Final Year B. Tech. Instrumentation and Control Engineering (Revised Syllabus**)**

PROCESS CONTROL-II

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		5
04	-----	02	06	25	25	80	50	180	

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- To give the students a comprehension of Process Control Instrumentation Design.
- To give the students knowledge about the most important issues in Design of Controllers.
- To give the students a comprehension of the relation between Instrumentation and controller design in industrial applications.
- To make the students able to analyze the control loops and to achieve the control actions with different Controllers.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Process Characteristics**: Types of processes- dead time single & multi capacity, self & non-self regulating, interacting & non-interacting, Linear & non-linear, Process gain, process reaction curve, process time constant & constant step analysis method for finding time constant, dead time, dynamic elements in control loops, PID control of processes, Process simulator.	10 Hrs.	Analytical
02	**Introduction to Chemical Process Control:** Incentives for Chemical Process Control, Design aspects and Hardware for a Process Control System. Modeling of Chemical Processes Development of a mathematical model, necessity, State Variables and State Equations, Additional Equations, Additional Elements of the Mathematical Models; Dead Time Modeling Difficulties The input-output Model; Degrees of freedom and process controllers; Transfer function of a process with single/multiple outputs.	10 Hrs	Analytical
03	**Analysis and Design of Advanced Control systems:** Feedback control systems with large dead time or inverse response; cascade, selective and split range control; feed forward and ratio control; adaptive and inferential control systems.	10 Hrs	Analytical
04	**Control Systems for various processes:** Development of control loops, Design aspects and selection criterion for field instruments and instrumentation scheme for boiler, compressors, pumps, chiller, evaporators, dryer,	10 Hrs	Discriptive

	cooling tower, distillation column, CSTR Design aspects of Instrumentation for Power, Water and Waste-Water Treatment, Food and Beverages, Pharmaceuticals (Introduction to International Standards S88, S95 and US FDA 21CFR 11), Cement, Automobile and Building Automation.		
05	**Analysis & properties of some common loops:** Flow, pressure level, temperature, composition, pH etc., linear & non-linear controllers, review of PID with limitations (offset, saturation in D, & reset windup) rate before reset, PID variations & tuning , digital controller(position & velocity algorithms, effect of sampling time) hardware structures, features & specification, single loop & multi loop controller & the application programs (PID, Timer, counter, dead time, lead lag, linearise, add-subtract-multiplication-division of two input signals temp, pressure compensation of gas flow, sq. root, median selector, pattern program, radio set, adaptive gain, feed forward, valve lineariser etc.) non-linear controller-two state, three state, proportional time, dual mode optimal switching.	12 Hrs	Analytical
06	**Chemical and biochemical sensors:** Polymers, Chemically modified Electrodes (CME), affinity sensors, Potentiometric and Amperometric devices, catalytic sensors, Gas sensors etc.	08 Hrs	Descriptive

SECTION:A :- Chapter 1,2,3
SECTION:B:- Chapter 4,5,6

B: PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	Design of an electronic ON-OFF controller and plot the characteristics of natural zone of controller
02	Design an electronic PID controller and study its response for step input.
03	Design electronic temperature transmitter for transmitting temperature from 50^{O}C -90^{O} C to 4 -20mA.
04	To determine the mathematical model of the given process (any one)
05	Study the close loop flow control system
06	To study the Tuning of a controller using different algorithm.
07	To study the adaptive control system
08	To study the cascade and Ratio control systems.
09	To study the design aspect of instrumentation scheme for boiler, compressors, pumps, chiller, evaporators, dryer, cooling tower, distillation column, CSTR Design aspects of Instrumentation for Power, Water and Waste-Water Treatment, Food and Beverages, Pharmaceuticals(any three).
10	To study the Chemical and biochemical sensors.

TERM WORK:

The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Process Control Systems	F. G. Shinskey	TMH.
02	Instrumentation Engineers Handbook: Process Control	B. G. Liptak	Chilton Book Company
03	Process Control Instrumentation	C. D. Johnson	PHI
04	Chemical Process Control	G. Stephanopoulos,	Prentice Hall of India, New Delhi, 2001
05	Process control	P. Harriot	Vol I & II

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Process Control -II

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

INDUSTRIAL AUTOMATION

Periods				Evaluation Scheme					Credit	Duration of End Semester Theory Examination – 3 Hours
				Sessional Exam		ESE		Total		
L	T	P	Total	TA	CT	TH	PR			
04	-----	02	06	25	25	80	50	180	5	

OBJECTIVE:

The contents aim to develop the knowledge of the student in the field of automation in industries. This will be comprising knowledge of PLC, DCS and SCADA Systems. They will also get familiar with different industrial standard protocols.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Control Systems and Automation Strategy:** Evolution of instrumentation and control, Role of automation in industries, Benefits of automation, Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC, Automation strategy evolution, Control system audit, performance criteria, Safety Systems.	08 hrs	Descriptive
02	**Programmable logic controllers (PLC):** Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, PLC design, Study of at least one industrial PLC.	12 hrs	Analytical
03	**Advance Applications of PLC and SCADA:** PLC programming methods as per IEC 61131, PLC applications for batch process using SFC, Analog Control using PLC, PLC interface to SCADA/DCS using communication links (RS232, RS485) and protocols (Modbus ASCII/RTU)	10 hrs	Analytical
04	**Instrumentation Standard Protocols:** HART Protocol introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations. Foundation Fieldbus H1 introduction, structure, programming, FDS configuration, implementation examples, Benefits, Advantages and Limitations, Comparison with other fieldbus standards including Device net, Profibus, Controlnet, CAN, Industrial Ethernet etc.	10 hrs	Descriptive
05	**Distributed Control Systems:** DCS introduction, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, DCS Architecture of different makes, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions	12 hrs	Descriptive

	viz. Advance Process Control, Batch application, Historical Data Management, OPC support, Security and Access Control etc.		
06	Automation for following industries – Power, Water and Waste Water Treatment, Food and Beverages, Cement, Pharmaceuticals, Automobile and Building Automation.	08 hrs	Descriptive

SECTION:A :- Chapter 1,2,3
SECTION:B:- Chapter 4,5,6

B: PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	Case study of Industrial PLC/PLC trainer.
02	Ladder diagram implementation of basic logic gates.
03	Ladder diagram implementation using timers.
04	Ladder diagram implementation using counters.
05	Ladder diagram implementation using relay sequencer.
06	Ladder diagram implementation for any one automation system.
07	Experiment on SCADA System.
08	Case study of Industrial DCS/DCS trainer.
09	Experiment on DCS Trainer for batch application, database management, and communication.
10	Interface of DCS with SCADA/PLC, using protocol/fieldbus.

TERM WORK:
The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C: SUGGESTED TEXT BOOKS AND REFERENCES

Sr. No	Title	Author	Publication
01	Distributed Computer Control for Industrial Automation	Poppovik Bhatkar	Dekkar Publications
02	Programmable Logic Controllers: Principles and Applications	Webb and Reis	PHI
03	Computer Aided Process Control	S.K.Singh	PHI
04	Introduction to Programmable Logic Controllers	Garry Dunning	Thomson Learning
05	The Management of Control System: Justification and Technical Auditing	N.E.Battikha	ISA
06	Computer Based Process Control	Krishna Kant	PHI

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Industrial Automation

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type. 2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type. 2. There should be intermixing in the questions.

Final Year B. Tech. Instrumentation and Control Engineering (Revised Syllabus**)**

PROCESS MODELING, SIMULATION AND OPTIMIZATION

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		5
04	-----	02	06	25	25	80	50	180	

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

The contents aim to develop the knowledge of the student in the direction of different tools used for process modeling, simulation and optimization.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Introduction:** Review of unit operations and processes, Vapor & Liquid systems: ideal & non-ideal gases. State equations for gases, ideal & non-ideal liquid & gaseous mixtures, route's law, Dalton's law, Chemical kinetics, Concept of chemical potential, fugacity, activity co-efficient, Gibbs-Duhein, equation	08 hrs	Analytical
02	**Mathematical Model:** Kinetics & Reactors: rate equations for simple first and second order reactions. Effect of different feed concentration. Reactors –batch, semi batch, continuous stirred flow & recycle. Types of simple first & second order reactions, steady state unsteady state reactors, Batch CSTR and PFR reactors in series and in parallel for different reactor combinations. Vaporizer, continuous and batch distillation, heat transfer system, dynamic modeling of process control loop.	12 hrs	Analytical
03	**Model Simulation:** Writing systems of differential equations for numerical solution, numerical methods- Euler method, modified - Euler method, Newton Raphson method, Runge kutta second and fourth order method, Adams-Bashforth.	10 hrs	Analytical
04	**Process identification:** Purpose, time domain fitting of step test data, sine wave testing, pulse testing, step testing and on-line identification.	08 hrs	Analytical
05	**Optimization problem:** The nature and organization of optimization problems, formulation of objective functions like equipment cost, operational and capitalized costs, time, value of money, profitability, rate of production. Fitting functions to empirical data, method of least squares data.	12 hrs	Analytical
06	**Optimization techniques and applications:** Single and multivariable optimization, linear programming, sequential quadratic programming and reduce gradient optimization techniques and application. Introduction to geometric programming and dynamic programming.	10 hrs	Analytical

SECTION A: Chapter 1,2,3

SECTION B: Chapter 4,5,6

B. PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	Simulation of CSTR System (in series) using Matlab/C programming.
02	Simulation of CSTR System (in parallel) using Matlab/C programming.
03	Solving differential equation using Euler's method.
04	Solving differential equation using Runge-Kutta 2^{nd} and 4^{th} order method.
05	Solving differential equation using Adams-Bashforth method.
06	Process identification using Step testing/ Sine wave Testing method.
07	Data fitting using least square fitting method.
08	Multi-variable optimization using Linear Programming.
09	Multi-variable optimization using quadratic Programming.
10	Multi-variable optimization using reduced gradient optimization technique.

TERM WORK

The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Process Control Systems	F. G. Shinskey	Tata McGraw Hill
02	Instrumentation Engineers Handbook: Process Control	B. G. Liptak	Chilton Book Company
03	Computer based Industrial control	Krishna Kant	Prentice-hall Of India
04	Chemical Process Control	G. Stephanopolous	Prentice-hall Of India
05	Process modeling; simulation & control for chemical engineers	W.L. Luyben	Tata McGraw Hill
06	Optimization of Chemical process	Edagar & Himmelblau	McGraw-Hill
07	Practical Process Instrumentation & Control	Jay Malley	McGraw-Hill
08	System simulation with digital Computer	Deo Narsingh	Prentice-hall Of India
09	Design of Thermal Systems	W. F. Stoecker	McGraw-Hill

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Process Modeling, Simulation and Optimization

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

PROJECT PLANNING, ESTIMATION AND ASSESSMENT

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		5
04	-----	02	06	25	25	80	50	180	

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

The contents aim to develop the knowledge of the student in the direction of cumulative project engineering. It will gather all knowledge required in project planning, execution and monitoring.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Introduction:** Definition of project, purpose, scope, time, quality and organization structure. Basic and detailed engineering: Degree of automation, Project S curves, manpower considerations, inter-department and inter organization interactions, Multi agency interaction. Types of projects and types of contracts e.g. EPC, BOOT etc.	08 hrs	Descriptive
02	**Project Pre-planning steps:** Role of Automation, Customer expectations and performance criterion, User Requirement Specifications (URS), Functional Design Specifications (FDS), Software Requirement Specifications and Hardware Requirement Specifications (SRS and HRS), International Standards and Practices, Consultant Requirements. Project execution steps. Instrumentation Audit, Plant layout, general arrangement drawing (plans and elevations). Selection criterion for equipment at different levels of automation.	10 hrs	Descriptive
03	**Project Documentation:** Design Engineering, documentation, Process function diagrams and interlock, interface diagrams, Process flow diagrams, P&ID, specification sheets, loop wiring diagrams, ladder diagrams, isometrics, installation detail drawing, Control console, centers and panels: Types, design, inspection and specification. Control panel drawings, Document control, Checklists, legend sheets, instrument catalogues, test and progress reports, minutes of the meeting. Documentation software to create, modify, add, revise and update I&C documentation. Documents and version control Cable engineering, different classes of conductors and their routines, types and specifications of cables, cable schedule, routing of cables.	12 hrs	Descriptive
04	**Procurement activities:** Vendor registration, tendering and bidding process, bid evaluation, purchase orders, vendor documents, drawings and reports as necessary at	12 hrs	Descriptive

	above activities. Construction activities: Site conditions and planning, front availability, installation and commissioning activities and documents require/generated at this stage. Factory Acceptance Test (FAT), On-site inspection and testing (SAT) installation sketches, bill of material, Quantity surveying, contracting, cold commissioning and hot commissioning, CAT (Customer Acceptance Test), performance trials and final hand-over.		
05	**Project management:** Management functions: Controlling, directing, project authority, responsibility, accountability, interpersonal influences and standard communication formats, project reviews. Project planning and scheduling, life cycle phases, the statement of work (SOW), projects specifications, bar charts, milestones, schedules, work breakdown structures, cost breakdown structures and planning cycle.	10 hrs	Descriptive
06	**Cost and estimation:** Types and estimates, pricing process, salary and other overheads, man-hours, materials and support costs. Program evaluation and review techniques (PERT) and critical path method (CPM), estimating activity time and total program time, total PERT/CPM planning crash times, software's used in project management.	08 hrs	Descriptive

SECTION A : Chapter 1,2,3
SECTION B: Chapter 4,5,6

B. PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	Defining a specific Project, its purpose, scope and other detailed engineering aspect as studied in Unit 1. Let us refer this as PROJECT- A.
02	Draw different standard symbols used in Process/Project.
03	Draw Process flow diagrams for PROJECT- A
04	Draw P&ID diagrams for PROJECT- A
05	Draw specification sheet for PROJECT- A for any one instrument.
06	Draw loop wiring diagrams for PROJECT- A for any one control loop.
07	Draw different control panel drawings.
08	Write a sample report including bid, purchase order, installation and commissioning activities for PROJECT- A.
09	Write a sample report about project management based on Unit 5 for PROJECT- A.
10	Draw PERT/CPM planning diagrams for PROJECT- A.

B.TERM WORK:

The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Applied instrumentation in process industries	Andrew and Williams	Gulf publishing
02	Instrumentation Engineers Handbook: Process Control	B. G. Liptak	Chilton Book Company
03	Project management: A systems approach to planning Scheduling and Controlling	Harlod Kerzner	Van Nostrand Reinhold publishing
04	Management systems	John Bacon	ISA
05	Batch control systems	T.G.Fisher	ISA
06	Instrument installation project management	Reference Set	ISA

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Project Planning, Estimation and Assessment

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

ELECTIVE-III (ARTIFICIAL INTELLIGENCE SYSTEM)

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		5
04	-----	02	06	25	25	80	-----	130	

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

- To give the students a comprehension of Neural and Fuzzy based system.
- To give the students a comprehension of the relation between the of design of control system based on Fuzzy & Neural Concept
- To make the students able to analyze the control loops and to achieve the control actions with different Controllers based on Fuzzy & Neural Concept.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Artificial Neural Systems:** Preliminaries, fundamentals concepts and models of artificial neural system, neural network learning rules, Hebbian, Perception, delta Windrow-Hoff learning rules. **Single layer Perception Classification:** Classification model, features and decision regions, training and classification using discrete perception, algorithm and example, single layer continuous Perception networks for linear separable classification	10 Hrs	Analytical
02	**Multilayer Feed forward Networks:** Generalized delta learning rule, feed forward recall and error back propagation training, learning factors **Single layer feedback networks:** Basic concepts of dynamical systems mathematical foundation of discrete time and gradient type Hopfield networks, transient response of continuous time networks solution optimization problems	10 Hrs	Analytical
03	**Neural network in control system:** Neuro control approaches, training algorithms, evaluation of training algorithms, through simulation, self running neuro-control scheme, self tuning PID neuro controller, neuro control scheme feed water bath temperature control system.	10 Hrs	Analytical
04	**Introduction of fuzzy control:** Introduction fuzzy control from an industrial perspective, mathematical of fuzzy control fuzzy sets, fuzzy relation, approximate reasoning representing a set of rules	08 Hrs	Analytical

05	**Fuzzy knowledge based controllers FKBS design parameters:** Structure of FKBC fuzzification and defuzzification module, rule base choice of variable and contents of rules, derivation of rules, data base choice of membership function and scaling factors, choice of fuzzification, defuzzification procedure	12 Hrs	Analytical
06	**Introduction to Genetic Algorithms:** Fundamentals, History, Creation of offsprings, Working Principle, Encoding, Fitness function, Reproduction, Inheritance Operators, Cross over, Inversion and Deletion, Mutation operator, Bit-wise operations, Generational cycle, Convergence of Genetic Algorithms, Applications in Control.	10 Hrs	Analytical

SECTION A: Chapter 1,2,3
SECTION B: Chapter 4,5,6

B. PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	Write a program to test the functioning of the artificial neuron with binary and continuous actuation function.
02	Write a generalized program to process the data by using the feed-forward neural network.
03	Write a program for the learning of the feed forward neural network-using delta learning neural network
04	Write a program to study the effect of different network parameter on the performance of the neural networks.
05	Develop an experimental set up to control the temperature of water bath using direct neural controller
06	Write a program to generate the different membership functions.
07	Write a program to perform different fuzzy operations like fuzzy relations, etc.
08	Write a program to study Fuzzy knowledge based control system
09	Develop an experimental set up to control the temperature of water bath fuzzy PID controller
10	Write a program to implement Genetic Algorithm and test it on some application.

C: SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Neural Network Design	M. T. Hagan, H. B. Demuth and M. Beale	Thomson Learning, Vikas Publishing House, New Delhi, 2002.
02	Introduction to Artificial Neural Systems	J. M. Zurada,	Jaico Publication

			House 1997.
03	Neural Networks: A Comprehensive Foundation	S. Haykin	Pearson Education, New Delhi, 2002.
04	Fuzzy Logic: Intelligence, Control and Information	John Yen and Reza Langari	Pearson Education New Delhi, 2003.
05	Neural Networks, Fuzzy Logic, and Genetic Algorithms, Synthsis and Applications	S. Rajsekaran, G. A. Vijayalaxmi Pai,	Prentice Hall of India, 2003

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Artificial Intelligence System (Elective –III)

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

Final Year B. Tech. Instrumentation and Control Engineering (Revised Syllabus**)**

ELECTIVE-III (ROBOTICS AND AUTOMATION)

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		5
04	-----	02	06	25	25	80	-----	130	

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

In a world of competitive industrial innovation, there is an ongoing need for engineering personnel who have specialized knowledge of the component technologies of Automation systems and increasingly the application of these to Robotics. Advanced robotics is an emerging field of automation that, while based on the existing and well-developed technology of industrial robotics and computer integrated manufacturing, incorporates attributes of advanced systems technology to produce mission-oriented systems capable of operating autonomously in unstructured environments. The aim of the course is therefore to provide graduate engineers with a generic technology and principles associated with robotics and automation systems. The contents aim to develop the knowledge of the student in the field of robotics. They will understand in general about the kinematics and dynamics aspect of robotic system. The introduction to control strategy of simple robotic system will be covered in the course. Emphasis is placed on design methodologies and the study and application of computer based control to integrated automation systems.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Introduction:** Robot definitions, Anatomy of robot, history, robot technology, and terms related to robot, Asimov's laws of robotics, robot specifications, detail classification, applications.	08 hrs	Descriptive
02	**Robot drivers, sensors and vision:** Drives for robots: Electrical, hydraulic and pneumatic. Sensors: Proximity and range, tactile, force and torque. End effectors, Position and velocity measurement. Robot vision: Introduction to techniques, image acquisition and processing.	12 hrs	Descriptive
03	**Robot kinematics:** Rotation matrix, Homogenous transformation matrix, Denavit- Hartenberg convention, Euler angles, RPY representation, Direct and inverse Kinematics for industrial robots for position and orientation Redundancy, Manipulator, Jacobian Joint, End effector, velocity -direct and inverse velocity analysis. Control: Individual joint computed torque.	10 hrs	Analytical
04	**Robot dynamics:** Lagrangian formulation, link Inertia tensor and manipulator Inertia tensor, Newton -Euler	10 hrs	Analytical

	formulation for RR & RP Manipulators, Trajectory planning, interpolation, cubic polynomial linear segments with parabolic blending, static force and moment transformation, Solvability, Stiffness, Singularities		
05	**Control of Robot Manipulators:** Control of the Puma Robot Arm, Computed Torque technique, Near-Minimum-Time Control, Nonlinear Decoupled Feedback Control, Resolved Motion Control, Adaptive Control	10 hrs	Analytical
06	**Applications of robots:** In industry -material handling, loading & unloading processing, welding & painting applications, assembly and inspection, Robot specification requirements. Introduction to robot programming languages like AL and AML.	10 hrs	Descriptive

SECTION - A: Chapter 1,2,3
SECTION -B: Chapter 4,5,6

B. PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	To study different drivers for robotic system
02	To simulate simple robotic system using Matlab/Msc Adams Software.
03	To study image processing system for robotic system.
04	Matlab program for direct and inverse kinematics of simple robot configuration
05	To simulate joint torque control of manipulator.
06	To model the robot dynamics using Euler-Lagrangian Method and to simulate the same.
07	To study feedback control of robot manipulator.
08	To study adaptive control of robot manipulator.
09	Case study of one of the industrial robot.
10	To study robotic programming languages like AL and AML.

B.TERM WORK:
The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Robotics, Control Sensing Vision and Intelligence	Fu.K.S. Gon Zalez RoC., Lee CoS.G	McGraw Hill, into Ed., 1987
02	Introduction to Robotics	Saeed B. Niku	EEE

03	Introduction to Robotics	John J. Craig	Pearson Education
04	Robotic Engineering An Integrated Approach	Richard D. Klafter, Michael Negin	Prentice-hall Of India
05	Robot Dynamics and Control	Spong and Vidyasagar	John Wiley and Sons, 1990
06	Robotics and Control	R.K. Mittal, I.J. Nagrath	Tata McGraw-Hill 2003
07	Industrial Robotics	Groover	McGraw-Hill
08	Robot Analysis and Intelligence	Asada and Slotine	Wiley Interscience, 1986
09	Design of Thermal Systems	W. F. Stoecker	McGraw-Hill

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Robotics and Automation (Elective –III)

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

Elective-III

INSTRUMENTATION FOR AGRICULTURE AND FOOD PROCESSING

Periods				Evaluation Scheme				Credit
				Sessional Exam		ESE		Total
L	T	P	Total	TA	CT	TH	PR	
04	-----	02	06	25	25	80	-----	130	5

Duration of End Semester Theory Examination – 3 Hours

OBJECTIVE:

India is the one of the largest sector in Agricultural products and Food processed products in world. There is lot of scope of applying engineering knowledge in these fields. In India, role of Instrumentation and Control engineering is also an emerging field in this field. Theer is an ongoing need for engineering personnel who have specialized knowledge of the component technologies of Automation systems and increasingly the application of these to develop agriculture products. The aim of the course is therefore to provide graduate engineers with a generic technology and principles associated with agriculture and food processing plants/systems. The contents aim to develop the knowledge of the student in this field. They will understand in general about the soil, need of instrumentation in agriculture field, different food processing plants, required controls, green house and environmental instrumentation. Emphasis is placed on the study and application of integrated automation systems for agriculture and related systems.

A. THEORY:

Unit	Contents	Duration	Nature
01	**Introduction:** Necessity of instrumentation and control for food processing and agriculture sensor requirement, remote sensing, biosensors in Agriculture, standards for food quality.	08 hrs	Descriptive
02	**Soil science and sensors:** P^H, conductivity, resistivity, temperature, soil moisture and salinity, ion concentration, measurements, methods of soil analysis. Instrumentation for environmental conditioning of seed germination and growth	10 hrs	Analytical
03	**Processes:** **a)** Flow diagram of sugar plant, sensors and instrumentation set-up for it. **b)** Flow diagram of fermenter and control (Batch process) **c)** Oil extraction plant and instrumentation set-up **d)** Pesticides manufacturing process and control **e)** Flow diagram of Diary and confectionary industry and instrumentation set-up. **f)** Juice extraction control set-up	12 hrs	Analytical

04	**a)** Application of SCADA for DAM parameters and control **b)** Water distribution and management control, Auto-Drip irrigation systems **c)** Irrigation Canal management, upstream and downstream control concepts, supervisory control.	10 hrs	Descriptive
05	**a)** Automation in Earth Moving Equipment and farm implements, pneumatic, hydraulic and electronic control circuits in harvesters, cotton pickers, tractors etc. **b)** Application of SCADA and PLC in packaging industry.	08 hrs	Analytical
06	**Green houses and Instrumentation:** Ventilation, cooling and heating wind speed, temperature and humidity, rain gauge, carbon dioxide enrichment measurement and control. Leaf area, length, evapo-transpiration, temperature, wetness and respiration measurement and data logging. Electromagnetic, radiation, photosynthesis, infrared and CV, bio sensor methods in agriculture. Agro meteorological instrumentation weather stations	12 hrs	Analytical

SECTION- A: Chapter 1,2,3
SECTION -B: Chapter 4,5,6

B: PRACTICAL/ DRAWINGS/ DESIGN/ WORKSHOP:

01	To test soil P^H, conductivity, resistivity, temperature, moisture and salinity.
02	To study instrumentation set-up for Sugar plant.
03	To study flow diagram of fermenter and control (Batch process).
04	To study pesticides manufacturing process and control
05	To study flow diagram of Diary and confectionary industry and instrumentation set-up.
06	To study juice extraction control set-up.
07	To study application of SCADA for DAM and irrigation systems.
08	To study automation in farm equipments.
09	To study Instrumentation and Control in Green house.
10	To study different bio-sensors methods in agriculture.

TERM WORK:
The assessment of term work shall be on the following criteria:

1. Continuous Assessment
2. Performing the experiments in the laboratory
3. Regular submission of practical report
4. Oral examination conducted internally on the practical work and assigned syllabus

C. SUGGESTED TEXT BOOKS AND REFERENCES:

Sr. No	Title	Author	Publication
01	Process Instrumentation, and	Considine D. M.	McGraw Hill

	Control Handbook		International
02	Instrument Engineers Handbook, Process Measurement Volume I and Process Control Volume II	Liptak B. G.	Chilton Book Company, 2001
03	Process Control Instrumentation Technology	Johnson C. D.	7th Edition, Pearson Education, New Delhi, 2003
04	Industrial Instrumentation	D. Patranabis	Tata McGraw Hill publications, New Delhi
05	Environmental Engineering	Peary II.S. and others	

PATTERN OF QUESTION PAPER

Faculty of Engineering and Technology

Final Year B. Tech. Instrumentation and Control Engineering (Revised Course) Examination

November / December, May/June 201_

Instrumentation for Agriculture and Food Processing (Elective –III)

Time: 3 Hrs **Max Marks: 80**

'Please check whether you have got the right question paper'

N.B:-

- All the questions are compulsory
- Use separate answer book for each section
- ……
- ……

SECTION A

Question no 1 **16 marks**

This question will consists of questions from all the chapters under section A mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 2 **12 marks**

OR

Question no 2

Question no 3 **12 marks**

OR

Question no 3

Note: 1. The questions will be memory based, application based and understanding type.
2. There should be intermixing in the questions.

SECTION B

Question no 4 **16 marks**

This question will consist of questions from all the chapters under section B mentioned in the syllabus.

This will consists of objective type, multiple choice type, short questions, concept oriented problems.

Question no 5 **12 marks**

OR

Question no 5

Question no 6 **12 marks**

OR

Question no 6

Note: 1. The questions will be memory based, application based and understanding type.

2. There should be intermixing in the questions.

PROJECT

Periods				Evaluation Scheme					Credit
				Sessional Exam		ESE		Total	
L	T	P	Total	TA	CT	TH	PR		
-----	-----	04	04	50	-----	-----	100	150	2

OBJECTIVE:

The practical implementation of theoretical knowledge gained during your study to till date is important for Engineering Education. The student should be able implement their ideas/real time industrial problem/ current application of their engineering branch which they have studied in curriculum. This will definitely help in building the confidence in the student what he has learnt theoretically. The dependent study of the state of the art topics in a broad area of his/her specialization.

GUIDELINES FOR STUDENTS AND FACULTY:

1. Students have to finalize their project title based on Industrial Assignments.
2. The projects selected should be such so as to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The term work will consist of a report prepared by the student on the project allotted to them.
3. Project topics may be chosen by the student or group of students (maximum 3 students) with advice from the faculty members.
4. To design a project at adequate scale level for the following applications- It may be based (i) Entirely on study and analysis of a typical Instrumentation and Control System, (ii) Experimental verification, or (iii) Design, fabrication, testing and calibration of an Instrumentation system. The software based project can be considered based on its application for instrumentation and control purpose. The students are required to submit the report based on project work done.
5. Use appropriate tools for the preparation of the report.
6. Each student/group is required to-
   a. Submit a one page synopsis before the project talk for display on the notice board in the first week of their academic semester.
   b. Give a 10 minutes presentation through OHP, PC, and Slide projector followed by a 10 minute discussion in the second week of their academic semester.
   c. Submit a report on the project topic with a list of required hardware, software or other equipment for executing the project in the third week of their academic semester.
   d. Start working on the project and submit initial development and CPM/PERT planning drawing in the fourth week of their academic semester.
   e. Preparation of PCB layout, wiring diagram, purchase of components, software demo, flowchart, algorithm, program/code, assembling, testing, etc. should be submitted by student/s within next five/Six weeks and minimum one page report should be there for each major activity.
   f. Overall assembling, wiring, code writing, testing, commissioning, should completed within next two weeks.

g. At the last but one week of end of academic semester the internal assessment of project will be done by panel of internal faculties and they will decide marks out 25 marks for term work (TA).
h. In the last week, student/group will submit final project report to guide and thereafter guide will finalize marks out of the remaining 25 marks for term work (TA).

7. Projects are to be scheduled in the weekly scheduled time-table during the semester and any change in schedule should be discouraged.
8. Every assigned faculty/s should maintain separate file for evaluating progress of each student or group.
9. Award 50 TA, Sessional marks based on the assessment done by internal guide and panel during semester and the involvement of student/group in the work assigned related to the topic and its application.

10. The format and other guidelines for the purpose of the Project Submission in hard bound copies should be as follows,

REPORT STRUCTURE

Index/Contents/Intent
List of Abbreviations
List of Figures
List of Graphs
List of Tables
and List of if any other inclusion
1. Introduction
2. Literature survey
3. System development
4. Performance analysis
5. Conclusions
References
Appendices
Acknowledgement

1. INTRODUCTION
1.1 Introduction
1.2 Necessity
1.3 Objectives
1.4 Theme
1.5 Organization
2. LITERATURE SURVEY
Literature Survey
Related information available in standard Books, Journals, Transactions, Internet Websites *etc.* till date (More emphasis on last three to five years)
3. SYSTEM DEVELOPMENT
Model Development

- Analytical
- Computational
- Experimental
- Mathematical

- Statistical

(out of above methods at least one method is to be used for the model development) Some mathematical treatment or related information is required to be embodied

4. PERFORMANCE ANALYSIS

- Analysis of system developed either by at least two methods depending upon depth of standard
- These methods normally used are Analytical /Computational/Statistical/Experimental/ or Mathematical
- Results at various stages may be compared with various inputs
- Output at various stages with same waveforms or signals or related information/parameters
- Comparison of above results by at least two methods and justification for the differences or error in with theory or earlier published results

5. CONCLUSIONS

5.1 Conclusions

5.2 Future Scope

5.3 Applications

Contributions (if any,)

The innovative work/invention/new ideas generated from the analysis of the work which can be taken from the conclusions

REFERENCES

- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, page to page (pp.__).

These references must be reflected in text at appropriate places in square bracket

In case of web pages complete web page address with assessing date has to be enlisted

List of references should be as per use in the text of the report

APPENDICES

Related data or specifications or referred charts, details computer code/program, *etc*.

(1 Page)

Expression of gratitude and thankfulness for helping in completion of the said task with name

Signed by the candidate

- General Guidelines

  Text should be printed on front and correct side of the watermark on quality bond paper

  Paper size- A4, 75 to 85 gsm paper

  Left Margin-1.5"

  Right Margin-3/4"

  Top Margin-1"

  Bottom Margin-1"
- First page of first chapter need not be printed anywhere ,second page onwards at right hand corner at ½ inch from right and top side from second chapter onwards starting page number of chapter should be printed at bottom center place report total pages –around.

  All Greek words must be italic

Report Heading -All Capital—16 Font
Chapter heading -All Capital—14 Font
Subchapter –title case-12 Font
Sub-Subchapter –First Alphabet Capital case-12 Font
Page numbers for Index/Contents/Intent should be in roman
Title of the Report should not be more than two lines
Text pages should be in times new roman
The page of the Index/Contents/Intent heading should be below the words for appropriate sub chapter or sub-sub chapter as shown in sample copy
Cover page should have (Mission statement of Institute) in inverted commas, Symbol of Institute, Name of Department, and Institute

Suitable flap with name of the candidate, Department and Institute name and symbol can be used with nylon strip.

For more information and sample of hard copy please contact the respective Head of the Department

Final Year B. Tech. Instrumentation and Control Engineering (Revised Syllabus**)**

Semester-VIII

IN PLANT TRAINING

(a)	**Rationale:** The techniques and processes of production of goods and services do not demand only technical skills, but also a cluster or conglomerate of skills. A significant part of which is related to the total humanistic growth of the man. Such conglomerate skills technical and humanistic can not obviously be acquired through pure academic learning of concepts in formalized and institutional courses and in isolation of the actual work situation. It, therefore, naturally follows that no technical education will be complete till it has two components, one learning of concepts vis-a vis acquiring conceptual skill and other application of the concepts in real work situation vis-a vis acquiring manipulative or practicing skills. Technical education needs to have a complement of learning of the techniques of applying the concepts within the industry and business.
(b)	**Objective:** 1) The students of B.Tech course shall get an opportunity to work on live problems of the industry. 2) He/She shall apply his leaving concepts in the real work situation. 3) He/She shall get an exposure to the industrial environment and thereby enable himself/herself to appreciate the other related aspects of industry vis, human, economic, commercial and regulatory. 4) He/She shall identify career paths taking into account their individual strengths and aptitude. 5) He/She shall contribute for the achievement of economic goals and aspirations of the industry and our country as a whole.
	The curriculum for B.Tech students of final Year Course of Part-II shall consist of; 1) In plant training for a period of one full term, and the period of the term shall be as prescribed by the university from time to time. 2) A project on live problems of the industry shall be undertaken by the student/group of students undergoing atraining in the same establishment. 3) The term work shall consist of the in plant training record-daily diary, work diary, progress report, a record containing the literature survey in the field of appropriate branch of Engineering, a preliminary report related to project work etc. 4) Seminars will be arranged after successful completion of period specified in the scheme of semester VIII of B.Tech. The date and times will be decided according to the convenience of guide and student.
	General Provisions, Rules And Regulation Of In-Plant Training **1. Definition** • In-plant training means a course of training in any industry or establishment undergone in pursuance of memorandum of understanding between industry and institute and under the prescribed terms and conditions of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Institution means an academic Institution of higher learning associated and admitted under the privileges of university, I.e. Maharashtra Institute of Technology, affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Industry means any industry or business in which any trade, occupation or subject

	field in engineering or technology may be specified as a designated trade. • Establishment includes any place where any industry is carried on. • University means any of the universities mentioned in the schedule of Maharashtra University Act, 1994 i.e. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. • Collaboration means collaborative academic activity of the Institute with industry. • Student means a B Tech Course student.
	2. Memorandum of understanding: Maharashtra Institute of Technology, Aurangabad will enter into an agreement with the industry through 'Memorandum of Understanding' for creating facilities of in-plant training in the appropriate branch of Engineering according to the Course Curriculum and keep this agreement for a period of 10 years to foster a healthy industry- institute interaction for mutual benefits of both.
	3. Admission to in-plant training: No student will be deputed for in-plant training unless he produces testimonial of having kept one term for the subject under B Tech Semester –VIII of final year course satisfactorily in Maharashtra Institute of Technology after passing the TY B Tech Examination (in the appropriate branch).
	4. Period of in-plant training: The period of in-plant training will be the period of one term for the subject under B Tech course semester-VIII, which will be notified by Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
	5. Contract of In-plant Training : • The student of Maharashtra Institute of Technology shall enter into a contract of in-plant training with the employing industry. • The in-plant training shall be deemed to have commenced on the date, on which the contract of in-plant training has been entered into. • Every contract of in-plant training will contain the Terms and Conditions to be agreed by both the parties. • Every contract of in-plant training shall be registered with the Maharashtra Institute of Technology within 15 days from entering into the contract.
	6. Violation of contract: Where an employer, with whom a contract for in-plant training has been entered into, is for any reason, unable to fulfill his obligation under the contract, the contract end with the consent of Maharashtra Institute of Technology. It is agreed between the employer, the student and any other employer that the student shall be engaged as an "in-plant trainee" under the other employer till the expiry period of the in-plant training. The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of in-plant training between the student and other employer, and from the date of such registration, the contract of in-plant training with the first employer shall terminate and no obligation under that contract shall be enforceable at the instance of any party to contract against the other party thereto.

	7. Termination of Contract: The contract of in-plant training shall terminate on the expiry of the period of in-plant training. Either party to the contract of in-plant training make an application to Maharashtra Institute of Technology, Aurangabad for the termination of the contract. After considering the content of the application, and objection, Maharashtra Institute of Technology by order in writing, will terminate the contract, if it is satisfied that the parties to the contract have/has failed to carry out the Terms and Conditions of the contract. Provided that where a contract is terminated- • For the failure on the part of the Employer, Maharashtra Institute of Technology will depute students to another Employer for providing facilities of in-plant training to the remaining period of training. • For the failure on the part of the student, the student will not be allowed to continue his/her in-plant training in that term. The student shall be deputed for in-plant training in the next coming term.
	8. Expectation from the Employer/Industry: The following expectations are derived for effective in-plant training. • To provide legitimate facilities for the training and learning of all the processes. • To guide the student for understanding a project of immense importance to industry and to help him/her for his/her career advancement.
	9. Obligation of Students: • To learn his/her subject field in Engineering or Technology conscientiously and diligently at his place of training. • To carry out all orders of his Employer and the Superior in the establishment. • To abide by the Rules and Regulations of the Industry/Establishment in all matters of conduct and discipline. • To carry out the obligation under the contract of in-plant training. • The student shall maintain a report of his work during the period of his in-plant training in a proforma Annexure. • Except in case of extreme urgency, the B.Tech student shall submit an application for all other leaves except the medical leave to the Manager/Gen. Manager (Personnel) of the concerned industry, where he is undergoing an in-plant training and obtain sanction before the leave is taken. In case of Medical Leave, he shall submit an application to Maharashtra Institute of Technology, Aurangabad. The shortage in attendance will be subjected to extending the period of in-plant training in which case, the student may not be allowed to appear for the test, project seminar and assessment of term work etc. which will be held immediately after successful completion of the in-plant training.
	10. Maintenance of Record: Every student of B.Tech course shall maintain a daily record of the work done by him/her relating to the in-plant training in the proforma (Annexure).

	11. Industry Sponsored Student Projects: The scheme envisages working out suitable programme for B.Tech students. They are required to complete their in-plant training in a given period. During this period, they shall be familiar with the understanding of the shop process and activities. The students can be asked to solve the mini-shop problem, which will make them think and try out short experiments as an improvement in the process, tools and equipment. The student here is not expected to acquire the skills in operating machines values. He should appreciate the application of theory learnt. The students in a group alone can undertake a project of immense importance for the benefit of the industry and also useful for the students for their advancementof career. Industry staff and Maharashtra Institute of Technology facultycan plan in advance to effectively complete the practical training with the project for preliminary studies on the floor. The projects should aim mainly- • Cost reduction • Reducing cycle time • Enhancing productivity • Energy conservation measures • Process Improvement technique • Inventory control • Quality control Technique • Improvement in Material handling system • Bottlenecks in material flow system and so on.
	12. What will form a good project? Through the project, it is hoped to provide the students an exciting experience in solving line problems under practical constraints. Hence it is desired that the project should be a well defined problem, which can be completed and implemented within the project period. It may be a problem, evolving analysis, design, fabrication and/or testing.
	13. Time Schedule for the Project: The following time schedule should be planned by each student or groups of students, who undertake the project. • Proposal to be received before specifies date. • Project acceptance before. • Commencement of the project. • Completion of the project.
	14. Commitment on the part of the Institute: • Providing a faculty member to supervise the project. • Providing the Institute facilities to complete the project. • Coordinator from industry will be invited to participate in the stage wise assessment of the students performance.

	15. Assistance for completion of the Project: All the projects undertaken by the students are time bound. Although, every attempt results may not be achieved within the period available for the student. In such cases, the services of the associated faculty members can be sought for the completion of the same on mutually agreed terms.
	16. Monitoring of In-Plant Training: The B.Tech students are expected to follow all the rules and discipline of the industry. However, because of other academic requirements and the nature of the project, the student may have to work in other places outside the industry. The faculty and Industry supervisor will work out a suitable arrangement to review the progress of the work from time to time. Maharashtra Institute of Technology, Aurangabad will monitor the progress of in-plant training in association with industry authority.
	17. Conduct and Discipline: In all matters of the conduct and discipline, B.Tech student shall be governed by the rules and regulations (applicable to employees of the corresponding category) in the Establishment, where he/she is undergoing a training.
	18. B.Tech Students are Trainees and not Workers: • Every B.Tech student undergoing an in-plant training in the respective branch of Engineering & Technology in any Establishment shall be treated as a trainee and not a worker and- • The provision of any law with respect to labour will not apply to such a trainee.
	19. Settlement of Disputes: Any disagreement or dispute between an industry and a B.Tech student trainee arising out of the contract of in-plant training shall be resolved both by Maharashtra Institute of Technology and the industry with mutual cooperation. The decision of both Maharashtra Institute of Technology and the industry shall be final.
	20. Holding of Test and Grant of Certificate: The progress in in-plant training of every student shall be assessed by the industry and Maharashtra Institute of Technology faculty from time to time. Every B.Tech student undergoing an in-plant training shall be issued a certificate of Proficiency on completion of his training to the satisfaction of the industry.
	21. Offer of Stipend / Other Welfare Activities and Employment: It shall not be obligatory on the part of the Employer / Industry to offer any stipend and other welfare amenities available, if any, to the students of B.Tech courses undergoing an in-plant training. However, if the industry desirous to do so, at will be a privilege for the students and also for Maharashtra Institute of Technology in view of the bonding of better understanding and cooperation forever.
	PRACTICAL EXAMINATION The Practical examination will be conducted after successful completion of the in-plant training for which guide will be internal examiner and external examiner will be appointed by the university. The date of practical examination will be same for the students of a branch and will be notified by the university. The assessment of the practical examination shall consist of 1. Seminar Performance

	2. An oral on the project work done. 3. Assessment of the term work. **Note:** A 'Guide Note' on In-Plant training approved by the University is prepared and made available in each faculty of B.Tech course.

Revised Syllabus for Final Year B.Tech (Instrumentation and Control Engineering)

Part:I

Sr.No.	Course Code	Subjects	Periods, hrs			Evaluation Schemes					Credits
			L	T	P	TA	CT	ESE	PR	Grand Total	
1		Process Control-II	4	---	2	25	25	80	50	180	5
2		Industrial Automation	4	---	2	25	25	80	50	180	5
3		Process Modelling, Simulation and Optimation	4	---	2	25	25	80	50	180	5
4		Project Planning, Estimation and Assesment	4	---	2	25	25	80	50	180	5
5		Elective-III	4	---	2	25	25	80	---	130	5
6		Project	---	---	4	50	---	---	100	150	2
Total of Part I			**20**	**---**	**14**	**175**	**125**	**400**	**300**	**1000**	**27**

Part:II

Sr.No.		Evaluation Schemes					Credits
		TA	---	---	PR	Grand Total	
1	Inplant training & Project Seminar after complition of training of 8 weeks	75	---	---	75	150	---
2	Inplant training & Project Seminar after complition of training of 14 weeks	75	---	---	75	150	---
3	Inplant training & Project Seminar after complition of training of 20 weeks	100	---	---	200	300	---
Total of Part II		**250**	**---**	**---**	**350**	**600**	**---**
Grand total of Part I & II		**425**	**125**	**400**	**650**	**1600**	**27**

Periods

L Lecture hours per week
T Tutorial hours per week
P Practical hours per week
Class Test Duration: 1 hou

Evaluation Scheme

TA Termwork Assessment
CT Class Test
PR Practical
ESE End Semester Examinatior

Elective-III

1 Artificial Intelligence System
2 Robotics and Automation
3 Instrumentaion for Agriculture and Food Processing