SEVENTH SEMESTER

Sr No	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Continual Assessment	End Sem Examination	Total
1.	22II701T	Industrial Automation	3			3	30	70	100
2.	22II701P	Industrial Automation Lab			2	1	25	25	50
3.	22II702T	Artificial Intelligence	3			3	30	70	100
4.	22II703T	Professional Elective - III	3			3	30	70	100
5.	22II761O	Open Elective - III	3			3	30	70	100
6.	22II704P	Dashboard and Mobile Application Development Lab			2	1	25	25	50
7.	22II705P	Project - II			8	4	50	50	100
8.	22II706P	Summer / Winter Internship *				2	50		50
9.	22II707P	Capstone Course **			2	1	50		50
Total			**12**		**14**	**21**	**320**	**380**	**700**

***Four weeks Internship Completion till 6th Semester**
**** Comprehensive Online Exam**

Open Elective – III	
22II761O	Robotics

Professional Elective- III	
22II703T	Signal Processing

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22II701T	Industrial Automation	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To impart fundamental knowledge of automation, industrial robotics, and their applications in manufacturing. 2. To introduce Programmable Logic Controllers (PLCs) and Supervisory Control and Data Acquisition (SCADA) systems for industrial automation. 3. To develop skills in PLC programming and its implementation in real-world automation applications.	Understand the fundamentals of automation, its types, and its role in modern manufacturing systems. Demonstrate knowledge of industrial robots, their specifications, components, and applications in automation. Interpret the architecture, working principles, and selection criteria of PLCs used in industrial applications. Develop PLC programs using ladder logic, timers, counters, and apply them to industrial automation scenarios. Analyze SCADA systems, their architecture, features, and applications in real-world industrial monitoring and control.

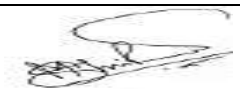
Unit I	**[08 Hrs]**
Automation- Definition, types, reasons for automating, arguments for and against automation. Types of production, functions in manufacturing. Automated Flow 'Lines- Methods of work part transport, Transfer mechanisms, Buffer storage. Automated Assembly Systems- Types, parts delivery system	
Unit II	**[09 Hrs]**
Industrial Robotics- Introduction, robot anatomy, robot control systems, Accuracy and repeatability and other specifications, End effectors, sensors, Introduction to robot programming methods, safety monitoring. Robot application.	
Unit III	**[08 Hrs]**
Introduction to PLC: Evolution of PLC, Architecture-PLC Block diagram and working, Selection of PLC, types of PLC, advantages, limitations and applications of PLCs, Networking of PLCs, PLC Hardware- Input and output modules for PLC- working, description, wiring details, specifications, interfacing, types of sensors and actuators	
Unit IV	**[07 Hrs]**
PLc Programming and applications: Programming languages for PLC, G-code and M-code, Ladder programming, relay type instructions – timer, counter, data handling instructions PLC based applications.	
Unit V	**[08 Hrs]**
Introduction to SCADA: Application area of SCADA, Architecture-Elements, block diagram of SCADA, types of SCADA, features of SCADA, MTU, RTU functions, and applications of SCADA.	

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Automation, production System & CIMS	M P, Groover	Third edition	PHI Prentice Hall
2.	Robotics	Deb S.R.	-	McGraw Hill Publications
3.	Programmable logic controllers and industrial automation	Madhuchahanda Mitra, Samarjitsen gupta	-	Penram International publishing India Pvt. Ltd.

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Programmable logic controllers	V R Jahav		Khanna publications

		July 2025	1.0	Applicable for 2025-26
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ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING &TECHNOLOGY, NAGPUR
(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B. Tech. Scheme of Examination & Syllabus 2022-23
Industrial IoT

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22II701P	Industrial Automation Lab		-	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended This course aims to provide hands-on experience in industrial automation by implementing CNC operations, robotic applications, and sensor-based object detection. It focuses on developing ladder logic programming skills for traffic control, lighting systems, and motor control. Additionally, students will work on real-time automation projects, including conveyor-based material handling and water level monitoring, enhancing their practical understanding of industrial processes.	**Students will be able to** Demonstrate the operation and performance analysis of CNC milling, CNC lathe, and robotic pick-and-place systems. Implement sensor-based automation for object detection, color sorting, and conveyor belt material handling. Develop and execute ladder logic programs for traffic light control, lighting systems, and conditional motor control. Design and implement real-time industrial automation projects, including palletizing and water level monitoring.

Sr. No.	List of Practical's
1	Performance based on pick and place using Dobot magician robot
2	Performance based on to detect objects in front of the photoelectric switch (Proximity Sensor).
3	Performance based on to categorize red, blue and green objects using color sensor.
4	Performance based on mini conveyor belt for material handling.
5	Performance based on palletizing cubical box.
6	Performance based on CNC milling machine
7	Performance based on CNC lathe machine
8	Write a ladder logic program for traffic light signal control
9	Write a ladder logic program for blinker light for single and double
10	Write a ladder logic program for staircase lighting using 2 way switch
11	Water level indication and pump control
12	Conditional control for two motors

Text books and Reference books

S.N	Title	Authors	Edition	Publisher
1.	Automation, production System & CIMS	M P, Groover	Third edition	PHI Prentice Hall
2.	Robotics	Deb S.R.	-	McGraw Hill Publications
3.	Programmable logic controllers and industrial automation	Madhuchahanda Mitra, Samarjitsen gupta	-	Penram International publishing India Pvt. Ltd.

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23II702T	Artificial Intelligence	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended to • Gain the basics of one of the most fascinating and fastest growing areas of Computer Science • Formulate artificial intelligence problems corresponding to different applications. • Apply artificial intelligence search strategies/ algorithms to solve the problems. • Learn the applications and existing systems of Artificial Intelligence in different areas.	**Students will be able to** • Learn the fundamentals of Artificial Intelligence domain. • Comprehend the basic AI problem solving strategies. • Analyze the applicability of various searching Techniques. • Distinguish between various search strategies. • Learn the various aspect of knowledge from AI point of view.

Unit I Introduction	**[10 Hrs]**
Definition of AI, history & importance of AI, AI winter, current status, scope, agents, environments, Turing test concept, Task domain of AI, AI Characteristics, AI Problems and its state space search, Introduction to intelligent agents. Case study: MYCIN, Dendral (any one)	
Unit II AI Problems and its Formulations	**[10 Hrs]**
Defining the problems as a state space search and representation, Introduction to Production system, it's type, Production system characteristics and Issues in the design of search problems, Additional problems. Specialized production system, Problem solving methods -Problem graphs, Matching.	
Unit III Uninformed Search Strategies	**[8 Hrs]**
Search strategies, blind search, Breadth-first search, Depth-first search, Branch and bound algorithm, Comparing uniformed search techniques. Related Algorithms.	
Unit IV Informed search strategies	**[8 Hrs]**
Indexing and Heuristic functions, Generate-and-test, Hill climbing, best-first search, problem reduction, constraint satisfaction, Mean-ends analysis. Search and optimization (gradient descent)	
Unit V Introduction Knowledge Representation	**[9 Hrs]**
Knowledge Progression, Knowledge model, categories of various knowledge, knowledge type, KR system requirements, mapping between facts and representations, Brief about Issues in knowledge representation, Case study of AI Systems: Google Duplex (or latest one.) and others.	

Text Books

Sr. No.	Title	Authors	Edition	Publisher
1	Artificial Intelligence	Elaine Rich, Kevin Knight, & Shivashankar B Nair	3rd	McGraw Hill
2	Artificial Intelligence: A Practical Approach	Rajiv Chopra	1st	S Chand & Co Ltd
3	Artificial Intelligence A modern approach	Stuart Russell, andPeter Norvig	2nd	Pearson

Reference Books

Sr. No.	Title	Authors	Edition	Publisher
1	Artificial Intelligence	Saroj Kaushik	I	Cengage Learning India.
2	A First Course in Artificial Intelligence	Deepak Khemani	VI	McGraw Hill Education

ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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B. Tech. Scheme of Examination & Syllabus 2023-24

INDUSTRIAL IoT

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22II703T	PE - I Signal Processing	3	---	---	3	30	70	100

Course Objectives	Course Outcomes
Understand the fundamental concepts of signals and systems, including their classifications, representations, and operations, enabling students to analyze and manipulate both continuous and discrete signals. Develop proficiency in the application of Fourier Series, Fourier Transform, and Z-Transform to analyze periodic and non-periodic signals, providing a strong foundation for studying signal behavior in both time and frequency domains. Gain practical skills in digital signal processing techniques, with an emphasis on discrete-time systems, the Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT), preparing students to analyze and design systems in real-world signal processing applications.	Students will be able to classify, represent, and perform basic operations on various types of signals and systems. Students will be able to apply Fourier Series and Fourier Transform to analyze periodic and non-periodic signals in both time and frequency domains. Students will develop the ability to analyze and process discrete-time signals using basic digital signal processing techniques, including convolution and correlation. Students will gain the skills to analyze discrete-time systems and solve difference equations using the z-transform and its properties. Students will be able to compute and apply the Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) for efficient signal analysis and system design.

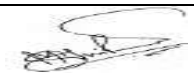
Unit I: INTRODUCTION TO SIGNALS AND SYSTEMS	**[7 Hrs]**
Representation of Signals, Elementary Signals, Basic Operations on Signals, Classification of Signals, Classification of Systems, Properties of Systems	
Unit II: FOURIER SERIES AND FOURIER TRANSFORM	**[10 Hrs]**
Fourier Series, Existence of Fourier Series, Different forms of Fourier Series, Wave Symmetry, Fourier Spectrum, Power Representation using Fourier Series, Fourier Transform Representation of Non-periodic Signals, Magnitude and Phase Representation of Fourier Transform, Existence of Fourier Transform, Fourier Transform of Standard Signals, Properties of Continuous Time Fourier Transform, Fourier Transform of a Periodic Signal, System Analysis with Fourier Transform	
Unit III: DIGITAL SIGNAL PROCESSING ESSENTIALS	**[8 Hrs]**
Basic Elements of a Digital Signal processing System, Advantages of Digital over Analog Signal Processing, The Concept of Frequency in Continuous-Time and Discrete-Time Signals, Analog-to-Digital and Digital-to-Analog Conversion, Discrete-Time Signals and Systems, Discrete Convolution and Correlation	
Unit IV: Z-TRANSFORM	**[10 Hrs]**
The *z* – transform, Properties of the ROC, Properties of *z* – transform, Rational *z* – transforms, Inverse *z* – transform, one sided *z* – transform, Analysis of Linear Time Invariant Systems in the z - Domain, Solution of Difference Equations using z-transforms, Deconvolution using z - transform	
Unit V: DISCRETE & FAST FOURIER TRANSFORM	**[10 Hrs]**
The Discrete Fourier Transform (DFT), Relationship of the DFT to other transforms, Properties of DFT, Comparison between Circular Convolution and Linear Convolution, Evaluation of Circular Convolution, Linear Convolution from Circular Convolution, Filtering long Duration Sequences, Direct Evaluation of DFT, The Fast Fourier Transform (FFT), Decimation in Time (DIT) and Decimation in Frequency (DIF) algorithms, IDFT using FFT Algorithm	

TEXT BOOKS

S. No.	Title	Authors	Edition	Publisher
1	Digital Signal Processing	John G. Proakis, Dimitris G. Manolakis	III	Prentice Hall India
2	Digital Signal Processing	A. Anand Kumar	II	Prentice Hall
3	Digital Signal Processing	P. Ramesh Babu	IV	Scitech Publication

REFERENCE BOOKS

S. No.	Title	Authors	Edition	Publisher
1	Discrete Time Signal Processing	Alan V. Oppenheim, Ronald W. Schafer	II	Prentice Hall India
2	Fundamentals of Digital Signal Processing using MATLAB	Robert J. Schilling, Sandra L. Harris	---	Tata McGraw Hill

		July 2025	1.0	Applicable for 2025-26
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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22II704P	Dashboard and Mobile Application Development Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
Upon successful completion of this lab course, students will be able to design, develop, and deploy lightweight dashboards and mobile applications to monitor and control IoT systems using real-time data visualization and cloud-based tools.	Design static and interactive dashboards using tools like Google Data Studio and Grafana for basic data visualization. Create real-time IoT dashboards by integrating data from sensors using InfluxDB and Grafana. Configure IoT devices to transmit sensor data to cloud platforms like ThingSpeak for visualization and analysis. Develop mobile applications using MIT App Inventor for real-time data display and basic device control via Bluetooth. Design event-triggered dashboards and notification systems using Node-RED and IFTTT for smart automation scenarios

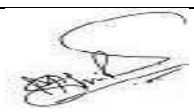
Sl. No.	List of Practicals
1.	Introduction to Dashboard Development using Google Data Studio / Grafana
2.	Creating a Real-Time Dashboard using Grafana and InfluxDB
3.	Visualizing Sensor Data with ThingSpeak
4.	Build a Simple Mobile App using MIT App Inventor
5.	Mobile App to Control an LED via Bluetooth using MIT App Inventor
6.	Mobile App for Live Temperature Monitoring
7.	Node-RED Dashboard Creation
8.	Push Notification using IFTTT

Text Books

S.N	Title	Authors	Edition	Publisher
1	The Big Book of Dashboards	Steve Wexler, Jeffrey Shaffer, Andy Cotgreave	---	Wiley
2	Google Data Studio for Beginners	Vishal Gokhale	---	---
3	Creating Mobile Apps with MIT App Inventor	David Wolber et al.	---	O'Reilly

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Internet of Things Projects with ESP8266: Buil exciting IoT projects with ESP8266 Wi-Fi module	Agus Kurniawan	---	Packt Publishing
2.	App Inventor 2: Create Your Own Android Apps	David Wolber, Hal Abelson, Ellen Spertus, Liz Looney	---	O'Reilly Media

		July 2025	1.0	Applicable for 2025-26
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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22II761O	OE - III Robotics	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
This course is intended To explore the evolution and principles of robotics, classify robotic systems, analyze resolution and dexterity, select robots based on usage, examine grippers and sensors including types and design guidelines, discuss robot cell layout programming methods and languages, and consider socio-economic impacts, safety standards, and AI integration.	Student will be able to ● Interpret terminologies related to Robotics technology. ● Understand various grippers and sensors for robotics. ● Apply logic for selection of robotic systems, cell layout and its programing. ● Integrate knowledge of AI techniques in the area of robotic technology.

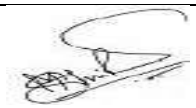
Unit I	**[9 Hrs]**
Introduction to robotics: Brief History, Basic Concepts of Robotics such as Definition , Elements of Robotic Systems i.e. Robot anatomy, DOF, etc., Classification of Robotic systems such as work volume, typeS of drive, Associated parameters i.e., accuracy, repeatability. Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.	
Unit II	**[9 Hrs]**
Grippers and Sensors for Robotics: Grippers for Robotics - Types of Grippers and applications. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.	
Unit III	**[9 Hrs]**
Drives and Control for Robotics: Drive - Types of Drives, Types of transmission systems, Actuators and its selection while designing a robot system. Control Systems: Types of Controllers, Introduction to closed loop control.	
Unit IV	**[9 Hrs]**
Robot Cell layouts and Languages for Robotics: Robot Cell layouts, multiple robots and machine interface, other considerations in work cell design. Robot Programming: Methods of robot programming, Programming Languages: Generations of Robotic Languages, Introduction to various types such as VAL, RAIL, AML, ROS	
Unit V	**[9 Hrs]**
Economical trends & Future aspects in Robotics: Socio-Economic aspect of robotisation. Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need and application of AI, New trends & recent updates in robotics.	

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Industrial Robotics	Groover.M.P.	1996.	McGraw – Hill International edition
2.	Introduction to Robotics	S. K. Saha	2014	TATA McGraw Hills Education
3.	Robotics and Control	R. K. Mittal, I. J. Nagrath	2003	TATA McGraw Hill Publishing Co Ltd

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Robotics Technology and Flexible Automation	Deb S R	1994	Tata McGraw Hill, New Delhi,
2.	Fundamentals of Robotics	Dilip Kumar Pratihar,	2019	Narosa Publishing House

		July 2025	1.0	Applicable for 2025-26
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