DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD / NP /T.Y. B.Tech. /Syllabi/184/2013

It is hereby informed to all concerned that, the syllabus prepared by the Boards of Studies, Committee and recommended by the Faculty of Engineering and Technology, the **Hon'ble Vice-Chancellor has accepted the** following **REVISED SYLLABI in all Braches of T.Y. B.TECH.** on behalf of the **Academic Council Under Section-14(7) of the Maharashtra Universities Act, 1994** as appended herewith :-

Sr. No.	Revised Syllabi
[1]	Third Year B.Tech. [CIVIL],
[2]	Third Year B.Tech. [MECHANICAL],
[3]	Third Year B.Tech. [ELECTRONICS & TELECOMMUNICATION ENGINEERING],
[4]	Third Year B.Tech. [COMPUTER SCIENCE & ENGINEERING],
[5]	Third Year B.Tech. [AGRICULTURAL ENGINEERING],
[6]	Third Year B.Tech. [PLASTICS AND POLYMER ENGINEERING],
[7]	Third Year B.Tech. [INSTRUMENTATION & CONTROL ENGINEERING],
[8]	Third Year B.Tech. [PRODUCTION],

This is effective from the Academic Year 2013-2014 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/ NP/ T.Y.B.TECH./
2013/14059-67

Date:- 15-06-2013.

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Director, 15-06-2013
Board of College and University Development.

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 [www.bamu.net].**

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

THIRD YEAR

B.TECH.

INSTRUMENTATION AND CONTROL ENGINEERING

[Effective from the Academic YEAR 2013-14 & onwards]

FACULTY OF ENGINEERING AND TECHNOLOGY
Proposed Revised Structure for 2013-14
[Third Year –Instrumentation and Control Engineering]

Sub No.	SEMESTER-V	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TA	P	Total	Credits	Duration of Theory /practical Exam
ICE301	Instrumentation System Design	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 302	Digital Signal Processing	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 303	Biomedical and Analytical Instrumentation	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 304	Electrical Drives and Control	4	-	-	4	20	80	-	-	100	4	3 Hrs
ICE 305	Microprocessor and Microcontroller	4	-	-	4	20	80	-	-	100	4	3 Hrs
ICE 306	Power Plant Instrumentation	2	-	-	2	10	40	-	-	50	2	2 Hrs
ICE 321	Lab-I Instrumentation System Design	-	-	2	2	-	-	25	25	50	1	-
ICE 322	Lab-II Electrical Drives and Control	-	-	2	2	-	-	25	25	50	1	-
ICE 323	Lab-III Microprocessor and Microcontroller	-	-	2	2	-	-	25	25	50	1	-
ICE 324	Lab-IV Electronics Workshop	-	-	2	2	-	-	50	-	50	1	-
ICE 325	Lab-V Seminar	-	-	2	2	-	-	50	-	50	1	-
	Total of semester-V	**19**	**3**	**10**	**32**	**110**	**440**	**175**	**75**	**800**	**27**	-

Sub No.	SEMESTER-VI	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TA	P	Total	Credits	Duration of Theory /practical Exam
ICE 351	Linear Integrated Circuits	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 352	Modern Control Theory	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 353	Process Control	3	1	-	4	20	80	-	-	100	4	3 Hrs
ICE 354	Soft Computing	4	-	-	4	20	80	-	-	100	4	3 Hrs
ICE 391-393	Elective-I	4	-	-	4	20	80	-	-	100	4	3 Hrs
ICE 355	Entrepreneurship Development and Management	2	-	-	2	10	40	-	-	50	2	2 Hrs
ICE 371	Lab-VI Linear Integrated Circuits	-	-	2	2	-	-	25	25	50	1	-
ICE 372	Lab-VII Modern Control Theory	-	-	2	2	-	-	25	25	50	1	-
ICE 373	Lab-VIII Process Control	-	-	2	2	-	-	25	25	50	1	-
ICE 374	Lab-IX Mat lab and Lab view	-	-	2	2	-	-	50	-	50	1	-
ICE 375	Lab-X: Project-I	-	-	2	2	-	-	50	-	50	1	-
	Total of semester-VI	**19**	**3**	**10**	**32**	**110**	**440**	**175**	**75**	**800**	**27**	
	Grand Total of V & VI	**38**	**6**	**20**	**64**	**220**	**880**	**325**	**175**	**1600**	**54**	

Elective I

1. ICE391 Data Communications and Computer Network
2. ICE392 Neural Networks and Fuzzy Logics

L: Lecture hours per week T: Tutorial hours per week P: Practical hours per week
CT: Class Test TH: University Theory Examination TW: Teachers Assessment
PR: Practical/Oral Examination

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation & Control System) Semester -V

Code No.:ICE 301
Teaching Scheme: 04Hrs/week
Theory: 04Hrs/week
Tutorial: 0 Hr/week
Credits:04

Title: Instrumentation System Design
Class Test: 20 Marks
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Prerequisites	:	Nil
Objectives	:	• To.give the student a comprehension Instrumentation System Design • To give the student knowledge about design of instruments • To make students capable to apply knowledge gained to develop the smaller modules for demonstration purpose.
Unit-I	:	**Basic concept of instrument design:** Basic concept of Instrument design, Factors to be considered in design of equipment, Functional requirement and specification of instrumentation component, Specification of Instrument for military application,Index Protection, Cable design guideline NEMA,DIN,ANSI Standards **[12 Hours]**
Unit-II	:	**Design Aspects:** General selection criteria for transducer, Selection criteria for flow, temperature,& pressure transd their types , Calibrations & their types **[8 Hours]**
Unit-III	:	**Electronic Design Guideline:** Noise , Types of noise, Noise reduction techniques, grounding, safety ground, Signal ground, single point ground, multipoint ground, Hybrid ground, ground loops, Capacitive & Inductive coupling, Co-axial & Twisted pair cable, construction & application **[10 Hours]**
U IV		**Printed Circuit Board:** General component layout scheme, Grid system, PCB Size, Types of board, Single & double sided & it types, Multilayer PCB, Design rules for digital circuit , design rule for analog circuit, Soldering techniques Component assembly techniques, Signal Conditioning,, Limitation in manual design, Automation in PCI design, Equipments for automated artwork, CAD, Components of CAD **[12 Hours]**
Unit-V	:	**Control Panel Design:** Types of control panel, Enclosure design guidelines & shielding techniques, Applications of control panel ,ESD, ESD protection in equipment,EMI,Virtual Instrumentation **[8 Hours]**

Unit-VI	:	**Reliability:** Reliability,MTTR,MTBF,Concept of Avalibility,Bath tube curve, Redundancy, Classification o Redundancy, Failure rate analysis **[08Hours]**
Reference Books	:	1) Electronic Instruments And instrumentation Technology, by Anand M S, New Delhi. Prentice Hall Of India, 2004. 2) Printed Circuit Boards, by walter C. Bosshart, CEDT series, TMH. 3) Process Control, by B.G.Liptak 4) Reliability Engineering, by E. Balguruswamy. 5) Measurement Systems by E. O. Doebline. 6) Process Control for Industries by Andrew Williams

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation & Control System) Semester -V

Code No.: ICE 302 | **Title: Digital Signal Processing**
Teaching Scheme: 04Hrs/week | **Class Test: 20 Marks**
Theory: 04Hrs/week | **Theory Examination (Duration): 03 Hrs**
Tutorial: 1 Hr/week | **Theory Examination (Marks): 80**
Credits:04

Prerequisites	:	Nil
Objectives	:	The contents aim to develop the knowledge of the student in the direction of solving the practical problem in the Digital Signals and Systems related applications. The Contents will help to find the solution for the problems based on the design of signal processing in the field of the Process Industries.
Unit-I	:	**Overview:** Continuous time signal & discrete time signal, properties of discrete signal, energy and powe signal, Response of LTI system using linear convolution, Difference equation & response of system fron difference equation. Z transforms, ROC of Z transform & its properties, system transfer function, impuls response of LTI system using Z transform. **[10 Hours]**
Unit-II	:	**Discrete time Fourier series**: DFT & its properties, circular convolution, frequency response analysis o signal using DFT, linear filtering based on DFT FFT algorithm, use of FFT for spectral estimation, filterin & correlation. **[10 Hours]**
Unit-III	:	**Infinite Impulse Response Filters**:Butterworth, Chebyshev approximation. Design of IIR filter: impuls invariance method, bilinear transformation, and digital-to digital transformation, Introduction to computer aided design of IIR filter. Realizations methods for IIR filter. **[10 Hours**
Unit-IV		**Finite Impulse Response Filter:**FIR filter design using windows & frequency sampling method, design o optimal equiripple linear phase FIR filter, design of FIR differentiators and Hilbert transform, Introduction t computer-aided design of linear phase FIR filter, basic structure of FIR system. **[10 Hours]**
Unit-V	:	**Introduction to DSP hardware**:TMS320C67XX processor, applications of TMS 320C67XX e.g. squar wave generator, matrix multiplication, and Applications of DSP processor for biomedical, speech, radar & image processing. **[10 Hours]**
Unit-VI	:	**Multirate DSP** :The basic sample rate alteration time domain characterization, frequency domai characterization : Cascade equivalences, filters in sampling rate alteration systems, digital filter banks an their analysis and applications, multi level filter banks, estimations of spectra from finite – duratio observation of signals. sampling rate conversion, decimation and interpolation, applications of multirat signal processing over sampling A/D and D/A conversion, sigma-delta converters **[10 Hours]**
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Reference Books

Sr. No	Title	Author	Publication
01	Digital Signal Processing Principles, algorithms and applications	Proakis, Manolakis	PHI
02	Digital Signal Processing	Oppenheium, Schaffer	PHI
03	Digital Signal Processing, applications using C & TMS320CSX DSK	Rulph Chassaing	WILAY publication
04	Digital filter analysis & Design	A Antoniou j	McGraw Hill 1979
05	Digital Signal Processing Implementation using DSP microprocessors with examples from TMS32OC54XX	Avtar Singh, S. Srinivasan	
06	TMS 32Oc67XX DSP Reference Set	Reference Set	Vol. 2, 1999

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester- V

Code No: ICE303	**Title: Biomedical and Analytical Instrumentation**
Teaching Scheme: 04Hrs/week	**Class Test: 20 Marks**
Theory: 03Hrs/week	**Theory Examination (Duration): 03 Hrs**
Tutorial: 01Hr/week	**Theory Examination (Marks): 80**
Credits:04	

Objectives	:	1. Exposing the students to the art and science of measurement with a view to impress. 2. Knowledge of the physical world depends on observation and measurement adds quantitative meaning to our knowledge 3. Observation, monitoring, analysis towards the instruments form the basis of measurement. 4. The method of measurement is a comparison. 5. The aids of measurement are standard.
t-I	:	**Introduction to measurements:** The Man-Instrument System: Components The origin of Bio-potential, Organization of Cell, Resting Potentials, Action Potential, Bioelectric Signal, Typical Waveform ,Electrodes, Electrode Based on Different Types, Material, Sizes, Applications. Electrodes and Transducers for Biomedical measurements: Electrodes for Biophysical sensing, Electrode model circuit, Medical surface electrodes, Microelectrodes, Cup electrodes, Disposable electrodes, Transducers used in Biomedical Instrumentation. **[10 Hours]**
Unit-II	:	**Cardiovascular Measurements:** Cardiac output measurement, Dilution methods, Input circuit for a thermo dilution cardiac output computer, Right side heart pressures, Plethysmography, Blood flow measurements, phonocardiography, Vectorcardiogaphy (VCG). Cardiac stimulation and life support equipments: Defibrillator, Defibrillator circuits, Cardio version, Testing Defibrillators, and Pacemakers. Heart lung machines, Different therapeutic instruments (electronic pain killer, ultrasound therapy. **[10 Hours]**
Unit-III	:	Physics of sound waves, Ultrasound energy, ultrasound transducer, Types and uses of X-Ray and Nuclear Medicine equipments. Generation of X-Ray in an X-Ray tube, Block diagram and operation of X-Ray machine. Electrical safety in the Medical environment: Definition of electrical safety, Macro shock and micro shock, Design considerations for reducing electric hazards, Line isolation system, Equipotential grounding systems, Ground fault interrupters, Proper power wiring, Distribution and ground systems, specialized electric safety test equipments. **[10 Hours]**
Unit-IV	:	**Introduction:** Selection of instruments for application in industries. On line instrumentation and laboratory techniques and brief review. Difference between analytical and other instruments.PH measurement: Calorimetric method, potentiometer methods, PH meters (Construction, advantages, disadvantages, factors affecting measurement) Applications. **[10 Hours]**
Unit-V	:	**Electrical conductivity measurement:** Electrical conductivity and molecular conductivity (definitions) Methods of measurement, conduct metric Titrations, High-frequency methods, applications.

		Thermal conductivity gas analysis: bridge circuit, thermal conductivity cell. **Chromatography:** introduction, definitions, classification, Gas chromatography apparatus, details of different parts, applications, factors affecting separation **[10 Hours]**
Unit-VI	:	**Absorption and emission spectroscopy:** The nature of electromagnetic radiation, electromagnetic spectrum, atomic energy levels, vibration energy level, Raman effect, nuclear spin behavior, electron spin behavior, X-ray energy levels. **Ultraviolet and Visible Spectrometry:** Instrumentation radiation sources, detectors, Readout module filters, Monochromators, Monochromatic performance, Grating Monochromatic systems, Instruments for absorption Photometry **[10 Hours]**

Reference Books: :

Sr. No	Title	Author	Publication
1	Biomedical Instrumentation	Joseph J. Carr and John M. Brown	
2	Handbook of Biomedical Instrumentation	Dr.R.S. Khandpur	Tata McGraw-Hill Education
3	Biomedical Instrumentation and Measurements	Leslie Cromwell, Weibell and Pfeiffer	Prentice Hall
4	Instrumental Methods of Analysis	Willard,Merrit and Dean	
5	Instrumental Methods of Chemical Analysis	Chatwal & Anand	
	Instrumental Methods of Chemical Analysis	B.K.Sharma	

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester- V

Code No: ICE304
Teaching Scheme: 04Hrs/week
Theory: 03Hrs/week
Tutorial: --
Credits:04

Title: Electrical Drives and Control
Class Test: 20 Marks
Theory Examination (Duration): 03 Hrs
Theory Examination (Marks): 80

Objectives	:	Concept of dc, ac drives systems, electrical drives with special electrical machines,. The basic structures of controlled electrical drives, the investigation methods and performances evaluation. Different drives;
Unit-I	:	**Introduction to Electrical Drives :** Introduction of Electrical Drives, Choice of Electrical Drives, torque equation, speed torque conventions and Multiquadrant operation, Equivalent values of drives parameters, components of load torques, nature and classification of load torques. **[10 Hours]**
Unit-II	:	**Solid State Power Controllers:** Overview of Semiconductor Power devices, Triggering Circuits, Rectifiers, Choppers, Inverters, AC Controllers. **[10 Hours]**
Unit-III	:	**DC Motor Drives :** DC Motors and their performance, starting, braking, speed control, single phase and three phase controlled rectifier fed DC drives, chopper controlled DC drives and their industrial applications. **[10 Hours]**
Unit-IV	:	**Induction Motor Drives :** Three phase induction motor analysis and performance, starting, braking, speed control, variable frequency control from voltage source and from current source inverter, Slip power recovery, Rotor resistance control and their industrial applications. **[10 Hours]**
Unit-V	:	**Synchronous and Other Special Motor Drives:** Synchronous motor, operation from fixed frequency supply, synchronous motor variable speed drives,, Introduction of Brushless DC motor, Stepper motor and switched reluctance motor drives and their industrial applications **[10 Hours]**
Unit-VI	:	**Control of Electrical Drives :** Modes of operation, speed control and drives classification, closed loop control of drives, current limit control, closed loop torque control, closed loop speed control, speed sensing, current sensing **[10 Hours]**

Reference Books:	:	Sr. No	Title	Author	Publication
		1	Fundamental of Electrical Drives	G.K.Dubey	Narosa Publishing House
		2	Electrical Drives and Control	U.A.Bakshi & M.V.Bakshi	Technical publications,Pune
		3	Power Electronics	P.S.Bimbhra	Khanna Publishers.
		4	A First course on Electrical Drives	S.K. Pillai	Wiley Eastern Limited
		5	Electric Drives	N.K De and P.K Sen	New Age International

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester- V

Code No: ICE305 — **Title: Microprocessor and Microcontroller**
Teaching Scheme: 04Hrs/week — **Class Test: 20 Marks**
Theory: 03Hrs/week — **Theory Examination (Duration): 03 Hrs**
Tutorial: -- — **Theory Examination (Marks): 80**
Credits:04

Prerequisites	:	Knowledge of digital electronics, Logic gates, Number system
Objectives	:	▪ To give the students a comprehensive knowledge of microprocessor and microcontroller. ▪ To study its applications from instrumentation point of view ▪ To give the students knowledge about the application of microcontroller from hardware and software point of view. • To make the students capable to apply knowledge gained to design a microcontroller based embedded for demonstration purposes
Unit-I	:	**Introduction to Microprocessor:** Overview of Microprocessor structure and its operation, Microprocessor evolution and its type. **[03 Hours]**
Unit-II	:	**Microprocessor 8085:** Pin diagram, Architecture, Addressing Modes, Timing diagram, Instruction Set, Programming Techniques, Counters & time delays, stack & subroutines, Interrupt structure, Code conversion. **[17 Hours]**
Unit-III	:	**Microprocessor system peripheral and Interface** : Different data transfer schemes, need of I/O Ports, memory mapping, memory mapped I/O & I/O mapped I/O. **[10 Hours]**
Unit-IV	:	**Microprocessor system peripheral and Interface:** Introduction to 8255, 8253, 8251, 8279, Interfacing of LED'S, 7 Segment display, ADC/DAC, Stepper motor & keyboard with 8085. **[10 Hours]**
Unit-V	:	**Introduction to microcontrollers**: Comparison of microprocessor and microcontrollers 4-bit, 8-bit, and 16-bit microcontrollers, 89C51 and other 8-bit microcontroller chips, Embedded System overview, design challenges – Optimizing design matrix, selection of microcontroller, watchdog timer. **8051 Architecture:** Pinout diagram, 8051 oscillator and clock, Program counter and Data Pointer, addressing modes, A and B, CPU registers, PSW, internal memory, , SFRS, Timer/Counter, I/P and O/P ports. **[10 Hours]**

Unit-VI	:	**Assembly language programming for 8051 microcontroller:** Addressing Modes, Instruction classification, instruction set, Writing assembly language programming based on instruction set, Introduction to stack, stack pointer and its programming, Interrupts of 8051, Serial data i/p and o/p, serial data transmission and communication counters and timers, timer modes. **8051 microcontroller interfacing with:** Keyboard (4 by 4) and Display (LED, LCD), ADC 0808/09 and DAC 0808/09, stepper motor, converters. **[10 Hours]**
Reference Books:	:	1] Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall 2] Kenneth J. Ayala, " The 8051 Microcontroller – Architecture, Programming & Applications". 3] James W. Stewart, "The 8051 Microcontroller – Hardware, Software and Interfacing", 2nd Edition, Pearson Education, 4] Atmel 8051 Microcontrollers Hardware Manual. 5] Mazidi - The 8051 Microcontroller and Embedded Systems Using Assembly and C, Pearson Education

Section A: Includes Unit I, II, III; Section **B**: Includes Unit V, VI, VII

Pattern of Question Paper:

The eight units in the syllabus shall be divided in two equal parts i.e. 2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions
- Five questions in each section
- Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
- Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T.Y. B. Tech. (Instrumentation and Control Engineering) Semester-VI

Code No: ICE 306 | **Title: Power Plant Instrumentation**
Teaching Scheme: 02Hrs/week | **Class Test: 10 Marks**
Theory: 02Hrs/week | **Theory Examination (Duration): 02 Hrs**
Credits:02 | **Theory Examination (Marks): 40**

Objectives	:	To introduce the students with a special application of Instrumentation in power industries. ☐ To get details about the control issues within such industries. ☐ To make the students able to correlate instrumentation and its role in such industry.
Unit-I	:	**Introduction to Power Plant:** Significance of Instrumentation in Power Plant, Indian energy scenario, only principles and working of Hydroelectric, Nuclear, Gas Turbine Plants, Salient features of power plants in India. Safety aspects. **(5 Hrs)**
Unit-II	:	**Gas turbine power plant:** Comparison of different types of gas turbine power plant analysis of closed cycle and open cycle constant pressure gas turbine plants, components of gas turbine plant, advantages of gas turbine power plant over Diesel and Thermal power plant. **(6 Hrs)**
Unit-III	:	**Combined Operation of Different power plants:** Introduction, advantages of combined working, Load Division between plants, storage type Hydro-electric power plant in combination with steam plant, coordination of Hydro-electric and gas Turbine station, coordination of hydro-electric and nuclear station. **(5 Hrs)**
Unit-IV		**Instrumentation and Control:** Importance of Measurement and Instrumentation in power plant, measurement of water purity, Gas analysis, O2 and CO2 Measurements, measurement of moisture in carbon dioxide circuit, nuclear measurements , Control for Boiler, Condenser, Steam Heaters, Pumps, Compressors, Generator Cooling System, Control in nuclear plant. **(5 Hrs)**
Unit-V	:	**Turbine Monitoring and Control:** Turbine-Supervisory System for monitoring of MechanicalParameters-Speed, Vibration, eccentricity Axial shift, Shell Temperature Monitoring, Lube Oil Temperature Control,Turbine Trip Condition. **(5 Hrs)**
Unit-VI	:	**Auxiliaries in Power Plants:** Soot Blowers, Electrostatic Precipitator, Oil Automation System, Water Treatment Plant, Cooling Towers, ID,FD fans, Economisers, Air Preheaters, Superheaters. **(4 Hrs)**

Reference Books: :

Sr. No	Title	Author	Publication
01	Instrumentation Engineers Handbook: Process Measurement	B. G. Liptak	Chilton Book Company
02	Instrumentation Engineers Handbook: Process Control	B. G. Liptak	Chilton Book Company
03	A Course in Power Plant Engineering	Arora and Domkundwar	Dhanpat Rai and Sons, New Delhi
04	Power Plant Engineering	Keswani H. B	Standard Book House

					Delhi
		05	Industrial instrumentation servicing hand book	Carrok	

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 marks Paper:

1. Minimum six questions
2. Three questions in each section
3. Question no 1 from section A and Question no 4 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 4 should be of objective nature.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Engineering & Technology) Syllabus of T.Y. B. Tech. (Instrumentation and Control Engineering) Semester-V **Lab I:** **Code No.: ICE 321** **Title: Instrumentation System Design** **Teaching Scheme: 02Hrs/week** **Teachers Assessment: 25 Marks** **Practical: 25 Marks** **Credits: 01**		
Course Objectives	:	To understand digital modulation techniques and digital communication systems.
List of Practical	:	1.Minimum 10 Drawings and Report from the following a list should be completed during the course . 2. Instrument Symbol 3. Transducer details dimensions, views and specifications, drawing. 4. Design of Transducer based on Reverse Engineering. 5. Case Study with design of Transducers module for Measurement.
List of Reference Books	:	1) Electronic Instruments And instrumentation Technology, by Anand M S, New Delhi. Prentice Hall Of India, 2004. 2) Printed Circuit Boards, by walter C. Bosshart, CEDT series, TMH. 3) Process Control, by B.G.Liptak 4) Reliability Engineering, by E. Balguruswamy. 5) Measurement Systems by E. O. Doebline. 6) Process Control for Industries by Andrew Williams

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva -voce based on the syllabus

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester- V

Code No.:-ICE 322 **Lab:II**
Title:-Electrical Drives and Controls
Teaching Scheme:-2 Hrs/Week **Teachers Assessment:-25 Marks**
Practical:25 Marks **Credit:-01**

Course Objectives	:	• **To Understand the concept of Power Devices** • **To study the usage of Power Devices**
List of Practical's	:	1. V/F control of Three phase induction motor 2. Voltage control of 3-phase I.M.(T-N characteristics) 3. Simulation of single phase rectifier 4. Simulation of dc drive using single phase converter 5. Simulation of chopper 6. Simulation of chopper fed dc drive 7. Simulation of inverter 8. Simulation of three phase induction drive

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Practical/Oral examination conducted on the syllabus and term work mentioned above

Reference Books: :

Sr. No	Title	Author	Publication
1	Fundamental of Electrical Drives	G.K.Dubey	Narosa Publishing House
2	Electrical Drives and Control	U.A.Bakshi & M.V.Bakshi	Technical publications,Pune
3	Power Electronics	P.S.Bimbhra	Khanna Publishers.
4	A First course on Electrical Drives	S.K. Pillai	Wiley Eastern Limited
5	Electric Drives	N.K De and P.K Sen	New Age International

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Code No.:-ICE 323 | **Lab:III**
Title:-Microprocessor and Microcontroller
Teaching Scheme:-2 Hrs/Week | **Teachers Assessment:-25 Mark**
Practical:25 Marks | **Credit:-01**

Course Objectives	:	• Understand concepts of various circuits. • Estimate power requirement and circuit performance.
List of Practicals (Not Less than 10)	:	1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers. 2. To perform multiplication and division of two 8 bit numbers using 8085. 3. To find the largest and smallest number in an array of data using 8085 instruction set. 4. To write a program to initiate 8251 and to check the transmission and reception of character. 5. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes. 6. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave. 7. Write a program using 8051 Microcontroller for Decimal, Hexadecimal addition and subtraction of two Numbers. 8. To perform multiplication and division of two 8 bit numbers using 8051. 9. To find the largest and smallest number in an array of data using 8051 instruction set. 10. To write a program to transfer data block from one memory location to another. 11. To write a program to interface LCD display. 12. To write a program to interface stepper motor. 13. To interface DAC with 8051 to demonstrate the generation of square, saw tooth and triangular wave. 14. Serial communication between 8051 and Computer through RS-232 C port.

List of Reference Books	:	1] Data sheets 2] Atmel 8051 Application notes
List of Equipments /Instruments	:	Multi-meter, CRO, Connecting wires, Microprocessor and Microcontroller trainer kit.

The assessment of term work shall be done on the basis of the following.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Engineering & Technology) Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester-V **Lab IV:** **Code No.: ICE 324** **Title: Electronic Workshop** **Teaching Scheme: 02Hrs/week** **Teachers Assessment: 50 Marks** **Credits: 01**		
Course Objectives	:	• Understand concepts of various circuits. • Estimate power requirement and circuit performance.
List of Practical	:	1. To design DC power supply using LM2576. 2. To design DC power supply using TL494. 3. To design constant current source using LM317 and LM334, 4. To design DC voltmeter using ICL7106/7. 5. To design stepper motor driver using MC3479. 6. To design isolated relay driver board using ULN2003 and PC817. 7. To design DC motor driver using L293D. 8. Study of various sensors. 9. To design battery charger for lead-acid battery. 10. Study of relay switching noise and its effects on electronic system. 11. To design enclosure and front panel of a consumer electronic product. 12. PCB design.
List of Reference Books	:	1. Data sheets 2. Texas Instrument www.ti.com 3. National Semiconductor Manual
List of Equipments /Instruments	:	Multimeter, PCB designing equipments, DSO, CRO, Connecting wires, Bread Boards, Electronic Components.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Engineering & Technology) Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester-V		
Code No.: ICE 325 **Teaching Scheme: 02Hrs/week**		**Lab V:** **Title: Seminar** **Teachers Assessment: 50 Marks** **Credits: 1**
Course Objectives	:	1. To create awareness amongst pre final year students for latest technological Aspects 2. To improve presentation and communication skills 3. To inculcate qualities of team work and team spirit 4. To motivate for research work in the respective areas 5. To have common platform where interaction between various groups of students will take place on the various advanced and emerging topics of technology 6. To improve skills related to search on the internet 7. To realize importance of basic technological aspects

Guidelines for students and faculty

1. Seminar topics may be chosen by the students with advice from the guide/Industry persons, which shall be finalized by guide and approved by concerned head of the department. Students are to be exposed to the following aspects of the seminar presentation.
    a. Literature Survey / Review
    b. Organization of the material
    c. Preparing for presentation
    d. Technical writing

2. Each student is required to-
    a. Submit one page synopsis before the seminar talk for display on the notice board and
    b. Give a 20 minutes presentation through OHP, PC, and Slide projector followed by a 10 minute question answer session.

3. For award of Sessional marks:
    a. 25 marks - based on the assessment done by internal guide during semester and the involvement of student in the work assigned related to the seminar topic
    b. Remaining 25 marks based on the examination at final presentation. Student is to be examined on the basis of an oral and written presentation by at least two examiners, one of them shall be guide and other as an external examiner appointed by the principal of the institute.

Seminar Report Format

1. The Seminar Report shall be typed on A-4 size white bond paper.
2. Typing shall be with spacing of 1.5 using one side of the paper.
3. Margins :- (i) Left 37.5 mm.
   (ii) Right, top and bottom 25 mm.
4. Binding: - Hard with golden embossing on the front cover of brown colour.
5. Front cover of hard bound report: - It should be identical to first title page.
6. Default font size TNR-12.
7. Format for title page (First Page) (Centre justified)

Report of Seminar (TNR-14, Bold)

In (TNR-12)

{Title}(TNR-18, Bold)

By (TNR-12)

{Name of student}(TNR-16, Bold)

(Roll No:) (TNR-12)

Submitted in partial fulfillment of the requirement for (TNR-12)

Degree of Bachelor of Technology (Branch Name) (TNR-14, Bold)

of (TNR-12)

Dr. Babasaheb Ambedkar Marathwada University,

Aurangabad. (TNR-14, Bold)

Department of _____Engineering, (TNR-14, Bold)

Maharashtra Institute of Technology, (TNR-16, Bold)

Aurangabad. (TNR-14, Bold)

200- 200 (Academic Year) (TNR 14)

Format for Certification page (Second page)

CERTIFICATE (TNR-16, Bold)

This is to certify that the Seminar Report (TNR-12)

Submitted by (TNR-12)

(Name of Student) (TNR-14, Bold)

(Roll No: __) (TNR-12)

Is completed as per the requirement of the Dr. Babasaheb Ambedkar Marathwada University, Aurangabad in partial fulfillment of (TNR-12)

Degree of Bachelor of Technology (Branch Name) (TNR-14, Bold)

For the academic Year 20__ - 20__(TNR-12)

(Name)	(Name)	(Name)
Guide	Head of Department	Principal (TNR -12, Bold)

8.The third page will be certificate issued by the industry regarding the completion of Seminar if applicable.

9.The fourth page would be for acknowledgement, which would be followed by index page (Fifth page).

10. Sketches should be drawn on separate sheet (minimum A4 size) and be inserted at proper places. The sketches should be drawn in black ink and be numbered.
11. Tables should preferably type in the text only.
12. The mathematical symbol should be typed or neatly written so as to match darkness of the text.
13. The last item on the index should be references.
14. Page number must appear on the right hand top corner of each page starting after index page.
15. The contents of the seminar can be decided by the internal guide / department and student.
16. Minimum number of copies = 5 Copies (Central Library + Department + Internal Guide + External Examiner + Student). The copy of External Examiner will be submitted by the student after completion of Seminar

Report of Seminar

in

Remote Sensing through Satellite System

by

Mr. A.B.C

(Roll No: T3103)

Submitted in partial fulfillment of the requirement for

Degree of Bachelor of Technology (Instrumentation and Control Engineering),

of

Dr. Babasaheb Ambedkar Marathwada University

Aurangabad

Department of Instrumentation and Control Engineering,

Maharashtra Institute of Technology,

Aurangabad.

General Attributes

- Chapter heading -All Capital—TNR 14 Font (Bold)
- Heading –All Capital- TNR 12 Font (Bold)
- Subheading–Title case- TNR12 Font (Bold)
- Text – TNR11 Font
- Title of the Report should not be more than two lines
- Page numbers are at right hand corner at ½ inch from right and top side.
- Page number should be allotted only from Chapter no. 1 onwards.

References

Last chapter of the report is references including the addresses of websites.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted (Internally) on the syllabus and term work mentioned above.

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Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester-VI

Code No: ICE 351	**Title: Linear Integrated Circuits**
Teaching Scheme: 04Hrs/week	**Class Test: 20 Marks**
Theory: 03Hrs/week	**Theory Examination (Duration): 03 Hrs**
Tutorial: 01Hr/week	**Theory Examination (Marks): 80**
Credits:04	

Objectives	:	The physical world is inherently analog, indicating analog circuitry is needed to condition Physical signals from transducers and then process and control it for various applications.
Unit-I	:	**Op- Amplifier Fundamentals:** Basic building blocks of op-amplifier, differential configuration, types, DC and AC analysis, current sources, current mirrors, Active load, Dc level shifter. Op-amplifier parameters: frequency response, offset nulling techniques, inverting and non inverting configuration An overview of different types of op-amplifier, their peculiarities, application areas, general purpose and precision, instrumentation amplifier, isolation, power, comparators, fast settling time. Op-amplifier parameters: frequency response, offset nulling techniques, inverting and non inverting configuration **Tutorials**: Additional Practice Problems on AC/DC Analysis. **[10+3 Hrs]**
Unit-II	:	**Linear Application of op-amplifier:** Summing amplifier, difference amplifier, instrumentation amplifier, voltage to current converter with floating load and grounded load, current to voltage converter, integrator, differentiator & its application, comparator, limitation of opamp as comparator, Schmitt trigger, comparator IC such as LM339, bandwidth and slew rate limitation, precision rectifiers and peak detector. **Tutorial**: Additional Practice Problems on linear applications **[6+2 Hours]**
Unit-III	:	**Non Linear Applications:** Introduction to Log, Antilog amplifiers, Analog & transconductance multipliers, Analog to Digital and digital to analog conversion techniques, sample and hold circuit, precision half wave & full wave rectifier, Phase lock loop IC 565 operating principle, locking capture range, applications of PLL : FM detector, FSK demodulator, Frequency synthesizer. **Tutorial**: Additional Practice Problems on nonlinear applications. **[6+2 Hours]**
Unit-IV	:	**Signal Generator and Voltage Regulator:** Sine wave generators, triangular wave generators, SAW tooth generators, Voltage to Frequency converter, frequency to voltage converter, function generator IC 8038, Multi vibrators IC 555 based astable & mono stable multi vibrators, monolithic waveform generators IC 566 function generators, Performance specifications, voltage reference and its applications, linear regulators switching regulators, monolithic regulators. **Tutorial**:Additional Practice Problems on ICs and designing **[8+3 Hours]**

Unit-V	:	**Active Filters Design:** Transfer Function, Op0-Amp based first order low pass active filters, standard second order low pass and high pass butter worth filters, KRC filters, multiple feedback filters, band pass, band reject, all pass filters design and its sensitivity analysis, active filter performance considerations, switched capacitor filters(first and second order). **Tutorial**: Additional Problems on Filter Designing. **[9+2 Hours]**
Unit-VI	:	**ICs in Instrumentation and Process Control:** Temperature transducers and its applications, IC LM335/AD590/ LM301 A, OP97 E,IC AD 594/595 isolation amplifiers IC 284 J, commutating auto zero(CAZ) Op- amp, Operational Amplifiers in process control system, feed forward, ON/OFF control, proportional, proportional plus integral(PI) control, proportional plus derivative(PD) control, proportional plus derivative plus integral control(PID),servomechanism IC LM 2907 J. **Tutorial**: Additional Practice on ICs **[6+2 Hours]**
Reference Books:	:	

Sr. No	Title	Author	Publication
1	Op Amps and linear integrated circuits Volume-III	R.A Gaikwad	PHI Publication
2	Linear Integrated Circuits	D.Roy Choudhary,Shail Jain	New Age International publications
3	Design with operational Amplifiers and Analog Integrated circuits	Sergio Franco ,3 rd Edition	Tata McGraw Hill publications
4	Integrated Circuits	K.R.Botkar, 9th Edition	Khanna Publications.

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum Six questions
2. Three questions in each section
3. Question no 1 from section A and Question no 4 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 4 should be of objective nature.

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Syllabus of T. Y. B. Tech. (Instrumentation & Control) Semester - VI

Code No.: ICE 352 | **Title: Modern Control Theory**
Teaching Scheme: 04Hrs/week | **Class Test: 20 Marks**
Theory: 04Hrs/week | **Theory Examination (Duration): 03 Hrs**
Tutorial: 01 Hr/week | **Theory Examination (Marks): 80**
Credits:04

Prerequisites	:	Nil
Objectives	:	▪ To give the students a comprehension about the state space model. ▪ To give the students knowledge about the most important design issues in modern contrc theory. ▪ To give the students a comprehension of the relation between continuous and digita controller design. ▪ To make the students able to apply nonlinear system analysis To provide the knowledge about the design aspects to design state feedback
Un. I	:	**Vector and matrix algebra: A review** Vector and Matrix norm, Unitary, Orthogonal and Orthonormal Vectors, Linear dependent an independent vectors, Definitions of different types of matrices, Diagonalisation of a Matrix Determinants and rank, Inverse of matrix, Eigen values, Eigen vectors, Pseudo inverse, Quadrati forms and definiteness of matrices, Significance of Vector and Matrix algebra in modern contrc theory **[08 Hours]**
Unit-II	:	**State Space Analysis of Systems:** Classical Vs Modern Control Theory, Concept of State, State Space and State Variables, State Model for Typical linear Systems, construction of state model using differential equations, State Variable Diagram and Block Diagram Representation of State Models, State Space Model for Electrical Circuits, Mechanical Systems, Electro-Mechanical Systems—DC Motors, Solution of Time Invariant State Equation, State Transition Matrix from Cayleigh–Hamilton Theorem, Solutior of Linear Time Varying State Equation. **[12 Hours]**
Unit-III	:	**Transformation in State Space Model:** State Space Model from Transfer Functions, Decomposition methods, State Model for a Multi-Inpu Multi-Output System from Block Diagrams, Similarity transformation, Non-Uniqueness of Stat Space Model, Transfer Function from State Model, Different Canonical Models like Phase Variabl Form or Controllable Canonical Model, Observable Canonical Model, Diagonal Canonical Mode Jordan Canonical Model, , State Variable Description of Discrete Time Systems, Solution of Tim Invariant Discrete Time State Equation. . **[10 Hours]**

Unit-IV

Design of State Feedback Controllers and Observers:

State and output Controllability of Systems, Criterion for Controllability for Continuous an Discrete Time Systems, Observability of Systems, Criterion for Observability of a System Significance of Controllability and Observability, Transfer Function an Controllability/Observability, State Feedback Controller design using Pole Placement for Plant Represented in Phase Variable Form, Determination of Feedback Gain **K** Using Ackerman' Formula, Design of full state and Reduced Order Observers **[10 Hours]**

Unit-V

Discrete Time Control Systems:

Basic Elements of a Discrete Data System, Examples of Discrete Data Systems, Sampling Theoren and Significance, Zero Order and First Order Hold and Data Reconstruction, Pulse Transfe Function, Different Block Diagram Realization for Pulse Transfer, Zero-Order Hold and **G(s)** i Cascade, Jury's Stability test, Digital controller algorithm and their realization **[10 Hours]**

Unit-VI :

Nonlinear Systems and Analysis Methods:

Characteristics of Nonlinear Systems, Limit cycle, Jump Phenomenon, Classification o Nonlinearities, Common Physical Nonlinearities, Methods of Analysis- Linearisation Techniques Phase Plane Analysis, Describing Function Analysis, Classification of Singular Points, Basi Definition of Describing, Describing Function for Typical Nonlinearities (Ideal Relay, Relay witl Dead Zone, Simple Dead Zone, Saturation or Limiter, Relay with Hysteresis and Dead Zone Friction Controlled Backlash) **[10 Hours]**

Reference Books :

Sr. No	Title	Author	Publication
01	Automatic Control Systems	B. C. Kuo and FARID Golnaraghi (8th Edition)	Wiley, 2003
02	Digital Control and state variable methods	M. Gopal (2ND Edition)	Tata McGraw-Hill, 2005
03	Discrete-time Control Systems	Katsuhiko Ogata	Pearson, 2002
04	Modern Control Engineering	Dr. K. P. Mohandas	Sanguine Technical
05	Control systems Engineering	I.J. Nagrath and M.Gopal (3rd Edition)	New age International Publishers, 2001

		06	Modern Control Theory	U. A. Bakshi and M. V. Bakshi (1st Edition)	Technical Publication, 2007

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

5. Minimum ten questions.
6. Five questions in each section.
7. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
8. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester- VI

Code No: ICE 353	**Title: Process control**
Teaching Scheme: 04Hrs/week	**Class Test: 20 Marks**
Theory: 03Hrs/week	**Theory Examination (Duration): 03 Hrs**
Tutorial: 01Hr/week	**Theory Examination (Marks): 80**
Credits:04	

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 with out most care. ▪ To make the students capable to apply
Unit-I	:	**Introduction of process control:** Servo mechanism, control system evaluation, negative feedback, the difficult element - dead time the easy element – capacity combination of dead time and capacity, process- control drawing first order response second order response of sensor time response [06 Marks]
Unit-II	:	**Process characteristics:** Process variables, , Elements of process dynamics, Liquid processes, Gas processes, Flow processes, Thermal processes, Dead time, Thermal element lag, Pressure element lag. Multi-capacity process, steady- state gain,. Smart transmitters for flow, pressure, temperature, E/P converter [06 Marks]
Unit-III	:	**Intrinsic safety design:** Hazardous locations and their classification, Intrinsically safe systems, installations, Barrier designs for Thermocouple, RTD, 80/20 rules for barrier designs, , Instrumentation in hazardous area, protection circuits using Shunt and Zener diode, Earthing considerations **[06 Marks]**
Unit-IV	:	**Control Valve design: Valves:** Selection, Performance, sizing and characteristics (inherent and installed), Control valve design for specific applications like liquid, gas, slurries applications, control valve noises and their remedies, **[08 Marks]**
Unit-V	:	**Controller Design:**

		Performance criteria, Proportional control, Integral control, Proportional integral control, Proportional derivative control, PID control action, Two position control, Single speed floating control, Two position floating controllers, Electronic, pneumatic and hydraulic Controllers designs, model based controllers **[10 Marks]**
Unit-VI	:	**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 **[10 Marks]**
Unit-VII		**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, Automobileand Building Automation. **[10 Marks]**

Reference Books: :

Sr. No	Title	Author	Publication
1	Process Control & Instrumentation Technology	Curtis D.Johnson	7th Edition, Pearson Education, 2002
2	Process control system	F. G. Shinskey	Mcgraw Hill Publications,3rd Edition
3	Instrument Engineers' Handbook Vol I & II	B.G.Liptak	Chilton Books Company,3rd Edition
4	Process Control Systems	F. G. Shinskey	TMH.
5	Instrumentation Engineers Handbook: Process Control	B. G. Liptak	Chilton Book Company
6	Process Control Instrumentation	C. D. Johnson	PHI
7	Chemical Process Control	G. Stephanopoulos,	Prentice Hall of India, New Delhi, 2001

		8	Process control	P. Harriot	Vol I & II

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

9. Minimum ten questions.
10. Five questions in each section.
11. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.: ICE 354 | **Title: Soft Computing**
Teaching Scheme: 04Hrs/week | **Class Test: 20 Marks**
Theory: 04Hrs/week | **Theory Examination (Duration): 03 Hrs**
Credits:04 | **Theory Examination (Marks): 80**

Prerequisites	:	Any High Level Language and digital system design concepts.
Objectives	:	To gain knowledge of Neural network & fuzzy logic and apply it in engineering field.
Unit-I	:	**Fundamental Concepts of Neural Networks:** Feed Forward and feedback networks, learning rules, perceptron learning rule, delta, window-hoff learning rule, Hebbian learning rule. Classification model, features and decision regions, training and classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearly separable classification. **[10 Hours]**
Unit-II	:	**Multilayer Feed forward network and single layered feedback network:** Linearly non separable pattern classification, delta learning for multi perceptron , generalized delta learning rule, error back propagation training, learning factors, basic concepts of single layer feedback network, Hopfield networks and training. **[10 Hours]**
Unit-III	:	**Associative Memories and self organizing networks:** Linear association, basic concepts of recurrent associative memories, storage algorithm, by directional associative memory, architecture, association encoding and decoding and stability. Supervised learning and Unsupervised learning, data checking and validation. **[10 Hours]**
Unit-IV		**Classical and Fuzzy Sets:** Overview of classical sets, membership function, a-cuts, properties of a-cuts, decomposition, theorem, extension principles, Compliment, intersection, unions, combinations of operations, aggregation operation. **[10 Hours]**
Unit-V	:	**Fuzzy arithmetic and relations:** Fuzzy numbers, linguistic variable, arithmetic operations on intervals and numbers, lattice of fuzzy numbers and fuzzy equation, Crisp and fuzzy relations, projections and cylindrical extension, binary fuzzy relations on single set, equivalence, compatibility and ordering relations, morphisms, fuzzy relation equations. **[10 Hours]**
Unit-VI	:	**Fuzzy Logic and Applications of Fuzzy logic:** Fuzzy measures, De fuzzification techniques, basic Fuzzy interference algorithm, application of fuzzy logic, Fuzzy system design implementation, useful tools supporting design. Applications in soft computing and control system. **[10 Hours]**
Reference Books:		1. Riza C. Berkan and Sheldon L. Trubateh, Fuzzy systems Design Principles, Standard Publishers and Distributors. Delhi 2. Abraham Kandel and Gideon Langholz, Fuzzy Control Systems, CRC Press- Boca Raton 3. J.S.R Jang, C.T.Sun and E.Mizutani, Neuro-Fuzzy and Soft computing, Prentice Hall of India. Pvt. Ltd; New Delhi 4. Simon Haykin, Neural Networks, Pearson Education 5. James A. Freeman and David M. Strapetuns, Neural Networks Prentice Hall.

		6. Bart Kosko Neural Network & Fuzzy System, PHI. 7. Rajshekaran & Pai, Neural Networks Fuzzy Logic & Genetic Alogrithms, Prentice Hall

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.: ICE 391	**Elective-I** **Title: Data Communications and Computer Network**
Teaching Scheme: 04Hrs/week **Theory: 04Hrs/week** **Credits:04**	**Class Test: 20 Marks** **Theory Examination (Duration): 03 Hrs** **Theory Examination (Marks): 80**

Prerequisites	:	Any High Level Language and digital system design concepts.
Objectives	:	To gain knowledge of Neural network & fuzzy logic and apply it in engineering field.
Unit-I	:	**Fundamentals of Data Communication:** Communication model, Electrical interface, Transmission media wired and wireless,analog and digital communication, Transmission impairments, channel capacity, Signal to Noise ratio, Signal encoding techniques, ASK, FSK, PSK, FDM, TDM, CDM, EIA-232-D. **[10 Hours]**
Unit-II	:	**Digital Data Communication Techniques:** Synchronous, asynchronous transmission, Types of errors, Error detection and correction, Line configurations, Data layer design issues, data link control protocols, flow control, error control, HDLC, OSI/ISO model, TCP/IP model. **[10 Hours]**
Unit-III	:	**Computer Networks:** Network hardware hub, bridges, routers, repeaters, gateways, Network software, network design issues, network topology, LAN, MAN, WAN, high speed LAN. data communication networks, circuit and packet switching networks and their classifications, data routing. **[10 Hours]**
Unit-IV		**ISDN:** Introduction to Integrated services digital network (ISDN), Integrated services digital network, architecture, user interface, services, types of ISDN, broadband ISDN **[10 Hours]**
Unit-V	:	**ATM & Frame relay:** X.25, frame relay, ATM, architecture, services, congestion control in data networks effect of congestion, congestion control, traffic management, congestion control in frame relay, ATM, packet- switching networks. **[10 Hours]**

Unit-VI	:	**Internet Applications:** IEEE standards 802 for LAN and MAN, Internet application, internet protocol, electronic mail, web, DNS, HTTP, FTP, SMTP. Network security, cryptography. **[10 Hours]**
Reference Books:		Computer Network Andrew S. Tannenbaum PHI Data & computer communication William Stallin PHI Data Communications, Computer Networks & open system Fred Halsall PHI

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T.Y.B. Tech. (Instrumentation and Control Engineering) Semester-VI
Elective-I

Course Code: ICE 392 | **Title: Digital Image Processing**
Teaching Scheme: 04Hrs/week | **Class Test: 20 Marks**
Theory: 03Hrs/week | **Theory Examination (Duration): 03 Hrs**
Theory Examination (Marks): 80

Credits:04

Objectives	:	1. To train the students for Image processing fundamentals. 2. To train the students for processing using related software. 3. To train the students for color image processing.
Unit-I	:	**Fundamentals of Image Processing:** Image Acquisition, Image Model, Sampling, Quantization, and Relationship between pixels and distance measurement, connectivity, Image Geometry, Photographic film. Histogram: Definition, Decision of Contrast biasing on histogram, Operations based on histograms like image stretching, Image classification. Definition and Algorithm of Histogram equalization **Tutorial:** Study of image processing toolbox in MATLAB. **(10Hrs)**
Unit-II	:	**Image Transforms:** Introduction to Fourier Transform, The Discrete Fourier Transform, Properties of two dimensional Fourier transform, Fast Fourier Transform, WALSH Transformation, HADAMARD Transformation, DCT **Tutorial**: MATLAB/C based program to generate basis function for HADAMARD and WALSH transformation of an image. **(10Hrs)**
Unit-III	:	**Image Enhancement:** **Image Enhancement (by Spatial Domain Methods):** Arithmetic and Analytical operations, pixel or point operations, size operations) Smoothing filters – Mean, Median, Low pass filters, high pass filters, sharpening filters. **Image Enhancement: (by Frequency Domain Method):** Design of Low Pass, High Pass, Edge enhancement, Sharpening filters in frequency domain. Butterworth Filter, Homomorphic filters in frequency domain and spatial domain **Tutorial:** MATLAB/C program for contrast stretching and gray level slicing. **(10Hrs)**

Unit-IV	:	**Image Compression:** Fundamentals: Coding redundancy, interpixel redundancy, psycho visual redundancy, Fidelity criterion: MSE, PSNR, Compression ratio, Lossless compression: Variable length coding, LZW coding, Lossy compression: transform coding, wavelet coding, Image Compression standards, Image File formats: bmp format, Graphics Interchange format, Tagged Image File Format. **Tutorial:** MATLAB/C based program for run length coding. **(10Hrs)**
Unit-V	:	**Image Segmentation:** Definition, Characteristics of segmentation, Detection of Discontinuities, Thresholding , Pixel based segmentation method, Region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation, and histogram based segmentation, split and merge technique **Tutorial:** MATLAB/C based program for Image segmentation. **(10 Hrs)**
Unit-VI	:	**Morphological Image Processing:** Dilation and erosion, Opening and closing, The Hit or Miss transformation, Basic Morphological algorithms: Boundary extraction, region filling, Applications of Gray-scale morphology. **Color Image Processing:** Color fundamentals, color models (RGB, CMY, HIS), Color transformations: formulation, color complements, color slicing, tone and color corrections. **Tutorial:** MATLAB/C based program for color image processing. **(10 Hrs)**
Reference Books:	:	1. "Digital Image Processing", BY Rafael C Gonzalez, Richard E Woods, Pearson Education. 2. "Digital Image Processing using MATLAB", BY Rafael C Gonzalez, Richard E Woods, Eddins, Pearson Education. 3. "Fundamentals of Digital Image Processing", BY Anil K Jain, PHI. 4. "Digital image processing", BY William K., Mc Graw Hill 1997.

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.

3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.: ICE 355 | **Title: Industrial Management**
Teaching Scheme: | **Class Test:10 Marks**
Theory: 02 Hrs/ week | **Theory Examination (Duration): 02 hrs.**
Credits:02 | **Theory Examination (Marks): 40.**

Objective	:	• To understand concept of Management, Administration, Organization, Industrial Law, Financial Management.
Unit-I	:	**Introduction to Management:** Managing and manager, organizations and the need for management, the management process, types of managers, the challenge of management, the evolution of management theory. **[03 Hours]**
Unit-II	:	**Management in the Twenty-First Century:** The importance of organizational and natural environment, elements of the direct action environment, managing multiple stock holder relationship, elements of the indirect action Environment, Natural environments, management 2000 and beyond, social responsibility and ethics, globalization and management. Evaluation of Case studies related to above concepts. **[03 Hours]**
Unit-III	:	**Business Organization**: Forms of business organization, individual proprietorship, joint stock company, co-operative enterprise and public sector undertakings. Organization structures in industries, line organization, functional organization, line and staff organization, committee organization, project organization, matrix organization. **[04 Hours]**
Unit-IV	:	**Nature and Significance of Economics**: Science, Engineering and technology their relationship with economic development. Basic economic concepts, human wants-economic goods, utility, value, price, cost, wealth and capital. Demand, supply, Elasticity of demand and supply. Concept of profit and revenue. **Financial Management:** Concept of management, accounting systems, financial accounting and cost accounting system, sources of industrial finance, sales organization of a firm, management of sales and advertisement, market research. **[09 Hours]**
Unit-V	:	**Accidents and Safety** Classification of accidents; according to nature of injuries i.e. fatal, Temporary; according to event and according to place. Causes of accidents-psychological, physiological and other industrial hazards. Effects of accidents. Accidents-prone workers. Action to be taken in case of accident with machines, electric shock, road accident, fires and erection and construction accidents. **Industrial Act:** Industrial, Factory act, pollution control, industrial safety, introduction to causes of accidents, safety, accident prevention techniques and related legal provisions.

		[07 Hours]
Unit-VI	:	**Personnel Management:** Man power, sources of recruitment, selection and training, job evaluation, performance appraisals, wages and incentives, self and time management. **[04 Hours]**
Suggested Text Books and References	:	1. James A.F.Stoner, Management, PHI 2. C.S. George Jr, Management for Business and industry 3. Mc Connel,Gupta, Economic principles, problems and polices, TMH 4. T.R Bange and S.C.Sharma, Industrial organization and Engineering Economic, Khanna Publication 5. O. P. Khanna, Industrial Management 6. Knootz & O'Donnell, Principles of Management 7. M.C.Shukla, Business organization & Management 8. G.D. Stervens, Engineering Economics

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

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 marks Paper:

1. Minimum eight questions
2. Four questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for six marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 7 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad (Faculty of Engineering & Technology) Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester-VI **Lab VI:** **Code No.: ICE 371** — **Title: Linear Integrated Circuits** **Teaching Scheme: 02Hrs/week** — **Teachers Assessment: 25 Marks** **Practical:-25 Marks** — **Credits: 01**		
Course Objectives	:	• Understand concepts of various circuits. • Estimate power requirement and circuit performance.
List of Practical	:	1. To design DC power supply using LM2576. 2. To design DC power supply using TL494. 3. To design constant current source using LM317 and LM334, 4. To design DC voltmeter using ICL7106/7. 5. To design stepper motor driver using MC3479. 6. To design isolated relay driver board using ULN2003 and PC817. 7. To design DC motor driver using L293D. 8. Study of various sensors. 9. To design battery charger for lead-acid battery. 10. Study of relay switching noise and its effects on electronic system. 11. To design enclosure and front panel of a consumer electronic product. 12. PCB design.
List of Reference Books	:	1. Data sheets 2. Texas Instrument www.ti.com 3. National Semiconductor Manual
List of Equipments /Instruments	:	Multimeter, PCB designing equipments, DSO, CRO, Connecting wires, Bread Boards, Electronic Components.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

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Lab VII:

Code No.: ICE 372	**Title: Modern Control Theory**
Teaching Scheme: 02Hrs/week	**Teachers Assessment: 25Marks**
Practical:-25 Marks	**Credits: 01**

Course Objectives	:	▪ To give the students a comprehension about the state space model. ▪ To give the students knowledge about the most important design issues in modern control theory. ▪ To give the students a comprehension of the relation between continuous and digital controller design. ▪ To make the students able to apply nonlinear system analysis To provide the knowledge about the design aspects to design state feedback
List of Practical	:	1.To perform different vector and matrix operations using MatLab tool, e,g, eigenvalues, eigenvectors, rank, pseudo-inverse, test for definiteness, etc. 2.To find the solution of linear equations using minimum norm method using pseudo-inverse method. 3.To derive the state space model of the inverted pendulum mounted on moving cart. 4.To derive state space model of spring mass system and series R-L-C circuit. To plot the response of these systems for step input. 5.To validate that the output response of the state space model obtained using similarity transformation and output response of original state space model is unique. 6.To design a state feedback controller to stabilize the inverted pendulum mounted on moving cart using Pole Placement technique. (Take model from Experiment No. 3.) 7.To design a state feedback controller to stabilize the inverted pendulum mounted on moving cart using full order observer. (Take model from Experiment No. 3.) 8.To design a state feedback controller to stabilize the inverted pendulum mounted on moving cart using reduced order observer. (Take model from Experiment No. 3.) 9.To design a digital PID controller for given controller specification. 10.Reconstruction of digital data using zero and first order hold circuit 11.To obtain describing function of commonly encountered nonlinearities. 12.To construct phase trajectory using Isoclines method.

List of Reference Books :

Sr. No	Title	Author	Publication
01	Automatic Control Systems	B. C. Kuo and FARID Golnaraghi (8th Edition)	Wiley, 2003
02	Digital Control and state variable methods	M. Gopal (2ND Edition)	Tata McGraw-Hill, 2005
03	Discrete-time Control Systems	Katsuhiko Ogata	Pearson, 2002
04	Modern Control Engineering	Dr. K. P. Mohandas	Sanguine Technical
05	Control systems Engineering	I.J. Nagrath and M.Gopal (3rd Edition)	New age International Publishers, 2001
06	Modern Control Theory	U. A. Bakshi and M. V. Bakshi (1st Edition)	Technical Publication, 2007

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

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Syllabus of T. Y. B. Tech. (Instrumentation and Control Engineering) Semester-VI

Lab VIII:

Code No.: ICE 373 | **Title: Process Control**
Teaching Scheme: 02Hrs/week | **Teachers Assessment: 50 Marks**
Credits: 01

Course 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 with out most care. To make the students capable to apply knowledge gained to develop the smaller modules for demonstration purposes.
List of Practical	:	1.To study SMART transmitter 2.To design 4-mA current transmitter 3. To design a barrier circuit for low voltage 4.To determine characteristics of thermal system 5.To determine response of first and second order system 6.To study tuning of controllers 7.To study model based controller 8.To design a barrier circuit for thermocouple 9.To design an electronic PID controller 10.To study nonlinear elements in closed loop control system
List of Reference Books	:	

Sr. No	Title	Author	Publication
01	Applied Instrumentation Vol –I-IV	Andrew Williams	
02	Process control system	F. G. Shinskey	Mcgraw Hill Publications,3rd Edition
03	Process /Industrial Instruments and Control	D.M.Considdine	Mcgraw Hill Publications,4th

			Handbook		Edition
		05	Instrument Engineers' Handbook Vol I & II	B.G.Liptak	Chilton Books Company,3rd Edition
		06	National Instruments Catalog		
		07	Automatic Process Control	Eckman D. P,	Wiley Eastern, 1975.
		08	Pneumatic System	Majumdar S.R	Tata McGraw, 1995
		09	Process Control & Instrumentation Technology	Curtis D.Johnson	7thEdition, PearsonEducation, 2002

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

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Lab IX:

Code No.: ICE 374 **Title: Matlab and Labview Practice**
Teaching Scheme: 02Hrs/week **Teachers Assessment: 50 Marks**
Credits: 01

Course Objectives	:	The knowledge of various Practical form the areas of control system, DSP and Instrumentation using base MatLab and LABVIEW,, tools boxes such as control system, Signal Processing, nonlinear Controls etc programming related to the tools boxes and programming for basic Arithmetic, logical operations, Loops ..
List of Practicals (Minimum eight experiments to be performed)	:	1. Program for the basic inputs like Step, Ramp,. 2. Program for the Impulse, Exponential,-Cos, Sin 3. Program to determine TF and state Models. 4. Program to determine stability using root locus, bode plots, Nyquist plots. 5. Program on Transients Response. 6. Design and implement FIR filter using windowing method. 7. Design and implement IIR filter using Chebyshev approximation. 8. Design and implement IIR filter using Butterworth approximation. 9. To perform different vector and matrix operations using MatLab tool, e.g. eigenvalues, Eigen vectors, rank, pseudo-inverse, test for definiteness. 10. Case Study.
List of Reference Books		

Sr. No	Title	Author	Publication
1	Introduction to MATLB	Mr.Rudrapratap	Prentice Hall of India,
2	Digital Signal Processing	Oppenheium, Schaffer	PHI publication
3	Digital Signal Processing, applications	Rulph Chassaing	WILAY publication
4	Modern Control Engineering	Dr. K. P. Mohandas	Sanguine Technical
5	Modern Control Theory	U. A. Bakshi and and M. V. Bakshi (1st Edition)	Technical Publication, 2007

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

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Syllabus of T. Y.B. Tech. (Instrumentation and Control Engineering) Semester-VI

Code No: ICE 375 — **Title: Lab-X (Project-I)**

Teaching Scheme: 2 Hrs — **Teachers Assessment : 50 Marks**
Practical/TA (Internal) — **Credits: 01**

Course Objectives	:	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 (Microsoft Word/Latex)for the preparation of the report.
6. Each student/group is required to-
    c. Submit a one page synopsis before the project talk for display on the notice board in the first week of their academic semester.
    d. 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.
    e. 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.
    f. Start working on the project and submit initial development and CPM/PERT planning drawing in the fourth week of their academic semester.
    g. 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.
    h. Overall assembling, wiring, code writing, testing, commissioning, should completed within next two weeks.

i. 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).
j. 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

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