SEM IV

Course Code: BIC26PCL251 **Course Name :** Industrial Process Operations **Course Category**: PCC
Credits: 3 **Teaching scheme:** L-3 **Evaluation scheme:** CA–60, ESE–40
Duration: 2h
Pre-requisites: Fundamentals of Instrumentation

Course Objectives:

1. To study operations and its effects
2. To study equipments used for various operations

Course Outcomes:

At the end of the course, students will be able to,
CO1: Knowledge of unit operations and effect of different parameters on these operations.
CO2 : Acquaintance with different equipment used for unit operations.
CO3: Apply basic measures to control and monitor unit operations..

Contents:

Unit	Content	Teaching Hours
1	**UNIT I** Introduction: Unit operations and unit processes. Basic concepts of corrosion and protection from corrosion. Selection materials, metals & alloys used in construction of field instruments for different applications. Unit operations in different industries: Identification and justification of unit operations used in different industries like food, Pharma, paper, sugar, cement, fertilizer, Petrochemical industry with help of process flow diagram	10
2	**UNIT II** **Transportation of Fluid & Equipment:** Definition and classification, Rheological behavior of fluids & Newton's Law of viscosity. Fluid statics Pascal's law, Basic equations of fluid flow – Continuity equation, and Bernoulli equation; Types of flow – laminar and turbulent; Reynolds experiment. Basic understanding about piping, valves. Specifications and working of pumps, compressors, fans, blowers. Selection of equipment and its material for different applications. **Heat transfer and Equipment:** Modes of heat transfer; Conduction–steady state heat conduction, Convection- Forced and Natural convection, principles of heat transfer co-efficient, log mean temperature difference, individual and overall heat transfer co-efficient, fouling factor. Basic principles, working and selection criteria and control for double pipe, shell & tube heat exchangers, boilers, condensers, evaporators, cooling towers.	12
3	**UNIT III** Mass transfer and Equipment: Mass, heat, and momentum transfer analogies Material balance with or without chemical reactions mass transfer coefficients. Principles, working design considerations and control for equipment used for unit operations like distillation, extraction, drying, humidification, dehumidification	12
4	**UNIT IV**	11

	Mechanical particulates and Screening and Equipment: Introduction of Particulate Sizes nd Shapes, Principle, working design considerations and control for equipment used for nit operations like Screening, Size Reduction, Filtration Cross Flow Filtration and lembrane Separations,GravitySedimentationProcesses,CentrifugalSeparations, Floatation	

Text Books:
• Unit operations in Chemical Engineering by Warren L. McCabe, Julian C. Smith & Peter Herriot, McGraw-Hill Education (India) Edition 2014.
• Transport Process Principles and Unit Operations by Christie Geankoplis, Prentice Hall of India
Reference Books:
• Unit operations in Chemical Engineering by Warren L. McCabe, Julian C. Smith & Peter Herriot, McGraw-Hill Education (India) Edition 2014.
• Transport Process Principles and Unit Operations by Christie Geankoplis, Prentice Hall of India
E-Resources:
Name of the website/ E-Journals/ Online Videos
1. nptel.ac.in/courses/108105064)
2. Industrial Instrumentation NPTEL Study Materials - Video Lectures & Resources | NPTELPrep

Course Code: BIC26PCL252 **Course name:** Process Control **Course Category:** PCC
Credits: 2 **Teaching scheme:** L-2 **Evaluation scheme:** CA–60, ESE–40 **Duration:** 2h

Pre-requisites:

1. Coordinate Geometry, Trigonometry, Sine & Cosine Rule, Unit Conversions
2. Fundamentals of Physic

Course Objectives:

To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

Course Outcomes:

Students are able to,

CO1: To Understand simple processes
CO2: To Design Feedback control systems
CO3: To understand and analyze friction gravity and moment of Inertia

Contents:

Unit	Content	Teaching Hours
1	**Dynamic behavior of simple processes** Objectives of Chemical Process Control, Mathematical modeling of chemical processes, State variables and state equations, Input-Output model, Linearization of nonlinear systems, Types of Forcing functions, dead-time systems, First order systems/processes Thermometer, Liquid level tank, Liquid level tank with constant outlet (pure capacitive), isothermal and non-isothermal CSTR, Dynamic response of first order system to impulse and step inputs, basic concepts of MIMO systems	08
2	**Design of single-loop feedback control systems** Second order systems/processes – Damped vibrator, Interacting and Non-interacting systems, Step response of second order system, Characteristics of under-damped system. Classical controllers – P, PI, PD, PID and ON- OFF controllers. Concept of feed-back control system, Servo & Regulatory problem, Block diagram reduction of complicated control systems, and Dynamic behavior of feed-back control processes	07
3	**Friction, Centre of Gravity and Moment of Inertia:** Friction: Introduction to friction, types and application, Laws of friction, Angle of friction, Angle of repose, Cone of friction, Problems on horizontal & inclined plane, block, and ladder.CG & MI: Design of Complex Control: Design of controllers with difficult dynamics such as large time delay system, inverse response system. Analysis and design of control system with multiple loops viz: cascade, selective, split range. Analysis and design of advance control system(feed forward, Ratio, Adaptive, Inferential.)	08
4	**Digital and Computer- based Control Systems:** Sampling of continuous signals to discrete- time signals, reconstruction of continuous- time signals from discrete-time signals using hold elements,	07

	Digital approximation of classical controllers, Role of digital computer in process control as process interface for data acquisition and control, Centralized control systems, supervisory control systems (SCADA), microcomputer- based control systems (PLC, DCS), Plant wide control for plants involving compressor, Heat Exchanger, Adiabatic Plug Flow Reactor.	

Text Books:
1. Chemical Process Control, George Stephanopoulos, PHI publication**,**
2. Process System Analysis& Control, Donald R. Coughanour, McGraw Hill
3. Process Control– Modeling, Design & Control, B. Wayne Banquette, PHI Publication
Reference Books:
1. Process Dynamics & Control, Dale E. Seaborg, Thomal F. Edgar, Dancan A. Melli champ
2. Process Dynamics, Modeling &Control– Babatunde A. Ogunnaike, W. Harmon Ray, Oxford University Press Inc.
3. Process Dynamics & Control- R.W. Gaikwad & S.A. Misal, Denett Publisher Nagpur
E-Resources:
1. www.nptel.ac.in (Learning platform from IIT profe**ssors)**
2. **nptel.ac.in/courses/103101142**
3. www.discoveryforengineers.com (Investigating Discoveries)

Course Code: BIC26PCL253 **Course Name:** Microcontrollers & Embedded System **Course Category:** PCC		
Credits: 3	**Teaching scheme:** L-3	**Evaluation scheme:** CA–60, ESE–40
Duration: 2 h		
Pre-requisites: Basic Of Electronics And Electrical		

Course Objectives:

1.To understand fundamental concepts of sensors and Transducers

2.To learn the different Measurements

3.To understand various environmental sensors

Course Outcomes:

CO1**:** Differentiate amongst various architectures of microcontrollers

CO2: Impart microcontroller programming and design skills

CO3: Interface and use different peripherals with microcontrollers

CO4: Evaluate and compare the performance of microcontrollers

Contents:

Unit	Content	Teaching Hours
1	**Introduction to Microcontroller:** Numbering system, Microcontrollers Vs Microprocessors, RISC and CISC architecture comparison. Von Neumann's. Harvard architecture, comparison between 8-bit, 16-bit, 32-bit Micro controller. Stack and use of stack pointer. Memory structure, Data Memory, Program Memory and execution of programs.	12
2	**Programming with microcontroller:** Interface and use different peripherals with microcontrollers Programming: Concept of assembler directives, editor, linker, loader, debugger, simulator, emulator. Instruction set, basic programming using assembly instructions. Introduction to embedded-C, Integrated Development Environment (IDE), cross compiler, ISP, software delay generation.	12
3	**8 Bit micro-controller:** Introduction to 8 bit microcontroller, Addressing Modes & Instruction Set, architecture and PIN description, Interrupts and Operating Modes, Analog Input-Output and PWM, Digital Input-Output, Memory Mapping (internal as well as external) of microcontroller	9
4	**I/O Interfacing:** I/O programming, interfacing with simple switch, LED, Keypad programming. Timers, various modes of operations of timers, counters, PWM programming.	12

Text Books:
1. Mazidi, "8051micro controller & embedded system" 3rd Edition, Pearson
2. Mazidi, "PIC micro controller & embedded system" 3rd Edition, Pearson
3. Kenneth J. Ayala, "8051 Microcontroller: Programming, Architecture and Interfacing", Thomas Delmar Learning, Third ed., 2007.
4. Newnes, 1st Edition, 2010"MSP430 Micro controller Basics" by John H Davies
Reference Books:
1. Kenneth J. Ayala, "The 8051 Micro-controller–Architecture, Programming & Applications", Penram International & Thomson Asia, Second Edition.
2. John B. Peatman, "Design with PIC Micro-controllers", Pearson Education Asia, Low Price Edition
3. MSP430TechnicalReferenceManual
4. Newnes Publication,2009*Texas Instruments MSP430 micro controller, Guide and Datasheet
5. Muhammad A. Mazidi, "AVR Microcontroller and Embedded Systems: Assembly and C", Pearson; 1st edition, 2015
E-Resources:
1. www.nptel.ac.in (Learning platform from IIT profe**ssors)**
2. **nptel.ac.in/courses/103101142**
3. www.discoveryforengineers.com (Investigating Discoveries)
4. **nptel.ac.in/courses/108105102**

Course Code: BIC26PCP252 **Course Name:** Process control lab **Course Category:** PCC

Credits: 1 **Teaching scheme:** P-2 **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Fundamentals of Instrumentation

Course Objectives:

The Objective of this course are

1. To Study simple processes
2. To study feedback systems.

Course Outcomes:

At the end of the laboratory course, the students will be able to,

CO1**:** Ability to understand and analyze process control engineering problems.

CO2 : To explain SCADA and PLC

CO3**:** Apply knowledge to build project

Contents:

Sr. No.	List of Practical	Lab Hours
1	Study of Process Control Training Plant and Compact Flow Control Unit.	02
2	PID Implementation Issues.	02
3	Tuning of PID Controller for mathematically described processes	02
4	Auto-tuning of PID Controller	02
5	CLOSED LOOP RESPONSE OF LEVEL CONTROL LOOP	02
6	Analysis and design of advance control system	02
7	Study of SCADA	02
8	Study of PLC	02

Course Code BIC26PCP253 **Course Name:** Microcontroller & Embedded system lab **Course Category:** PCC

Credits: 1 **Teaching scheme:** P-2 **Evaluation scheme:** CA–30, ESE–20

Pre-requisites: Digital Electronics Fundamentals

Course Objectives: The Objective of this course are

1. To Study 8 Bit Microcontroller

2. To Study Microcontroller Interfacing.

Course Outcomes:

At the end of the laboratory course, the students will be able to,

CO1: To Introduce 8 bit controller

CO2: To understand and use compilers

CO3: apply knowledge to build project

Contents:

Sr. No.	List of Practical	Lab Hours
1	Study of Introduction to microcontroller	02
2	Study of fundamentals of programming compilers	02
3	Arithmetic operations using 8 bit controller	02
4	Data transfer using 8 bit controller	02
5	Logical operations using 8 bit controller	02
6	LED interfacing using 8 bit controller	02
7	Relay interfacing using 8 bit controller	02
8	Application of 8 bit controller	02

Course Code:BICVSP254	**Course name:** Industry 4.0 Lab	**Course Category:** VSEC
Credits: 1	**Teaching scheme:** L-2	**Evaluation scheme:** CA–30, ESE–20
Duration: 2h		
Pre-requisites: Fundamentals Of Sensors Simulators		
Course Objectives: To study and practice industry 4.0		
Course Outcomes: Students are able to, CO1. Understand the key attributes of industry 4.0 CO2. Understand conceptual framework for industry 4.0 CO3 To understand role of industry 4.0 in real world		

Contents:

Unit	Content	Teaching Hours
1	**Introduction** Introduction to industry 4.0, core idea of 4.0, concept,, current status of industry 4.0, how India preparing it.	02
2	**A Conceptual Framework for Industry 4.0:** Introduction, Main Concepts and Components of Industry 4.0, State of Art, Supportive Technologies, Proposed Framework for Industry 4.0.	03
3	**Advances in Robotics in the Era of Industry 4.0:** Introduction, Recent Technological Components of Robots- Advanced Sensor Technologies, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics, Industrial Robotic Applications- Manufacturing, Maintenance and Assembly.	06
4	**The Role of Augmented Reality in the Age of Industry 4.0:** Introduction, AR Hardware and Software Technology, Industrial Applications of AR.	04

Text Books:
1. Alp Ustundag and Emre Cevikcan," Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan" The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröder," The Challenges of Industry 4.0 for Small and Medium-sized Enterprises"
Reference Books:
1. Alp Ustundag and Emre Cevikcan," Industry 4.0: Managing the Digital Transformation".
2. Bartodziej, Christoph Jan,"The Concept Industry 4.0".
3. Klaus Schwab,"The Fourth Industrial Revolution".
4. Christian Schröder ,"The Challenges of Industry 4.0 for Small and Medium-sized Enterprises"**.**
E-Resources:
1. www.nptel.ac.in/

Course Code:BIC26VSP255	**Course name:** Industrial Safety	**Course Category:** VSEC
Credits: 1	**Teaching scheme:** P-2	**Evaluation scheme:** CA–30, ESE–20
Duration: 2h		
Pre-requisites: Fundamentals Industry Technical Structure		

Course Objectives: To study and practice industry safety

Course Outcomes:

Students are able to,

CO1. Understand noise safety

CO2. Understand conceptual sensitivity test

CO3. To understand Personal and fire safety

Contents:

Unit	Content	Teaching Hours
1	**NOISE LEVEL MEASUREMENT AND ANALYSIS** Measurement of noise level for various sources – Impact, continuous and intermittent. Frequency and spectrum analysis of noise: Instrument – precision type of Noise level meter with frequency and spectrum analyzer	03
2	**VIBRATION MEASUREMENT AND ANALYSIS** Measurement of whole body vibration for various acceleration: Instrument – vibration simulator and vibration analyzer	02
3	**SENSITIVITY TEST** Measurement of thermal reactivity for unstable materials, Measurement of impact sensitivity for unstable materials	02
4	**STUDY OF PERSONAL PROTECTIVE EQUIPMENT:** Types, need of PPE Safety helmet, belt, hand gloves, goggles, safety shoe, gum boots, ankle shoes, face shield, nose mask, ear plug, ear muff, apron and leg guard. **STUDY OF FIRE EXTINGUISHERS** Fire triangh, types of fire, fire load, fire fighting: Method fire alarms, fire detection, fire hydrant systems. Selection and demonstration of first-aid fire extinguishers: soda acid, foam, carbon dioxide (CO2), dry chemical powder, halon	08

Note: field visit to study all above points practically

Course Code:BIC26HSL256 **Course name:** Entrepreneurship Development **Course Category:** EEMC
Credits: 2 **Teaching scheme:** L-2 **Evaluation scheme:** CA–60, ESE–40
Duration: 2h
Pre-requisites: Fundamentals Of Social Science

Course Objectives:

To study and practice entrepreneur concept and attributes

Course Outcomes:

Students are able to,

CO1. Understand the key attributes and mindsets of entrepreneurial and entrepreneurial leadership by analyzing role models and their contribution to economic development

CO2. Apply design thinking principles to identify a real-world problem, define customer segments, and validate needs through primary research.

CO3. To understand and analyze friction gravity and moment of Inertia

CO4 Analyze the components of a business model using the Lean Canvas framework to identify riskiest assumptions and validate value propositions.

Contents:

Unit	Content	Teaching Hours
1	**Introduction** Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.	08
2	**Understanding and analyzing the macro-Problem** Understanding and analyzing the macro-Problem and Industry perspective, technological, socio economic and urbanization trends and their implication on new opportunities. Identifying passion, identifying and defining problem using Design thinking principles. Analyzing problem and validating with the potential customer. Iterating problem-customer fit. Understanding customer segmentation, creating and validating customer personas. Competition and Industry trends mapping and assessing initial opportunity	07
3	**Understanding Customer Jobs-to-be-done** Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition. Developing Problem-solution fit in an iterative manner. Understanding prototyping and MVP.	08
4	**Developing a feasibility prototype** Developing a feasibility prototype with differentiating value, features and benefits. Initial testing for proof-of concept and iterate on the prototype. Assess relative market position via competition analysis, sizing the market and assess scope and potential scale of the opportunity..)	07

Text Books:
1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGraw Hill, 11th Edition.
2. Ries, E. (2011). The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business
Reference Books:
1. Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015.
2. Oster walder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.
3. Simon Sinek (2011) Start with Why, Penguin Books limited 4. Brown Tim (2019) Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation, Harper Business
E-Resources:
1. https://onlinecourses.nptel.ac.in/noc25_de20/preview
2. Learning resource and Venture Creation- Ignite 5.0 Course Wadhwani platform (Includes 200+ components of custom created modular content and 500+ components of the most relevant curated content)