Price:- 9/- Rs.

॥ अंतरी पेटवू ज्ञानज्योत ॥

North Maharashtra University, Jalgaon

Syllabus for Fourth Year Engineering Degree Course (B.E.)

INSTRUMENTAION

w.e.f. July,2001

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NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (INSTRUMENTATION)
(1998 Course)
With Effect from Academic Year 2000-2001
TERM - I

Subject Code	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper duration Hours	Maximum Marks			
					Paper	Term work	Practical	Oral
	Elective - I	4	2	3	100	25	25	-
	Unit Operations	4	-	3	100	25	-	-
	Process Equipment Design	4	2	3	100	25	25	-
	Process Instrumentation PI	4	2	3	100	25	25	-
	Seminar	-	2	-	-	-	-	50
	Project Work	-	4	-	-	50	-	-
	Total	16	12	-	400	150	75	50
	Grand Total	28		-	675			

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (INSTRUMENTATION)
(1998 Course)
With Effect From Academic Year 2000-2001
TERM - II

Subject Code	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper duration Hours	Maximum Marks			
					Paper	Term work	Practical	Oral
	Elective - II	4	2	3	100	25	25	-
	Instrumentation System Designs	4	2	3	100	25	25	-
	Project Planning Estimation and Assessment	4	2	3	100	25	-	-
	Process Modelling and Optimization	4	2	3	100	25	25	-
	Technical Visit	-	-	-	-	50	-	-
	Project Work	-	4	-	-	50	-	50
	Total	16	12	-	400	200	75	50
	Grand Total	28		-	725			

Total Marks of Term I + II = 1400

Elective - I

1. DSP 2. PPI 3. Microelectronics 4.AET

Elective - II

1. FO&T 2. FUZZY & NURUL NEW. 3. BI
4. COMPUTER NETWORKS

B.E. INSTRUMENTATION SYLLABUS

Elective-I

SUBJECT:- DIGITAL SIGNAL PROCESSING

Teaching scheme :
Lectures 4 hrs/week
Practicals 2 hrs /week

Examination scheme
Theory - 100 marks
TW:-25 marks
Practical :-25 marks

UNIT-I (8 to 10 hours)

Overview of continuous time signal & Discrete time signals , properties of discrete signals, energy & power signals, Response of LTI system using linear convolution, Difference equation & Response of system from difference equation.

Z-transforms, ROC of Z-transforms & inverse Z-Transforms, it's properties, system tansfer function & impulse response of LTI system using Z-transform.

UNIT-II (8 to 10 hours)

Representation of periodic sequence, The Discrete time Fourier series & its properties sampling the Z-transform on unit circle, DFT & it's properties, circular convolution, FFT algorithms Use of FFT for spectral estimation,filtering & correlation.

UNIT-III (8 to 10 hours)

Design techniques of IIR filter, analog low pass filter design, design of digital filters from analog filter, impulse invariant & bilinear transformation techniques, digital to digital transformation, introduction to computer aided design of Iir filter. Realization methods for IIR filters.

UNIT-IV (8 to 10 hours)

FIR filter design using windows, and frequency samping method Design of optimum equiripple linear phase FIR filters, Design of FIR differentiators and Hilbert's transform, computer aided design linear phase FIR filters. Basic structure of FIR system.

UNIT-V (8 to 10 hours)

Introduction to DSP hardware,Study of two recent DSP microprocessors, application of DSP for Bio medical,speech & radar, image processing .

BOOKS:-

1) Digital signal processing by Oppenheim & Schafer, PHI 1988
2) Theory & application of digital signal processing by Rabiner & Gold ,PHI 1975
3) Digital filters : Analysis & design by A.Antoni McGraw Hill 1979
4) Digital signal processing algorithm & application by Prokies & Vanolokis.
5) Digital signal processing by Jony K. Johnson PHI

Practicals:-

Students should perform maximum two experiments on each unit & minimum eight experiments should be performed.

Term work:-

40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT: -POWER PLANT INSTRUMENTATION

Teaching scheme
Lectures 4 hrs/week
Practicals 2 hrs /week

Examination scheme
Theory - 100 marks
TW: -25 marks
Practical 25 marks

UNIT-I

Introduction to power plants:-Thermal hydro electric, nuclear, Gas turbine, salient features & computerison, significance of Instrumentation in power plants, Types & selection of Instruments Combined operation of different power plant working & load division between power stations. (8 to 10 hours)

UNIT-II

Boiler Instrumentation & control: - Measurements & control loops for feed water, dram lovel etc. Fuelflow cenrtool , furnace draft & air control fuel - air ratio control , superheat & preheat steam temperature control , main steam pressure control furnace safeguard supervisory control , Boiler safety Interlock. (8 to 10 hours)

UNIT-III

Turbine monitoring & control: -Superviaory system for monitoring mechanical parameters. Speed. Vibration. quial shift , differencial expansion betn stator & rotar. (8 to 10 hours)

Unit-IV

Parallel Operation of inter connected stations: Parallel running of alternator's synchronizing current, synchronizing power torque, load sharing of two alternator's, effect of change of excitation, Effect of change of fuel synchronous machine of infinite busbar, speed vs power O/P characteristics for alternator's running in parallel, Inter connected stations. (8 to 10 hours)

Unit-V

Voltage Regulation:Introduction, Types of regulators, Requirement of voltage regulator Magnetic amplifier regulator, voltage regulator with magnetic amplifier auxiliary A.C. network Busbar system & Reactors, protection of generators (8 to 10 hours)

Book:

Electrical power - by S.L. Uppal
Generation, distribution & utilization.- by
Instrumentation Engg's handbook by - B.G. Liptak
Power system by W. L . Wadhwa.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT: - MICROELECTRONICS

TEACHING SCHEME
LECTURE: - 4 hrs/week
PRACTICAL: - 2 hrs/week

EXAM SCHEME
THEORY: - 100 marks
PRACTICAL: -25 marks
TW:- 25 marks

UNIT-I (8 to 10 hours)

Finite state machines :- Moore & Mealey machines, synchronus controller stirring consideration, control using PLA/EPROM, CPLDs & FPGAs.

VHDL:-

Overview of design automation approach to digital design :- Use of hardware description languages. Introduction to VHDL & Virology .Digital system simulation & hardware synthesis.

UNIT-II (8 to 10 hours)

Structure of VHDL, timing & concurrency issues. Structural specification of hardware, wiring & component interconnections.

Definition & usage of packages & components, Design of general purpose Test bench.

UNIT-III (8 to 10 hours)

Synthesis & Design implementation with case studies using download facilities at minimum 4MHZ into CPLD 9500 series & FPGA 5200 or 4000 series with seven segment display on board to verify results with different configuration modes.

Architecture of FPGA & CPLD such as Xilinx 9500 series CPLDs & 5200 or 4000 series FPGAs.

UNIT-IV (8 to 10 hours)

Microcontrollers :- Architecture, instruction set, programming and their applications, (8031/8048/8051/8748, etc). Introduction to advanced (16/32 bit) microcontrollers(e.g.8096/97), interfacing of ADC with microcontrollers.

UNIT V (8 to 10 hours)

Special features of architecture and instruction set of advanced Microprocessors (80186/286/386/486 etc.).

Computer aided testers,logic analysers and signature analyzer.

BOOKS: -

1) Digital design by M.Morris Maro 2nd Edition EEE-PHL
2)VHDL analysis & Modeling of digital synthesis by Z.Navabi 2nd edition McGraw-Hill.
3)VHDL techniques, experiments & caveats by Joseph pick McGraw-Hill.
4) Principles of CMOS VLSI design by Neil & Kamran Addison Wesley
5) Xilinx manual
6) Digital logic & state machine design by Saunders college Publishing
7)Design with microcontrollers by Peatman. McGraw Hill, 1988.
8)Computer aided design and manufacturing . by M.P.Groover & E.W.Zimmers. PHI 1985.

Practicals:-

Students are expected to perform minimum eight experiments based on above topics.

Term work:-TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT:-ADVANCED POWER ELECTRONICS

Teaching scheme
Lectures :- 4 hrs/week
Practicals :-2 hrs /week

Examination scheme
Theory :- 100 marks
TW:-25 marks
Practical:- 25 marks

UNIT-I

D.C. motor control:- Equivalent circuits, characteristics, variable speed-A.C.(LCC) type, DC(chopper), type single phase, three phase,half wave, full wave, half control, full control, dual converter, breaking , dynamic & regenerative, chopper limit , closed loop control, microprocessor based control of series, shunt & separately exited motors.

UNIT-II

Special motor & control:- Brushless DC – three phase half wave , full wave, synchronous type position sensor, servo control.

Stepper motor-variable reluctance, permanent magnet-hybrid. Drive requirement, implementation. microprocessor based controls.

Traction drive:- Special features working of DC, AC(Ind. Motor/syn. Motor), single & multiple unit chopper fed.

UNIT-III

Induction motor control:- Equivalent circuit, torque equation, power flow, phase diagram, operation sinusoidal & nonsinusoidal input, sinusoidal & nonsinusoidal input (six step & PWM) control, strategies & implementation, constant V, constant V/f, VSI fed, CSI fed, rotor resist, slip recovery, microprocessor based control.

UNIT-IV

Synchronous motor control:- Types, wound rotor, salient pole, PM, synchronous, reluctance, inductor, steady state behaviour control , strategies & implementation, adjusant frequency control current, VSI drive self controlled-I fed, large scale integration, PWM, torque, AWGLR, closed loop servo control.

UNIT-V

Instrumentation in power electronics:- Parameters voltage, current (sinusoidal & nonsinusoidal) power phase, HF, DF, RF, PF , transducer signal conditioning microprocessor based analysis & design, FFT, PC based display.'

BOOKS:-

1)Power electronics converter application & design	Ned Mohan(Wiley International)
2)Power electronics	Cyril W. Lander
3)AC drives	Ved Subramanium
4)Thyristorised power controllers	Dube D. Doradla
5) Thyristor & their application	Rammaorthy
6)DC drives	P.C. Sen

Practicals:-
Students should perform minimum eight experiments based on above syllabus.

Term work:-
40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT:- UNIT OPERATION

Teaching scheme
Lectures 4 hrs/week

Examination scheme
Theory - 100 marks
TW:-25 marks

UNIT-I

(8 to 10 hours)

Introduction :- Concepts of Unit operations & unit processes, material balance & energy balance,simple calculation of specific consumption, batch & continuous processes, endothermic & exothermic reaction ,reversible & irreversible processes.

UNIT-II

(8 to 10 hours)

Evaporation:- Liquid characteristic, types of evaporators,Method of feeding, principle & operation of single & capacity & economic of multiple effective evaporation, vapour recompression,operation of mechanical & thermal recompression. Instrumentation and control for this process

Drying :- Classification of dryers,principle & operations, drying equipments. Instrumentation and control for this process

UNIT-III

(8 to 10 hours)

Distillation :- Equipment setup, operation of flash distillation, batch distillation, continous distillation, fractionating column slevwplate arrangement, rectification & stripping. Instrumentation and control for this process

Leaching & Extraction :- Principles,various types of equipments for this process.

UNIT-IV

(8 to 10 hours)

Size reduction :- Principle of communution, equipment, classification & operation of crushers & grinders.

Crystallization :- Defination, magma, supersaturation, formation of crystal, equipment classification & operation. Instrumentation and control for this process.

Filteration :- Centrifuges cyclones, types of industrial filters, rotary filters, bag filters, electrostatic precipitators.

UNIT-V

(8 to 10 hours)

Heat exchangers :- Theory, types, characteristics.Combustion processes-liquid & solid fuels,automization. Application of above unit operations in paper cement fertilizer, petrochemical & sugar industry. Instrumentation and control for H.E.

Termwork : It shall consist of eight assignment based on Process flow diagram and Instrumentation and control for above uint operations. 40% weightage for theatical perfarmance in classroom & 60% weightess for assignment perfermmanance

BOOKS:-

1)Unit operation of chemical engineering by MsCabe Smith 5th edition McGraw Hill
2)Chemical engineers Handbook by Perry 6thedition McGraw Hill int. student ed. 1984
3)Elementary principles of chemical processes by Felder,Rotsseau,Henriot,Wiley 1978
4) Basic Principle and calculation in chemical Engg. By D. H. Himmelblau , PHI 1989
5)Design of thermal system by W.F.Stoeker 3rd edition McGraw Hill int. ed. 1989
6))Introduction to chemical engineering by Walter L Badger & Julic T Banchero McGraw Hill int. student ed.
7)Outline of chemical technology by M.GopalaRao & M.Sitting 2nd edition East West 1973

SUBJECT: - PROCESS EQUIPMENT DESIGN

Teaching scheme
Lectures 4 hrs/week
Practicals 2 hrs /week

Examination scheme
Theory :- 100 marks
Practical:- 25 marks
Termwork:-25

UNIT-I (8 to 10 hours)

Designing of control valve for gas, vapour, liquid. Effect's & remedies of cavitation, flashing condition, noise in control valve, pressure drop across the valve, sequenced valve arrangement, valve pair's, valve linearizer, testing procedure of auxiliary valves, high pressure & high temperature service control valve, Installed rangeability & viscosity correction for control valve , different type of actuator's & their designing .

UNIT : II (8 to 10 hours)

Digital hardware design for process control system , study of PLC, architecture & programming of PLC, development of ladder diagram for various processes, PLC simulator , Interfacing of PLC with process, study of limit switches, relay's.

UNIT-III (8 to 10 hours)

Personal computer in process control, direct digital control, distributed control system, advanced process control system, DCS configuration, application of DCS in industry, data highways, fieldbus, multiplexers & remote sensing terminal units, supervisory control & data acquisition system

UNIT-IV (8 to 10 hours)

Instrumentation in hazardous location, intrinsic safety, emergency shutdown, fail safe design, microelectronic, mechanical switches, I/O hardware, single loop process controllers & specification, annuciators, CRT displays, printers & operator interface in DCS.

UNIT-V (8 to 10 hours)

Application of SCADA , PLC , DCS & open system for following plant-
a) paper & pulp b) Glass c) Distilation d) Cement e) Steel.

BOOKS:-

1) Microprocessor based process control	by C.D.Johnson McGraw Hill
2) DCS for industrial automation	by Popovik & Bhatkar Marcel Dekkar
3) Programmable Logic controller	by J.D.Otter
4) Industrial automation	by Considyne McGraw Hill
5) PLC	by Huges from ISA
6) Analysis & design of pneumatic systems	by B.W.Anderson
7)Applied instrumentation	by Andrew's

Practicals:-
Students are expected to perform minimum eight experiments based on above syllabus.

Term work:-
40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT - PROCESS INSTRUMENTATION

TEACHING SCHEME
LECTURE: - 4 hrs/week
PRACTICAL:- 2 hrs/week

EXAM SCHEME
THEORY:- 100 marks
PRACTICAL:- 25 marks
TW:- 25 marks

UNIT-I (8 to 10 hours)

Process Characteristics :- Types of process, step analysis method for finding time constant for single & two capacity process, percent complete & incomplete method, multi_capacity system,
Finding control modes by step analysis, controller adjustments based on reaction curve, PID controller tunning, dead time, dynamic elements in control loops.

UNIT-II (8 to 10 hours)

Linear controllers:- Performance criteria, disturbance model based PID controller, interupting the control loop, design consideration of digital control, nonlinear elements in the closed loops, nonlinear phase shifting elements , nonlinear elements in control loops.

UNIT-III (8 to 10 hours)

Analysis of some common loops: - Flow control, pressure regulation, liquid level & hydraulic resonance, control of composition, temperature control, interaction & decoupling, relative gain analysis, procedures to calculate relative gain, effects of interaction, decoupling.

UNIT-IV (8 to 10 hours)

Multiple loops system :- Feedback, feedforword, cascade, multiple output control systems, selective control system, adaptive control system, ratio & split range control systems.

UNIT-V (8 to 10 hours)

Batch process control :- Special requirements of batch process, selecting controllers for batch process, integral windup, batch reactor, batch distillation, program control systems, seqential control systems, Introduction PLC programming language.

BOOKS: -

1) Process control systems by F.G. Shinsky,McGraw Hill.
2) Instrumentation for process measurements & control by N.A.Anderson.
3)Process control by Liptak.
4) Batch control system by T.G.Fisher.

Practical:-
Students of expected to perform Maximum 8 experiment based on above syllabus.

Term work:-
TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

Seminar (oral-50)

Talk should be deleverd during academic semester on topics selected for seminar. Seminar topics can be based on latest development in tech. / survey report on particular industry. 25 marks should be allotted by internal guide based on efforts taken for presentation of seminar work during academic semester, There 25 marks should be consider by the examiners. Probably there should be two examiners. One examiner should be guide.

Project-I (TW-50)

The Project work will be carried out by group of at the most 3 students on latest development in tech., problem rectification in industry, New innovatative idea presented based on privious literature available till to that date.

Project work-I should consist of selection of Project work, survey on decided project work & Tentative design work required, the report of this thing should be should at the end of semester which will be evaluated by guide & one examiner appointed by head of institution.

Elective-II

SUBJECT: - FIBRE OPTICS & TELEMETRY

Teaching Scheme
Lectures: - 4 Hours / Week
Practical: -2 Hours / Week

Examination Scheme
Theory: - 100 Marks
TW: - 25 marks
Practical: - 25 Mark

UNIT-I (8 to 10 hours)

Ray Theary of transmission, total internal reflection, acceptance angle, numerical aperture Electromagnetic mode theory of optical propagation modes, cylindrical modes, mode caupling - step, index, multimode & single mode fibers, graded index fiber.

Losses: - Material absorption, linear scattering nonlinear scattering, bending losses, Intermodal dispersion, material & waveguide dispersion, model noise polarization.

UNIT-II (8 to 10 hours)

Optical sources: - Incandescent Lamp, LEDS Gas filled lamps, Gas discharge Lamp, different type of LASER (Ruby, He-Ne, Co* & Semiconductor)

Detectors: - Thermal, UV detectors, photo emissire photoconductive (bulk LDR, photodiode, phototransistors, photo FET, LASER etc.), Photovoltaic sensors, photomultiples.tube, optocouplers.

UNIT-III (8 to 10hours)

Fabrication of fiber optic: - Material consideration, Methods – Inside, Outside, Lateral, and Axial deposition, different fiber drawing processes, couplers & splices

Applications of fiber optic: - Holography, Endoscopy, Distance Measurement, Displacement measurement, Laser printing, data communication, level measurement, Thermometer sensor, flow measurement, Pressure measurement & vibration measurement.

UNIT-IV (8 to 10hours)

Modulation: - Need of modulation, Linear modulation. A.M,Frequency spectrum of AM wave, Representation of A.M., Power relation in the A.M. wave, Generation of A.M., F.M, Deacription of system, Mathematical representation of F.M., frequency spectrum of F.M. Wave, Generation of F.M.

Introduction to Phase Modulation,Pulse Modulation, PAM, PPM, PWM

UNIT-V

Demodulation: - Tuned R.F. Receiver, Superheterodyne receiver.

A.M. receiver: - R.F. Section & Characteristics, Frequency changing & tracking, Intermediate frequency & If amplifiers, Detection & Automatic gain control, Extension & superheterodyne receiver.

F.M. receiver: - Amplitude limiting, Basic FM. Demodulators, Radio detector, FM demodulator, Comparison, Stereo PM Multiplex reception.

Books: -
1) Sentegrated ckt & semiconductor devices- Deboo (MG) Burrows.
2) Optical Fiber Communication - Principal & parches -John Senior - Prentice Hall I
3) Optical Fiber Communication --G Keiser - McGraw Hill.
4) Electronic Communication System --Kennedy - Prentice Hall
5) Communication Systems - - A.B. Carlson - Mc Graw Hill
6) Optoelectionlc - Theory & Practical - Alan Chapple Texas Instrument

PRACTICAL: -

Students are expected to perform minimum eight experiments based on the above topics: -

1) Measurement of Numerical Aperturs
2) Measurement & Loses.
3) Charactenstics of LDR
4) Characlenstics of Optocoupler
5) Generation of AM
6) Pulse Width modulation
7) Pulse Position modulation
8) Frequency modulation
9) AM receiver
10) FM receiver
11) Displacement measurement by fiber optic
12) Data Communication by fiber optic.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

Elective-II

SUBJECT: -BIO- MEDICAL INSTUMENTATION

Teaching Scheme
Lectures: - 4 Hours / Week
Practical: -2 Hours / Week

Examination Scheme
Theory: - 100 Marks
Practical: - 25 Mark
TW: - 25 marks

UNIT-I **(8 to 10 hours)**

Introduction to gross anotomy of human body, major physiologycal systems, their structure & function.

Cell structure, basic cell functions. Origin of bio-potentials, electrical activity of cells (electrophysiology) Introduction to bio-medical instruments, classification justification.

UNIT-II

Transducers for bio-medical instrumentation and selection bio-medical electrodes.

Cardiological System :- structure of heart , rhythmicity , cardiac cycle , heart sounds , cardiac output , blood pressure measurement direct, indirect , spygmomanometer ,digital B.P.

Cardio vascular instrumentation: ECG electrodes & leads, einthoven triangle, ECG quantification ,PC based ECG analysis.

UNIT-III

Pacemakers, defibrillators, Biotelemetry, Bedside monitors, ICU (Intensive Care Unit), Heart Lang machine, Phonocardio-graph, plethysmograph, Artificial kidney, Blood cell counters.

UNIT-IV

Central Nervous system: - The brain, Receptors, sensory pathway and motor systems. Evoked potentional, Electron rephalogram EEG Analysis, EMG (Electromyograph)

Mechanics of breathing 02/Co2 transport between langs and tissue cells , spirometer , Artificial Respiration .

UNIT-V

Imaging Systems: - X-rays, ct.scan, utrasonography, MRI (Magnetic Reasonance Imaging). endoscopy .

Electrical Safety :- Significance of electrical danger, physiological affects of electrical current , ground shock hazards methods of accident preventation.

References: -

1) An Introduction to biomedical Instrumentation By Prof S.G. KAHALEKAR
[Sadhusudha prakashan , H.NO.3/5/83, Gurudasara Road Nanded]
2) Biomedical Instrumentation and measurements by Cromwell, PHI.
3) Handbook of Bio-Medical Instrumentation by R.S. Khandpur T.M.H.

Practicals: -

Students are expected to perform minimum eight experiments based on the above topic. Practical shall based upon oral/practical performance on the practical conducted during the term.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

Elective-II

SUBJECT: -COMPUTER NETWORK

Teaching Scheme
Lectures: 4-hours/ week

Practicals : 2 hours /week

Examination Scheme
Theory: - 100 marks
TW: -25 marks
Practical :- 25 marks

UNIT-I (8 to 10 hours)

Introduction to computer n/w . Uses of computer n/w. Networking concepts of protocols Remore access protocols , serial Line Internet protocol {SLIP} , Point to point protocol {PPP} Layering concept in comp n/w . Need for standardization, ISO seven layer model Terminologies & Delination.

UNIT-II (8 to 10 hours)

Network services & primitives. Various services provided by n/w. Remore Access Services. Data Link layer definiqued & scope. Design issues fsaming techniques. Error control, Flow control link management, Examples of data link layer.

Data Link protocols, sliding window protocol one bit sliding window protocol, A protocol Using go back selective repeat. Protocol performance impact of sliding window.

UNIT-III (8 to 10 hours)

Network topology, Bus, ring, star & hybrid topologies. Medium access control methods for LANs CSMA/CD. Token ring register standards. Static & Dynamic allocation of channels billerent access protocols sate networks.

UNIT-IV (8 to 10 hours)

Network layer concepts, network layer design issues LAN &WAN services. Routing flow control, congestion control.

Transport layer concepts, design issues same frames, protocols, connection management.Session layer concepts design issues protocols & examples.Presentation layer concepts design issues protocols & examples.Application layer concepts design issues protocols & examples.

UNIT-V (8 to 10 hours)

Characteristics of N/W Fault tolerance, Remore access services provided, multiprocessor support, Diagnostic capabilities Resource management capabilities file transfer protocol electronic mail & other applications Internetworking, network security. Data compression techniques cryptography.

Books:

1) Computer Networks - A.S. Tanenbown -2nd Edition
2) Local Networks - An Introduction = W. stalling -2nd editing
3) Local Area Networks - Geiser - Mc Graw Hill
4) Computer Networks protocols , standards & Interfacing - U.Black

Practicals: -

Students should perform minimum of eight experiments.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT: - INSTRUMENT SYSTEM DESIGN

TEACHING SCHEME
LECTURE: - 4 hrs/week
PRACTICAL: - 2 hrs/week

EXAM SCHEME
THEORY: - 100 marks
PRACTICAL: -25 marks
TW: - 25 marks

UNIT-I (8 to 10 hours)

ISD, design philosophy, types of design, design method ,optimal design selection, scientific method analysis, general transducer design consideration, testing of transducer & selection criteria of transducer.

UNIT-II (8 to 10 hours)

Design of RTD, thermocouple, themistor based temperature system, design of displacement measurement system using LVDT, potentiometer,ultrasonic transducer & complete signal conditioning circuits for above temp. & displacement measurement system.

UNIT-III (8 to 10 hours)

Design of orifice, rotameter, venturi based flow system & signal conditioning circuit for above system, design of level sensor & its signal conditioning circuits, design of pressure gauge, diaphragm based pressure gauge like DP transmitters, study of smart transmitter.

UNIT-IV (8 to 10 hours)

Study of indicators, recorders, annuciators & its signal conditioning cct. , monitor for instrumentation system control panels design consideration, reliability, MTTR, MTBF.

UNIT-V (8 to 10 hours)

Printed circuit board design guidelines, general component layout scheme, grid system, PCB size, mechanical stress, design roll for analog & digital circuit PCB'S,single & multiplayer PCB's.

BOOKS:-

1) Applied Instrumentation by Andrew
2)PCB design by Boeshart
3)Liptak handbook
4)Process instrumentation by C.D.Johnson
5) Instrumentation by Kirk

Practical:-

Student will perform minimum eight experiment based on above syllabus.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT: - PROJECT PLANNING ESTIMATION & ASSESSMENT

TEACHING SCHEME
LECTURE: - 4 hrs/week
PRACTICAL: - 2 hrs/week

EXAM SCHEME
THEORY: - 100 marks
TW: - 25 marks

UNIT-I (8 to 10 hours)

Project implementation & cost estimation:- Activity verses documents, manpower planning ,project time schedule, cost heads & estimation.

Project engineering & documentation: -document system, standard symbols & legends, process flow sheet, P&I diagram, control schematics, instrument list, interlock diagrams, plant G.A. diagram, power/air distribution, cable engineering, loop schematics & termination diagrams, installation sketch, bill of material, control system documentation.

UNIT-II (8 to 10 hours)

Specification, configuration & design criteria, degree of automation, manpower matching, instrument specification sheet, area of classification & instrument selection, control system specification including control panels, PLC's & D.C.S., sub systems & integration, configuration diagram.

UNIT-III (8 to 10 hours)

CENTUM CS 3000 integrated production control systems overview, system configuration, human interface stations, field control stations (FCS), standard FCS, compact FCS, I/O model nest,networks,V-net,ethernet,fieldbus,redundancy & reliability, operating & monitoring functions,conman operations & monitoring function, standard operation & monitoring windows, operation & monitoring support functions, system maintenance function ,trend function, open interface (options),FCS data setting, graphic web display function, configuration of FCS control function, sub system communication function , engineering, configuration, engineering environment,engg. Procedure, standard engg. Function, test function, utility function, online maintenance functions, remote maintenance, batch management functions, requirement for a DCS for batch process, main function of C.S. batch 3000 package.

UNIT-IV (8 to 10 hours)

Project monitoring & control: -PERT/CPM techniques, project bar chart, tendering procedure, bid evaluation & procurement procedure, project co-ordination, multi agency interaction.

UNIT-V (8 to 10 hours)

Test procedure, installation & commissioning :-Factory acceptance & site acceptance test, inspection report & checklist, installation & commissioning, contract schedule & site activities upto handover, post installation maintenance, spaul management, annual maintenance contract.

SHEETS: -

1) Symbol
2) Index sheet, instrument schedule sheet
3) Loop diagram: -temp.flow, pressure, conductivity
4) Specification & hookup
5) Mechanical flow sheet
6) Process flow sheet
7) Actual wiring panel
8)Control room layout, D.C.S.
9) Configuration of CENTUM-3000 system Along with journal

Using HTML or JAVA you can also produce the above sheets, depending upon the facilities available

Visit to process plant like refinery, food processing, industry, process based instrumentation like energy, thermal, hydro, wind power (preparation of report into the journal), surveying of activities like critical loops, installation, commissioning.

Books: -

1) HTML book for practice.
2) Andrew Williames Vol-2.
3) Intelligent SMAR manual of Rousemount, Tata Honeywell
4) CENTUM CS 3000, Integrated Production Control System Overview Yokogawa Manual

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

SUBJECT: - PROCESS MODELLING & OPTIMIZATION

TEACHING SCHEME
LECTURE: - 4 hrs/week
PRACTICAL: - 2 hrs/week

EXAM SCHEME
THEORY: - 100 marks
PRACTICAL: -25 marks
TW: - 25 marks

UNIT –I (8 to 10 hours)

Fundamentals of chemical process dynamics, continuity equation, equation of motion, transport equation, equation of state equillibrium, chemical kinetics.

Solving mathematical models for series of isothermal constant holdup, variable hold up CSTRs, modelling of non-isothermal CSTRs, modelling of Gravity flow Tank.

UNIT-II (8 to 10 hours)

Solving mathematical models for single component vaporizer, modeling of Flash drum, modelling of batch reactor, modelling of binary distillation column, modelling of batch distillation.

UNIT-III

(8 to 10 hours)

Numerical methods :- Newton Rapson method (linear & nonlinear equation), Euler's method, second order Runga kutta method, fourth order Runga kutta method, Adam Bashforth method.

Process Identification :- Purpose, time domain eyeball fitting of step test data, sine wave testing, pulse testing, step testing, on-line identification.

UNIT-IV

(8 to 10 hours)

Nature & organization of optimization problems, formulation of objective function –cost, time value of money, measure of profitability, optimizing profitability.

Fitting models to data classification, building models, fitting function to empirical data, method of least squares.

UNIT-V

(8 to 10 hours)

Single variable optimization, multivariable optimizatinon, linear programming (simplex & Graphical) Quadratic programming, Reduced gradient optimization techniques.

BOOKS: -

1) Process Modeling, simulation & control for chemical engineers. by W.L.Luyben Mcgraw Hill
2) Optimization of chemical processes . by Edgar & Himmelbag Mcgraw Hill.
3) Practical process Instrumentation &control. by Jay Matley Mcgraw Hill
4) Chemical process control – Introduction to theory & practice .by G.Stephanopoulos Prentice Hill.

Practical: -

Students are expected to perform minimum eight experiments based on the above topics.

1) Newton Rapson method.
2) Second order Runga kutta method.
3) Fourth order Runga kutta method.
4) Euler's method.
5) Modelling of gravity flow tank.
6) Modelling of series of isothermal CSTR of const holdup.
7) Modelling of variable holdup CSTR.
8) Modelling of Flush Drum.
9) Modelling of single component vaporize.
10) Modelling of Non isothermal CSTR.
11) Simulation of least square method.

Term work:-

TW is based on 40% weightage for theoretical performance in classroom & 60% weightage for practical performance.

Industrial Visit

(TW 25)

The students are expected to visit two industry out of this, one should be combined visit of whole class, to a process industry during academic semester other visit should be of 4 to 6 students group to- electronics / electrical instrument mfg. industry R&D establishment , consulting firm, national laboratories ect. During winter vacation, The student should submit a report of information collected during their two visits two teachers appointed by head of institution should evaluate Report.

Project-II

Project-II will be continued on project part-I TW of project-II should be evaluated by guide bared on weekly progress report of the student. Oral marks should be allotted to the students by examiner, bared on work carried out by student, of success achieved in the project at the end of semester

SUBJECT:- NEURAL AND FUZZY BASED CONTROL SYSTEM

Teaching scheme
Lectures :- 4 hrs/week
Practicals :-2 hrs /week

Examination scheme
Theory :- 100 marks
TW:-25 marks
Practical:- 25 marks

UNIT-I (8 to 10 hours)

Artificial neural systems:- preliminaries, fundamental concepts & models of artificial neural system, neural networks learning rules, Hebbian, perceptron, delta Widrow-Hoff learning rules.
Single layer perceptron classification :- classification model, features & decision regions, training & classification using discrete perception, algorithm & examples,single layer continuous perceptron networks for linear separable classification .

UNIT-II (8 to 10 hours)

Multilayer feedback work networks:- Generalized delta learning rule,feedforword recall & error back-propagation training,learning factors.
Single layer feedback networks:- basic concepts of dynamical systems mathematical foundation of discrete time & gradient type Hopfield networks, transient response of continuous time network solution optimization problems.

UNIT-III (8 to 10 hours)

Neural network in control system:- neuro-control approaches ,training algorithm, evaluation of training algorithms, through simulation , self tuning neuro-control scheme, self tuning PID neuro controller, neuro-control scheme feed water bath temperature control system .

UNIT-IV (8 to 10 hours)

Introduction of fuzzy control:-introduction fuzzy control from an industrial perspective,mathematical of fuzzy control fuzzy sets,fuzzy relations,approximate reasoning representing a set of rules.
Non linear fuzzy control:-The control problem, FKBC as non linear transfer element.PID& sliding mode type FKBC some typical application of fuzzy based control systems.

UNIT-V (8 to 10 hours)

Fuzzy knowledge based controller FKBC design parameters:-Structure of FKBC fuzzification and defuzzification module, rule based choice of variable and contents of rules, derivation of rules, data based choice of membership function and scaling factors, choice of fuzzification, defuzzification procedure.

BOOKS:-

1) Introduction to artificial neural systems. J.M.ZURADA. Jaico Publication House 1997.
2) Neural networks: comprehensive foundation . S. HAYKIN. McMillan College Publishing company inc. 1994
3) Neuro control and its application S.OMATU, M. KHALID, R.YUSOF. Springer-Verlag,London Ltd. 1996.
4) An introduction to fuzzy control. D. DRIANKOV, H. HELLENDOORN and M. REINFRANK. Narosa Publication House. 2nd reprint 1997.

Term work:-

40% weightage for theoretical performance in classroom & 60% weightage for practical performance.