DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD/SU/Engg./B.Tech./Syllabi/96/2014

It is hereby informed to all concerned that, the syllabus prepared by the Boards of Studies, Ad-hoc Board, Committees and recommended by the Faculty of Engineering and Technology, the Academic Council at its meeting held on 08-07-2014 has accepted the following **"Revised Syllabi in ali Branches of B.TECH."** as appended herewith :-

Sr. No.	Revised Syllabi
[1]	B.Tech. Civil Engineering,
[2]	B.Tech. Mechanical Engineering,
[3]	B.Tech. Electronics & Telecommunication Engineering,
[4]	B.Tech. Computer Science & Engineering,
[5]	B.Tech. Agricultural Engineering,
[6]	B.Tech. Plastics & Polymer Engineering,
[7]	B.Tech. Instrumentation & Control Engineering,
[8]	B.Tech. Production Engineering.

This is effective from the Academic Year 2014-2015 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO. ACAD/ SU/ B.TECH./
SYLLABI / 2014/
A.C.S.A. I.No.446[02].

Date:- 13-08-2014.

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Director,
Board of College and
University Development.

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Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above all syllabi on University Website.**

Copy to :-

1] The Controller of Examinations,

2] The Superintendent, [Engineering Unit],

3] The Programmer [Computer Unit-1] Examinations,

4] The Programmer [Computer Unit-2] Examinations,

5] The Superintendent, [Eligibility Unit] ,

6] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter,
Dr. Babasaheb Ambedkar Marathwada University,

7] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

Revised Syllabus of

B. TECH.

INSTRUMENTATION & CONTROL

ENGINEERING

[Effective from 2014-15 & onwards]

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
FACULTY OF ENGINEERING AND TECHNOLOGY
Syllabus Structure- 2014-2015
B. Tech (Instrumentation and Control Engineering)

Sub Code	SEMESTER-VII	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of theory Exam
ICE401	Advanced Process Control	3	1	-	4	20	80	-	-	100	4	3 Hours
ICE402	Industrial Automation	3	1	-	4	20	80	-	-	100	4	3 Hours
ICE403	Process Modeling, Simulation and Optimization	4	-	-	4	20	80	-	-	100	4	3 Hours
ICE404	Project Planning Estimation and Assessment	4	-	-	4	20	80	-	-	100	4	3 Hours
ICE441-ICE444	Elective-II	4	-	-	4	20	80	-	-	100	4	3 Hours
ICE421	Laboratory-I:Advanced Process Control	-	-	2	2	-	-	50	50	100	1	NA
ICE422	Laboratory-II:PLC and SCADA	-	-	2	2	-	-	50	50	100	1	NA
ICE423	Laboratory-III:Process Modeling and Simulation	-	-	2	2	-	-	50	-	50	1	NA
ICE424	Laboratory-IV:Project Planning Estimation and Assessment	-	-	2	2	-	-	50	-	50	1	NA
ICE425	Project-II	-	-	6	6	-	-	100	100	200	3	NA
	Total of semester-VII	**18**	**02**	**14**	**34**	100	400	300	200	1000	27	-

Sub Code	SEMESTER-VIII	Contact Hrs /week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of theory Exam
ICE471	Inplant Training (IPT) *	-	-	-	-	-	-	300	300	600	27	NA
	Total of semester-VIII	-	-	-	-	-	-	300	300	600	27	-
	Grand Total of VII & VIII	-	-	-	-	100	400	600	500	1600	54	-

L: Lecture hours per week T: Tutorial hours per week P: Practical hours per week CT: Class Test
TH: University Theory Examination TW: Term Work P: Practical/Oral Examination NA: Not Applicable

Elective-II
ICE441. Robotics and Automation
ICE442. Instrumentation for Agriculture and Food Processing
ICE443. Automobile Instrumentation
ICE444. Open Elective

***After every two weeks of Inplant Training (IPT) student shall apprise the progress of training to the internal guide and get the required inputs.**

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: 1CE401
Teaching Scheme: 04Hrs./week
Theory: 03Hrs./week
Tutorial: 01 Hr./week
Credits:04

Title: Advanced Process Control
Class Test(Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Nil
Objectives	:	▪ To give the students a comprehension Instrumentation System Design. ▪ To give the students knowledge about the design of Instruments according to International Standard. ▪ To give the students a comprehension of the aspects relating to the design of Instrumentation system without most care.
Unit-I	:	**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]**
Unit-II	:	**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]**
Unit-III	:	**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. **[6 Hrs]**
Unit-IV		**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, 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. **[14 Hrs]**

Unit-V	:	**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-muti-div, 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. **[14 Hrs]**
Unit-VI	:	**Chemical and biochemical sensors:** Polymers, Chemically modified Electrodes (CME), affinity sensors, Potentiometric and Amperometric devices, catalytic sensors, Gas sensors etc. **[6 Hrs]**
Reference Books	:	1) F. G. Shinskey ,"Process Control Systems" Tata Megrahill 2) B.G.Liptak ,"Instrumentation Engineers Handbook",Chilton Book Company 3) C.D.Johnson ,"Process Control", Prentice Hall of India 4) G. Stephanopoulos,"Chemical Process Control", 2001, Prentice Hall of India, New Delhi. 5) Peter Harriot ,"Process Control" . 6) Andrew Williams ,"Process Control for Industries"

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six units in the course syllabus shall be divided in two equal parts of 3 units each. Question paper shall be set having two sections; Section A and Section B. The questions of Section A shall be set on first part and questions of Section B on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Set ten questions in all, with five questions in each section.
2. Question no. 1 from section A and Question no. 6 from section B should be made compulsory and should cover the entire course syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
3. Two questions of 15 marks each from remaining questions from each section A and B should be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE402
Teaching Scheme: 04Hrs./week
Theory: 03Hrs./week
Tutorial: 01 Hr./week
Credits:04

Title: Industrial Automation
Class Test(Marks): 20
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Nil
Objectives	:	• 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 • They should be able to develop small a real time application based on Automation
Unit-I	:	**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. **[10 Hrs]**
Unit-II	:	**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. **[10 Hrs]**
Unit-III	:	**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]**
Unit-IV		**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. **[12 Hrs]**
Unit-V	:	**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 viz. Advance Process Control, Batch application, Historical Data Management, OPC support, Security and Access Control etc. **[10 Hrs]**
Unit-VI	:	**Automation for following industries:** Power, Water and Waste Water Treatment, Food and Beverages, Cement, Pharmaceuticals, Automobile and Building Automation. **[8 Hrs]**
Reference Books	:	1.) Poppovik Bhatkar ,"Distributed Computer Control for Industrial Automation ", Dekkar Publications 2.) Webb and Reis ,"Programmable Logic Controllers: Principles and Applications" , Prentice Hall of India 3.) Garry Dunning," Introduction to Programmable Logic Controllers" ,Thomson Learning 4.) S.K.Singh ,"Computer Aided Process Control" , Prentice Hall of India 5.) Krishna Kant ,"Computer Based Process Control", Prentice Hall of India

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six units in the course syllabus shall be divided in two equal parts of 3 units each. Question paper shall be set having two sections: Section A and Section B. The questions of Section A shall be set on first part and questions of Section B on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Set ten questions in all, with five questions in each section.
2. Question no. 1 from section A and Question no. 6 from section B should be made compulsory and should cover the entire course syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
3. Two questions of 15 marks each from remaining questions from each section A and B should be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE403 — Title: Process Modeling Simulation & Optimization

Teaching Scheme: 04Hrs./week — Class Test(Marks): 20

Theory: 04Hrs./week — Theory Examination (Duration): 03 Hrs

Theory Examination (Marks): 80

Credits:04

Prerequisites	:	Nil
Objectives	:	▪ The contents aim to develop the knowledge of the student in the direction of different tools used for process modelling, simulation and optimization. ▪ They will also get familiar with different simulation of small chemical Processes ▪ They should be able to verify the optimization of the model
Unit-I	:	**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 **[10 Hrs]**
Unit-II	:	**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 loops. **[10 Hrs]**
Unit-III	:	**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]**
Unit-IV		**Process identification:** Purpose, time domain fitting of step test data, sine wave testing, pulse testing, step testing and on-line identification **[10 Hrs]**
Unit-V	:	**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. **[10 Hrs]**
Unit-VI		**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]**
Reference Books	:	1.) W.L. Luyben ,"Process modeling; simulation & control for chemical engineers", Tata McGraw Hill 2.) Edagar & Himmelblau ,"Optimization of Chemical process", McGraw-Hill 3.) Jay Malley ," Practical Process Instrumentation & Control ",Prentice-Hall Of India 4.) Deo Narsingh ,"System simulation with digital Computer ", McGraw-Hill 5.) W. F. Stoecker ," Design of Thermal Systems", McGraw-Hill

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

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For 80 marks Paper:

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE404 — Title: **Project Planning, Estimation and Assessment**

Teaching Scheme: 04Hrs./week — Class Test(Marks): 20
Theory: 04Hrs./week — Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Credits:04

Prerequisites	:	Nil
Objectives	:	▪ 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
Unit-I	:	**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. **[10 Hrs]**
Unit-II	:	**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]**
Unit-III	:	**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, bill of material, 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. **[10 Hrs]**
Unit-IV		**Procurement activities:** Vendor registration, tendering and bidding process , purchase orders, vendor documents, drawings and reports as necessary at 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. **[10 Hrs]**
Unit-V	:	**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, work breakdown structures, cost breakdown structures and planning cycle. **[10 Hrs]**
Unit-VI	:	**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. **[10 Hrs]**
Reference Books	:	1.) Andrew and Williams ,"Applied instrumentation in process industries" , Gulf publishing 2.) B. G. Liptak,"Instrumentation Engineers Handbook: Process Control", Chilton Book Company 3.) Harlod Kerzner ,Van Nostrand ,"Project management: A systems approach to planning Scheduling and Controlling", Reinhold publishing 4.) John Bacon ,"Management systems", ISA 5.) T G.Fisher ,"Batch control systems", ISA 6.) Instrument installation project management Reference Set ,ISA

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE441 — Title: EL-II Robotics and Automation
Teaching Scheme: 04Hrs./week — Class Test(Marks): 20
Theory: 04Hrs./week — Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Credits:04

Prerequisites	:	Nil
Objectives	:	▪ 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. ▪ 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.
Unit-I	:	**Introduction:** Robot definitions, Anatomy of robot, history, robot technology, and terms related to robot, Asimov's laws of robotics, robot specifications, detail classification, applications. **[10 Hrs]**
Unit-II	:	**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 **[10 Hrs]**
Unit-III	:	**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]**

Unit-IV		**Robot dynamics:** Lagrangian formulation, link Inertia tensor and manipulator Inertia tensor, Newton -Euler formulation for RR & RP Manipulators, Trajectory planning, interpolation, cubic polynomial linear segments with parabolic blending, static force and moment transformation, Solvability, Stiffness, Singularities. **[10 Hrs]**
Unit-V	:	**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]**
Unit-VI	:	**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]**
Reference Books	:	1.) W.L. Luyben ."Process modeling: simulation & control for chemical engineers ", Tata McGraw Hill 2.) Edagar & Himmelblau ,"Optimization of Chemical process ".McGraw-Hill 3.) Jay Malley ."Practical Process Instrumentation & Control", Prentice-hall Of India 4.) Deo Narsingh," System simulation with digital Computer", McGraw-Hill 5.) W. F. Stoecker ."Design of Thermal Systems", McGraw-Hill

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

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Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE442	Title: EL-II Instrumentation for Agriculture and Food Processing
Teaching Scheme: 04Hrs./week Theory: 04Hrs./week Credits:04	Class Test(Marks): 20 Theory Examination (Duration): 03 Hrs Theory Examination (Marks): 80

Prerequisites	:	Nil
Objectives	:	▪ 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. ▪ 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 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.
Unit-I	:	**Introduction:** Necessity of instrumentation and control for food processing and agriculture sensor requirement, remote sensing, biosensors in Agriculture, standards for food quality. **[10 Hrs]**
Unit-II	:	**Soil science and sensors:** **PH, 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]**
Unit-III	:	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 **[10 Hrs]**
Unit-IV		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]**
Unit-V	:	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. **[8 Hrs]**
Unit-VI	:	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]**
Reference Books	:	1.) Considine D. M ,"Process Instrumentation and Control Handbook",McGraw-Hill 2.) Liptak B.G.." Instrument Engineers Handbook, Process Measurement" Volume I and " Instrument Engineers Handbook Process Control " Volume ,B.G. Chilton Book Company, 2001 3.) Johnson C.D." Process Control Instrumentation Technology". 7th Edition, Pearson Education, New Delhi, 2003 4.) D. Patranabis," Industrial Instrumentation". Tata McGraw Hill publications, New Delhi. 5) Pears ,"Environmental Engineering"

Section A: Includes Unit I, II and III: **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

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For 80 marks Paper:

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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE443 — Title: **EL-II Automobile Instrumentation**

Teaching Scheme: 04Hrs./week — Class Test(Marks): 20
Theory: 04Hrs./week — Theory Examination (Duration): 03 Hrs
Credits:04 — Theory Examination (Marks): 80

Prerequisites	:	Nil
Objectives	:	▪ 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. ▪ The aim of the course is therefore to provide graduate engineers with a generic technology and principles associated with automobile systems. ▪ The contents aim to develop the knowledge of the student in the field of automobile. ▪ The introduction to control strategy of automobile 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.
Unit-I	:	**Introduction:** Fundamentals of Automotive Electronics: Open loop and closed loop systems components for electronic engine management, vehicle motion control, Current trends in modern Automobiles **[8 Hrs]**
Unit-II	:	Electronic Fuel Injection and ignition systems: Introduction, Carburetor control system, throttle body ignition and multi port or point fuel injection, Advantages of electronic ignition system, Types of solid state ignition systems and their principle of operation, electronic spark timing control system. **[12 Hrs]**
Unit-III	:	Engine control system: Engine cranking and warm up control, Acceleration enrichment Deceleration leaning and idle speed control, integrated engine control system, exhaust emission control system, Engine performance tests. **[10 Hrs]**
Unit-IV		Automobile chassis electronic control system: Principle of electronic braking, automatic transmission electronic control circuit, cruise control circuit, the electronic steering control theory, ABS, ASR, ESP, and other electronic control method. **[10 hours]**

Unit-V	:	Auto Body Electronic Control Technology: Automotive central locking and anti-theft system control technology, electronically controlled windows and doors and airbag technology, principle of control circuit components and characteristics. **[10 Hrs]**
Unit-VI	:	Ergonomics and safety: Driver information system, lighting system components. battery monitoring and control, Air conditioning, steering control techniques, Automatic gear control systems, Emission standards. **[10 Hrs]**
Reference Books	:	1. William B. Riddens. "Understanding Automotive Electronics", 5th Edition. (Butterworth Heinemann Woburn), (1998). 2. Tom Weather Jr and Cland C. Hunter, "Automotive Computers and Control System",Prentice Hall Inc., New Jeresy. 3. Jiri Marek, Hans Peter trah, "Sensors Applications, Sensors for Automotive Technology" 1st Edition , Wiley 4. T. Mellard, "Automotive Electronic Systems"1987 by Heinenmann Professional

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six units in the course syllabus shall be divided in two equal parts of 3 units each. Question paper shall be set having two sections; Section A and Section B. The questions of Section A shall be set on first part and questions of Section B on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Set ten questions in all, with five questions in each section.
2. Question no. 1 from section A and Question no. 6 from section B should be made compulsory and should cover the entire course syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
3. Two questions of 15 marks each from remaining questions from each section A and B should be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE421
Teaching Scheme: 02Hrs./week
Credits: 01

Title: Laboratory-I Advanced Process Control
Term Work (Marks): 50
Practical Examination(Marks): 50

Course Objectives	:	▪ To understand design of analog and digital Controllers. ▪ To study of different types of controllers and implementation for different processes.
List of Practical	:	1.Design of an electronic ON-OFF controller and plot the characteristics of natural zone of controller 2. Design an electronic PID controller and study its response for step input. 3.Design electronic temperature transmitter for transmitting temperature from 50 ^{0}C to 90 ^{0}C to 4 to 20mA 4. To determine the mathematical model of the given process. 5. Study the close loop flow control system. 6. To study the Tuning of a controller using different algorithm. 7. To study the adaptive control system. 8. To study the cascade and Ratio control systems. 9.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 assessment shall be done on the basis of

- Performing the experiments in the laboratory and
- Continuous assessment

Practical Examination shall be conducted on the syllabus and term work mentioned above.

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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE422 | **Title: Laboratory-II PLC and SCADA**
Teaching Scheme: 02Hrs./week | **Term Work (Marks): 50**
Credits: 01 | **Practical Examination(Marks): 50**

Course Objectives	:	▪ To Study the automation tools used in Industries. ▪ To study the PLC and its interfacing to the processes and develop the ladder logic. ▪ To study the SCADA ▪ To study the DCS
List of Practical	:	1. Case study of Industrial PLC/PLC trainer. 2. Ladder diagram implementation of basic logic gates. 3. Ladder diagram implementation using timers. 4. Ladder diagram implementation using counters. 5. Ladder diagram implementation using relay sequencer. 6. Ladder diagram implementation for any one automation system. 7. Experimem on SCADA System. 8. Case study of Industrial DCS/DCS trainer. 9. Experiment on DCS Trainer for batch application, database management, and communication. 10. Interface of DCS with SCADA/PLC, using protocol/fieldbus.

Term Work assessment shall be done on the basis of

- Performing the experiments in the laboratory and
- Continuous assessment

Practical Examination shall be conducted on the syllabus and term work mentioned above.

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Syllabus of Final Year, B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE423	Title: Laboratory-III Process Modeling, Simulation
Teaching Scheme: 02Hrs./week	Term Work(Marks): 50
Credits: 01	

Course Objectives	:	• The contents aim to develop the knowledge of the student in the direction of different tools used for process modelling, simulation and optimization. • They will also get familiar with different simulation of small chemical Processes They should be able to verify the optimization of the model
List of Practical	:	1. Simulation of CSTR System (in series) using Matlab/C programming. 2. Simulation of CSTR System (in parallel) using Matlab/C programming. 3. Solving differential equation using Euler's method. 4. Solving differential equation using Runge-Kutta 2nd and 4th order method. 5. Solving differential equation using Adams-Bashforth method. 6. Process identification using Step testing/ Sine wave Testing method. 7. Data fitting using least square fitting method. 8. Multi-variable optimization using Linear Programming. 9. Multi-variable optimization using quadratic Programming. 10. Multi-variable optimization using reduced gradient optimization technique.

Term Work assessment shall be done on the basis of

- Performing the experiments in the laboratory and
- Continuous assessment

Practical Examination shall be conducted on the syllabus and term work mentioned above.

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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE424 — **Title: Laboratory-IV Project Planning, Estimation and Assessment**

Teaching Scheme: 02Hrs./week — **Term Work(Marks): 50**

Credits: 01

Course Objectives	:	▪ 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
List of Practical	:	1.) Defining a specific Project, its purpose, scope and other detailed engineering aspect as studied in Unit 1. Let us refer this as PROJECT- A. 2.) Draw different standard symbols used in Process/Project. 3.) Draw Process flow diagrams for PROJECT- A . 4.) Draw P&ID diagrams for PROJECT- A. 5.) Draw specification sheet for PROJECT- A for any one instrument. 6.) Draw loop wiring diagrams for PROJECT- A for any one control loop. 7.) Draw different control panel drawings. 8.) Write a sample report including bid, purchase order, installation and commissioning activities for PROJECT- A. 9.) Write a sample report about project management based on Unit 5 for PROJECT- A. 10.)Draw PERT/CPM planning diagrams for PROJECT- A.

Term Work assessment shall be done on the basis of

- Performing the experiments in the laboratory and
- Continuous assessment

Practical Examination shall be conducted on the syllabus and term work mentioned above.

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Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VII

Code No.: ICE425	**Title: Project-II**
Teaching Scheme	**Practical: 06 Hrs./week**
Credits: 03	**Term Work (Marks): 100**
	Practical Examination (Marks): 100

Course Objectives	:	1. The practical implementation of theoretical knowledge gained during the 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. 2. To motivate students for creativity. 3. To create awareness regarding latest technology 4. To have common platform for interaction about emerging technology. 5. To inculcate qualities of team work. 6. To explore related information using books, research papers, journals & websites. 7. To improve presentation and communication skills.
		Guidelines For Students And Faculty: 1. Students shall complete the Project-II in continuation of the work planned in third year under the course Project-I 2. Each student/group is required to- a. Submit a report with latest status of the project work. 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 along with performance analysis, should be completed within next two weeks. g. In the last week, student/group will submit final project report to the guide. 3. Every assigned faculty/s should maintain record of progress of each student or group. 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 Figures List of Tables

		List of Symbols / Abbreviations 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 • Mechanical / Fabricated • Analytical • Computational • Experimental • Mathematical • Software (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.* **ACKNOWLEDGEMENTS** 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" • Pagination First page of every chapter need not be printed but counted, second page onwards page number to printed at bottom center place. 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 All text should be in times new roman Cover page should have complete symbol of institute Suitable flap (bookmark) 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.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of Final Year. B. Tech. (Instrumentation & Control System) Semester -VIII

Code No.: ICE471	**Title: Inplant Training(IPT)**
Examination Scheme	**Term work (Marks): 300**
Credits: 27	**Practical (Marks): 300**

(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 cannot 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) **Objectives:**

1) The students of B.Tech course shall get an opportunity to work on live problems of the industry.
2) He/She shall apply learning 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 viz. 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.

(c) The curriculum for B.Tech students of Final Year Course of Part-II shall consist of;

- Inplant 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.
- A project on live problems of the industry shall be undertaken by the student/group of students undergoing training in the same establishment.
- The term work shall consist of the inplant 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.
- 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.

(d) **General Provisions, Rules and Regulation of Inplant Training**

1. Definition

- In-plant training (IPT) 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.
- Institute means an academic Institution of higher learning associated and admitted under the privileges of university, i.e. Maharashtra Institute of Technology, Aurangabad 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 research organizations (like IITs, NITs, National Laboratories or research center/organization as recognized by Central Govt. / State Govt. / University) or any other organization of repute with the permission of Head of the institute.
- 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 inplant 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 inplant training:

No student will be deputed for inplant training unless he/she produces testimonial of having kept one term for the subject under B.Tech. of final year course satisfactorily in Maharashtra Institute of Technology, Aurangabad.

4. Period of inplant training:

The period of Inplant 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 Inplant Training :

- The student of Maharashtra Institute of Technology shall enter into a contract of inplant training with the employing industry.
- The inplant training shall be deemed to have commenced on the date, on which the contract of inplant training has been entered into.
- Every contract of inplant training will contain the Terms and Conditions to be agreed by both the parties.
- Every contract of inplant 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 inplant 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 "inplant trainee" under the other employer till the expiry period of the inplant training. The agreement on registration with Maharashtra Institute of Technology shall be deemed to be the contract of inplant training between the student and other employer, and from the date of such registration, the contract of inplant 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 inplant training shall terminate on the expiry of the period of inplant training.

Either party to the contract of inplant 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 inplant 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 inplant training in that term. The student shall be deputed for inplant training in the next coming term.

8. Expectation from the Employer / Industry / Establishment:

The following expectations are derived for effective inplant 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:

- Student must maintain a minimum attendance of 90% of total working days for the period of Inplant Training.
- To learn his/her subject field in Engineering or Technology consciously and diligently at his place of training.
- To carry out all orders of his/her 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 inplant training.
- The student shall maintain a report of his work during the period of his inplant training in a proforma (form no: 2) made available in 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 inplant 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 inplant 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 inplant 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 inplant 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 inplant 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 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 advancement of career. Industry staff and Maharashtra Institute of Technology faculty can 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
- Enhancing productivity
- Develoment/Improvement/ Effective use of Softwares/ Systems
- Energy conservation measures
- Process Improvement technique
- Apllication Development
- Plastic and Polymer working
- Hardware/ Software
- Agro engineering 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 specified 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 Inplant 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 inplant 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 inplant 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 inplant 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 inplant 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 inplant training shall be issued a certificate of Proficiency on completion of his/her 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 inplant training. However, if the industry desirous to do so 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.

(e) **PRACTICAL EXAMINATION**

The Practical examination will be conducted after successful completion of the inplant 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 / report.