NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Instrumentation Engineering

Faculty of Engineering and Technology

Teachers, Paper Setters and Examiners Guidelines Manual

SEMESTER – VII and VIII

W.E.F 2015 – 2016

Syllabus Structure For Final Year Instrumentation Engineering w.e.f year 2015-16(Semester –VII)

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Instrumentation In Unit Operations (TH)	D	3	–	–	3	20	80	–	–	100	3
	Biomedical Instrumentation(TH)	D	3	–	–	3	20	80	–	–	100	3
	Interdisciplinary Elective (TH)	E	3	–	–	3	20	80	–	–	100	3
	Elective – I (TH)	E	3	–	–	3	20	80	–	–	100	3
	Digital Image Processing (TH)	D	3	–	–	3	20	80	–	–	100	3
	Biomedical Instrumentation (LAB)	D	–	–	2	2	–	–	25	25 (PR)	50	1
	Digital Image Processing (LAB)	D	–	–	2	2	–	–	25	25 (PR)	50	1
	Elective – I (LAB)#	E	–	–	2	2	–	–	25	25 (OR)	50	1
	Project – I (LAB)	D	–	–	2	2	–	–	25	25 (OR)	50	2
	Seminar – II	D	–	–	2	2	–	–	25	–	25	2
	Industrial Visit	D	–	–	–	–	–	–	25	–	25	1
Total			**15**	**0**	**10**	**25**	**100**	**400**	**150**	**100**	**750**	**23**

ISE: Internal Sessional Examination   ESE: End Semester Examination   ICA : Internal Continuous Assessment

	Interdisciplinary Elective		Elective - I
1	Programmable Logic Controller & Distributed Control System	1	Industrial Drives and Control
2	Virtual Instrumentation and LABVIEW	2	Environmental Instrumentation
3		3	Fiber Optics & Laser Instrumentation
		4	Neural Network & Fuzzy Logic Instrumentation

- # lab for Elective – I (LAB)
- Interdisciplinary Elective shall be offered by the department to the students of other departments. Students from one department can not register for Interdisciplinary Elective of the same department.
- At least 15 students should register for offering any elective.

Course Code	Name of the Course	Group	Teaching Scheme				Evaluation Scheme				Total	Credits
							Theory		Practical			
			Theory Hrs /week	Tutorial Hrs /week	Practical Hrs /week	Total	ISE	ESE	ICA	ESE		
	Instrumentation System Design (TH)	D	3	–	–	3	20	80	–	–	100	3
	Industrial Automation (TH)	D	3	–	–	3	20	80	–	–	100	3
	Elective – II (TH)	E	3	–	–	3	20	80	–	–	100	3
	Elective – III (TH)	E	3	–	–	3	20	80	–	–	100	3
	Instrumentation System Design (LAB)	D	–	–	2	2	–	–	25	25 (PR)	50	1
	Industrial Automation (LAB)	D	–	–	2	2	–	–	25	25 (PR)	50	1
	Elective – II (LAB)#	E	–	–	2	2	–	–	25	25 (OR)	50	1
	Industrial Lecture	C	–	–	1*	1	–	–	50	–	50	2
	Project – II	D	–	–	4	4	–	–	75	75(OR)	150	6
Total			**12**	**0**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

ISE: Internal Sessional Examination   **ESE: End Semester Examination**   **ICA : Internal Continuous Assessment**

	Elective-II		Elective - III
1	Power Plant Instrumentation	1	Optimal & Adaptive Control
2	Computer Network	2	Nano Instrumentation
3	Agricultural Instrumentation	3	Automotive Instrumentation
4	Soft Computing	4	Embedded Systems

- # lab for Elective – II (LAB)
- * Lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.
- At least 15 students should register for offering any elective.

Instrumentation in Unit Operations

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
A	**Introduction: -** Concept of unit operations & unit processes, material balance and energy balance.	01	1-5
B	Evaporation: - Liquid characteristics, types of evaporators,	02	1-5
C	Methods of Feeding, operation of single effect and multi effect evaporator,	01	1-5
D	capacity & economy of multiple effect evaporation, Vapour recompression,	01	1-5
E	Operation of mechanical and thermal Recompression,	01	1-5
F	Instrumentation and control for this process. Drying: -	01	1-5
G	Classification of dryers, Principle & operations, Drying equipments, Instrumentation for this process.	02	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus.			

Unit-II

Sr.No.	Unit- II: Distillation	Lecture required	References
A	Equipment set up	01	1-5
B	Operation of flash Distillation, Batch Distillation, Continuous Distillation	02	1-5
C	Fractionating Column	01	1-5
D	slue plate arrangement	02	1-5
E	Rectification and stripping	01	1-5
F	Instrumentation and control for this process	01	1-5
G	Leaching and Extraction: - Principles, Various types of equipments for this process.	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus.			

Unit - III

Sr.No	Unit-III: Material Handling Equipments	Lecture required	References
A	Transport Equipments	01	1-5
B	Positioning Equipments	01	1-5
C	Unit load formation Equipment	01	1-5
D	Storage equipment, Identification & control equipment	02	1-5

E	Size Reduction:-Principle of commutation Equipments	01	1-5
F	Classification and operation of crushers & grinders	02	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	**Unit – IV: - Crystallization**	Lecture required	References
a	Definition, Magma, Super-saturation	01	1-5
b	Formation of Crystal, Equipment classification & operation. Instrumentation & control for this process.	02	1-5
c	Mechanical separation: Screening, Filtration – Mechanisms of filtration	02	1-5
d	Types of Industrial filters- Rotary filter, filter press	01	1-5
E	Centrifuges, cyclones, Bag filter	01	1-5
F	electrostatic precipitators and Centrifuge separator	01	1-5
Guidelines for the examiner and paper setter. Numerical may be asked from topic d			

Unit – V

Sr.No	**Unit – V:- Heat Exchangers**	Lecture required	References
A	Theory	01	1-5
B	Types of heat exchanger	01	1-5
C	temperature pattern in heat exchanger	01	1-5
D	condensers, Boilers, Application of above Unit operations in Paper	02	1-5
E	Cement, Fertilizer	01	1-5
F	Petrochemical	01	1-5
G	sugar industry	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus.			

Reference Books: -

1. McCabe Smith, 'Unit Operation of Chemical Engineering', 5th Edition, McGraw Hill.

2. Perry, 'Chemical Engineers Handbook', 6th Edition, McGraw Hill int. Student ed. 1984.

3. Felder, Rotsseau, Herriot, 'Elementary principles of Chemical Processes', Wiley 1978

4. W.F. Stoeker, 'Design of Thermal System', 3rd Edition McGraw Hill int. ed. 1989.

5. M. Gopalrao& M. Sitting, 'Outline of Chemical Technology', 2nd edition east west 1973.

Biomedical Instrumentation

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Introduction to gross anatomy of human body	01	1-5
b	major physiological systems, their structure and function	02	1-5
c	Cell structure	01	1-5
d	basic cell functions	01	1-5
e	Origin of bio potentials	01	1-5
f	electrical activity of cells	01	1-5
g	Introduction to biomedical instruments	01	1-5
h	classification and justification	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr. No		Lecture required	References
a	Transducers for biomedical instrumentation and selection	01	1-5
b	biomedical electrodes	01	1-5
c	Cardiological systems: Structure of heart, rhythamicity, cardiac cycle, heart sounds, cardiac output	02	1-5
d	blood pressure measurement, direct, indirect, Spygmomanometer	02	1-5
e	Digital B.P.Cardio vascular instrumentation: ECG electrodes, & leads	01	1-5
f	Cinthoven triangle, ECG quantification, PC based ECG analysis	02	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-III

Sr. No		Lecture required	References
a	Pacemakers	01	1-5
b	Defibrillators	01	1-5
c	Biotelemetry, bedside monitors	01	1-5
d	ICU, Heart Lang machine	01	1-5
e	Phonocardio graph	01	1-5
f	plentysmograph, Artificial Kidney	02	1-5

g	Blood cell counters	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-IV

Sr. No		Lecture required	References
a	Central Nervous system: The Brain, Receptors	02	1-5
b	sensory pathway and motor systems, Evoked potential	02	1-5
c	Electron rephalogram, EEG analysis, EMG	02	1-5
d	Mechanics of breathing O2/CO2 transport between lungs and tissue cells	01	1-5
e	Spirometer, Artificial respiration	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-V

Sr. No		Lecture required	References
a	Imaging system: X-ray	01	1-5
b	CT Scan	01	1-5
c	Ultrasonography, MRI, Endoscopy	02	1-5
d	Electrical safety: Significance of electrical danger	01	1-5
e	Physiological effects of electrical current	01	1-5
F	Ground shock hazard	01	1-5
g	methods of accident prevention	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Reference Books:-

1.   R S Khandpur, "Handbook of Biomedical Instrumentation, "TMH
2.   Cromwell, "Biomedical Instrumentation and Measurement, "PHI
3.   IS G Khalekar, "Introduction to Biomedical instrumentation?"
4.   Handbook of Biomedical Instrumentation, "Webster".
5.   http://nptel.iitm.ac.in

Interdisciplinary Elective
I. Programmable Logic Controller & Distributed Control System

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Plant Automation	01	1-10
b	Control Systems Strategy	01	1-10
c	Evolution of instrumentation and control	02	1-10
d	Role of automation in industries	01	1-10
e	Benefits of automation	01	1-10
f	Introduction to automation tools PLC, DCS, SCADA, Hybrid DCS/PLC	01	1-10
g	Automation strategy evolution	01	1-10
h	Performance criteria and Safety Systems	01	1-10
Guidelines for the examiners and paper setters: Question should not be asked from introductory part of syllabus			

Unit-II

Sr.No.		Lecture required	References
a	Applications of PLC's, Specifications of advanced PLC's, Input speed modules	01	1-10
B	modular controller, High speed counter, Remote input-output scanner	01	1-10
c	Communication module, limit switches, scan time, watchdog timer	01	1-10
d	PLC programmer and its features, programming instructions	01	1-10
e	input output timer counter, bit comparison FIFO LIFO branch instructions etc.	01	1-10
f	System configuration hardware, system sizing and selection, wiring diagram, PLC installation, Interfacing to PC, Multi programming languages like ladder diagram	02	1-10
g	Structured text, Sequential flow chart, Instruction language, Functional block diagram, State diagrams etc	01	1-10
h	Development of ladder diagram for Industrial applications.	01	1-10
Guidelines for the examiners and paper setters: Question should not be asked from introductory part of syllabus			

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Unit - III

Sr. No.		Lecture required	References
a	DCS- Basic Packages Introduction, analog control, direct digital control, distributed process control	01	1-10
b	DCS configuration with associated accessories, control console equipment	01	1-10
c	control unit (Relay Rack mounted equipments), local control units, attributes of DCS & DCS Flow sheet symbols	01	1-10
d	DCS System Integration I/O hardware stations, Set-point station control, Supervisory Computer Tasks & configurations	02	1-10
e	system integration with PLCs and computers, Human Machine Interface for process monitoring and control	02	1-10
f	Introduction to expert systems, and Statistical Process Controls	01	1-10
Guidelines for the examiners and paper setters: Question should not be asked from introductory part of syllabus			

Unit – IV

Sr.No.		Lecture required	References
a	Instrumentation Standard Protocols	01	1-10
b	HART Protocol, frame structure	01	1-10
c	Programming implementation examples, Benefits, Introduction	01	1-10
d	Advantages and Limitations of Field bus	01	1-10
e	FDS configuration, Comparison with other field bus standards including Device net	02	1-10
f	Profibus, Controlnet, CAN	01	1-10
g	Industrial Ethernet, MAP and TOP	01	1-10
Guidelines for the examiners and paper setters: Question should not be asked from introductory part of syllabus			

Unit - V

Sr.No		Lecture required	References
a	Industrial applications of PLC, SCADA, DCS	02	1-10
b	open systems for following plants: Cement plant	02	1-10
c	Thermal power plant, Steel Plant	02	1-10
d	Glass manufacturing plant, Paper and Pulp plant.	02	1-10

Guidelines for the examiners and paper setters:
Question should not be asked from introductory part of syllabus

Reference books

1. Bela G, LIPTAK "Instruments Engineers Handbook" Vol-II, Process Control 3rd Edition 1995," Chilton
2. Popovicand Bhatkar , "Distributed Computer Control for Industrial Automation, Dekker.
3. KrishanKant , "Computer-based Industrial Controls" PHI.
4. Applications of computers in Process Control, "Considine".
5. T.HTsai, "Modern Control Techniques for the Process Industries"
6. Lane", Mareeet Dekkar, N.Y 1986.
7. Iserman, "Digital Control System,"
8. J.D.Otter, " Programmable Logic Controller," (PHI).
9. Huges, "Industrial Programmable controller, (ISA).
10. http://nptel.iitm.ac.in

Interdisciplinary Elective
ii. Virtual Instrumentation and LABVIEW

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Review of Virtual Instrumentation	01	1-4
b	Historical perspective	01	1-4
c	Need of VI	01	1-4
d	Advantages of VI	01	1-4
e	Define VI	01	1-4
f	block diagram & architecture of VI	01	1-4
g	data flow techniques	01	1-4
h	graphical programming in data flow, comparison with conventional programming	02	1-4
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.		Lecture required	References
a	Programming Techniques	01	1-4
b	VIS & Sub VIS	01	1-4
c	loops & charts	01	1-4
d	arrays, clusters, graphs	02	1-4
e	case & sequence structures	01	1-4
f	formula modes	01	1-4
g	local and global variable	01	1-4
h	string & file input	01	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No.		Lecture required	References
a	Data Acquisition basics	01	1-4
b	ADC	01	1-4
c	DAC, DIO	01	1-4
d	Counters & timers	02	1-4
e	PC Hardware structure, timing	01	1-4
f	interrupts, DMA	01	1-4
g	Software and Hardware Installation	01	1-4
Guidelines for the examiner and paper setter.			

	Questions should not be asked on introductory part of syllabus

Unit – IV

Sr.No.		Lecture required	References
A	Common Instrument Interfaces for Current loop, , , , ,	01	1-4
b	Rs232C/Rs 485	01	1-4
c	GPIB	01	1-4
d	System basics	01	1-4
e	interface basics: USB, PCMCIA, VXI, SCXI, PXI etc	01	1-4
f	networking basics for office & industrial application VISA &IVI	01	1-4
g	image acquisition & processing	01	1-4
h	Motion Control	01	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No		Lecture required	References
a	Use of Analysis Tools, Fourier transforms	01	1-4
b	Power spectrum, Correlation methods	01	1-4
c	windowing & flittering	01	1-4
d	Application of VI: Application in Process Control	01	1-4
e	Designing of equipments like Oscilloscope, Digital Millimeter using Lab view Software	01	1-4
f	Study of Data Acquisition & control using Lab view Virtual instrumentation for an Innovative Thermal Conductivity Apparatus to measure the Thermal Conductivity	01	1-4
g	Apparatus- to measure the conductivity of non Newtonian fluids white they are subjected to sharing force.	02	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books

1.   Gary Johnson, "Labview Graphical Programming", second edition, MC GrawHill,
2.   Lisa K. Wells &Jettrey Travis, "Labview for Everyone", Prentice Hall, NewJersey, 1997.
3.   Sokoloff , "Basic Concepts of Labview 4", Prentice Hall, New Jercy, 1998.
4.   S. Gupta, J.P.Gupta, "PC interfacing for Data Acquisition & process control",

Second Edition, Instrument Society of America, 1994.

Elective-I
I.   Industrial Drives & Control
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Introduction to motor drives: Classification, comparison of AC and DC drives	01	1-7
b	Basic elements, torque equations	01	1-7
c	component of load torque, multi-quadrant operation	01	1-7
d	equivalent drive parameters, components of power electronic drives	01	1-7
e	criteria for selection of drive components match between the motor and the load	01	1-7
f	calculation of time and energy in transient conditions, characteristics of mechanical systems, stability consideration, thermal consideration	02	1-7
g	thermal model of motor for heating and cooling, match between the motor and power electronics converter, closed loop control of drives	02	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus.			

Unit-II

Sr.No.		Lecture required	References
a	DC drives System model, motor rating	02	1-7
b	motor mechanism dynamics, drive transfer function	02	1-7
c	effect of armature current waveform	01	1-7
d	torque pulsations	01	1-7
e	adjustable speed drives	01	1-7
f	chopper fed and 1 phase converter fed drives	01	1-7
g	effect of field weakening.	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus.			

Unit - III

Sr.No.		Lecture required	References
a	Induction Motor drives Basic Principle of operation of 3 Phase motor	01	1-7
b	equivalent circuit	01	1-7
c	MMF space harmonics due to fundamental current	01	1-7

d	fundamental spatial MMF distributions due to time harmonics simulation, effect of time and space harmonics	02	1-7
e	speed control by varying stator frequency and voltage	01	1-7
F	impact of non-sinusoidal excitation on induction motors, variable square wave VSI drives	01	1-7
g	Variable frequency CSI drives, line frequency variable voltage drives.	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.		Lecture required	References
a	Induction Motor drives Review of induction motor equivalent circuit,	01	1-7
b	effect of voltage, frequency and stator current on performance of the m/c	02	1-7
c	effect of harmonics, slip power recovery schemes-static	02	1-7
d	Kramer drive and dynamic d.q model, small signal model	01	1-7
e	voltage and current fed scalar control, direct and indirect vector control	01	1-7
f	sensor less vector control, direct torque and flux control	01	1-7
Guidelines for the examiner and paper setter. Numerical may be asked from topic d			

Unit - V

Sr.No		Lecture required	References
a	Synchronous motor drives: Review of synchronous motor fundamental, equivalent circuit, dynamic d-q model	01	1-7
b	synchronous reluctance, sinusoidal and trapezoidal back emf permanent magnet motors	02	1-7
c	sinusoidal SPM machine drives, trapezoidal SPM machines drives	02	1-7
d	wound field machine drives, switched reluctance motor drives	01	1-7
e	Closed loop control: Motor transfer function-P	01	1-7
f	PI and PID controllers, current control-Design procedure	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:
1. V. Subramanyam , "Thyristerised Control of Electric Drives", Tata McGraw Hill, New Dehli.
2. Dubey, Joshi, Sinha, "Thyristor Power Control", Willey Eastern Publication.
3. M. Rashid, "Power Electronics Circuit Devices & Applications", Prentice Hall of India.
4. G. K. Dubey , "Fundamentals of Electrical Drives", Narosa Publishing House.
5. Mohammad A. El-Sarkawi, "Fundamentals of Electrical Drives" , vikas Publishing House.
6. Ned Mohan, "Electric Machines and Drives", Wiley India Pvt. Ltd.

Elective-I

ii.   Environmental Instrumentation

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Sr. No	**Unit-I**	Lecture required	References
a	Environmental Definition, Constituents, biochemical cycle, causes of pollution, types of pollution and their measurements	01	1-6
b	Effects of pollution, Different sensors for measurement of pollution	02	1-6
c	difference between off-line Measurement and continuous monitoring	02	1-6
d	Environmental Toxicology and Hazards, Common toxic agents, their analysis	02	1-6
e	safety measures, environmental regulations and standards	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr. No		Lecture required	References
a	Review of standard methods of pollution analysis	01	1-6
b	Sampling Operations	02	1-6
c	Devices and techniques as related to environmental engineering	02	1-6
d	Air Pollution Analysis: Analysis of Aerosols and Monitoring of gaseous pollutants like SO_2, H_2S, $NO-Nox$, $CO-CO_2$, Ozone, NH_3 and organic gases, Vapor analysis	02	1-6
e	Monitoring of suspended particulate matter and trace metal pollutants.	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-III

Sr. No		Lecture required	References
a	Water Pollution Analysis Physical Examination – color, conductivity, temperature, odor, turbidity, hardness	01	1-6
b	Chemical Characterization – Ca^{2+}, Mg^{2+}, Na^+, Cl^-, $SO4^{2+}$, $HCO3^-$, Al^{3+}, Ba^{2+}Boron, F^-, $NO2^-$, $PO4^{3-}$, Fe^{3+} $Mn2^-$, $SiO2^{2-}$	01	1-6
c	Biological Investigations – DO, BOD, bacteriological examination, and types of water quality monitoring instruments (pH meters, conductivity meters etc.)	02	1-6

d	Effluent Analysis: Physical Methods of characterization: density, viscosity, temperature, conductivity, turbidity, volatile, and dissolved solids, oil and immiscible liquids, color, odor, radioactivity, and analysis of organic pollutants	02	1-6
e	BOD, COD, TOC, Specific analysis of Organic pollutants, Analysis of metal pollutants, Analysis of anion and dissolved gases dissolved oxygen, pH, dissolved chlorides, suspended solids, nitrogen, sludge index	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-IV

Sr. No		Lecture required	References
a	Soil pollution and Pesticide Analysis: Analysis of Micronutrients	02	1-6
b	trace element pesticides, Chromatographic Characterization	02	1-6
c	Polarographic and Spectroscope	02	1-6
d	Analysis of pesticides. a.Noise pollution and its Measurement: Units, Devices and maps Noise Control System. b.Radiation pollution and its Measurement and Control.	02	
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-V

Sr. No		Lecture required	References
a	Instrumentation Setup for different types of pollution control like waste water treatment, HVAC Control etc.	02	1-6
b	Environmental testing	02	1-6
C	Dry heat, Dry cold, Damp heat, Salt Spray, Dust	02	1-6
d	Altitude bump, Vibration Drop/Topple, free fall and study of ISO 14001	02	
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

References:

1.   S.M. Khopkar, "Environmental Pollution Analysis", 1st Ed. Wiley eastern 1993
2.   S. M. Khopkar ,, "Basic Concepts of Analysis Chemistry"
3.   Peary H.S. and other, "Environmental Engg.,".
4.   Campbell, "Sensor System for Environmental Monitoring"
5.   J. A. Nathanson, "Basic Environmental technology (Ed. 1997)".
6.   Neal K. Ustler, "Environmental tech series, V, I, II, III, IV"

Elective-I
Fiber Optics & Laser Instrumentation
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Principles of light propagation through a fiber	01	1-6
b	Different types of fibers and their properties	02	1-6
c	Fiber materials and their characteristics	02	1-6
d	Transmission characteristics of fibers, absorption losses, scattering losses, Dispersion	02	1-6
e	Measurement on optical fibers, Optical sources, Optical detectors	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr. No		Lecture required	References
a	Fiber optic instrumentation system	01	1-6
b	Fiber optic sensors	02	1-6
c	Different types of modulators, Applications in instrumentation	02	1-6
d	Inter-ferometric method of measurement of length	02	1-6
e	Measurement of pressure, temperature, current, voltage, liquid level and strain	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-III

Sr. No		Lecture required	References
a	Fundamental characteristics of laser	01	1-6
b	three level and four level lasers, properties of lasers	01	1-6
c	laser modes- resonator configuration	02	1-6
d	Q switching and mode locking, cavity dumping, types of Laser, gas laser	02	1-6
e	Solid laser, liquid laser, semi conductor laser	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-IV

Sr. No		Lecture required	References
a	Laser for measurement of distance, length, velocity, acceleration, current, voltage, and atmospheric effect ,;	01	1-6
b	Laser application in Spatial Frequency Filtering	01	1-6
c	Holography -Basic principle; methods	02	1-6
d	Holographic interferometry and applications	02	1-6
e	Holography, for non-destructive testing- Holographic components	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-V

Sr. No		Lecture required	References
a	Applications in Material processing	01	1-6
b	Laser Welding, Hole drilling	01	1-6
c	Laser Cutting, Laser Tracking	02	1-6
d	Medical applications of lasers	02	1-6
e	laser and tissue interaction, Laser instruments for surgery	02	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Reference Books:

1 I. John and Harry, "Industrial lasers and their Applications", McGraw Hill,

2 John F Ready, "Industrial Applications of Lasers" Academic press, 1978.

3 John Crisp, "Introduction to Fibre Optics", an imprint of Elsevier Science, 1996.

4 Jasprit Singh, "Semi Conductor Optoelectronics", McGraw Hill, 1995.

5. Jeff Hecht, "Understanding Fiber Optics", 5th edition, Prentice Hall publishers

6 A. Selvarajan, S.Kar and T.Srinivas , "Optical Fiber Communication Principles and Systems",TMH

Neural Network & Fuzzy Logic Instrumentation
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Artificial neural systems, Preliminaries	02	1-7
b	fundamental concepts & models of artificial system	02	1-7
c	neural network learning rules, Hebbian, perceptron, delta Widrow-Hoff learning rules	02	1-7
d	Single layer perception classification: Classification model, features &decision regions training	01	1-7
e	classification using discrete perception, algorithm &examples	01	1-7
f	single layer continuous perceptron networks for linear separable classification	01	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.		Lecture required	References
a	Multilayer feedback work networks,	01	1-7
b	Generalized delta learning rule	01	1-7
c	feed-forward recall	01	1-7
d	back propagation training learning factors	02	1-7
e	Single layer feedback networks: basic concepts of dynamical systems mathematical of discrete time	01	1-7
f	gradient type Hopfield networks	01	1-7
g	transient response of continuous time solution optimization problems	02	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus.			

Unit - III

Sr.No.		Lecture required	References
a	Neural network in control system, Neuro-control approaches	02	1-7
b	training algorithm evaluated training algorithms through simulation	02	1-7
c	self tuning Neuro-control scheme, self tuning PID controller	02	1-7

d	Application of Neuro-control for process control	02	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.		Lecture required	References
a	Introduction of fuzzy control	01	1-7
b	Introduction fuzzy control form an intuition perspective	01	1-7
c	mathematical of fuzzy control fuzzy sets	01	1-7
d	fuzzy relations	01	1-7
e	approximate resolving representing a set of rules	01	1-7
f	Non linear fuzzy control: The control problem	01	1-7
g	FKBC as non linear transfer element PID& duding mode type FKBC	01	1-7
h	some typical application of fuzzy based control systems	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No		Lecture required	References
a	Fuzzy knowledge based controller FKBC design parameters	02	1-6
b	Structure of FKBC fuzzification and Defuzzification module	02	1-6
c	rule based choice of variable and contents of rules	02	1-6
d	derivation of data based choice of membership function and scaling factors	01	1-6
e	choice of fuzzification and Defuzzification procedure, Fuzzy-Neuro and Neuro-Fuzzy Controllers	01	1-6
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:

1. J.M.Zurad, "Introduction of artificial neural systems," Jaico publicationHouse 1997
2. S.Iiaykin, "Neural Networks: Comprehensive Foundation," McMillianCollege Publishing company inc. 1994
3. S.Omatu, M.Kiialid, R.Yusof , "Neuro Control and its Application, " SpringVerlag London Ltd. 1996.
4. D.Driankov, H. Hellendoorn Andm Reinfrank, "An Introduction to Fuzzy Control," Narosa Publication House, 2nd reprint 1997.
5. Hagan, Demuth Deak, "Neural Network Design", Thomson Learning.
6. Neuro-fuzzy and soft computing, PHI publication
7. John Yen, "Fuzzy logic: Intelligence control and Information," Pearsonpublication.

Digital Image Processing

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No		Lecture required	References
a	Digital Image representation, steps in Image processing	02	1-5
b	Elements of IP system, Frame Grabber, Digital camera	02	1-5
c	Elements of visual perception, Image model	02	1-5
d	Sample and Quantization, Basic relationship between pixels	01	1-5
e	Image Geometry, 2D linear convolution	01	1-5
f	2D Circular Convolution, 2D Correlation	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.		Lecture required	References
a	Image Transforms	01	1-5
b	Introduction to Fourier Transform	01	1-5
c	2D Discrete Fourier Transform	01	1-5
d	Properties of 2-D Discrete Fourier Transform, FFT, Walsh transform	02	1-5
e	Hadamard Transform, Discrete Cosine transform	01	1-5
f	Harr transform, Slant Transform	01	1-5
g	Hough Transform, Radon Transform, Curvelet Transform	02	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus.			

Unit - III

Sr.No.		Lecture required	References
a	Image Enhancement methods by Spatial and Frequency domain methods, point processing, Spatial filtering, Color Image processing, Image Restoration,	02	1-5
b	Degradation model, Digitalization of circulant and block circulant matrices	02	1-5
c	Algebraic approach, inverse filtering, Least Mean Square filter, constrained Least square restoration	02	1-5
d	Restoration in spatial domain, geometric Transformation	02	1-5
Guidelines for the examiner and paper setter.			

| | Questions should not be asked on introductory part of syllabus |

Unit – IV

Sr.No		Lecture required	References
a	Image Compression by Redundancies	01	1-5
b	Image compression models	01	1-5
c	Elements of Information theory	01	1-5
d	Error-Free compression, Lossy compression	01	1-5
e	compression standards: JPEG & MPEG Image Segmentation	01	1-5
f	Detection of Discontinuities	01	1-5
g	Edge linking and Boundary detection	01	1-5
h	Thresholding, Region oriented segmentation, use of motion in segmentation	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No		Lecture required	References
a	Representation and Description Representation schemes	02	1-5
b	Boundary descriptors	02	1-5
c	Regional descriptors	02	1-5
d	Morphology	01	1-5
e	Applications of Image Processing in Instrumentation and Control	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:
1. R.C.Gonzalez and R.E.Woods, "Digital Image Processing," Addison-WesleyLongman,Inc, 1999.
2. A.K.Jain, "Digital Image Processing" Prentice Hall India.
3. M.Sonka, V.Hlavac, andR.Boyle, " Image Processing, Analysis and Machine Vision," Thomson Asia pvt. Ltd, 1999.
4. Jayaraman,Esakkirajan, Veerakumar , "Digital Image Processing," McGraw Hill.
5. S. Shridhar , "Digital Image Processing," Oxford University Press.

Biomedical Instrumentation LAB
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Study of different biomedical transducers.	02
2	Study of cardiovascular systems	02
3	Study of ECG machine	02
4	Study of EEG simulator.	02
5	Study of EMG simulator.	02
6	Study of blood sugar meter.	02
7	Measurement of heartbeats using heart beat monitor.	02
8	Measurement of lung capacity using spiro meter.	02
9	Demonstration of defibrillator.	02
10	Measurement of blood pressure by indirect method.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work, practical performance and oral in the practical examination.

Digital Imaging Processing Lab

Teacher should facilitate learning following lab experiments:

Sr. No	Lab Experiment	Lecture required
1	Study of IP Toolbox in Matlab	02
2	Perform Arithmetic & Logical operations on Image	02
3	To study application of Histogram Equalization for image contrast improvement	02
4	To study application of Edge detection in IP for image identification	02
5	Application of FFT to perform operations on image like Convolution, Translation.	02
6	Application of FFT to perform operations on image like Rotation.	02
7	To Study application of Transform, Filtering by applying LPF& Mask for smooth imaging.	02
8	To Study application of Transform, Filtering by applying HPF& Mask for Image shaping.	02
9	Study of IP Toolbox in Matlab	02
10	Perform Arithmetic & Logical operations on Image	02
11	To study application of Histogram Equalization for image contrast improvement	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student should be asked to perform any one practical. Evaluation will be based on paper work, practical performance and oral in the practical examination.

Elective-I
Industrial Drives & Control Lab
(Lab Course Contents)
Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Transfer function of a DC Motor.	02
2	VSI fed three phase induction motor drive.	02
3	Three phase synchronous motor and drive.	02
4	Closed loop control of high frequency of DC – DC converters	02
5	Closed loop control of BLDC motors.	02
6	Closed loop control of Switched reluctance motors.	02
7	Vector control of three phase induction motors.	02
8	Vector control of three phase synchronous motors.	02
9	Closed loop control of PMSM.	02
10	Sensor less control of motors.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Elective-I
Environmental Instrumentation Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Turbidity of Water Sample by Nephlometric Method	02
2	PH Value of Water	02
3	Total Hardness of Water by EDTA Method	02
4	Suspended Solids in Water	02
5	Alkalinity of Water by Indicator Method	02
6	Coliform Bacteria by Multiple Tubes Fermentation	02
7	Chemical Oxygen Demand in Waste Water by Close Reflux Method	02
8	Bio Chemical Oxygen Demand in Waste Water	02
9	Dissolved Oxygen in Water by Azide Modification Method	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Elective-I
Fiber Optics & Laser Instrumentation Lab
(Lab Course Contents)
Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	To study attenuation losses in optical fiber.	02
2	To study dispersion losses in optical fiber.	02
3	To study different splicing techniques.	02
4	To study OTDR.	02
5	To study characteristic curves of optical sources and detectors.	02
6	To measure numerical aperture of an optical fiber.	02
7	To study optical power meter.	02
8	Design of an optical fiber sensor.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Elective-I
Neural Network & Fuzzy Logic Instrumentation
(Lab Course Contents)
Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Write a program to generate the different Membership Functions of Fuzzy Logic.	02
2	Write a program for addition, difference, product and division of two membership functions of Fuzzy Logic Using.	02
3	Develop a Fuzzy Interface System for Restaurant Tipping.	02
4	To Perform the Fuzzy Logic Control for Two Inputs.	02
5	Write a program for Single Layer and Multi-Layer Feed Forward Neural Network.	02
6	To perform Load Forecasting using Artificial Neural Network.	02
7	Write a Matlab program to design Fuzzy Controller for Water Level of Tank.	02
8	Write a Matlab Program for Neural Controller for CSTR.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on practical. Evaluation will be based on answers given by student in oral examination.

Project-I
(Lab Course Contents)

1	It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2	A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3	Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4	Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data, conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5	Approximately more than 50% work should be completed by the end of VII semester.
	Each student group is required to maintain log book for documenting various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format: a. *Title* b. *Abstract* c. *Introduction* d. *Problem identification and project objectives* e. *Literature survey* f. *Case study/Analysis/Design Methodology* g. *Work to be completed (Progress status)* h. *Expected result and conclusion* i. *References.*
	Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Total
		5	5	5	5	5	25

Seminar-I

1	Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2	Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3	The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee. a.
4	Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format: b. *Title* c. *Abstract* d. *Introduction* e. *Literature survey* f. *Concept* g. *Functional and Technical Details* h. *Applications* i. Comparison with similar topics / methods j. *Future scope* k. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: _____

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	5	5	5	5	25

Industrial Visit

1	Industry visits for minimum two industries shall be carried out by each student preferably or college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2	The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3	Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)

4	The report(Thermal Bound) should contain information about the following points:
	
	    a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
	    b. *The project / industry brief description with sketches and salient technical information.*
	    c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
	    d. *Suggestions (if any) for improvement in the working of those organizations.*

	The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	**10**	**25**

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Instrumentation Engineering

Faculty of Engineering and Technology

Teachers, Paper Setters and Examiners Guidelines Manual

SEMESTER –VIII

W.E.F 2015 – 2016

Instrumentation System Design

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	**UNIT-I:**	Lecture required	References
a	General transducer design consideration	01	1-6
b	testing of transducer	01	1-6
c	selection criteria of transducer	01	1-6
d	Design of temperature measurement system based on RTD	01	1-6
e	Thermocouple and thermisters	02	1-6
f	Design of Displacement measurement system based using LVDT	01	1-6
g	Ultrasonic transducer Complete signal conditioning circuits for above temperature and	01	1-6
h	Potentiometer Displacement transducers.	01	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	**UNIT-II:**	Lecture required	References
a	Design of orifice, rotameter,	01	1-9
b	venture based flow system	01	1-9
c	signal conditioning circuits for above system	01	1-9
d	Design of level sensors and its signal conditioning circuits	02	1-9
e	design of pressure gauge,	01	1-9
f	diaphragm based pressure gauge	01	1-9
g	Load cell and its signal conditioning,	01	1-9
h	study of P/I and I/P converters, Design of smart transmitters	01	1-9
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No	**Unit-III:**	Lecture required	References
a	Concept of reliability definition,	01	1-9
b	Distinction between Quality and reliability, failures, Availability, Maintainability, (MTBF, MTTF, MTTR)	01	1-9
c	Life Cycle and Bathtub curve	01	1-9
d	Reliability Modeling Exponential, Weibull and Gamma	02	1-9

	Distribution, Hazard rate and Derivation of MTTF Failure Density Function, Cumulative Distribution Function and Reliability		
e	function system Transition Diagrams and Markov Chain modeling concurrent and sequential systems.	01	1-9
f	Component and Operational Modes. Reliability Prediction	01	1-9
g	Life Testing and Accelerated Life testing Burn-in and Initial Failure removal.	01	1-9
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	Unit-IV:	Lecture required	References
a	Guidelines for enclosure:	01	1-9
b	components and accessories, Grounding and	01	1-9
c	shielding techniques noise in electronic circuits,	01	1-9
d	EMI/ EMC protection against EMI,	01	1-9
e	ESD selection of cables, connectors, types of knobs,;	01	1-9
f	Mechanical fixture PCB holders, clamps,.	01	1-9
g	control panel layout ergonomics, types of' gear boxes and drives	01	1-9
h	Ingress protection authorized regulatory bodies for certifying instruments in Hazardous location (BASEEFA, FM, PTB, UL, CESI, LLIE, CSA, DEMKO, IEC &CENELEC).	01	1-9
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Printed circuit board design guidelines	01	1-9
b	general components layout scheme	01	1-9
c	grid system, PCB size mechanical stress	01	1-9
d	design rules for analog	01	1-9
e	digital circuit PCB, single,	01	1-9
f	multilayer and SMD boards	01	1-9
g	Artwork CAD packages, soldering techniques	02	1-9
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:
1. Warren Boxleitner, "Electrostatic Discharge and Electronic Equipment, IEEE presse.
2. Walter C. Bosshart , "Printed Circuit Boards," CEDT series, TMH.
3. Ott, "Noise Reduction Techniques,"
4. E. Balguruswamy, "Reliability Engineering,' PHI.
5. S. Soclof, "Applications of Analog Integrated Circuit," PHI.
6. B. G. Liptak , "Process Control," Chilton.
7. National Instruments Catalog.
8. E.O. Doebline, "Measurement Systems".
9. C. D, Johnson , "Process control and Instrumentation technology," PHI

Industrial Automation
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Introduction to Industrial Automation, basics of PLC and Automation strategy.	Lecture required	References
a	Introduction to Industrial Automation	01	1-6
b	Role of automation industry	01	1-6
c	Programmable Logic Controller	01	1-6
d	Basic operation	01	1-6
e	PLC architecture and components, Programming language	02	1-6
f	PLC application and Manufacturers	01	1-6
g	Introduction to Automation tools like PLC, SCADA, DCS, etc.	01	1-6
h	Hybrid DCS	01	1-6
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	UNIT-II: Basics PLC Functions and configuration	Lecture required	References
a	PLC registers, PLC modules	02	1-6
b	Addressing System	01	1-6
c	Field Input/ Output system	01	1-6
d	PLC timers functions	02	1-6
e	PLC counters	02	1-6
f	Industrial process Timing application	01	1-6
g	Selection of PLC and I/O modules	01	1-6
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – III

Sr.No	Unit-III: Instructions , Data handling functions	Lecture required	References
a	PLC logical instruction, PLC arithmetic instruction	01	1-6
b	PLC repetitive clock functions, PLC numbering systems,	01	1-6
c	conversion function	01	1-6
d	PLC master relay control function, Jump	02	1-6
e	Data Move instructions	01	1-6
f	other data handling functions	01	1-6

g	scaling instructions	01	1-6
Guidelines for the examiner and paper setter.			
Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	**Unit-IV: Programming of PLC**	Lecture required	References
a	Introduction Ladder/ FBD language,	02	1-6
b	PLC configuration with I/O designations, ,	01	1-6
c	addressing system in programming,	01	1-6
d	Process to develop ladder language in software	01	1-6
e	Uploading/ Downloading the program to/ from PLC,	01	1-6
f	To develop ladder for ON/OFF controlling of motor	01	1-6
g	Traffic signal light	01	1-6
Guidelines for the examiner and paper setter.			
Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	**Unit-V : Application of PLC/Industrial application and Introduction to SCADA system**	Lecture required	References
a	Application development and automation for following industries	02	1-6
b	Power	01	1-6
c	Pharmaceutical	01	1-6
d	Automobile	01	1-6
e	Rubber industry	01	1-6
f	Introduction to SCADA system	02	1-6
Guidelines for the examiner and paper setter.			
Questions should not be asked on introductory part of syllabus			

Reference Books:
1. John Webb & Ronald, "PLC Principles and Application**,** Prentice Hall India.
2. S.K.Sigh, "Computer Aided Process Control", Prentice Hall India.
3. John Hackworth & Frederick D Hackworth, "PLC: Programming Methods and Applications",Pearson Education.
4. Krushnakant, "Computer Based Process Control" Prentice Hall India.
5. Prof. Rajesh Mehra and Er. VikramVij, "PLC and SCADA", Laxmi Publication, Delhi
6. http://nptel.iitm.ac.in

Power Plant Instrumentation

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
a	Fundamentals of generation of Electricity	01	1-7
-b	its transmission and Distribution.	01	1-7
c	Conceptof regional and national.	01	1-7
d	power grid	01	1-7
e	Concept of distance protections and is landing typesof power plant , introduction	02	1-7
f	comparison of thermal Power plant, ,	01	1-7
g	Hydro ElectricPower Plant	01	1-7
h	Nuclear Power Plant, Solar Power Plant.	01	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	UNIT-II:	Lecture required	References
a	Unit overview, air and fuel path,	01	1-7
b	boiler instrumentation: Combustion control	01	1-7
c	air to fuel ratio control	01	1-7
d	3-element drum level control, steam temperature and pressure	02	1-7
e	control, oxygen/CO_2 in flue gases, furnace draft	01	1-7
f	boiler interlocks, Start-up	01	1-7
g	shut-down procedures Boiler load calculation	01	1-7
h	boiler efficiency calculation.	01	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No	Unit-III:	Lecture required	References
a	Hydraulically controlled speed governing and.	01	1-7
b	turbine steam inlet control valve actuation system, vibration	01	1-7
c	Condenser vacuum control- gland steam exhaust pressure control speed	01	1-7

d	Shell temperature monitoring-lubricating oil temperature control hydrogen generator.	02	1-7
e	Start-up and shut-down, thermal stress control,	01	1-7
f	Condition monitoring and power distribution instrumentation. Synchronous Induction	01	1-7
g	Generators cooling system.	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	Unit-IV:	Lecture required	References
a	Hydro Power Plant: Overview on units, ,	01	1-7
b	Types of water turbine. Regulation of speed and voltage. Surge tank level control.	01	1-7
c	Nuclear Power Plant: Overview on units	01	1-7
d	Concept of energy generated from atomic fission.	01	1-7
e	Block diagram of an Atomic power station	01	1-7
f	. Types of coolants. Control of chain reaction..	01	1-7
g	Radio activity and safety measures. Layout of control rooms	01	1-7
h	Criterion for selection of Instrumentation system DCS system for nuclear and hydropower plant	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V : Factors Affecting Transient State Stability	Lecture required	References
a	Concept of power generation from non conventional sources of energy like wind power	02	1-7
b	Solar Power and Tidal waves	01	1-7
c	Photovoltaic cells	01	1-7
d	Hydrogen cells	01	1-7
e	Power generation using incinerators and bagasse fired boilers.	01	1-7
f	Criterion for selection of Instrumentation system for	02	1-7

wind and solar and tidal wave plant.		
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus		

Reference Books:
1. "Handbook of Instrumentation and Control", H. Kallen, McGraw-Hill Education.
2. "Power plant Engineering", F. Morse, Khanna Publishers.
3. "Modern Power Plant Engineering", J. Balasubramaniam and R. Jain, KhannaPublishers.
4. "Instrument Engineer's Handbook – Process control", B. Liptak, CRC Press.
5. "Distributed Computer Control for Industrial Automation", Bhatkar, DekkarPublication
6. "Power Plant Engineering", Central Electricity Generation Board.
7. "O & M manuals of power plant", Bharat Heavy Electricals Ltd.

Computer Network

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
a	Introduction in Computer Networks and Devices, Structure of communication network.	01	1-5
-b	Point to point and multi-drop circuits, Network topologies	01	1-5
c	Hub, switch, router ,bridges, additional	01	1-5
d	Network components. Network	01	1-5
e	Models. Network software	02	1-5
f	OSI reference model	01	1-5
g	TCP/IP reference model	01	1-5
h	comparison of OSI and TCP/IP model	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	UNIT-II:	Lecture required	References
a	Physical Layer: Transmission media, wireless transmission	01	1-5
b	Geostationary communication satellite,	01	1-5
c	modems, RS – 232C serial interface	01	1-5
d	SONET/SDH. Data Link layer	02	1-5
e	Data Link layer design issues	01	1-5
f	Error detection and correction	01	1-5
g	Elementary data link layer protocols	01	1-5
h	Sliding window protocols, SDLC and HDLC	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No.	Unit-III:	Lecture required	References
a	Medium Access Sub layers: The Channel allocation problem, multiple access protocols,	01	1-5
b	Ethernet, Bluetooth, Bridges	01	1-5
c	High speed LAN's	01	1-5
d	Network Layer: Need of Network layer	02	1-5
e	Network layer design issues	01	1-5
f	routing algorithms	01	1-5

g	Congestion control algorithms.	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	Unit-IV:	Lecture required	References
a	Internet Working: Concatenated virtual circuits,	01	1-5
b	connectionless internetworking, tunneling	01	1-5
c	Internet work, routing,	01	1-5
d	fragmentation, and firewalls	01	1-5
e	Internet and its main applications, Broadband	01	1-5
f	ISDN and ATM and its reference model	01	1-5
g	Internet Protocols: IPv4, IPv6, IP address	01	1-5
h	Internet control protocols – ICMP, ARP,RARP.	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Transport Layer: Transport service, Elements of transport protocols,	01	1-5
b	The internet transport protocols – UDP, TCP – Introduction, Services	01	1-5
c	TCP segment header, connections, ,	01	1-5
d	Transmission policy and congestion control.	01	1-5
e	Application Layer: DNS – Domain name system	01	1-5
f	Electronic mail	01	1-5
g	World Wide Web, Multimedia	02	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:
1. Andrew S. Tanenbaum, "Computer Networks,"4th edition, Pearson LPE /PHI.
2. BehrouzForouzan , "Data Communications and Networking," TMH, 4thEd.
3. Irvine, "Data Communication and Networks: AnEngg. Approach," Wiley India.
4. S. Keshav , "An Engineering Approach to Computer Networking," PearsonEducation, 5thEd.
5. Irvine Olifer, "Computer Networks:Principles,Technologies and Protocols," Wiley India

Elective-II

Agricultural Instrumentation

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
a	Introduction: necessity of Instrumentation and control for agriculture,	02	1-4
b	food processing and pharmaceutical industries,	02	1-4
c	Sensor requirement remote sensing biosensors inagriculture standards for food quality.	01	1-4
d	Soil science and sensor: pH conductivity resistively temp.	01	1-4
e	Soil moisture and salinity on concentration measurement, methods of soil analysis.	02	1-4
f	Instruments for environments conditioning of seed germination and growth	01	1-4
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	UNIT-II:	Lecture required	References
a	Flow Diagram of sugar plant sensors	02	1-4
b	Instrumentation set up for it	01	1-4
c	Flow diagram of fermenter and control (batch process)	01	1-4
d	Oil extraction plant and instrumentation setup,	02	1-4
e	Pesticides Manufacturing Process and control, a) Flow diagram of dairy and confectionery	01	1-4
f	industry and instrumentation set up	01	1-4
g	Juice Extraction control set up.	01	1-4
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No.	Unit-III:	Lecture required	References
a	Application of SCADA for dam parameters and control	01	1-4
b	Water distributions	01	1-4
c	management control auto drip irrigation systems	01	1-4
d	Irrigation Canal Management upstream and downstream control systems	02	1-4
e	Green houses and Instrumentation	01	1-4

f	Ventilation cooling and heating wind speed temp.	01	1-4
g	Humidity rain gauge carbon dioxide enrichment measurement and control.	01	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	**Unit-IV:**	Lecture required	References
a	Automation in earth moving equipment and	01	1-4
b	farm implements pneumatic hydraulic	01	1-4
c	Electronic control circuits in harvester's cotton pickers tractors etc. Application of SCADA	01	1-4
d	PLC in Packing industry.	01	1-4
e	Leaf area length evapo transpiration temp,	01	1-4
f	Wetness and respiration measurement and data logging electromagnetic radiations photosynthesis infrared	01	1-4
g	UV Bio sensor methods in agriculture	01	1-4
h	Agro meteorological Instrumentation weather stations.	01	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	**Unit-V :**	Lecture required	References
a	Speciality bioproducts for agricultural, food and pharmaceutical industries: Biopesticides, biofertilizers and plant growth factors	01	1-4
b	Natural bio preservatives (nisin), biopolymers (xanthan gum pi single cell protein.	01	1-4
c	Enzymatic bioconversion processes: Production of synthetic penicillin's and cephalosracemically pure drug intermediates	01	1-4
d	Steroid bioconversion. High-fructose corn syrp.	01	1-4
e	Bioconversion of vegetable	01	1-4
f	Biological waste treatment processes: Objectives of biological waste treatment processes	01	1-4
g	A brief overview of various aerobic and anaerobic processes for removal of organic waste.	02	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:
1. Patranabis , "Industrial Instrumentation," ,TMH.
2. B.G.Liptak, "Instrumentation handbook-Process Control" Chilton.
3. C.D.Johnson , "Process Control and Instrumentation technology,",PHI.
4. Wills B.A., "Mineral Processing Technology", 4th Ed.,Pergamon Press.

Elective-II
Soft Computing
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
a	Fuzzy Set Theory: Basic Definition and Terminology,	01	1-5
-b	Set Theoretic Operations	01	1-5
c	MF Formulation and Parameterization,	01	1-5
d	MF of two dimensions, Fuzzy Union,	01	1-5
e	Intersection and Complement. Fuzzy Rules	02	1-5
f	Fuzzy Reasoning: Extension Principles and Fuzzy Relations	01	1-5
g	Fuzzy IF THEN Rules, Fuzzy Reasoning.	01	1-5
h	Fuzzy inference systems: Mamdani model- Sugeno model. Tsukamoto model	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No	UNIT-II:	Lecture required	References
a	Fuzzy decision making, Multi objective Decision Making--Fuzzy classification-	02	1-5
b	Fuzzy control methods:	02	1-5
c	Application Neuro-Fuzzy Modeling	02	1-5
d	Adaptive Neuro Fuzzy based inference systems –	02	1-5
e	classification and regression trees: decision tress- CART algorithm	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No	Unit-III:	Lecture required	References
a	Data clustering algorithms: K means clustering	01	1-5
b	Fuzzy C means clustering Mountain clustering-Subtractive clustering	01	1-5

c	rule base structure identification	01	1-5
d	Neuro fuzzy control: Feedback Control Systems	02	1-5
e	Expert Control- Inverse Learning	01	1-5
f	Specialized Learning.	01	1-5
g	Back propagation through Real Time Recurrent Learning	01	1-5

Guidelines for the examiner and paper setter.
Questions should not be asked on introductory part of syllabus

Unit – IV

Sr.No	Unit-IV:	Lecture required	References
a	Genetic Algorithms: Basic Concepts Creation,	01	1-5
b	Offspring's Encoding, Fitness functions, Reproduction, Genetic Modeling	01	1-5
c	Inheritance Operators	01	1-5
d	, Cross over, Inversion and detection, Mutation operator, Bitwise operators.	01	1-5
e	Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittest	01	1-5
f	crossover- Inversion and Deletion-mutation-reproduction- Generational cycle-rank method	01	1-5
g	rank space method- Other derivative free optimization simulated annealing	01	1-5
h	Random search- Downhill simplex search	01	1-5

Guidelines for the examiner and paper setter.
Numerical from equal area criteria

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Application Applications of Computational Intelligence:	02	1-5
b	Printed Character Recognition	02	1-5
c	Inverse Kinematics Problems	02	1-5
d	Automobile Fuel Efficiency Prediction –	01	1-5
e	Soft Computing for Color Recipe Prediction	01	1-5

Guidelines for the examiner and paper setter.
Questions should not be asked on introductory part of syllabus

Reference Books:

1. J.S.R. Jang, C.T. Sun and E. Mistune, "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education
2. S. Rajasekaran & G.A. VijayalakshmiPai, PHI
3. T. J. Ross, "Fuzzy Logic with Engineering Applications." TMH
4. Laurene Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms and Applications ", Pearson Education India, 2006
5. S.N. Sivanandam, S.N. Deepa, "Introduction to Genetic Algorithm", Springer 2008

Elective-III
Optimal & Adaptive Control
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	**UNIT-I:**	Lecture required	References
a	Introduction to adaptive control.	01	1-7
b	Effects of process variations	01	1-7
c	Adaptive control schemes	01	1-7
d	Adaptive control problem	01	1-7
e	Non-parametric identification	02	1-7
f	Step response method	01	1-7
g	Impulse response method	01	1-7
h	Frequency response method	01	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	**UNIT-II:**	Lecture required	References
a	Linear in parameter models, ARX, ARMAX, ARIMAX,	01	1-7
b	Least square estimation, Recursive least square estimation,	01	1-7
c	Extended least square estimation, Maximum likelihood estimation	01	1-7
d	Introduction to non-linear systems identification, Pseudorandom binary sequence.	02	1-7
e	Self-tuning regulator: Deterministic in-direct self-tuning regulators	01	1-7
f	Deterministic direct self-tuning regulators,	01	1-7
g	Introduction to stochastic self-tuning regulators,	01	1-7
h	Stochastic indirect self-tuning regulator	01	1-7
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No	**Unit-III:**	Lecture required	References
a	Model reference adaptive controller: The MIT rule, Lyapunov theory,–	01	1-7
b	Design of model reference adaptive controller using MIT rule and Lyapunov theory	01	1-7

c	Relation between model reference adaptive controller and self-tuning regulator	01	1-7
d	Tuning of controllers and case studies: Design of gain scheduling controller	02	1-7
e	Auto-tuning of PID regulator	01	1-7
f	Stability analysis of adaptive controllers	01	1-7
g	Application of adaptive control in chemical reactor, distillation column and variable area tank system	01	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No	Unit-IV:	Lecture required	References
a	Statement of optimal control problem, Problem, , , ,	2	1-7
b	formulation and forms of optimal control	2	1-7
c	Performance measures for optimal control	1	1-7
d	Selection of performance measure	1	1-7
e	Various methods of optimization, Linear programming	1	1-7
f	Non-linear programming, Dynamic programming	1	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Principle of optimality	01	1-7
b	recurrent relation of dynamic programming for optimal control problem	01	1-7
c	Computational procedures for solving optimal control problems	01	1-7
d	Characteristics of dynamic programming solution	01	1-7
e	Hamilton Jacobi Bellman equation	02	1-7
f	Application to a continuous linear regulator problem	02	1-7
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:

1. Adaptive Control, "Karl J. Astrom & Bjorn Wittenmark", Pearson Education (Singapore), Second Edition, 2003.
2. System Identification, "C.H.A. Hsia", Lexington books, 1974.
3. Chemical Process Control, "Stephanopoulis G", Prentice Hall of India, New Delhi, 1990.
4. Optimal Control Theory – An introduction, "Donald E. Kirk", Pearson Education, 1970.

5. Robust & Optimal Control, "KeminZbou, J.C. Doyle", Pearson Education, 1996.
6. Modern Control System Theory, "M. Gopal", New Age International Ltd.
7. Control System Design – The Optimal Approach, "B. Sarkar", Wheeler Publishing, New Delhi, 1997.

Elective-III
Nano Instrumentation
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I:	Lecture required	References
a	Physical Properties of Nanoscale Structures	01	1-3
-b	Energy subbands and Density of states in nanoscale structure	01	1-3
c	electron transport in a two dimensional electron gas	01	1-3
d	resistance of ballistic conductor,landauer formula	01	1-3
e	transmission probability calculation, electron tunneling ,resonant tunneling devices, coupled nanoscale structures and super lattices	02	1-3
f	Columb blockade, Quantization of thermal conductance in ballistic nanostructures, non ballistic electron propagation	01	1-3
g	Nanotechnology: Deposition technique for nanoscale devices, nanolithography	01	1-3
h	self assembly technique Nanomaterials: nanoparticales, nanowires, nanomagnetic materials, nanostructered Surfaces	01	1-3
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	UNIT-II:	Lecture required	References
a	MEMS and NEMS: Micro and nanocantilevers,	02	1-3
b	frequency analysis Micro and nanocantilevers	02	1-3
c	Quality factor and noise of cantilevers, magnetic	01	1-3
d	optical actuation of cantilevers Scaning probe Instrumentation for nanoelectronics:	02	1-3
e	The Atomic force Microscope (AFM),	01	1-3
h	scanning tunneling Microscopy, scanning near field optical Microscopy	01	1-3
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No	Unit-III:	Lecture required	References
a	Physical properties: band structure and band	01	1-3

	modulation		
b	electrical properties of CNT's	01	1-3
c	CNT based electronic Devices: The CNT Transistor,	01	1-3
d	CNT based field emission Devices junction, hetrojunction	02	1-3
e	quantum confined structure based on carbon nanotube	01	1-3
f	microwave devices based on carbon nano tube	01	1-3
g	CNT based NEMS	01	1-3
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No	**Unit-IV:**	Lecture required	References
a	Physical Principle of Spintronic Devices:	01	1-3
b	Spin relaxation mechanism, spin injection	02	1-3
c	spin detection,	01	1-3
d	Spontaneous Devices: spin filter, spin valve	01	1-3
e	spin pump, spin diode, spin transistor,	01	1-3
f	Spin based optoelectronic devices	01	1-3
g	spintronic computation	01	1-3
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	**Unit-V :**	Lecture required	References
a	Design of nanotransducers, nanomechanical elements, nanomechanicalsensors	02	1-3
b	nanometer precision position measurement, electrically controlled nanoactuators	01	1-3
c	chemically driven nanoactuators, quantum dots	01	1-3
d	localjization of elementary Particles,nano switches ,molecular switches, and logic element	01	1-3
e	particle Emitting nanotransducers, magnetic nanotransducers, chemical nanoscale sensors and actuators	01	1-3
f	Optics-optoelectronic devices based on nanowires, optoelectronic devices based on Nanoparticles	02	1-3
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:

1. Nano electronics: Principles and Devices Mircea Dragoman, Diniela Dragoman, Artech House, Boston (2006)

2. Nanotechnology: An introduction to nano structuring technique Michael Kohler, Wolfgang fritzsche, Wiley –VCH (2007)

3. Handbook of Nanotechnology, Bhusan (Editor) Springer, Berlin Heidelberg New York (2010)

Elective-III
Automotive Instrumentation
Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	**UNIT-I:**	Lecture required	References
a	Fundamentals of Automotive Electronics: Open loop and,	03	1-4
b	closed loop systems components for electronic engine management	02	1-4
c	vehicle motion control	02	1-4
d	Current trends in modern Automobiles	02	1-4
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	**UNIT-II:**	Lecture required	References
a	Electronic Fuel Injection and ignition systems: Introduction,	01	1-4
b	Carburettor control system, throttle body ignition	01	1-4
c	multi port or point fuel injection	01	1-4
d	Advantages of electronic ignition system	02	1-4
e	Types of solid state ignition systems	02	1-4
f	their principle of operation	01	1-4
g	electronic spark timing control system	01	1-4
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No.	**Unit-III:**	Lecture required	References
a	Engine control system: Engine cranking and warm up control,	01	1-4
b	Acceleration enrichment De-acceleration leaning	01	1-4
c	idle speed control, integrated engine control system	01	1-4
d	Exhauste mission control system	02	1-4
e	Engine performance testing Automobile chassis electronic control system: Principle of electronic braking	01	1-4
f	Automatic transmission electronic control circuit, cruise control circuit,	01	1-4
g	the electronic steering control theory, ABS, ASR, ESP, and other electronic control method	01	1-4

Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	Unit-IV:	Lecture required	References
a	Auto Body Electronic Control Technology: Automotive central locking	02	1-4
b	anti-theft system control technology	02	1-4
c	electronically controlled windows and doors and airbag technology	02	1-4
d	principle of control circuit components and characteristics	02	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Ergonomics and safety: Driver information system, lighting system components	02	1-4
b	Battery monitoring and control,	01	1-4
c	Air conditioning	01	1-4
d	steering control techniques,	01	1-4
e	Automatic gear control systems	01	1-4
f	Emission standards	02	1-4
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Book:

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, "Sensers Applications, Sensers for Automotive Technology" 1st Edition , Wiley
4. T. Mellard, Automotive Electronic Systems" 1987 by Heinenmann Professional

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Embedded Systems

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	**UNIT-I:**	Lecture required	References
a	Introduction to functional building blocks of embedded systems,	02	1-5
b	Register	02	1-5
c	memory devices, ports, timer,	02	1-5
d	interrupt controllers using circuit block diagram representation for	01	1-5
e	each categories	02	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit-II

Sr.No.	**UNIT-II:**	Lecture required	References
a	Structural units in a processor	01	1-5
b	selection of processor & memory devices	01	1-5
c	Shared memory	01	1-5
d	DMA	02	1-5
e	interfacing processor	01	1-5
f	memory and I/O units	01	1-5
g	memory management –Cache mapping techniques	01	1-5
h	dynamic allocation - Fragmentation	01	1-5
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus			

Unit - III

Sr.No.	**Unit-III:**	Lecture required	References
a	I/O devices; timer & counting devices;	01	1-5
b	serial communication using I2C, CAN,	01	1-5
c	USB buses	01	1-5
d	parallel communication using ISA, PCI	02	1-5
e	PCI/X buses, arm bus;,	01	1-5
f	Interfacing with devices/ports	01	1-5
g	Device drivers in a system – Serial port & parallel port.	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit – IV

Sr.No.	Unit-IV:	Lecture required	References
a	Intel I/O instruction: Transfer rate, latency; interrupt driven I/O,	01	1-5
b	Non maskable interrupts; software interrupts,	01	1-5
c	writing interrupt service routine in C &assembly languages	01	1-5
d	Preventing interrupt overrun; disability interrupts.	01	1-5
e	Multi threaded programming: Context switching, premature & non-premature multitasking, semaphores	01	1-5
f	Scheduling: Thread states, pending threads	01	1-5
g	context switching, round robin scheduling,	01	1-5
h	Priority based scheduling, assigning priorities, deadlock and watch dog timers.	01	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Unit - V

Sr.No	Unit-V :	Lecture required	References
a	Introduction to basic concepts of RTOS,	02	1-5
b	Basics of real time & embedded system operating systems	01	1-5
c	RTOS – Interrupt handling, task scheduling	01	1-5
d	embedded system design issues in system development process, Action plan	01	1-5
e	use of target system, emulator,.	01	1-5
f	use of software tools	02	1-5
Guidelines for the examiner and paper setter. Questions should not be asked on introductory part of syllabus			

Reference Books:

1. Embedded System – Architecture, Programming, Design, "Rajkamal", TataMcGraw Hill, 2003.
2. Fundamentals of Embedded Software, "Daniel W. Lewis", Prentice Hall ofIndia, 2004.
3. An Embedded Software Primer, "David E. Simon", Pearson Education, 2004.
4. Embedded System Design – A Unified hardware & Software Introduction,"Frank Vahid", John Wiley, 2002.
5. Embedded Real Time Systems Programming, "Sriram V. Iyer, PankajGupte",Tata McGraw Hill, 2004.

Embedded System Design, "Steve Heath", II edition, Elsevier, 2003

Instrumentation System Design Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Design of signal conditioning for displacement measurement transducer..	02
2	Design of signal conditioning RTD (Pt-100)	02
3	Design of signal conditioning for thermocouple	02
4	Study and Calibration of I/P & P/I converter	02
5	Study of D.P. Transmitter and its application for flow	02
6	Study of D.P. Transmitter and its application for level	02
7	Study of smart transmitter	02
8	Design of signal conditioning for load cell.	02
9	Study of Enclosure design for circuit and instrument.	02
10	Design of PCB on above any one signal conditioning application	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work, practical performance and oral in the practical examination.

Industrial Automation Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Study of different PLC and their specification.	02
2	Study of installations and troubleshooting of PLC.	02
3	Solving example by LD and ST programming in PLC.	02
4	Solving example by timer and counter in PLC.	02
5	Solving example using SFC programming in PLC.	02
6	Study of Interfacing between PLC and Process loop.	02
7	Develop a one application on SCADA system.	02
8	Study different type of DCS and their latest trends.	02
9	Selection steps of DCS for industrial automation.	02
10	Study of specification list for DCS	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked to perform any one practical. Evaluation will be based on paper work, practical performance and oral in the practical examination.

Elective –II
Power Plant Instrumentation Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Study of instrumentations for Hydro-electric and thermal power plant.	02
2	Study of instrumentations for safety in Nuclear power plants.	02
3	Study of solar power analyzer and wind flow meter for solar and wind power plants.	02
4	Design and development of interlocks and safety system for thermal power plants.	02
5	Selection of instrumentation system for thermal power plant.	02
6	Design of boiler automation using DCS and PLC.	02
7	Study on boiler safety instrumentation.	02
8	Study on turbine control system.	02
9	Study on regional and national power grid.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Elective –II
Computer Network Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Study of network resources and various components.	02
2	Use of RS – 232C for character transfer (Half duplex, Full duplex)	02
3	Use of RS – 232C for file transfer between two personal computers (Half duplex, Full duplex)	02
4	Sliding window protocols using RS 232c.	02
5	Interconnection of personal computers and PSTN (Public switching Telephone Networks) using MODEMS.	02
6	Data transfer and sharing resources in LAN.	02
7	Study of WAN.	02
8	Study of various applications like Electronic mail, E- commerce, WWW.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Agricultural Instrumentation Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	To test soil PH, conductivity, resistivity, temperature, moisture and salinity.	02
2	To study instrumentation set-up for Sugar plant.	02
3	To study flow diagram of fermenter and control (Batch process).	02
4	To study pesticides manufacturing process and control.	02
5	To study flow diagram of Diary and confectionary industry and instrumentation set-up.	02
6	To study juice extraction control set-up.	02
7	To study application of SCADA for DAM and irrigation systems.	02
8	To study automation in farm equipments.	02
9	To study Instrumentation and Control in Green house.	02
10	To study different bio-sensors methods in agriculture	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Soft Computing Lab
(Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Write a MATLAB program to implement discrete hope field network and test for input pattern.	02
2	Write a MATLAB program to implement full counter propagation network for a given input pattern.	02
3	Write a MATLAB program to implement back propagation network for a given input pattern.	02
4	Write a MATLAB program to implement fuzzy set operation and properties.	02
5	Write a program to implement composition of fuzzy and crisp relations.	02
6	Write a MATLAB program for maximizing $f(x) = x2$ using genetic algorithm, where x is rangesfrom0 to 31. Perform only 5 iteration.	02
7	Design Fuzzy Controller for level control of Process Tank.	02
8	Design Neural Controller for level control of Process Tank.	02
9	Design Fuzzy Controller for CSTR.	02
10	Design Neural Controller for CSTR.	02

Note: Lab file should consist of minimum **eight** experiments.

Guide lines for ICA:
ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-
In ESE the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Industrial Lecture
(Course Contents)

1	There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2	List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.
3	Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4	Minimum **five** Lectures to be delivered by experts from the industry in alternate weeks
5	Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
6	The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA : Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	15	10	50

Project-II
(Lab Course Contents)

1	Project-I work decided in VII semester shall be continued as Project-II
2	Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3	Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing

4	Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
	       a. Title
	       b. Abstract
	       c. Introduction
	       d. Problem identification and project objectives
	       e. Literature survey
	       f. Case study/Analysis/Design Methodology
	       g. Project design and implementation details
	       h. Result and conclusion
	       i. Future scope
	       j. references.

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-

In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project: _____

Name of the Guide: _____

Table-D

SN	Name of Student	Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		Total
		Attendance , Participation and team work	Material procurement/ assembling/Designing/Programming	Case study/ Execution	Project Report	Dept of Understan- ding	Presentation	
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**