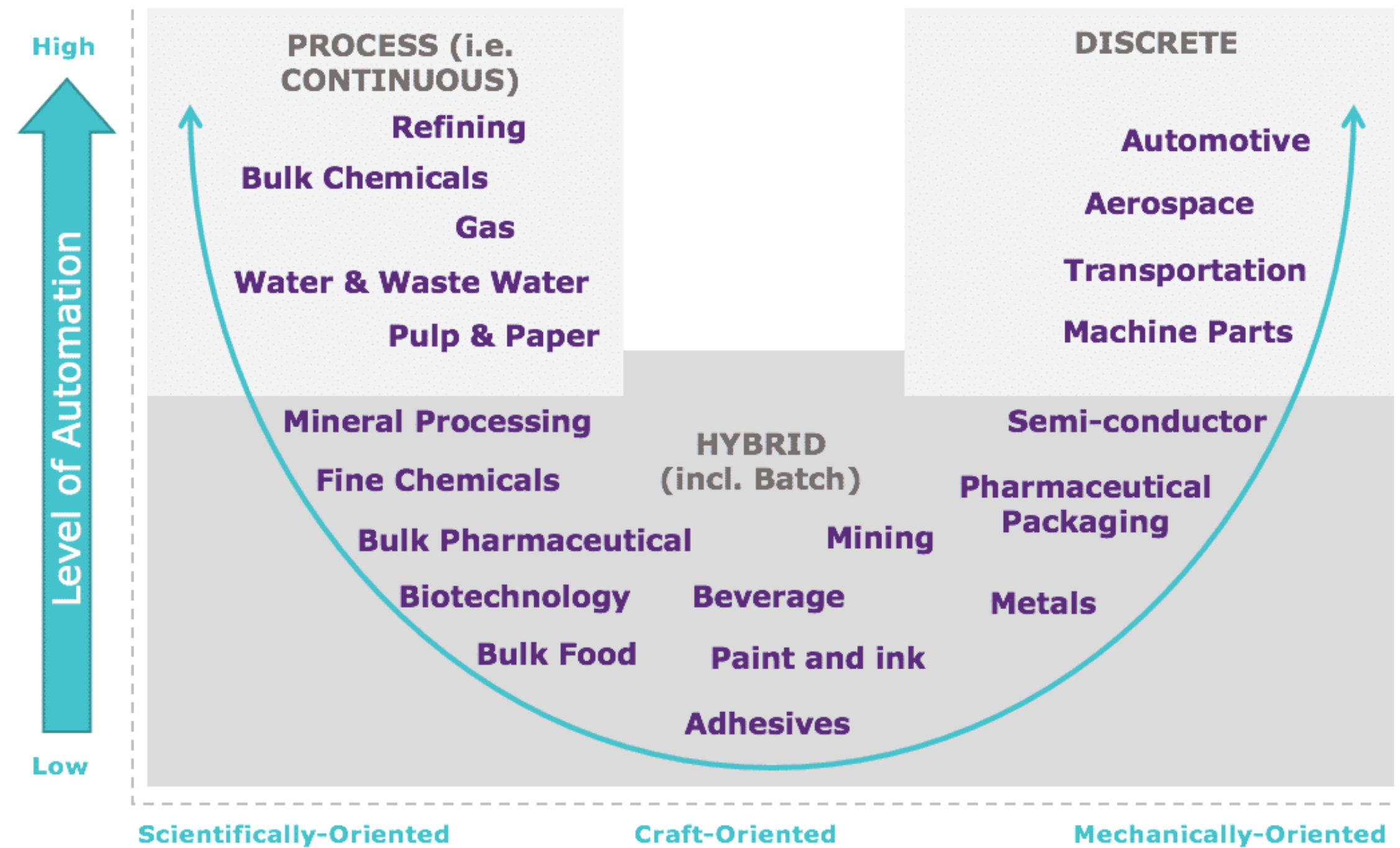
Course 1

Section A: Context of Automation (Module 010)

Module 010 | Introduction to automation for Life Sciences manufacturing

This introductory module aims to introduce you to automation for Life Sciences manufacturing by asking:

- What is the Life Sciences industry?
- What is automation?
- What is automation for Life Sciences manufacturing?
- What standards relate to automation systems design and operation?
- What is the future of automation for Life Sciences manufacturing?



Course 1

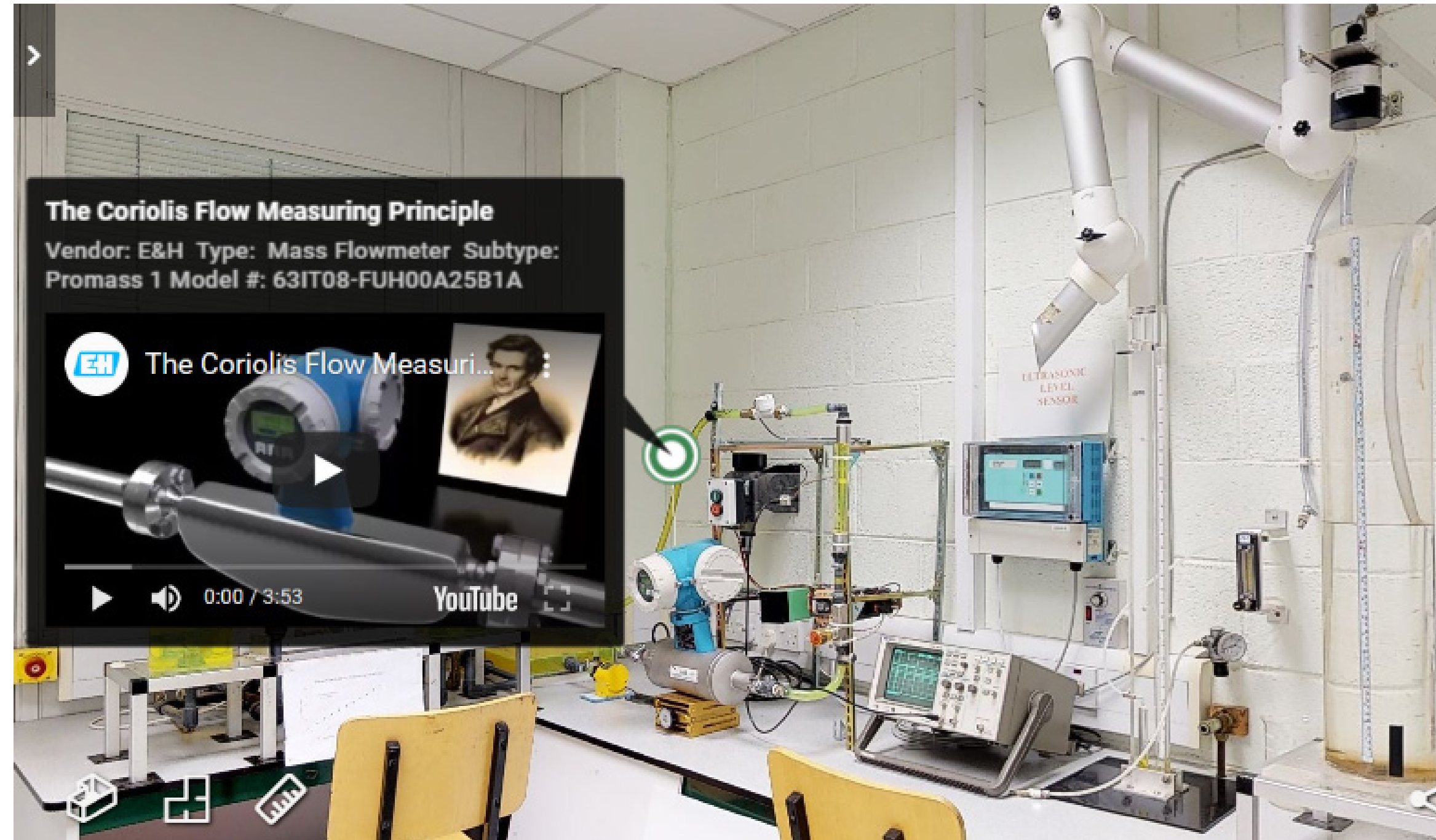
Section B: Measurement, Sensors, and Actuation (Modules 020-070)

Module 020 | Basic Process Instrumentation

This module aims to give you an introduction to measurement and basic process instrumentation.

The learning objectives of this module are that you will be able to explain measurement of:

- Flow
- Temperature
- Pressure
- Level



Course 1

Section B: Measurement, Sensors, and Actuation (Modules 020-070)

Module 030 | Analytical Instrumentation

This module aims to give you an introduction to the purpose of analytical instrumentation and the design frameworks and tools that are adopted when specifying and implementing this category of instrumentation for improved process control.

The learning objectives of this module are that you will be able to explain:

- the Quality by Design (QbD) process
- the analyzer sampling type process
- the analytical instrument technology selection process
- the steps in choosing and installing a sample conditioning system
- the importance of maintaining analytical instruments and analyzers
- at a high level what a Process Analytical Technologies framework is

Module 040 | High Performance Sensors

This module aims to give you an introduction to high performance sensors and specialized technologies/systems for measurement.

The learning objectives of this module are that you will be able to explain:

- Some of the application needs for high performance sensors
- Auto-identification
- Vision systems

Module 050 | Valve Actuation

This module aims to give you an introduction to the types of valve actuation as well as various types of valves used for automated control.

The learning objectives of this module are that you will be able to explain:

- The purpose of actuation
- Electric actuation
- Hydraulic actuation
- Pneumatic actuation
- A variety of valve types

Module 060 | Motor and Drive Control

This module aims to give you an introduction to motor and drive control.

The learning objectives of this module are that you will be able to explain:

- Concepts of motor and electronic drive control



Course 1

Section B: Measurement, Sensors, and Actuation (Modules 020-070)

Module 070 | Electrical Planning and Installation

This module aims to give you an introduction to electrical installations.

The learning objective of this module is that you will be able to explain:

- The electrical installation requirements for an automated manufacturing plant

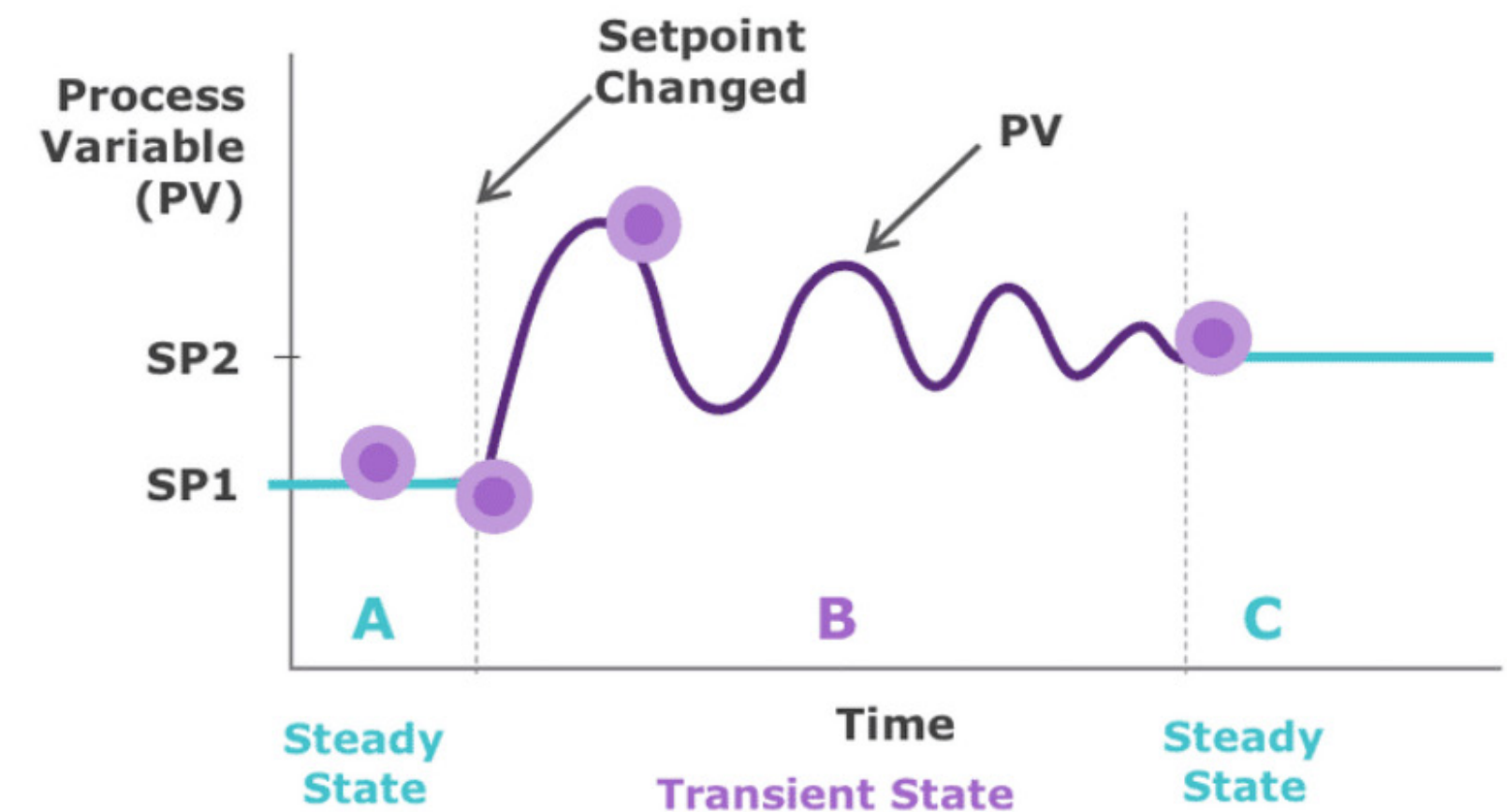
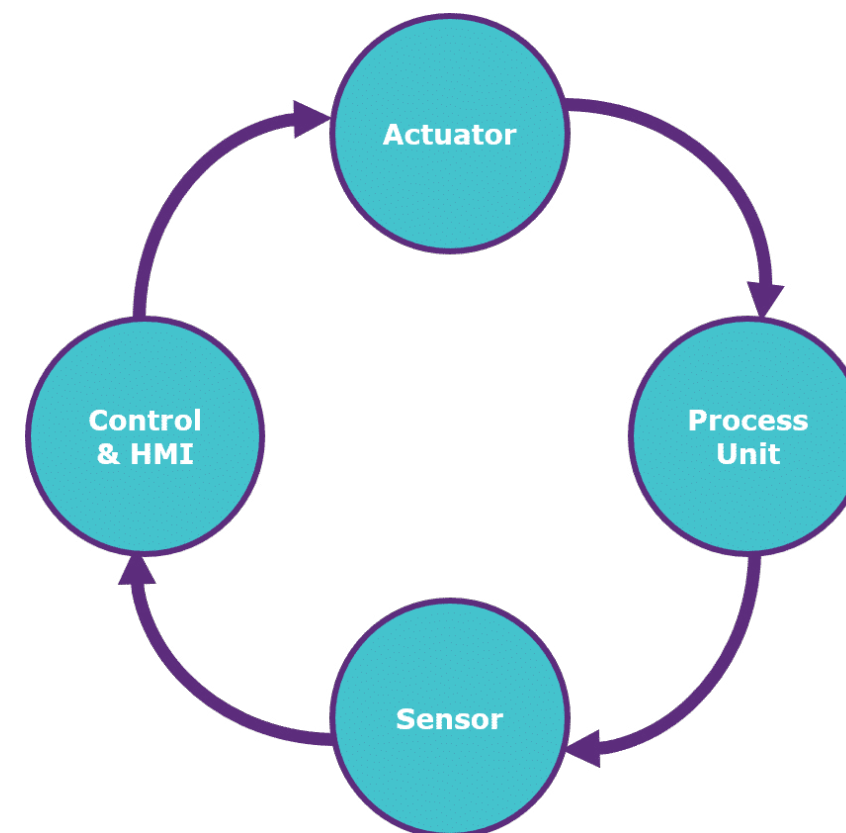
Section C: Control (Modules 080-170)

Module 080 | Continuous and Process Control

This module aims to give you a clear understanding of continuous process control.

The learning objectives of this module are that you will be able to explain:

- Continuous process characteristics
- Feedback control & what loop tuning is
- The principles of advanced regulatory control



Course 1

Section C: Control (Modules 080-170)

Module 90 | Discrete and Sequencing Control

This module aims to give you a clear understanding of discrete and sequencing control.

The learning objectives of this module are that you will be able to explain:

- The concepts behind discrete/sequential control
- The basic functional structure of a Programmable Logic Controller
- Some of the textual and graphical languages used to program automated systems

Module 100 | Batch Control

This module aims to give you a clear understanding of the basics of batch control concepts.

The learning objectives of this module are that you will be able to explain:

- batch process and batch processing configurations
- types of batch control, including basic control, procedural control and coordination control
- batch control and the S88 Standard
- different types of batch recipes and the information required in a recipe

Module 110 | Building Automation Systems and HVAC

This module aims to give you a clear understanding of the basics of Building Automation Systems (BAS) - including Heating, Ventilation, Air Conditioning (HVAC) for the Life Sciences industry with a focus on the regulatory requirements using design examples.

The learning objectives of this module are that you will be able to explain:

- The different design requirements for office spaces and mission critical spaces such as spaces for manufacturing, lab, and warehouse, which may be called Good Manufacturing Practice (GMP) spaces
- HVAC equipment
- BAS architectures and components
- HVAC/BAS project lifecycle
- Popular BAS vendors and products

[Download the full course catalog](#)

