AISSMS
INSTITUTE OF INFORMATION TECHNOLOGY
(IOIT)

ADDING VALUE TO ENGINEERING

An Autonomous Institute Affiliated to Savitribai Phule Pune University
Approved by AICTE, New Delhi and Recognised by Govt. of Maharashtra
Accredited by NAAC with "A+" Grade | NBA - 5 UG Programmes

PROGRAM IN
INSTRUMENTATION ENGINEERING

CERTIFICATE COURSE

On

"SMART FACTORIES FOR SUSTAINABLE BUSINESS"

STRUCTURE AND DETAIL SYLLABUS

(Pattern 2025)

AISSMS INSTITUTE OF INFORMATION TECHNOLOGY
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BOS–INSTRUMENTATION ENGINEERING
AISSMS IOIT (AUTONOMOUS),
PUNE–1.

Program in Instrumentation Engineering

Structure for Certificate Course on

"SMART Factories for Sustainable Business"

Duration: 12 Months

Objectives:

- Preparing Industry working professionals, Engineers, and Managers for transformation to SMART Factories
- Shaping the future of Manufacturing and Process Industries
- Cost Reduction and Product Differentiation
- Optimal Production
- Energy Saving and SMART Energy Management

Eligibility: B.Tech. or B.E. or higher degree in any branch of Engineering or Masters in science, electronics science, computer science, Instrumentation science, Industrial Mathematics and computer Applications.

Working Professionals, Engineers and Managers from Manufacturing and Process Industries.

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Structure: SEM-I

Subject Code	Subject	Hours per week			Credits	Exam Scheme			Total
		Lecture	Tutorial	Practical/Field Assignment		MSE	ESE	SURPRISE Test	
INCC01	Manufacturing Industries	2	0	2	3	30	40	30	100
INCC02	Technology and Business in Industry 4.0	2	0	2	3	30	40	30	100
INCC03	Production Process in Industry 4.0	2	0	2	3	30	40	30	100
INCC04	Logistics and Supply Chain Management in SMART Factories	2	0	2	3	30	40	30	100
INCC05	Inventory Management in SMART Factories	2	0	2	3	30	40	30	100
INCC06	Optimization of Industrial Operations	2	2		4	30	40	30	100
INCC07	Digitization Digitalization and IIOT	3	0		3	30	40	30	100
Total		15	2	10	22	210	280	210	700

Structure: SEM-II

Subject Code	Subject	Hours per week			Credits	Exam Scheme			Total
		Lecture	Tutorial	Practical		MSE	ESE	SURPRISE Test	
INCC08	INDUSTRY 4.0 & Smart Factories	2	0	2	3	30	40	30	100
INCC09	Plant and Business Analytics	2	0	2	3	30	40	30	100
INCC10	Industrial Cyber Security and Safety	2	0	2	3	30	40	30	100
INCC11	Automation and Industry 4.0	2	0	2	3	30	40	30	100
INCC12	Industrial Safety of SMART Factories	2	0	2	3	30	40	30	100
INCC13	Product Differentiation and Cost Reduction	2	2		4	30	40	30	100
INCC14	Academic Project	0	0	6	3	30	40	30	100
Total		15	2	10	22	210	280	210	700

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SEMESTER-I

INCC01-Manufacturing Industries:

Lect/week 02, Assignment per week 02, Credits-3

Objectives: To know and understand the challenges for sustainable business

Unit-1:

Manicuring Industries, Overview, Values and Motivation, Modern Trends, Product development cycle, Manufacturing processes, Energy management, material management from business perspective.

(6)

Unit-2: Failure Modes and Effect Analysis FMEA, Operation and Maintenance

(6)

Unit 3: Regulatory Bodies, Norms and Standards for Quality control of Products (6)

Unit-4: Market competition, Business drivers, Need for improved production, Rapid manufacturing, precision manufacturing, the need for advance technologies for manufacturing (6)

Unit-5: Organizational issues, management needs, use of data science, shift from small data to big data for manufacturing industries (6)

Practical Assignments: - Based on above topics (30)

INCC02-: Technology and Business in Industry 4.0

Lect/week 02, Assignment per week 02, Credits-3

Objective is to understand and justify the need of industry 4.0

Unit-1: Business Needs and Technological Advances: Overview of business in manufacturing industries, cost variations, operational costs, maintenance costs(6)

Unit-2: Market Trends, Challenges for survival and sustainability, knowledge and technology driven business models, Influences due to technology change(6)

Unit-3:Technology and disruption, the need for new product development, strategies for survival and sustainability under the influence of technologies, Technology trends (6)

Unit-4: Effect of technology and research on manufacturing industries, transformation of manufacturing processes, Automation in Industry 3.0 (6)

Unit-5: Industry 4.0 and Automation: The need of Industry 4.0, Motivation and Values, Business in Industry 4.0 (6)

Practical Assignments: - Based on above topics (30)

INCC03- Production Processes in Industry 4.0:

Lect/week 02, Assignment per week 02, Credits-3

Objectives: To know the updates in production processes for Industry 4.0 transformation

Unit-1: Overview of production processes in today's manufacturing industry with examples on challenges and shift due to market requirements (6)

Unit-2: Modern technologically advanced manufacturing: Rapid manufacturing, Assembly line and work flow management, use of robotics, AI assisted manufacturing, Design for assembly, design for manufacturing, design for servicing and testing (6)

Unit-3: Traceability of parts, quality management, end to end developments, customer needs and regulatory compliances (6)

Unit-4: Process and Manufacturing Industries, Transformation needs, optimal and reliable production (6)

Unit-5: Investment and return on investment in industry 4.0, transformational procedures, Work culture in Industry 4.0, advantages and benefits of Industry 4.0 transformation on production processes.

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Practical Assignments: - Based on above topics (30)

INCC04: Logistics and Supply Chain Management in SMART Factories

Lect/week 02, Assignment per week 02, Credits-3

Objectives: To know the way in which logistics and supply chain management is altered in Industry 4.0

Unit-1: Basic background of logistics (07)

Unit-2: Basics of supply chain management(07)

Unit-3: Big data analytics for logistics, Mathematical preliminaries of logistics, big data analytics for logistics management

(08)

Unit-4: Big data analytics for supply chain management, Mathematical preliminaries of data analysis, **(08)**

Practical Assignments: - Based on above topics (30)

INCC05: Inventory Management in SMART Factories

Lect/week 02, Assignment per week 02, Credits-3

Unit-1: Basics of Inventory Management, workflow, cost of inventory management, time and work study for managing the inventory (7)

Unit-2: Augmented reality for inventory management(7)

Unit-3: Mathematical methods for inventory management (8)

Unit-4: Inventory management in Industry 4.0 (8)

Practical Assignments: - Based on above topics (30)

INCC06: Optimization of Industrial Operations

Lect/week 02, Assignment per week 02, Credits-3

Unit-1: Basics of Optimization, formulating objective functions for minimum fuel, minimum loss, maximization of profits (12)

Unit-2: Optimization of industrial operations over time, optimal production (9)

Unit-3: Industry 4.0, self-optimizing loops and plant wide controls, optimal control (9)

Practical Assignments: - Based on above topics (30)

INCC07: Digitization and Digitalization

Lect/week 02, Assignment per week 02, Credits-3

Unit-1: Industrial Internet of Things (IIOT), Internet of People, Internet of Services, Internet of Things and Industry 4.0 (10)

Unit-2: Basic digitization and Digitalization, Digitalization as a system thinking, Devices and available technologies for digitization and digitalization (10)

Unit-3: Data Management: Connection sensory data to cloud, Cloud computing, Edge Analytics, Basic architecture of data management system in Industry 4.0 (10)

Practical Assignments: - Based on above topics (30)

INCC08: INDUSTRY 4.0 & Smart Factories

Lect/week 02, Assignment per week 02, Credits-3

Objectives: Understanding the methodology of industry 4.0 transformation

Unit-1: Industry 4.0 basics, Journey from Industry 1.0 to 4.0, The basic architecture of Industry4.0, The concept of cyber physical systems(8)

Unit-2: SMART Factories, Echo-systems in SMART factories, SMART city and SMART factories, SMART Energy Management, SMART resource management (12)

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Unit-3: Transformation to SMART factories from the existing factories, Strategic plans form transformation, Benefits of Industry 4.0 (10)
Practical Assignments: - Based on above topics (30)

INCC09: Plant and Business Analytics
Lect/week 02, Assignment per week 02, Credits-3
Unit-1: Background of statistical methods of data processing(08)
Unit-2: Basics of big data analytics using machine learning and deep learning(12)
Unit-3: Plant data analytics, big data from control loops in process plants, data driven methods of plant analytics, Machine learning approaches (10)
Practical Assignments: - Based on above topics (30)

INCC10: Industrial Cyber Security and Safety
Lect/week 02, Assignment per week 02, Credits-3
Unit-1: Basics of cyber security, Industrial safety (10)
Unit-2: Industrial fire safety, Electrical safety (10)
Unit-3: Safety Standards and Practices (10)
Practical Assignments: - Based on above topics (30)

INCC11: Automation and Industry 4.0
Lect/week 02, Assignment per week 02, Credits-3
Unit-1: Process Control and Automation, PLC Automation (08)
Unit-2: SCADA and DCS Automation (12)
Unit-3: Industrial Communication (10)
Practical Assignments: - Based on above topics (30)

INCC12: Industrial Safety of SMART Factories
Lect/week 02, Assignment per week 02, Credits-3
Unit-1: Hazardous areas, classes, safety and best practices, Intrinsic safety (10)
Unit-2: Disaster Management (10)
Unit-3: SMART FACTORY and implementation(10)
Practical Assignments: - Based on above topics(30)

INCC13: Product Differentiation and Cost Reduction
Lect/week 02, Assignment per week 02, Credits-3
Objectives: To know SMART production and Product differentiation
Unit-1: Product differentiation, the need and how to do it in SMART factories(10)
Unit-2: New product development(10)
Unit-3: SMART FACTORY and SMART Production(10)
Practical Assignments: - Based on above topics (30)

INCC14: Academic Project (45)
6 hours per week, 3 credits
Objectives: To bring out projects using big data analytics which are industry 4.0 compliant. This might lead to a start up problem, or Industry project.
Academic Project based on Field Exposure/Survey/Problems faced by Industries

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