SCHEME OF INSTRUCTION AND EXAMINATION
B.TECH (INSTRUMENTATION ENGINEERING)

B.TECH . 1/4 : Common to All Branches

B.TECH. 2/4 : SEMESTER-I

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 211	Mathematics	3	1	-	4	3	70	30	100	4
INE 212	Basic Electronics & Circuit Theory	3	1	-	4	3	70	30	100	4
INE 213	Strength of Materials & Theory of Machine	3	1	-	4	3	70	30	100	4
INE 214	Electrical Machines	3	1	-	4	3	70	30	100	4
INE 215	System Dynamics & Transducers	3	1	-	4	3	70	30	100	4
INE 216	Digital Electronics & Logic Design	3	1	-	4	3	70	30	100	4
	Lab Courses									
INE 217	Electronics Lab	-	-	3	3	3	50	50	100	2
INE 218	Electrical Machines Lab	-	-	3	3	3	50	50	100	2
		18	6	6	30	-	520	280	800	28

B.TECH. 2/4 : SEMESTER-II

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 221	Environmental Sciences	3	1	-	4	3	70	30	100	2
INE 222	Electrical Measurements & Measuring Instruments	3	1	-	4	3	70	30	100	4
INE 223	Operational Amplifiers &Linear IC Applications	3	1	-	4	3	70	30	100	4
INE 224	Electronic Circuits	3	1	-	4	3	70	30	100	4
INE 225	Industrial Instruments	3	1	-	4	3	70	30	100	4
INE 226	Material Science	3	1	-	4	3	70	30	100	4
	Lab Courses									
INE 227	Linear & Digital IC Lab	-	-	3	3	3	50	50	100	2
INE 228	Electronic & Simulation Lab	-	-	3	3	3	50	50	100	2
		18	6	6	30	-	520	280	800	26

B.TECH. 3/4 : SEMESTER-1

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 311	Optical Instruments and Lasers	3	1	-	4	3	70	30	100	2
INE 312	Electronic Instrumentation	3	1	-	4	3	70	30	100	4
INE 313	Microprocessors and Applications	3	1	-	4	3	70	30	100	4
INE 314	Control Systems-1	3	1	-	4	3	70	30	100	4
INE 315	Computer Organisation	3	1	-	4	3	70	30	100	4

	and Operating Systems									
INE 316	***Elective***	3	1	-	4	3	70	30	100	4
	a) Signals & Systems									
	b) Reliability and Safety Engg.									
	c) Nondestructive Testing									
	d) Advanced Sensors									
	Lab Courses									
INE 317	Transducers Lab	-	-	3	3	3	50	50	100	2
INE 318	Optical Methods in Measurements Lab	-	-	3	3	3	50	50	100	2
INE 319	Soft skills lab	-	-	3	3	3		100	100	1
		18	6	9	33	-	570	330	900	29

B.TECH. 3/4 : SEMESTER-II

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 321	Digital Signal Processing	3	1	-	4	3	70	30	100	4
INE 322	Advanced Micro Processors and Micro Controllers	3	1	-	4	3	70	30	100	4
INE 323	Industrial Electronics	3	1	-	4	3	70	30	100	4
INE 324	Process Control and Control Components	3	1	-	4	3	70	30	100	4
INE 325	Control Systems-II	3	1	-	4	3	70	30	100	4
INE 326	***Elective***	3	1	-	4	3	70	30	100	4
	a) Petro Chemical Instrumentation									
	b) Power Plant Instrumentation									
	c) Steel Plant Instrumentation									
	d) Instrumentation for special processes									
	Lab Courses									
INE 327	Industrial Instruments Lab	-	-	3	3	3	50	50	100	2
INE 328	Control Systems Lab	-	-	3	3	3	50	50	100	2
		18	6	6	30	-	520	280	800	28

B.TECH. 4/4 : SEMESTER-I

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 411	Computer Control of Process	3	1	-	4	3	70	30	100	4
INE 412	VLSI Design	3	1	-	4	3	70	30	100	4
INE 413	Industrial Management	3	1	-	4	3	70	30	100	4
INE 414	Biomedical Instrumentation	3	1	-	4	3	70	30	100	4
INE 415	Data Communication and Networking	3	1	-	4	3	70	30	100	4

INE 416	***Elective***	3	1	-	4	3	70	30	100	4
	a) Telemetry									
	b) Artificial Intelligence									
	c) Robotics									
	d) Physiologic and Neural Networks									
	Lab Courses									
INE 417	Micro Processors Lab	-	-	3	3	3	50	50	100	2
INE 418	Industrial Instruments (Simulation Lab)	-	-	3	3	3	50	50	100	2
INE 419	Industrial Training	-	-	-	-	-	-	-	100	2
		18	6	6	30	-	520	280	900	30

B.TECH. 4/4 : SEMESTER-II

Code	Title	L	T	P	Tot. Hrs.	University Examinations				No. of Credits
						Hrs	Mrks	Ses. Marks	Total Marks	
INE 421	Fiber Optics and Sensors	3	1	-	4	3	70	30	100	4
INE 422	Analytical Instruments	3	1	-	4	3	70	30	100	4
INE 423	Design of Instrument Systems	3	1	-	4	3	70	30	100	4
	Lab Courses									
INE 424	Process Control lab	-	-	3	3	3	50	50	100	2
INE 425	Project Work and Comprehensive Viva	-	-	-	-	-	50	50	100	8
		9	3	3	15	-	310	190	500	22

INE : 211 – MATHEMATICS-III

(COMMON TO ALL BRANCHES)

INE : 212 - BASIC ELECTRONICS AND CIRCUIT THEORY

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

JUNCTION DIODE: Basic structure of a diode Depletion region and barrio potential formation conduction process – Volt – ampere characteristic --- cutin voltage – Diode resistance – Temperature dependence of VI Characteristic – Transition and diffusion capacitances – varactor diode – Volt – ampere characteristic of a Zener diode – Avalanche and Zener breakdowns.

BIPOLAR JUNCTION TRANSISTOR: Basic structure of a transistor – conduction process – Input and output characteristics of CB and CE configurations—Active, saturation and cutoff regions – current gains—outline of biasing arrangements – The operating point of transistor and its stability – Compensation techniques for operating point stability – Analysis of self-bias Circuit for stability factor 'S' -- Self heating and thermal runaway – Thermal resistance.

THE TRANSISTOR AT LOW FREQUENCIES: Typical circuits for CB, CE and CC configurations – Analysis of transistor amplifier using hybrid parameters – Hybrid parameters from graphical characteristics.

THE TRANSISTOR AT HIGH FREQUENCIES: The hybrid-pi model of a CE transistor – Analysis of an RC-Coupled CE amplifier for low, mid and high frequencies – The gain and phase plots of an RC-coupled CE amplifier

THE TRANSISTOR FEEDBACK AMPLEFIERS: Classification of amplifiers—Feedback concept—Positive and negative feedbacks—Block diagram of a signal – loop feedback amplifier – Output sampling modes—Input mixing modes—Feedback topologies of an amplifier—Transfer gain of a signal – loop feed back amplifier – Advantages of negative feedback in an amplifier—Typical amplifier circuits with negative feed back

TRANSISTOR POPWER AMPLIFIERS: Class A, Class B and Class C operating conditions—outline of signal-end class A and class B transformer- coupled power amplifiers – An outline of nonlinear distortion—Analysis of Class A push-pull power amplifier—Advantages of push-pull system—Outline of class B push-pull power – pull system – outline of class B push-pull power amplifier—crossover distortion – Class AB operation in push-pull configuration – complementary symmetry power amplifier—phase inverter circuits for push-pull input—Impedance matching output transformer

RECTIGIERS AND POWER SUPPLIES: Half –wave, full-wave and bridge rectifiers – Ripple factors and efficiencies—outline of filter circuits – Analysis of full-wave rectifier with condenser filter-zenor diode voltage regulator – Series Voltage regulator

RESONANCE AND THEOREMS: Series resonance—Parallel resonance – Thevenin's theorem – Norton's theorem – Miller's theorem and its dual—Maximum power transfer theorem

TWO- PORT NET WORKS: Z, Y, h and ABCD parameters – Equivalent circuits with Z, Y and h parameters –

CIRCUIT TRANSIENTS : Direct current transients in RL, RC and RLC series circuits – Alternate current transients in RL, RC and RLC series circuits

REFERENCES:

1. Electronic Devices and Circuits, by Mailman and Halkias
2. Integrated Electronics : Analog and Digital circuits and systems, by Millman and Halkias
3. Electronic Fundamentals and Applications, by John D. Ryoler.
4. Electric Circuits, by Joseph A. Edminister, Schaum's outline series.
5. Circuit Theory, by Umesh Sinha

INE : 213- STRENGTH OF MATERIALS AND THEORY OF MACHINES

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Simple stresses and strains – tensile, compressive and shear stresses. Elastic limit, Hook's law, stress-strain relation, poission's ratio, Moduli-relation among them. Stresses in bars of varying section, composite sections, temperature stresses. Change in modulus if all the lateral strains are prevented.

Bending moment and shearing force – cantilever, simply supported beams, pointed loads, uniformly distributed loads, S.F and D.M diagrams. Over hanging beams.

Link and element- lower and higher pairs- kinematic chain mechanisms with turning and sliding pairs-criteria, degrees of freedom, joint analysis-Grubler's criteria- inversion of single slider and double slider crank chains

Exact straight line mechanisms- pantograph, peaucellier mechanism, Harts mechanism, Scott-Russel mechanism, Approximate straight line mechanisms- Scott-Russel , Watt,Tchebicheff's mechanism, Roberts mechanism,Modified Scott-russel , Grass hopper mechanism.

Friction and bearings- limiting friction, laws, limiting angle, angle of repose, Equilibrium of a body on a rough, inclined plane, friction between screw and nut, mechanical efficiency-friction in journal bearings, friction circle, work done-ball and roller bearings- Hoffman transmission bearings

Text books:

1. J.A.Taraporebala- Strength of materials
2. S.B.Junnarkar- Machines of structures.
3. Toft.L. and Kersy ,A.T.J- Theory of machines
4. Khurmi R.s. and Gupta J.K- theory of machines

INE : 214 - ELECTRICAL MACHINES

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

POLYPHASE CIRCUITS:
Star and why connections, vector diagrams, phase sequence, voltage, current relations in two phase and three phase circuits. Analysis of balanced three phase circuits. Measurements of power in three phase circuits.

MAGNETIC CIRCUITS:
Hysteresis loss. Lifting power of a magnet. Analysis of series and parallel reluctance circuits.

TRANSFORMERS:
Single phase transformer-construction-voltage equation, transformer on no-load and effect of resistance and reactance. Equivalent circuit –efficiency-auto transformer, use of transformers with instruments-testing of transformer. Three phase transformer.

D.C.Machines-construction-armature windings – e.m.f equation-armature reaction and commutation-Generator characteristics-D.C.motor back e.m.f-speed torque characteristics-starters-speed control testing.

Synchronous machines-the alternator-frequency -single and poly phase windings-synchronous impedance-armature reaction-e.m.f.equation-synchronous motor, nature of torque, vector diagram-characteristics of a synchronous motors-starting methods.

Induction motor-construction-theory of induction motor –efficiency-equivalent circuit-circle diagram-starting and speed control-single phase series motor, repulsion motor. Fractional H.P Motors-single phase induction motors-hysteresis motor-reluctance motor.

TEXT BOOKS:
1. Electrical technology by B.L.Theraja.
2. Electrical technology by H.Cotton.
3. Electrical machinery by Fitzgerald/kingsley/umans.
4. Electrical machinery by Irving L.Kosow.

INE : 215 - SYSTEM DYNAMICS AND TRANSDUCERS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Measurements and Measurement Systems: What is measurement – Measuring Instruments and measurement systems – Functional elements and Block diagram of a measurement system – Classification of the measuring instruments - Specifications of Instruments – Standards of measurement – International system of units- Calibration of measuring instruments.

Errors in measurements: Types of errors – Sources of errors – Methods of minimization or elimination of errors- Statistical analysis of errors – selection of instruments.

Sensing Elements and Transducers: Introduction – Elastic sensors – Diaphragms – Capsules – Bellows – Bourdon Tubes. Pneumatic Sensors – Flapper Nozzle Mechanism.– Differential Pressure sensor –Temperature sensors - Bi-metal – Obstruction type flow sensors – Orifice – Venturi – Pitot tube – Variable area sensors.

Electrical Sensors: Resistive sensing elements – Potentiometer – Resistive strain gauge elements – Thermo electric - Resistive temperature sensors – Photo conductive sensors – Capacitive sensors- Variable area – Variable distance – Variable dielectric type sensors. Inductive sensors- Variable reluctance type– Linear variable differential transformers.

Photo voltage sensors – Piezo electric sensing elements – Turbine flow transducers – Electromagnetic flow sensors – Electromagnetic speed sensors – Photo electric speed sensors.

Characteristics of a Measurement System : Static Characteristics of a measurement System – Dynamic Characteristics of a measurement system – Mathematical modeling of a measurement system – Order of the measurement System – Transfer function of a measurement system – System response for standard test signals – response of first and second order system to the standard test signals.

Thermo Electric Transducers : Photo voltage sensors – Piezo electric sensing elements – Turbine flow transducers – Electromagnetic flow sensors – Electromagnetic speed sensors – Photo electric speed sensors.

Books:

1. A Course in Mechanical Measurements and Instrumentation – A.K.Sawhney
2. Mechanical and Industrial measurements – R.K.Jain.
3. Electrical and Electronic Measurements and Applications – A.K.Sawhney.
4. Measurement Systems: Application and Design – E.O.Doeblin.
5. Engineering Metrology – R.K.Jain.

INE : 216 - DIGITAL ELECTRONICS AND LOGIC DESIGN

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Digital Principles : Definition for Digital signals, Digital wave forms, Digital logic, moving and storing Digital information, Digital operations

Number systems & codes : Review of number systems, weighted codes, conversion from one to another, non weighted codes, error detecting codes, error correcting codes , binary arithmetic.

Digital logic & Boolean algebra : Basic gates OR, AND, NOT, universal gates NAND ,NOR, introduction to HDL. Boolean law & theorems, representation of switching functions, Karnaugh map representation, minimization using Karnaugh map, SOP and POS methods. Design of single out put and multi out put functions using conventional gates and HDL implementation models

Arithmetic circuits : Half & full adders and subtractors , 4 bit binary adder, fast adder, ALU, arithmetic circuits using HDL

Data processing circuits : Multiplexers, demultiplexure, 1 of 16 decoder, seven segment decoders, encoders, HDL implementation of data processing circuits

Synchronous sequential logic : RS flip - flops, gated flip - flops, edge triggered RS,D,JK flip - flops, master slave flip - flop, T flip- flop switch contact bounce circuits, analysis of sequential circuits, HDL implementation of Flip- Flops .

Registers and Counters : Types of registers, serial in – Serial out, Serial in – parallel out, parallel in – Serial out , Parallel in - Parallel out registers, Asynchronous & Synchronous counters, mod counter , Decade counters, Presettable counters, Digital clock, Implementation of HDL in registers and counters

D/A conversion and A/D conversion : Variable register net works, Binary ladders, D/A converters, D/A Accuracy and resolution. A/D converters- simultaneous, counter, continuous, Dual slope techniques.

Analog Switches : Switch configuration, Basic operating principles of switch diode transmission gates. High speed S/H circuits BJT and FET gates, S/H circuits CMOS gates, multiplexing introduction to comparators.

Clocks & Timing Circuits : Clock wave forms, TTL clock, Schmitt Trigger, 555 Timer- astable & mono stable pulse generators, Mono stables with input logic, pulse performing circuits.

Text Books:

1. Digital Principles and Applications. Albert paul Malvino and Donaldp. Leach, T.M.H.
2. Digital Integrated Electronics. Herbert Taub and Donald Schilling, Mcgraw Hill Co.
3. Digital Logic and Computer Design by M. Morris Mano, P.H.I.

INE: 221 : ENVIRONMENTAL SCIENCE

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Module 1: Introduction

- Definition ,scope and importance
- Measuring and defiing environmental development : indicators

(1 lecture)

Module 2: Ecosystems

- Introduction ,types,characteristic features,structure and functions of Ecosystems -Forest

-Grassland
-Desert
-Aquatic(lakes,rivers,and estuaries)

(2 lectures)

Module 3: Environment and Natural resources management

- Land resources
  -Land as a resource
  -Common property resources
  -Land degradation
  -Soil erosion and desertification
  -Effects of modern agriculture,fertilizer-pesticide problems.
- Forest resources
  -Use and over-exploitation
  -Mining and dams-their effects on forest and tribal people
- Water resources
  -Use and over-utilization of surface and ground water
  -Floods and droughts
  -Water logging and salinity
  -Dams –benefits and costs
  -Conflicts over water
- Energy resources
  -Energy needs
  -Renewable and non-renewable energy sources
  -Use of alternate energy sources
  -Impact of energy use on environment

(8 lectures)

Module 4: Bio-diversity and its conservation

- Value of bio-diversity-consumptive and productive use,social,ethical,aesthetic and option values.
- Bio-geographical classification of India as a mega diversity habitat
- Threats to biodiversity-hot spots,habitat loss,poaching of wildlife,loss of species,seeds ,etc.
- Conservation of bio-diversity-In-situ and Ex-situ conservation

(3 lectures)

Module 5: Environmental pollution-local and Global Issues

- Causes,effects and control measures of
  -Air pollution
  -Indoor air pollution
  -Water pollution
  -soil pollution
  -Marine pollution
  -Noise pollution
  -Solid waste management,composing,vermiculture
  -Urban and industrial wastes ,recycling and re-use.
- Nature of thermal pollution and nuclear hazards
- Global Warming

Acid rain

- Ozone depletion

(8 lectures)

Module 6: Environmental problems in India

- Drinking water ,sanitation and public health
- Effects of activities on the quality of environment
  -Urbanization
  -Transportation
  -Industrialization
  -Green revolution
- Water scarcity and ground water depletion
- Controversies on major dams,resettlement and rehabilitation of people,problems and concerns.
- Rain water harvesting,cloud seeding and watershed management

(5 lectures)

Module 7: Economy and Environment

- The economy and environment interaction
- Economics of development,preservation and conservation
- Sustainability:theory and practice
- Limits to growth
- Equitable use of resources for sustainable lifestyles
- Environmental impact Assessment

(4 lectures)

Module 8: Social Issues and the environment

- Population growth and environment
- Environmental education
- Environmental movements
- Environment vs Development

(2 lectures)

Module 9: Institutions and governance

- Regulation by Government
- Monitoring and Enforcement of Environmental regulation
- Environmental acts
  -Water(prevention and control of pollution)act
  -Air(prevention and control pf pollution)act
  -Envt. Protection act
  -Wild life protection act
  -Forest conservation act
  Coastal zone Regulations
- Institutions and policies relating to India
- Environmental Governance

(5 lectures)

Module 10: International Conventions

- Stockholm Conference 1972
- Earth Summit 1992
- World Commision for Environmental Development(WCED)

(2 lectures)

Module 11: Case Studies

- Chipko Movement
- Narmada Bachao Andolan
- Silent Valley project
- Madhura Refinery and Taj Mahal
- Industrialization of Pattancheru

- Nuclear reactor reactor at Nagarjuna Sagar
- Tehri Dam
- Ralegaon Siddhi(Anna Hazare)
- Kolleru Lake-aqua culture
- Florosis in Andhra Pradesh

(3 lectures)

Module 12: Field work :

Visit to a local area to document and mapping environmental Asscts river / forest / grass land / hill / mountain

Study of local environment – common plants, insects, birds
Study of simple ecosystems – pond, river, hill, slopes etc.
Visits to Industries, Water treatment plants, affluent treatment plants. (5lectures)

INE : 222 - ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

MEASUREMENT OF RESITANCE, CAPACITANCE AND INDUCTANCE: D.C bridges, potentiometers, A.C bridges, measurement of inductance and capacitance, errors in bridge measurements, Wagner's earthing device.

MEASUREMENT OF VOLTAGE, CURRENT: Electrical analog instruments, classification and constructional details, galvanometers, operating principle dynamic response, measurement of galvanometer constants, moving-iron, PMMC, Electro dynamic, electro static and inductive type instruments, range extension

MEASUREMENT OF POWER: Watt meters, dynamometer induction electrostatic watt meters, poly phase watt meters.

MEASUREMNT OF ENERGY: induction watt-hour meter-errors and compensation, polyphase induction watt-hour meter, measurement of frequency, phase angle, power factor, special purpose instruments.

TEXT BOOKS:
1.Electrical measurement and measuring Instruments by Golding and Widdis.
2. Electrical and Electronic measurements and Instruments By A.K.Sawhney.
3.Electrical measurements and Measuring instruments By Rajendra Prasad.

INE : 223 - OP AMPS AND LINEAR INTEGRATED CIRCUITS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

The Op-AMP: Block diagram of typical op-amp types of integrated circuits, power supplies for integrated circuits. Electrical characteristics of an op-amp, measurement of op-amp parameters,

equalent circuits of an op-amp, ideal voltage transfer curve, open loop differential amplifier configuration. The open loop inverting and non-inverting amplifier configuration.

AN OP-AMP WITH NEGATIVE FEEDBACK: Block diagram of feed back configuration voltage-series feed back amplifier analysis, voltage shunt feed back amplifier analysis. Basic differential amplifier and instrumentation amplifiers.

THE PRACTICAL OP-AMP: Offset voltages, offset voltage null circuit, offset voltage compensating network, configurations of inverting and non- inverting amplifiers with feed back and offset-voltage compensation, thermal drift noise.

FREQUENCY RESPONSE OF OP-AMP: DC and AC amplifiers, the peaking amplifier, summing, scaling and averaging amplifiers. A sub tractor, V/I converter with floating load, low-voltage Dc and AC voltmeters, V/I converter with ground load, I/V converter. DAC using I/V converters. DC coupled follower, AC coupled voltage follower with input resistance bootstrapped. The differentiator, Integrator.

ACTIVE FILTERS: First and Second order low pass filter butter worth filters, first and second order high pass butter worth filter, high order filters, wide band-pass, narrow band-pass filter, wide band-reject filter, narrow band reject filter.

OSCILLATORS: Phase shift oscillator, wien bridge oscillator, quadrature oscillator, square wave generator, triangular generator, saw tooth wave generator, voltage-controlled oscillator.

COMPARATORS AND CONVERTERS: basic comparator, the transfer characteristics, zero-crossing detector, the Schmitt trigger, voltage limiter, window detectors, V/F and F/V converters, positive and negative clippers, positive and negative clampers, precision half wave rectifier, absolute value output circuit, peak detector, sample-hold circuit.

LOGARITHEMIC AMPLIFIERS: logarithmic amplifier, antilog amplifier, logarithmic multiplier, log ration amplifier.

SPECIFIED IC APPLICATIONS: the 555 as square wave generator, 555 as free running ramp generators, block diagram of a phase locked loop and its operating principle, 565 PLL as a frequency multiplier and as an FSK demodulator.

POWER AMPLIFIERS: Power amplifiers using power boosters LM 380 audio power amplifier.

VOLTAGE REGULATORS: three- terminal fixed positive and negative voltage regulators three terminal adjustable positive and negative voltage regulators. A switching regulator.

TEXT BOOKS:
1.Op-amps and linear integrated circuits by RamaKant A.Gayakwad, P.H.I.
2. Op-amps and linear integrated circuits by Robert Coughlin.
3. Applications of analog integrated circuits by Sidney soclof PHI.

INE: 224:ELECTRONIC CIRCUITS

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

HIGH – INPUT – RESISTANCE TRANSISTOR CIRCUITS : LF analysis of emitter follower -- Boots trapped emitter follower – The darlington pair – LF analysis of darlinton emitter follower – Bootstrapped darlington emitter follower.

TRANSISTOR DC AMPLIFIERS: Drift – compensation techriques for drift – The emitter coupled differential amplifier – DM and CM voltage gains – CMRR – Differential amplifier with constant current source – Advantages of differential amplifier – Chopper amplifier – Synchronous Chopper amplifier.

FET CIRCUITS : Basic structure of a JEET – Conduction process – CS drain and pinchaff regions – Pinchoff voltage – Drain resistance and Trans conductance parameters – Biasing arrangements for a JFET – Biasing for zero – drift in drain current – LF and HF small – signal models of a JFET – LF AND HF analysis of CS and CD amplifiers – On – resistance of a JFET – JFET as a voltage variable resistor -- Basic structure of a MOSFET – Drain and transfer characteristics of a DEMOSFET – Biasing arrangements for a DEMOSFET – The enhancement MOSFET – Typical drain and transfer curves of an EMOSFET – Handling precautions for a MOSFET – Gate protection for a MOSFET – comparison between a FET and a BJT

TRANSISTOR TUNED RF AMPLIFIERS: An outline of single tuned and double tuned amplifiers with inductive coupling

NOISE : Thermal noise – shot noise – Transistor noise – FET noise – Noise figure – Measurement of noise figure of an active device – Noise figure of cascaded amplifiers

TRANSISTOR SINUSOIDAL OSCILLATORS : Classification of oscillators – Oscillator as a positive feedback amplifier – Barkhausen criterion – constituents of an oscillator – Analysis of phase – shift oscillator – Analysis of colpitt's oscillator – analysis of wion bridge oscillator – Crystal oscillator – Frequency and amplitude stabilities.

TRANSISTOR PULSE CIRCUITS: Differentiating and integrating circuits using RC elements – Analysis of astable and monostable multivibrators – Bistable multivibrator – Schmitt trigger circuit – astable blacking oscillator – transistor switching times.

TRANSISTOR VOLTAGE TIME-BASE GENERATORS: General features of a time-base signal – Methods of generating time-base waveforms – Exponential voltage sweep circuit – voltage sweep circuit using constant current source charging of a condenser – Miller time base generator – Bootstrap voltage time-base generator

TRANSISTOR CURRENT TIME-BASE GENERATORS: A simple current sweep circuit – a transistor current time-base generator

VIDEO AMPLIFIER: Pulse fundamentals – Amplifier response to rectangular pulses – Bandwidth requirement for pulse amplification – shunt peaked video amplifier.

REFERENCES :

1. Electronic Devices and circuits, by Millman and Halkias
2. Integrated electronics : Analog and Digital Circuits And System, by Millman and Halkias
3. Pulse, Digital and Switching waveforms, by Millman and Taub
4. Electronic Fundamentals and applications by John D. Ryder

INE : 225 - INDUSTRIAL INSTRUMENTS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Instruments for Measurement of –volume-area-mass-weight-force and torque-stress & strain – mechanical, electrical, optical type .

Measurement of displacement – vibration - velocity acceleration - mechanical, electrical, optical types of measurement systems.

Measurement of - humidity and moisture – basic principles – hygrometers – psychrometers - humidity charts –dew point hygrometers-electrical transducers and measurement systems for humidity. Infrared moisture measuring systems - radio active moisture measuring systems.

Measurement of Viscosity and Consistency: basic principles of capillary viscometers, friction type viscometers, float type viscometers, ultrasonic viscometer, electrical type viscometers, coefficient of viscosity, and temperature compensation.

Pressure measurement systems: Measurement of pressure and vacuum ,units of pressure, Elastic type pressure gauges, electrical pressure gauges.

Measurement of flow: Classification of flow measurement systems, Obstruction type flow meters . Turbine flow meters. Electromagnatic flow meters. Ultrasonic flow meters. Quantity flow meters. Mass flow meters.

Liquid level measuring systems: Classification of level measurement methods and devices, mechanical methods, electrical methods, Radiation methods.

Temperature measuring systems: Introduction, classification of temperature measuring systems, filled in thermal systems, resistance thermometers, thermo electric thermometers – radiation pyrometers.

Books:

1. Mechanical and Industrial Instruments – R.K Jain.
2. Instrumentation Devices and Systems – C.S.Rangan, Mani, Sharma.
3. Electrical and Electronic Measurements and Instrumentation – A.K.Sawhney.
4. Industrial Instrumentation – D.Patranabis.
5. Process Instrumentation and Analysis – G.B.Liptak.
6. Sensors and Transducer – D.Patranabis.
7. Transducers and Instrumentation – D.V.S. Murthy.

INE : 226 - MATERIAL SCIENCE

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

MECHANICAL PROPERTIES: Tensile Testing-Impact Testing-hardness Tests-Brinell, Vickers and Rockwell tests-Plastic deformation-Fracture toughness-Creep-fatigue-Cold work-Recovery-recrysallisation-Grain growth.

EQUILIBRIUM DIAGRAMS: Phase rule-binary Alloy systems-Solid Solutions-Eutectic-Peritectic-Meritect-Entectoid systems-The Lever Rule-Micro Structural development during slow cooling-Elementary metallography.

STRUCTURAL MATERIAL: IRON-CARBON Diagram-Ferrous Alloys, Carbon and Low Alloy steels-High alloy steels-cast irons-nonferrous Alloys-copper –Aluminum-Nickel base Alloys-bearing metals-composites.

PHASE TRANSFORMATIONS: Diffusion on solids-fick's law,Solutions to Fick's second law-applications based on second law solutions-kirkendal effect-other diffusion processes-Pearlite,Bainite and Martensite transformations in steels-Austempering and Martempering-Annealig,Normalising and Hardening methods for ferrous and nonferrous alloys-precipitation hardening.

MAGNETIC AND DIELECTRIC MATERRIALS : Ferromagnetism and related Phenomena- Domain structure-Hysterisis Loop- Soft and Hard magnetic materials-dielectric materials-polarization-temperature and frequency effects- dielectric Breakdown- Ferro Electric materials.

SEMICONDUCTORS: intrinsic and Extrinsic semiconductors-different semi conducting materials-band shapes of real semiconductors- direct and Indirect band gap materials- Fermi energy level and P-N junction diode,homojunction and Heterojunction- Transistor action.

BASIC SHAPING PROCESSES: Sand Casting- Die casting-Forging processes- Soldering and Brazing- spot welding- Arc Welding- Gas welding Processes- Powder Metallurgy Processes.

TEXTBOOKS:

1. Material Science and Engineering by V.Raghavan-prentice Hall of India, New Delhi.
2. Testing of Metallic Materials by A.V.K.SuryaNarayana, Prentice Hall of India.

REFERENCE BOOKS:

1. Introduction to Material science for Engineers by J.F.Shackelford, Macmillan publishing Co., New York
2. Semiconductor and Electronic devices, Adir Bar-Lev, Prentice Hall of India, New Delhi.
3. Practical Experimental Metallurgy by D.Eurof Davies, Elsevier Publishing Co. Ltd., London.

INE : 311 – OPTICAL INSTRUMENTS & LASERS

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

GEOMETRICAL OPTICS: Laws of reflection, critical angle – Linear and angular magnifications cardinal points, aberrations – corrections.

TELESCOPES & MICROSCOPES & PHOTOGRAPHIC SYSTEMS : Reflecting and refracting

telescopes – microscopes eye pieces and objectives. Bionocular, stereoscopic and phase contrast microscopes. Numerical aperture – resolving power – Airys disc, resolving power of a telescope – microscope and brightness.

SPECTROSCOPES & INTERFEROMETERS : Constant deviation spectroscope direct vision spectroscope – gratings – applications in spectroscopes. Twyman and Green Interferometer – Michelson interferometer – applications.

PHOTOMETRY, PROJECTION SYSTEM AND REFRACTOMETER : Basic laws of photo meter Abbe and Kohler illuminations – Episcope – Epidiascope, slide and over head projector – Abbe and palfrich refract meter.

LASERS : Einstein Coefficients, Q-switching & Mode Locking, Gas, Solid State and Semiconductor Lasers. Applications of Lasers.

Text Books :

1. Introduction to classical and modern optics by Jurgen R.Meyer – Arendt.
2. Optics by Finchem and freeman.
3. Applied optics and optical engineering vol. V: by Radon Kingslake.
4. Laser & Holography by Thyganrjn.

INE : 312 - ELECTRONIC INSTRUMENTATION

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

ANALOG INSTRUMENTATION : Electronic voltmeters VTVM, TVM, FETVM Voltmeters, electronic – multimeters differential voltmeters.

CATHODE RAY OSCILLOSCOPE : Block diagram vertical and horizontal amplifires, sweep circuits delay line, dual trace oscilloscopes. Q-meters, vector – voltmeters, instruments for generating and analyzing wave forms, sqare wave, pulse, standard-signal, random noise and function generators wave analysers spectrum analysers, wave-meters.

DIGITAL INSTRUMETNS : Digital voltmeters, digital frequency meters, digital display method and units, digital read out oscilloscopes, data acquisition system.

Textbooks : 1. Modern electronic instrumentation measurements techniques by Helfrick and cooper. 2. A course in electrical and electronic measurement and instrumentation by A.K.Shawney. 3. Electronic measurements and instrumentation by Rajendra Prasad.

INE : 313 – MICRO PROCESSORS AND APPLICATIONS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Micro processors – Introduction – evolution – architecture and micro computer systems – 8080/8085 based micro computer systems – 8085 CPU – block diagram instruction set – addressing modes – writing assembly language programs – soft ware development systems and assemblies – programming 8085 micro processor – looping – counting – indexing – stacks – sub routines- code conversions.

Memory interfacing and I/O interfacing of 8085 – address decoding – interfacing RAMS & EPROMS, I/O interfacing concepts – interfacing key boards and out put displays – direct I/O and memory mapped I/O, I/o techniques – simple polled and interrupt driven I/O – Interrupts of 8085 – interfacing data converters – A/D converter interface – D/A converter interface – stepper motor interface.

Programmable peripheral devices – 8255PPI, 8253 programmable interval timer, 8259 programmable interrupt controller, 8257 DMA controller, and 8279 key board / display device. Serial I/O and data communication techniques – software controlled asynchronous – serial I/O lines – hardware controlled serial I/O using programmable devices, 8251 USART.

Microprocessor applications – a smart scale design – μp based temperature and level measuring system. Overview of industrial process control system. An 8085 based industrial process control system – block diagram – comparison of contemporary 8 bit microprocessors – zilog z 80, Motorola 6800 etc.

Reference books: 1. Microprocessors architecture, programming and applications – R. S. Goankar – Wiley Eastern India Publications. 2. Microprocessors and digital systems – 2nd edition – D.V. Hall, McGraw Hill Publications. 3. Fundamentals of microprocessors and microcomputers – Badri Ram Dhanpat Rai & sons publications.

INE : 314 – CONTROL ENGINEERING 1 (CONTROL SYSTEM ENGINEERING)

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

The control systems, closed loop control, open loop control, servo mechanisms, Differential equations of physical systems, transfer functions, procedure for deriving transfer functions, Block diagram, algebra, signal flow graphs, Mason's gain formula, application of signal flow graph to control systems.

The concept of stability, necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion, application of a Routh stability criterion to Linear feed back systems. The Root locus concept, construction of root loci, construction rules, determination of roots from root locus. Relation between time and frequency response, polar plots, Bode plots, Niquist stability criterion, gain margin and phase margin, closed loop frequency response nichols chart.

Text books : 1. Nagarath IJ and Gopal M – Control systems and Engineering, Willey Eastery, 1985. 2. Ogata K – Modern control Engineering 2nd Edition PHI – 1995.

INE : 315 - COMPUTER ORGANIZATION AND OPERATING SYSTEMS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

computer arithmetic, point representations, introduction to CISC processor architecture, instruction set and addressing modes, hardware design principles polling of processors, memory types & interfacing & timing I/O handling, interrupts & DMA & device interfaces ? CRT, floppy disk, HDD, optical disk, serial interfaces & data acquisition, operating system concepts & architectural support privileged mode, software interrupts, memory hierarchy and virtual memory, multiprocessors concept, cache memory, pipelining and introduction, RISC processors, super scalar processors.

Text books: 1. Computer organization and architecture designing for performance, William Stallings 4th Ed.

INE : 316 - ELECTIVE (a)

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Unit –I

SIGNAL ANALYSIS: Approximation of a function by a set of mutually orthogonal functions, evaluation of mean square error. Orthogonality in complex functions. Trigonometric and exponential Fourier series. Representation of a periodic function by Fourier series. Fourier transform, properties of Fourier transform. Fourier transform of simple functions.

Convolution integral. Convolution in time domain and frequency domain. Graphical representation. Sampling theorem – statement and proof, aliasing.

UNIT – II

CORRELATION: Cross correlation and auto correlation functions, properties of correlation function, correlation and convolution, energy and power spectral density functions. Parseval's theorem.

UNIT – III

SIGNAL TRANSMISSION THROUGH LINEAR NETWORKS: Linear time invariant system. Transfer function. Filter characteristics of linear systems. Conditions for distortionless transmission. Causality and physical realizability. Bandwidth and rise time.

UNIT – IV

LAPLACE TRANSFORMS: Review of Laplace transforms, partial fraction expansion, inverse Laplace transforms, concept of region of convergence (ROC) for Laplace transforms. Constraints on ROC for various classes of signals, properties of Laplace transforms, relation between Lapalce transform and Fourier transform of a signal. Laplace transform of a certain signals using wave form synthesis.

UNIT – V

Z-TRANSFORMS : Fundamental difference between continuous and discrete time signals, discrete time complex exponential and sinusoidal signals, periodicity of discrete time complex exponential signals. Concept of Z – transform of a discrete sequence. Distinction between Laplace, Fourier & Z –transforms. Region of convergence in Z-transforms, constraints on ROC for various classes of signals, inverse Z – transforms, properties of Z-transforms.

TEXT BOOKS:

1. Signals, systems and communications – by B.P Lathi, BS publications.
2. Signals and systems – by A.V Oppenheim , AS Willesky & SH Nawab, PHI

REFERENCE:

1. Signals and systems – by Simon Haykins, Wiley Student Ed.

INE : 316 – ELECTIVE (B) RELIABILITY AND SAFETY ENGINEERING

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Reliability, introduction – definition of reliability failure data analysis – introduction – failure density, mean failure rate – mean time to failure (MTTF) – mean time between failure (MTBF) MTTF in terms of failure density – generalisation – reliability in terms of hazard rate and failure density.

HAZARD MODULES: Introduction – constant hazard – linearly increasing hazard – weibull model – density function and distribution function, distribution functions and reliability analysis – some important distributions – choice of distributions expected value standard deviation and variance. Conditional probability, additions – multiplication rules in probability, venn diagrams - sample space-probability calculation by venn diagrams – an example in structural reliability.

SYSTEM RELIABILITY: Introduction – series configuration – parallel configuration – mixed configurations – applications to specific hazard models – methods of solving complex systems – mean time to failure of systems – logic diagrams – Markov models – Markov graphs. Reliability improvement – introduction improvement of components redundency – element redundancy – unit redundancy – stand by redundancy – optimization and reliability- cost trade off .Maintainability and availability – introduction- maintainability – system down time – availability, availability, reliability and maintainability trade – off – reliability allocation for series systems. Fault – tree analysis and other techniques – fault-tree analysis introduction – calculation of reliability from fault tree – tie set

and cut set methods – use of Boolean algebra – basic operations truth tables – demogans thermos – applications to reliability analysis.

TEXT BOOKS: 1.Reliability engineering by E.Balguruswamy Publishers T.M. 2.Reliability and life testing by S.K.Sinha Welly Eastern Ltd.

INE : 316 - ELECTIVE (C) - NON-DESTRUCTIVE TESTING

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Need for inspection- quality of inspection-Benefits of NDT-Liquid penetrant inspection-Principles- Characteristics of a penetrant- Water washble systempost emulsifiable system-Solvent removable system- Surface preparation and cleaning- Penetrant application- Sensitivity-Viewing- Recording- Applications.

Magnetic methods; Basic principles- Magnetising methods- Characterristics of magnetic particles- Magnetic links- Magnetography- Fiels sensitive probes- Measurement of metal properties- Fferrography- Applications.

Ultrasonic testing: Basic priniciples- different kinds of ultrasonic waves- Propeties propagation-Mode conversion- Construction of normal and angle probes- Piezo electric materials-attenuation. Different methods of flow detection - Transmission,refletion and immersion methods. Pulse- Echo method- Different types of display- A- Scan,B-Scan, C-Scan methods-Identification of detects- Sensitivity- calibration and reference standards- Applicatons.

Radiographic methods: general priciples- X-ray and gammaray sources- Shadow formaton-Enlargement and distortion recording of radiation-Radio graphic techinics- Single and double image techinics- Sensitivity- Penetramaters- Fluoroscopic method- Real time radiography-Application.

Electrical methods: Principle of eddy current testing- Conductivity of material- Maganetic properities- Coil impedence. Lift off factor and edge effect- Sking effect- Impedace plant diagrams- inspection frequency- Coil arragements inspection problems- Types of circuit-Reference standardas- Phase analysis-Display methods- Typical applications.

Other methods: Optical holographic methods- Electronic / speckle pattern inter-formetry dynamic inspection-Neutron Radiography-Laser induced ultrasonics-Crack depth gauges-Thermography-Surface texture analysis-Acoustic emission methods.

Textbooks:1.Non-destructive testing by Barry Hull and Vennon john ELBS/Momillon,1988, 2.Non-destructive testing by R.Halmshaw Edward Arnold, London. 3.Non destructive testing by Warren J.Mcgonnagle McGraw-hill book Co., 1961. Reference books: 1.Ultrasonic testing of material by J.Krantkramer and H.Krantkramer Springer Verlag, Newyork. 2. Ultrasonic Engineering by Julien r. Frederick, chapters 1,2,4,7, John wiley & son Newyork.

INE : 316 - ELECTIVE(D) - ADVANCED SENSORS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Semiconductor Sensors: Metal Oxide Semiconductors, Hall Elements. Silicon Sensors : Silicon Planar Technology, Micromachine Technology, Silicon Sensors for sensing radiation, mechanical, magnetic, chemical and other signals, IC sensors. Chemical & Biomedical Sensors: Polymers, chemically modified electrodes, membrane, Electrodes, thick film devices, catelytic devices, integrated Optics. Micro-Sensors: thin film sensors, magnetic and chemical signals. Interfacing and signal processing: Intelligent and smart sensors, Concepts of redundant and multisensory systems, operation in coded mode and mapping mode.

Text books: 1.Middlehoek S and Audel S.a-silicon sensors, Academic Press London, 1989 2. Edmonds T E (Ed)-chemical sensors, Blackie,London,1988. 3. Sensors and Actuators: No.8,1985(pp.227-233);No.10.1986(pp.65-82);No.12.1987(pp.129-144). 4.Patranabis D -sensors and transducers, Wheeler Publishing.

INE:319 – SOFT SKILLS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
--	--	3	3	--	--	100	100

Communication:
Importance of communication
Non verbal communication
Personal appearance
Posture
Gestures
Facial expressions
Eye contact
Space distancing

Goal setting:
Immediate, short term, long term,
Smart goals, strategies to achieve goals

Time management:
Types of time
Identifying time wasters
Time management skills

Leadership and team management:
Qualities of a good leader
Leadership styles
Decision making
Problem solving
Negotiation skills

Group discussions:
Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
Group behavior, Analyzing performance

Job interviews:
Identifying job openings
Preparing resumes & CV
Covering letter
Interview (Opening, body-answer Q, close-ask Q),
Types of questions

Reference books:

1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication Skills' by Jain Alok, Pravin S.R. Bhatia & A.M. Sheikh, S.Chand & Co.

INE : 321 – DIGITAL SIGNAL PROCESSING

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

INTRODUCTION TO DIGITAL SIGNALS AND SIGNAL PROCESSINGS: Continuous – time and discrete –time signals, discrete time signal and their characteristics, discrete – time signals from continuous time signals, linearity, shift invariance and convolution sum, stability and casuality, linear constant coefficient difference equations, frequency response of discrete – time system transfer function relationship.

Z – TRANSFORM: Introduction, linearity, casuality and shift invariance frequency response of sampler sampling theorem Z- transform some useful discrete – time functions, convergence of Z – transform, properties of Z- transform, inverse Z- transform, responses corresponding to different pole locations in the Z- plane, two – side Z- transform.

DISCRETE FOURIER TRANSFORM: introduction, properties of DFT, comparison of circular convolution with linear convolution, relation between DFT and Z- transform, sampling the Z-transform, linear convolution using DFT, pitfalls in using DFT, computation of DFT using fast fourier transform decimation – in – time (DIT) algorithm, FFT FORTRAN program, decimation – in frequency (DIF) algorithm, binary equivalent description of FFT (DIF). Theory and design of infinite impulse response (IIR) digital filter.

INE : 322 – ADVANCED MICROPROCESSORS & MICRO CONTROLLERS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

General architecture of a microcomputer system – 8086/8088 – 16 bit microprocessors – architecture – address/data bus structure – control bus, minimum/maximum modes – software model of 8086/8088 – BIU and EU –registers – segment addressing – addressing modes, programming the 8086/8088 microprocessors – instruction set memory interface and I/O interface for 8086/8088 μps of 8087 a co-processor.

80186/80188 – 16 bit processor introduction – architecture – instruction set – 80286 microprocessor architecture – real address mode, protected virtual address mode – memory management – selectors – descriptors – address translation registers – instruction set.

32 bit microprocessor – the 80386 – introduction – registers – operand addressing – 80386 implementation and bus operation, the 80486 – performance – block diagram – software compatibility – cache support – NDP – memory management unit (MMU) – pipelining facility – task switching – instruction set. Pentium and Pentium Pro Processors.

Single chip microcomputer – introduction – 8748 micro controller architecture instruction decoder, ALU – program memory – data memory – I/O ports – BUS Ports, Test and I N T Inputs Instruction Set – Programming.

8051 Micro Controller Family - Architecture, Parallel and Serial I/O - Instruction Set – Programming.

8096 Micro Controller – CPU, RAM space, Memory space, High Speed Input & Outputs, Analog Inputs - Serial I/O Ports - Parallel I/O Ports and Watch Dog Timer.

Reference Books: 1. The 8088 and 8086 microprocessors – programming interfacing, software, hardware and applications W. A. Triebel. Avatar Singh – PHI Publications. 2. Microprocessors and micro controller – B.P. Singh – Galgotia Publications. Pvt. Ltd. 3. Microprocessors and interfacing – programming and hardware – D.V. Hall – TMH. INTEL Micro Processors By Barry Bray. PHI Publications.

INE : 323 - INDUSTRIAL ELECTRONICS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks

3	**1**	**--**	**4**	**3**	**70**	**30**	**100**

THYRISTORS: PNPN diode: Basic structure. Two transister version. Volt Ampere Characteristics. Holding current. Temperature dependence. rate effect. Bilateral PNPN diodes switch(DIAC) : Basic structure. Volt-Ampere charactreristics. Silicon controlled Rectifire(SCR): Basic structure. Two transister Representation. Volt-Ampere charestics.ON and OFF times of gate.SCR rating. Silicon Controlled Switch(SCS): Basic structure.Two transister equivalent. Diode transister equivalent. Traic: Basic structure. Volt-Ampere characteristics. positive bias and nagitive bias operatons . uni junction transister: Basic structure.Potential divider equivalent. Static emitter characteristics. Gate circuit of SCR. Two SCR's connected back to back. Dlay firing of SCR by phase shifted AC wave. Delay firing of SCR by UJT.

POLY PHASE RECTIFIERS: Three phase half wave delta -wye rectfier with resistive load. Six - phase star Half wave rectifier with resistive load. Delta line to line double wye half wave rectifier with inter phase transformer and with resistive load. three phase delta wye bridge rectifier with resistive load. General m-phase rectifier DC power outputs, efficiencies and ripple factors. Transformer utility factor.Rectifier performance Commutation in polyphase rectifiers.

RESISTANCE WELDING: Basic circuit for a.c.resistance welding.Spot welding. Projection welding. Butt welding, Seam welding and Pulsating welding arrangements. Induction Heating: Principle of induction heating. Applications. High frequency power source for induction heating. Dielectric Heating: Principle of dielectric heating. Electrodes used in dielectric heating. Methods of coupling of Electrodes to R.F.Generator.Applications.

CONTROLLED RECTIFIERS (outlines of topics only): Single-Phase Controlled Rectifiers: Half-wave controlled rectifier with resistance load. Full-wave controlled rectifier with resistance load. Three-Phase Controlled Rectifiers: Half wave controlled rectifier with resistance load. Six-phase half-wave Controlled rectifier with resistance load.

ELECTRONIC SPEED CONTROL OF MOTORS (outlines of topics only): DC Motor sreed Control: Methods of speed control, single phase SCR feedback circuit for series motor drive. Half controlled SCR bridge for series motor drive. Chopper-controlle rotor resistance scheme. Speed control by variation of stator voltage using SCRs.Closed-loop speed control of an induction motor by variation of stator voltage using SCRs.Variable-frequency A.C.motor drive.Voltage-fed inverter control.P.W.M. control scheme. Current-fed inverter control.

Text books: 1.Industrial Electronics by G.K.mithal and Ravi mittal. Khanna publishers. 2. Power electronics by P.C.Sen, T.M.H. 3.Thrister Engineering by M.S.Berde.

INE : 324 – PROCESS CONTROL & CONTROL COMPONENTS

L	**T**	**PD**	**TOTAL Pds**	**Univ Exam**		**Sessnl Marks**	**Total Marks**
				Hrs	**Marks**		
3	**1**	**--**	**4**	**3**	**70**	**30**	**100**

Process Dynamics: Process variable and load variables. Dynamics of simple pressure, flow, level and temperature processes. Interacting and non-interacting systems, continuous and batch process. Servo and regulator operation problems.

Optimum controller settings: Evaluation criteria-1/4 decay ratio, I.A.E., ISE, ITAE. Determination of optimum settings for mathematically described process using time response and frequency response.

Tuning of controllers: Continuous oscillation and damped oscillation methods-problems, process reaction curve method.

Multi loop control systems: Feed forward, ratio, cascade and split range controls. Multivariable control –examples from distillation column and boiler systems.

Final control elements: I/P, P/I converters, pneumatic, electric and hydraulic actuators. Relief and safety valves, relays and volume boosters.

Control valve sizing: Flow formulae through control valves. Viscosity correction, range ability, turn down cavitation and flashing in control valves.

References: 1. Pollard A, Process control. 2. Eckman, D.P., Automatic Process and Control. 3. Harriot,P., Process control. 4. Patrinabis,D, Principles of process control.

INE : 325 – CONTROL SYSTEMS II

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Introduction to complex control system, state variable analysis of dynamic systems, conical forms, stability, controllability and observability.

Continuous and discrete systems, linear system design by state variable feedback. Introduction to optimal control quadratic performance index and regular problems.

Non linear elements and systems – phase plane and describing function methods.

Stability analysis and liapunov's method.

Textbooks:1. Gopal, M. – Modern control theory.

INE : 326 - ELECTIVE (A) PETRO CHEMICAL PLANT INSTRUMENTATION

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Basics of petro-chemical production, importance of automation

Automation strategy: different levels, input, output data

Batch process description and terminology: batch process classification, batch automation, recipe activities, control functions.

Batch process and their automation: batch standards, definitions, models, characteristics of a batch process, equipment for batch automation, batch control functions.

Distillation column controls: basic control, columns, condensers, reboilers, models-steady state and dynamic.

Advanced control strategies: process model, feed forward systems, supervisory control.

Model based control, multi variable control , dynamic matrix control, nueral control.

Pollution control and monitoring for petro-chemical plant environment.

Text Books:

1. D. Patranabis: Principles of process control., TMH, New Delhi, second edition.
2. Krishna Kant: Computer based industrial control, Prentice Hall India Pvt Ltd.
3. George Stephanopoulos: Chemical process control; Prentice Hall India Pvt Ltd.

Reference:

Bela.G.Liptak: Instrumentation Engineers Hand book

INE : 326 - ELECTIVE(B) POWER PLANT INSTRUMENTATION

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Basics of power plant operation- major input variables, major control variables
Automation strategy: Distributed hierarchical system, software for data logging- input/output variables- direct digital control, man- machine interface, communication
Automatic boiler control- basic boiler operation
Combustion controls; series-parallel operation, optimizing control for air-flow- oxygen trimming control
Drum level control: feed water control, drum level control, steam flow control, two-element control, and three-element control

Furnace pressure control, steam temperature control, super heater control

Digital electro hydraulic governor: basic functions, turbine speed control

Automatic startup systems- safety systems

Text Books:

1. D. Patranabis: Principles of process control., TMH, New Delhi, second edition.
2. Krishna Kant: Computer based industrial control, Prentice Hall India Pvt Ltd.
3. George Stephanopoulos: Chemical process control; Prentice Hall India Pvt Ltd.

Reference:

Bela.G.Liptak: Instrumentation Engineers Hand book

INE : 326 - ELECTIVE (C) STEEL PLANT INSTRUMENTION

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Basics of steel production; mill zones: iron zone, steel zone, mill zone, utility zone
Automation strategy: different levels, input, output data.
Iron zone: supervisory control, direct digital control; instrumentation for-raw material handling, coke oven, sinter plant, Blast furnace; input/output data, control architecture.
Steel zone: Automation for- LD converters, continuous casting, soaking pit control, blooming mill controls.
Utility zone: instrumentation for-Gas distribution, liquid fuel distribution, power generation, steam generation, compressed air generation
Instrumentation for water management system
Pollution control and monitoring for steel plant environment.

Text Books:

1. D. Patranabis: Principles of process control., TMH, New Delhi, second edition.
2. Krishna Kant: Computer based industrial control, Prentice Hall India Pvt Ltd.
3. George Stephanopoulos: Chemical process control; Prentice Hall India Pvt Ltd.

Reference:

Bela.G.Liptak: Instrumentation Engineers Hand book

INE : 326 - ELECTIVE (d) INSTRUMENTATION FOR SPECIAL PROCESSES

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Air handler and building conditioning controls. Batch control description and terminology. Batch process and automation. Blending and ratio controls, boiler control and optimization. Centrifuge controls, chiller control and optimization. Clean room control and optimization. Compressor control and optimization, cooling tower control and optimization. Crystallizer controls, distillation basic controls and advanced controls – relative gain calculations. Dryer controls – evaporator controls. Extruder controls – fan controls. Furnace and reformer controls. Heat exchanger, condenser and evaporator controls. ORP controls, PH control, pump control and optimization. Reactors: control and optimization, Recipe charging and batch automation. Reactors: Simulation and modeling, rolling mill controls, steam turbine controls, water treatment controls.

Reference :

1. Process control by Liptak

INE : 411 - CONTROL ENGINEERING III (COMPUTER BASED PROCESS CONTROL)

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Introduction: Historical developments of control systems-current trends in computer control of process plants. Fundamentals of automatic process control-Process definition feedback control-Single controller loop-Two Position control- multiposition control - PID control - Multivariable control - Feed forward control. Building blocks of Automation system - Processing system - Multi microprocessor systems - local area networks- Analog and digital I/O modules - supervisory and data acquisition systems - Remote terminal unit. Direct Digital Control (DDC): introduction - DDC Structure - DDC software position algorithm and velocity algorithm, Microcomputer based DDC structure. Programmable logic controllers (PLC's)-Principles of operation, Architecture of programmable controller- Programming the programmable controllers-Ladder diagram instructions-Software-configuration-applications. Distributed Digital Control: Introduction - Distributed vs Centralized control - Advantages-Functional requirements of distributed process control system - System Architecture-Distributed Control System (DCS)-Sub-systems-Local field station-Presentation and monitoring device-Communication options in DCS - configuration. Some popular distributed control systems. Display systems-Display parameters-Display in process control environment-Computer graphics. Personal Computers in real time environment - PC system and facilities-PC bus and signals - interrupts-interfacing PC to outside world - PC in real time environment - Application of IBM PC in real time - PC based distributed control systems. Modeling and simulation - Mathematical model of a plant-model evaluation and improvement-modern tools for modeling and simulation of systems, application examples. Industrial control applications-cement plant - thermal power plant- water treatment plant-irrigation canal management steel plant.

INE : 412 ---VLSI DESIGN

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

INTRODUCTION TO VLSI TECHNOLOGY:
Various types of technologies – Bi-polar, MOS, CMOS, NMOS, PMOS.
The generic process flow for a typical cMOS including device structures. Current states of the art in terms of devices, feature sizes. Modeling at various levels – Process modeling, devices modeling, circuit modeling. Circuit delays as function of technology and other parameters.

SEMI-CUSTOM INTEGRATED CIRCUIT DESIGN:
Gate arrays including channeled sea-of gates and FPGA. Standard Cells. Design approach for full custom and semi-custom devices.

VLSI DESIGN TOOLS:
VHDL synthesizers, simulators, layout, design rule checks, test vector generation, BIST.

THE DESIGN FLOW:

Capturing of user impediments, circuits synthesis, simulations, layout, post layout simulators, foundry specific features, testing, qualification.

PACKAGING:
Types of packages, constraints, thermal models.

ANALOG DESIGNS:
Circuits, performance parameters

Reference:
Applications specific integrated Circuits by Michel John Sebastian Smith, Addison Wesley, 1997.

Introduction of VLSI by Mead and Convay.

Basic VLSI Design by Douglass 3rd Edition, A Puchnell and Kamran Eshraghian, PHI,1994.

INE : 413- INDUSTRIAL MANAGEMENT

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Principles of plant organisation, Organisation design; responsibility, authority, span of control; organisation chart. Plant location, facilities layout and line balancing-factors governing plant location, local economics and rural vs urban plant sites; objectives principles of layout, process, product and cell layout; work station design, line balancing.

Principles and practice of management-function of management, scientific management types of organisations. Types of ownership - advantages and disadvantages. Types of leaders and leadership styles. Personnel management, recruitment and training. Safety and safety programmes, welfare measures, industrial disputes and grievance handling procedures, employee participation and union mangement relations.

Quality and quality control quality assurance, ISO 9000 and total quality management (TOM), reliability, maintainability and maintenance management. Small scale industries - role and scope at small scale industries, government assistance and incentives to small scale industries, assistance to educated reemployed and a model scheme to start a small scale industry.

Textbooks : 1.KoontzH.O'Donnell C and Weihrich H- Essentials of management, McGraw Hill, international Edn, 1986.2. Blanchard B S - engineering organization and management, prentice hall of India, N. Delhi. 3. Khanna O P- Industrial engineering and management, dhanpat raj & sons,N.Delhi 4. RiggsJ L - Production system planning, analysis and control, john Wiley, 4th edition, 1987.

INE : 414 - BIOMEDICAL INSTRUMENTATION

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Introduction to the man-instrument system – components of the system – physiological systems of the body – problems encountered in measuring a living system –transducers for biomedical applications – sources of bioelectric potentials – resting and action potentials, sodium pump – electrode theory – bio potential electrodes – bio chemical transducers.

The cardiovascular system – the heart – blood pressure – characteristics of blood flow – heart sounds – electro cardiography – measurement of blood pressure – sphygmomanometer automated methods – direct measurements – percentaneous insertion catheterization – transducer implantation – measurement of blood flow and cardiac output - plathysography – measurement of heart sounds – elements of intensive care monitoring – pacemakers – defibrillators. Physiology of the respiratory system – tests and instrumentation for the mechanics of the breathing – gas exchange and distribution respiratory therapy inhalators – ventilators and respirators humidifiers nebulisers and aspirators. Non invasive diagnostic instrumentation - temperature measurements – principles of ultra sound measurement and diagnosis – echo – cardiogram – echo encephalogram – ultra sonogram.

The nervous system and its anatomy – neuronal communication – the organization of brain – neuronal receptors – the somatic nervous system – the autonomic nervous system – measurements from the nervous system – neuronal firing measurements EEG and EMG.

Psycho physiological measurements – BSR and GSR – principles of polygraph – beksey audiometer – skinner box – bio feedback instrumentation – introduction to biotelemetry and parameters adaptable to it implantable units – application of telemetry in patient care.

Instrumentation for the clinical laboratory – blood testing – chemical tests – automation of chemical tests. X-ray and radioisotopes – radiation therapy. Computer in biomedical instrumentation – interfacing of the computer with medical instrumentation linear tomography axial tomography – CAT scan. Physiological effects of electric current – shock hazards from electric equipment – methods of accident prevention.

Text books: 1. Chromwell et al biomedical instrumentation, prentice – hall (India) inc. 2. handbook of biomedical instrumentation R. S. Khandpur, tata McGraw hill pub company Ltd, New Delhi.

INE : 415 - DATA COMMUNICATION & NETWORKING

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Introduction, uses of computer networks, network hardware, network software, reference models. The internet, broadband ISDN and ATM, comparison of services. Local area buses and

ring structures. Fibre optical local area networks, adapting fibre optics to MAP protocols, adapting fibre optics to buses, MAP/ TOP network protocols. Field bus standardisation Smart transmitters- transmission modes, profibus, international field bus standards-intelligent controllers, introduction , model based controllers, predictive control, Artificial intelligent based systems, Expert controllers Fuzzy logic tools, artificial neural networks, neural controllers, neuro-fuzzy control system.

Textbooks : 1. Computer Networks -ANDREW S. Tanandaum 3rd edition., ph. 2. Instrument engineers handbook B.G. Liptak 3rd edition.

INE : 416 - ELECTIVE(A) TELEMETRY

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

CLASSIFICATION OF TELEMETRY SYSTEMS voltage, current position, frequency, pulse, land-line and radio telemetry.

LAND-LINE TELEMETRY voltage telemetering system current telemetering system motion balance current telemetering system position telemetering system using bridge configuration position telemetering system using sychors.

AMPLITUDE MODULATION AND DEMODULATION OF A CARRIER WAVE Expression for an AM-wave frequency spectrum of an AM-wave bandwidth AM-detector illustration of AM for measuring system full-wave phase sensitive demodulator block diagram of carrier amplifier system.

FREQUENCY MODULATION AND DEMODULATION OF A CARRIER WAVE Expression for an FM-wave frequency spectrum of an FM-wave bandwidth diode FM modulator phase shift discriminator ratio detector.

AMPLITUDE MODULATION AND DEMODULATION CIRCUITES FOR MEASURENT SYSTEMS: Basic configuration for a modular electromechanical chopper semiconductor modulator balanced modulator basic configuration of a demodulator chopper demodulator semiconductor demodulators balanced demodulator. Block diagrams of DC and AC signal conditioning systems.

MULTIPLEXING IN TELEMETRY SYSTEMS: Block diagram of multiplexer and its mechanical switch equivalent block diagram of a demultiplexer and its mechanical switch equivalent frequency division multiplexing time division multiplexing sample-and –hold circuit an out line of pulse modulation techniques used in telemetry.

RADIO TELEMETRY SYSTEMS: Analog TDM system FM-FM telemetry system standard telemetry channel frequencies for FDM block diagrams of PAM, PCM, and FDM telemetry systems.

TRANSMISSION CHANNELS: Wire line channels, radio channels, microwave channels, power line carrier channels and fiber optic transmission.

References: 1.Electrical and electronics measurements and instrumentation, by A.K.Sawhney, Dhanpat Rai & Sons .2.Introduction to Telemetry by Alan Andrews, Foulsham-Sams technical

books, published by W-Foulsham &Co Ltd., England. 3. Understanding telemetry circuits, by John D.Lenk, Foulsham – Sams technical books, Published by W.Foulsham & Co., England

INE : 416 - ELECTIVE(B) ARTIFICIAL INTELLIGENCE

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

BASIC PROBLEM SOLVING METHODS: Production systems – state space search –control strategies – heuristic search – forward and backward reasoning – hill climbing techniques – breadth first search – depth first search – best search – staged search.

KNOWLEDGE REPRESENTATION: Predicate logic – resolution question answering – nonmonotic reasoning – statistical and probabilistic reasoning semantic nets – conceptual dependency – frames- scripts.

A1 LANGUAGES: important characteristics of A1 languages- PROLOG, introduction to expert systems,structure of an expert system-interaction with an expert design of an expert system.

NEURAL NETWORKS: basic structure of a neuron, perception feed forward, back propagation, Hopfield network.

FUZZY LOGIC: fuzzy sets, member ship function, rules and algorithms, de-fuzzication and implementation.

Textbooks: 1. Rich E and knight K- Artificial intelligence. Tata McGraw Hill, New Delhi 1991. 2. Nillson NJ – Principals of artificial intelligence, Springer Veriag Berlin 1980. 3. Barr A.Fergenbaum E A & Cohen P R- Artificial intelligence, edition- Wesley reading (mass 0,1989). 4. Water man D A- A guide to expert systems, edition- Wesley reading (mass),1986. 5. Artificial intelligence Hand book VOL 1-2,ISA,Reasearch triangle park,1989. 6. Kos Ko B-neural networks and fuzzy systems, PHI.

INE : 416 - ELECTIVE (C) ROBOTICS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Introduction: Need for automation, Robotics fundamentals, Classification of Robots **(6)** based on co-ordinate system, Method of control, Major components of Robotics system, fixed and flexible automation, Application of Robotics.

Mechanical system: Components of Robot - Manipulator, Controller, Sensors, Power **(8)** conversion unit, Fundamentals of Pneumatic, Hydraulic and Electrical actuators used in Robots, Vision systems for Robot.

Motion conversion: Rotary to rotary, Rotary to Linear, Linkages, Modeling of **(6)** Mechanical systems - Translational, Rotational, Kinematics' chain, Lagrangian analysis of manipulator, End effectors, Control of Robotic joints.

Transformation and Kinematics: Homogeneous co-ordinates, Vector operations, **(12)** Matrix operations, Co-ordinate reference frames, Homogeneous transformation and manipulator orientation, Relative points reference frames forward solutions – Link co-ordinate frames, Denavit Hartenberg (D-H) Matrix.

Inverse or back solution: Problem of obtaining inverse solution, Techniques using **(8)** direct and geometric approach. Motion generation - On and off line trajectory, Velocity profile, Acceleration profile, Cartesian motion of manipulator, Joint interpolated control, Jacobian in terms of D-H matrix.

Computer consideration for Robot system: Robot programming - Fixed instruction **(4)** sequence control, General programming language, Specific programming languages.
Artificial intelligence and Robotics: Artificial intelligence, Real time considerations, **(6)** Event driven processes and Sensor information processes. Path Planning - Co-ordination motion, Automatic programming.

Reference Books:
1. R.J. Schilling: Fundamental of Robotics - Analysis and control.
2. R. Jain, R. Kasturi and B. J. Shunck: Machine Vision.
3. M. P. Groover: Automation, production systems and computer integrated manufacturing.

INE : 416 - ELECTIVE(D) FUZZYLOGIC AND NUERAL NETWORKS

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Motivation [1].

The role of neural networks in engineering, artificial intelligence, and cognitive modeling.

Supervised learning in neural networks [4].

Feed-forward neural networks of increasing complexity, gradient descent learning and extensions, learning and generalization theory

Computation and dynamical systems [4]

Hopfield model of content-addressable memory, Hopfield-Tank approach to optimisation, resistive networks for vision models, complex dynamical learning models.

Reinforcement Learning [4]

The problem of reinforcement learning, Arp learning, Q-learning, TD-learning. Generalization and function approximation.

Unsupervised Learning [4]

Competitive learning, Self-organizing feature maps, ART networks, GWR networks.

Selected Applications [8]

Fuzzy Systems

An introduction to fuzzy logic , Operations on fuzzy sets, Fuzzy relations , The extension principle ,Metrics or fuzzy numbers , Fuzzy implications , Linguistic variables , The theory of approximate reasoning , An introduction to fuzzy logic controllers, Defuzzification methods , Inference mechanisms , Construction of data base and rule base of FLC , Ball and beam problem , Aggregation in fuzzy system modeling, Averaging operators, Fuzzy screening systems , Applications of fuzzy systems.

Textbook:

1. Haykin S., *Neural Networks* , 2nd Edition, Prentice Hall, 1999, ISBN 0 13 273350 1
2. Intoduction to Neuro-Fuzzy Systems, Advances in Soft Computing Series, Springer-Verlag, Berlin/Heildelberg, 2000, 289 pages. [ISBN 3-7908-1256-0]

INE : 421 – FIBER OPTICS & FIBER SENSORS

L	T	PD	TOTAL Pds	Univ Exam Hrs	Univ Exam Marks	Sessnl Marks	Total Marks
3	1	--	4	3	70	30	100

Optical Fibers :

Elements of a Optical Fiber Transmission Link, wave guiding. The Nature of Light:

Linear Polarization, Elliptical and Circular Polarization, The quantum Nature of Light.

Basic Optical Laws and Definitions, fiber types, Rays and Modes, Step and Graded Index fiber structure, mode theory for circular wave guides.

Signal Degradation in Optical Fibres : Attenuation : attenuation units, Absorption, Scattering Losses, Bending Lasses, core and cladding Losses.

Signal Degradation in Optical Waveguides :
Information Capacity Determination, Group delay, Material Dispersion, Waveguide Dispersion, Signal Distortion in signal-Mode fibers, Mode Dispersion and Inter modal Distortion.

Pulse Broadening in Graded-Index waveguides.

Sensors :

Intensity-modulated sensors :
Introduction, Transmissive Concept, reflective Concept, Micro bending Concept, Intrinsic Concept.

Phase-Modulated Sensors:
Introduction and Interferometer Techniques.

Wavelength-Modulated Sensors:
Introduction, Bragg Grating Concept and Bragg Grating Technology.

Temperature Sensors:
Introduction, Reflective concept, Micro bending Concept, Interferometric Concept and Bragg Grating concept.

Pressure Sensors:
Introduction, Transmissive Concept, Micro bending and Intrinsic concepts, Interferometer concepts and Bragg Grating concept.

Text Books :
Optical Fiber Communications by Gerd Keiser
Optical Communication Systems by Gower
Optical Communication Systems by Senior
Fiber Optics Sensors B.D.Gupta.

INE : 422 –ANALYTICAL INSTRUMENTS

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Introduction, laboratory and industrial analzers classification of the methods of analysis block diagram of an analysing system. Sampling systems, and their importance, automatic sampling, Colorimeters & Spectrophotometers (visible & ultraviolet) electromagnetic radiation, the Beer Lambert law absorption instruments calibration if the systems. Infra - red spectrophotometers types of instruments, principles of operation, basic components of the systems, calibration if the systems. Nuclear magnetic resonance spectrophotometer (NMR) principle, construction, details fourier transform NMR, spectroscopy computerised NMR. Electro spin resonance spectrometer (ESR), principle of operation construction of the ESR spectrometer. X-ray spectrometer : X-ray spectrum, instrumentaion for X-ray spectrometery X-ray diffratometers X-ray absorption meters X-ray fluroscence spectrometers. Gas & liquid chromatographic systems : Principles of chromatography, Schemes and constructional details and functions of chronatographic system components.

THERMO ANALYTICAL SYSTEMS : Systems working on thermal conductivity. Principle of operation- conductivity cell construction-Measuring circuits. Differential thermal analysis.- principle of operation - instrumentation and working.

ELECTRO-CHEMICAL INSTRUMENTS: electro-chemical cell, construction-potentiometers. conductivity meters- construction-measurement of conductance. polarographs-types of electrodes-instrumentation.

PH MEASURING SYSTEMS : Principles of PH measuring electrodes, measuring-reference-selective ion type measuring circuits, industrial PH-meters

INDUSTRIAL GAS ANALYZERS : Types of gas analyzers- flue gas analyzers, paramagnetic oxygen analyzers, electrochemical gas analyzers. Hydrozen gas analyzers-IR gas analyzers, analyzers based on gas density systems based on ionization of gases.

ENVIRONMENTAL POLLUTION MONITORING INSTRUMENTS:Air pollution monitoring, instrument systems for-carbon monoxide-sulpher dioxide-nitrozen oxides-hydro carbons-ozone automated wet chemical analyzerswater pollution monitoring.

REFERENCE : Handbook of analytical instruments - R.S.Kandhpur, TMH pub, instrumental methods of analysis-HH Willard,Jr.,JA Dean,FA Settle,JR,CBS Publications. Mechanical and industrial measurements-RK Jain,kanna pub, instrument engineers Handbook.Instrumentation and Analysis-GB Liptak Edition-Charge Chilton book Company.

INE : 423 - DESIGN OF INSTRUMENT SYSTEMS

L	T	PD	TOTAL Pds	Univ Exam		Sessnl Marks	Total Marks
				Hrs	Marks		
3	1	--	4	3	70	30	100

Design of Pressure and vaccum guages with bourdon tubes,bellows and diaphragms. Design of manometers-single, two liquid U-Tube manometers, inclined tube, well and ring types. Design of flow meters-orifice, ventury and Rota meters. Design of liquid level measuring instruments-displacer and bubble types. Design of control system components-flapper nozzle with ball valve, pnuematic globule valve, butterfly valve and saunders patent valve. Design of temp measuring systems with RTD, thermocouples and thermistors. Design of displacement measuring circuits with LVDT,and differential capacitors.Design of strain guages and measuring circuits. Design of piezoelectric transducers and measuring circuits.

References: DP Eckman-industrial instru