

TEACHING & EVALUATION SCHEME

DISCIPLINE : APPLIED ELECTRONICS & INSTRUMENTATION

SEMESTER : III

Sl. No.	Subject	Teaching Scheme (House/ Week)			Evaluation Scheme					Total Marks
		L	T	P	End Exam.	Theory		Practical		
						Internal Assessment		End Exam	Sessional	
						Class Test	Assignment			
1.	Operating System	4	–	–	80	15	5	–	–	100
2.	Process Instrumentation – 1	4	–	–	80	15	5	–	–	100
3.	Digital Electronics	4	1	–	80	15	5	–	–	100
4.	Electronic Device & Circuits	4	1	–	80	15	5	–	–	100
5.	Engg. Math – III	4	–	–	80	15	5	–	–	100

PRACTICAL

1.	Operating System Lab	–	–	5	–	–	–	50	50	100
2.	Process Instrumentation Lab – I	–	–	5	–	–	–	25	25	50
3.	Digital Electronics Lab	–	–	5	–	–	–	25	25	50
4.	Technical Seminar	–	–	2	–	–	–	25	25	50
	Total	20	02	17	400	75	25	125	125	750

Floating Subject :

- (i) Computer Architecture and Organization (Syllabus same as 3rd seme IT)
- (ii) Video Editing Using in Photoshop.

TEACHING & EVALUATION SCHEME

DISCIPLINE : APPLIED ELECTRONICS & INSTRUMENTATION

SEMESTER : IV

Sl. No.	Subject	Teaching Scheme (House/ Week)			Evaluation Scheme					Total Marks
		L	T	P	End Exam.	Theory		Practical		
						Internal Assessment		End Exam	Sessional	
						Class Test	Assignment			
1.	Electrical Machine	4	–	–	80	15	5	–	–	100
2.	Circuit Theory	4	1	–	80	15	5	–	–	100
3.	Elements of Instrumentation	4	1	–	80	15	5	–	–	100
4.	Signal Conditioning & Data Converters	4	1	–	80	15	5	–	–	100

PRACTICAL

1.	Electrical Machine Lab	–	–	6	–	–	–	50	50	100
2.	Circuit Theory Lab	–	–	6	–	–	–	50	50	100
3.	Signal Conditioning & Data Converter Lab	–	–	6	–	–	–	50	50	100
4.	Technical Seminar	–	–	2	–	–	–	25	25	50
	Total	16	3	20	320	60	20	175	175	750

Floating Subject :

- (i) Communication Engg (Syllabus same as IV same ETC Engg.)
- (ii) Operating System & System Programming (Syllabus same as IV seme IT.)

TEACHING & EVALUATION SCHEME

DISCIPLINE : APPLIED ELECTRONICS & INSTRUMENTATION

SEMESTER : V

Sl. No.	Subject	Teaching Scheme (House/ Week)			Evaluation Scheme					Total Marks
		L	T	P	End Exam.	Theory		Practical		
						Internal Assessment		End Exam	Sessional	
						Class Test	Assignment			
	THEORY									
1.	Process Instrumentation – II	4	1	–	80	15	5	–	–	100
2.	Biomedical Instrumentation	4	–	–	80	15	5	–	–	100
3.	Process Control	4	–	–	80	15	5	–	–	100
4.	Industrial Control & Devices	4	–	–	80	15	5	–	–	100
5.	Microprocessor and its Interfacing	4	1	–	80	15	5	–	–	100

PRACTICAL

1.	Process Instrumentation Lab – II	–	–	5	–	–	–	25	25	50
2.	Process Control Lab	–	–	6	–	–	–	50	50	100
3.	Microprocessor and its Interfacing Lab	–	–	4	–	–	–	25	25	50
4.	Technical Seminar	–	–	2	–	–	–	25	25	50
	Total	20	2	17	400	75	25	125	125	750

Floating Subject :

- (i) Mechatronics (syllabus same as VI Seme. Mechanical Engg.)
- (ii) Power Transmission and distribution (Syllabus same as V Seme. Elect Engg.)
- (iii) Advanced communication Engg. (Syllabus same as V Seme. E+C Engg.)

TEACHING & EVALUATION SCHEME

DISCIPLINE : APPLIED ELECTRONICS & INSTRUMENTATION

SEMESTER : VI

Sl. No.	Subject	Teaching Scheme (House/ Week)			Evaluation Scheme					Total Marks
		L	T	P	End Exam.	Theory		Practical		
						Internal Assessment		End Exam	Sessional	
						Class Test	Assignment			
1.	Entrepreneurship & Industrial Mgt	4	1	–	80	15	5	–	–	100
2.	Control System Engg.	4	–	–	80	15	5	–	–	100
3.	Industrial & Intelligent Instrumentation	4	1	–	80	15	5	–	–	100
4.	Electives (i) Digital Signal Processing (ii) Computer Network & Data Communication (iii) Industrial Automation	4	1	–	80	15	5	–	–	100

PRACTICAL

1.	Industrial & Intelligent Inst. Lab	–	–	5	–	–	–	50	50	100
2.	PLC Programming Lab	–	–	5	–	–	–	25	25	50
3.	Project Work & Seminar	–	–	10	–	–	–	100	100	200
	Total	16	3	20	320	60	20	175	175	750

OPERATING SYSTEM

Period/Week : 4 Hrs. (Th.)
Total Contact hrs : 60

Exam. (Th.) 3 Hrs.
End Term Exam : 80 marks
I.A. : 20 (15+5)
Total : 100 marks

RATIONALE :

As Operating System is the resource manager of the Computer System, so students should be exposed towards learning the role of Operating System in controlling and coordinating all the Hardware and Software resources available with a digital computer. System programming deals with Assembler, Compiler, loader etc. which are the system software tools for the students to learn in the field of programming.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Periods
1.	Introduction	05
2.	Process Management	10
3.	Memory Management	10
4.	I/O Management	15
5.	Device Management	05
6.	Dead Locks	05
7.	File Management	10
	Total	60

A. OPERATING SYSTEM

1. INTRODUCTION

05

- 1.1 State Objectives and Explain of operating system.
- 1.2 Discuss Evolution of Operating system and explain structure of operating system.

2. PROCESS MANAGEMENT

10

- 2.1 Define process and Explain Process concept, process control, interacting processes, inter process messages.
- 2.2 Explain implementation issues of Process.
- 2.3 Discuss process scheduling, job scheduling.
- 2.4 Explain process synchronization, semaphore.
- 2.5 State principle of concurrency, types of scheduling.
- 2.6 Explain deadlock.
- 2.7 Discuss prevention, recovery, detection of deadlock.

3. MEMORY MANAGEMENT

10

- 3.1 Explain Resident monitor, multiple partition, swapping.
- 3.2 Explain segmentation, virtual memory using paging, virtual memory using segmentation, contiguous memory allocation, non contiguous memory allocation.

- 4. I/O MANAGEMENT** **15**
- 4.1 Discuss I/O organization.
 - 4.2 Describe I/O devices.
 - 4.3 Explain principles of I/O hardware, Principles of I/O software, serial and parallel port access terminal access.
 - 4.4 Discuss different device management technique : dedicated shared, virtual.
 - 4.5 Explain I/O traffic control, I/O device handler, I/O buffering, I/O functions.
- 5. DEVICE MANAGEMENT** **05**
- 5.1 Discuss the techniques for Device Management – Dedicated, shared and virtual.
 - 5.2 Explain device allocation considerations I/O traffic control & I/O Schedule, I/O Device handlers.
 - 5.3 Define SPOOLING.
- 6. DEAD LOCKS** **05**
- 6.1 Explain concept of deadlock.
 - 6.2 Define Resources.
 - 6.3 Discuss Dead Lock Detection, Recovery & Prevention, Explain Bankers Algorithm & Safety Algorithm.
- 7. File Management** **10**
- File organization, Directory & file structure, sharing of files, file access methods, file systems, reliability, allocation of disk space, file protection, secondary storage management.

RECOMMENDED BOOKS :

1. Operating System By Silverschz & Galvin, Addison Wesley
2. System Programming By : J.J. Donovan – TMH
3. Modern Operating System By Tanenbaum, PHI.
4. Operating System & System Programming – By Harjeet Kaur & Astha Sharma, Kalyani Publishers



PROCESS INSTRUMENTATION – I

Period/Week : 4
Total Period : 60

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 20 (15+5)
Exam. Time : 3 Hours

RATIONALE :

The study of Industrial Measurement and Instrumentation – I, will help the students for clear understanding about different industrial process parameters such as temperature, pressure, flow, level through use of measuring instruments used in industries.

OBJECTIVES :

1. To determine and compute the parameters of interest in process industry
2. To use different methods for temperature measurement
3. To know about LVDT and other pressure gauges use for pressure measurement
4. To measure flow by using flow meters
5. To utilize the concepts of system stability and to deduce stability criterion from the observed data.

TOPIC WISE DISTRIBUTION PERIODS

Sl. No.	Topics	Periods
1.	Measurement of temperature	16
2.	Measurement of pressure	14
3.	Flow measurements	14
4.	Level measurements	08
5.	System stability	08
Total		60

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. MEASUREMENT OF TEMPERATURE

- 1.1 Classify methods of temperature measurements
- 1.2 Explain Measurement of temperature by non-electrical methods
 - (a) Liquid Expansion type
 - (b) Solid Expansion type
 - (c) Gas and Vapour Expansion type.
- 1.3 Explain Measurement of temp by Electrical methods of Measurements :
 - (a) Resistance Thermometers
 - (i) State advantages of Resistance Thermometer over other types
 - (ii) Describe the method of measurement of change in resistance by null balance bridge method,
 - (iii) compensation of lead Resistance by 3-wire & 4-wire methods.

- (b) Thermocouples
 - (i) Explain principle of thermoelectricity (Seebeck, Peltier, Thomson effects)
 - (ii) Classify thermocouple materials
 - (iii) Describe the function of thermocouple extension wires
 - (iv) Describe the method of measurement of output of thermocouple. State the types of Thermocouple insulation materials and their functions.
 - (v) State the advantages & disadvantages of thermocouple type thermometer
 - (vi) Explain the Cold junction compensation of Thermocouple.
- (c) Thermistors
 - (i) Explain the basic principles & characteristics of thermistors
 - (ii) State the method of temperature measurement by thermistors and their uses.
- (d) Pyrometers :
 - (i) Explain the principle & operation of Radiation & Optical pyrometers with suitable diagram and sketches
 - (ii) State its advantages & disadvantages
 - (iii) Describe the source of errors & precautions to be taken in various types of thermometer insulation.
- (e) Describe the function and use of Temperature switch

2. MEASUREMENT OF PRESSURE

- 2.1 Classify methods of pressure measurement
- 2.2 Explain the working principles and use of Mechanical Methods of measurement of pressure by :
 - (i) Manometers (U-tube, well type, inclined type)
 - (ii) Elastic type pressure gauge (hourdon tube, diaphragm, bellows)
 - (iii) Bell gauge
- 2.3 Explain the working principles and use of Electrical Methods of measurement of pressure by :
 - (a) Strain gauge pressure transducer
 - (b) Capacitive pressure transducer
 - (c) Reluctance type pressure transducer
 - (d) Piezoelectric pressure transducer
- 2.4 Describe the operation and explain the working principles of Vacuum Gauges
 - (i) Thermal conductivity gauge
 - (ii) McLeod gauge
 - (iii) Hot filament ionization vacuum gauge.
- 2.5 Explain the working of mechanical & pneumatic pressure transmitters. Pressure switch (two wire and four wire type of transmitter) and state their uses.

3. FLOW MEASUREMENTS

- 3.1 Classify flow meters and explain the principles of operation with diagrams
- 3.2 Variable head type flow meters.
Explain the principle of operation, advantages & disadvantages of
 - (i) orifice plate (ii) venturi tube
 - (iii) nozzles (iv) dall tubes
 - (v) elbow taps

- 3.3 Explain Variable area flow meters (Rotameter), Cylinder & piston type and state their uses.
- 3.4 Explain Non-hydraulic meters and state their industrial uses.
 - (i) Magnetic flow meter
 - (ii) Ultrasonic flow meter
- 3.5 Describe the construction and explain working principle of Thermal flow meters
- 3.6 Describe the construction and explain principle of Quantity flow meters
 - (i) Positive displacement type
 - (ii) Reciprocating piston type

4. LEVEL MEASUREMENTS

- 4.1 Classify level indicators
- 4.2 Explain the working of sight glass, Float type of indicator and displacement level detector
- 4.3 Explain the construction and use of pressure gauges for
- 4.4 Explain the working of Capacitor level detector and Radiation level detector
- 4.5 State and explain the function of different types of level switches

5. SYSTEM STABILITY

- 5.1 Explain the concept of stability
- 5.2 Determine the Characteristics Equation
- 5.3 State and explain Routh-Hurwitz criteria
- 5.4 Determine the stability of control system by applying Routh-Hurwitz criterion.

RECOMMENDED BOOKS :

(A) Text Books :

- (i) Industrial Instrumentation, By – S.K.Singh
- (ii) Electrical & Electronic Measurements & Instrumentation by R.K. Rajput (S.Chand Publishers.)

(B) Reference Books :

- (i) Mechanical measurement and measuring instruments, By – R.K.Jain
- (ii) Control system engineering, By – Nagraj & Gopal



DIGITAL ELECTRONICS

Period/Week : 5
Total Period : 75

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 20 (15+5)
Exam. Time : 3 Hours

RATIONALE :

The subject Switching Theory and Logic Design will be very much helpful for the students to understand clearly about the development concept of digitisation process and different types of combinational and sequential logic circuits.

OBJECTIVES :

1. To develop the concept of Digitization process.
2. To enumerate the advantage of digital electronics over analog electronics
3. To construct, explain and state uses of different digital Circuits & Systems
4. To apply different techniques to minimize digital Logic Circuits.

TOPIC WISE DISTRIBUTION OF PERIODS :

Sl.No.	Topics	Periods
1.	Number systems	06
2.	Binary codes	06
3.	Logic gates	08
4.	Boolean algebra	12
5.	Functions of combinational logic	10
6.	Flip Flops and MV	10
7.	Counters and shift registers	08
8.	Memories	05
9.	A/D and D/A converters	06
10.	Introduction to digital logic families	04
	Total	75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. NUMBER SYSTEM

- 1.1 Explain the general characteristics of Number Systems
- 1.2 Explain the concept of two-state devices
- 1.3 Define Binary, Octal, Decimal & Hexadecimal Number Systems
- 1.4 Compute Conversion of Number Systems
- 1.5 Compute Binary Arithmetic (Addition, Substraction, Multiplication & Division)
- 1.6 Define Signed Binary Number

- 1.7 Explain Concept of 1's Complement & 2's Compliments of Binary Number
- 1.8 Explain 2's Compliments for addition, subtraction
- 1.9 Define double precision number and state its use
- 1.10 Define Floating-Point Number and state its use.

2. BINARY CODES

- 2.1 Define Concept of Digital Code & its application
- 2.2 Distinguish between weighted & Non-Weighted Code
- 2.3 Distinguish between Reflective & Sequential Codes
- 2.4 Explain (BCD code, Grey code, Excess-3 code)
- 2.5 Convert Binary to Gray Code & vice versa
- 2.6 Compute BCD Addition & Subtraction
- 2.7 Define Alphanumeric Code (ASCII Code, EBCDIC Code)
- 2.8 Define the concept of Parity Bit for detection & correction of error in digital
- 2.9 Generate Error Detection & Correction Code using parity bit.

3. LOGIC GATES

- 3.1 State define and construct logic gates
- 3.2 State fundamental characteristics of logic gates
- 3.3 Distinguish between Universal & Non-universal type logic gates
- 3.4 Determine the truth table (Logic & Binary) of logic gates
- 3.5 Explain Inverter, Buffer, OR, AND, NAND, NOR, EXOR & EXNOR Gate
- 3.6 Develop Realization of Logic Gates using NAND & NOR Gates
- 3.7 Explain PIN Configuration & Number of standard TTL-IC Chip for two input AND, OR, NAND, NOR, EXOR Gate

4. BOOLEAN ALGEBRA & COMBINATION LOGIC

- 4.1 Define and describe of Binary Logic
- 4.2 Distinguish between Positive & Negative Logic
- 4.3 Define the concept of Boolean Algebra
- 4.4 State and Explain Boolean Theorem & Postulates
- 4.5 Describes Standard forms of Logic functions (POS & SOP)
- 4.6 Define the term Minterms & Maxterms
- 4.7 State and explain Complimentary nature of Minterms & Maxterms
- 4.8 Simplify Boolean Functions by using Boolean theorem & postulates
- 4.9 Define the Concept of Karnaugh map technique for simplification of Boolean functions
- 4.10 Describe the concept of two variable, three variable & four variable map
- 4.11 Describe the concept of Don't Care Condition
- 4.12 Simplify the Boolean function using Don't Care Condition

5. FUNCTIONS OF COMBINATIONAL LOGIC

- 5.1 Distinguish between Combinational & Sequential Logic
- 5.2 Define the function of Combinational Logic Circuits in terms of block diagram
- 5.3 Define the general procedure for designing Combinational Logic Circuits

- 5.4 Classify Combinational Logic circuit
- 5.5 Design and develop Half-adder, Half-subtractor, Full-adder & full-subtractor circuits
- 5.6 Design and develop BCD-adder circuit
- 5.7 Design Binary Multiplier & Divider
- 5.8 Distinguish between the concept of Encoding & Decoding Logic
- 5.9 Design Binary to Decimal decoder, Decimal decoder, BCD decoder/7-segment driver
- 5.10 Design Octal to Binary encoder, Decimal to BCD encoder
- 5.11 Define Priority Encoder
- 5.12 Distinguish between Multiplexing & Demultiplexing
- 5.13 Design and develop 4:1 line Mux circuit
- 5.14 Design and develop 4×1 line de-Mux circuit
- 5.15 Design & bit comparator.

6. FLIP-FLOPS & MULTIVIBRATORS

- 6.1 State and explain Sequential Logic
- 6.2 Represent sequential Logic Circuits by a block diagram and explain its operation
- 6.3 Distinguish between Synchronous & Asynchronous Sequential Logic circuits
- 6.4 Explain Flip-Flops and its use
- 6.5 Classify of Flip-Flops
- 6.6 Design RS-Latch
- 6.7 State concepts of Clocked RS Flip-Flop
- 6.8 Define level clocking & edge-triggering
- 6.9 Design JK Flip Flop, D Flip Flop, T Flip Flop & Master Slave Flip Flop
- 6.10 State concept of the Concept of Presentable Flip Flop
- 6.11 State the use of flip-flops
- 6.12 Design of Monostable, Astable and bi-stable multi vibrators.

7. COUNTERS & SHIFT REGISTERS

- 7.1 State elementary concept of Binary Counter
- 7.2 Classify Binary Counter
- 7.3 Design four Bit Ripple Counter
- 7.4 Design Mod-m Binary Counter
- 7.5 Design Decade Counter
- 7.6 Explain the working Binary Register
- 7.7 Distinguish between Register & Shift Register
- 7.8 Define Universal shift Register
- 7.9 Explain basic Shift Operation

9. MEMORIES

- 9.1 Define the Concept of Memory
- 9.2 Distinguish between Volatile & Non-Volatile Memory
- 9.3 Distinguish between Maskable & Non-Maskable memory
- 9.4 Classify Semiconductor Memories
- 9.5 Classify ROM Family & RAM Family

- 9.6 State concept of Memory Word size (Bit, Byte & Nibble)
- 9.7 State concept of Real, Virtual & Cache Memory
- 9.8 Classify Computer Storage Device (CCD)

10. D/A & A/D CONVERTERS

- 10.1 Explain the digital Converter
- 10.2 Distinguish between D/A & A/D converter
- 10.3 Design Binary Weighted type & Binary Weighted Register type & Ladder Network type D/A Converter

11. INTRODUCTION TO DIGITAL LOGIC FAMILY

- 11.1 State classification of various logic family as per level of integration & as per technology
- 11.2 Distinguish between state and explain general Characteristics of Digital IC's
- 11.3 Distinguish between Wired AND & Wired OR Logic
- 11.4 Explain RTL, DTL, TTL & CMOS Logic.

RECOMMENDED BOOKS :

(A) Text Books :

- 1. Digital Principles by R.P. Jain
- 2. Digital Electronics by Malvino & Leach
- 3. Digital electronics and microprocessors. By – R.K.Gour
- 4. Digital Electrons – By R.S.Sedha (S.Chand Publishers.)

(B) Reference Books :

- 1. Digital Circuits & Systems by Douglas V.Hall Mc. Grey Hill Publication
- 2. Digital system Design. By – Morris Mano
- 3. Principles of Digital Electronics By – Sajjan Singh & Gurpreet Sandhu, Kalyani Publishers



ELECTRONICS DEVICES AND CIRCUITS

Period/Week : 5
Total Period : 75

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 20 (15+5)
Exam. Time : 3 Hours

RATIONALE :

The study of analogue electronics circuits from the basis of understanding the discipline of Applied Electronics & Instrumentation Engineering. Any electronics equipment/instrumentation comprises devices and circuit modules. The characteristics of the devices and functional operational principles of the circuits are extremely important not only for understanding the performance of the electronic equipment/instruments but also for their repair and maintenance.

OBJECTIVES :

1. To explain the parameters and characteristics of different solid state devices, such as diode, transistors, multi-vibrators and explain their principles of operation.
2. To draw and develop different electronic circuits such as rectifiers, Amplifiers, oscillators, multi-vibrators and explain their principles of operation.
3. To explain the principles of different wave shaping circuits such as clippers, clampers and state their uses.

TOPIC WISE DISTRIBUTION OF PERIODS :

Sl. No.	Topics	Periods
1.	Junction diodes	08
2.	Rectifiers and filters	10
3.	Bipolar transistor	08
4.	Analysis of transistor amplifier	10
5.	Audio power amplifiers	09
6.	Feedback amplifiers	10
7.	Oscillators	08
8.	Tuned amplifiers	06
9.	Wave shaping circuits	06
Total		75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. JUNCTION DIODES

- 1.1 Explain biased P-N junction and unbiased P-N junction
- 1.2 Explain energy-band diagram of an unbiased P-N junction and biased P-N junction
- 1.3 Explain Volt-ampere characteristic of P-N junction
- 1.4 Explain temperature dependence of junction capacitance, diffusion capacitance
- 1.5 Explain the working principles and state the use of Zener diode, Tunnel diode, Varicap diodes, Gun diode, LCD, PIN diode, Schottky diode, Snap diode.

2. RECTIFIERS AND FILTERS

- 2.1 Explain the concept of Load line of diode ckt. Solve simple problems
- 2.2 Explain Static and dynamic characteristics and construction of load line
- 2.3 Explain the working principle, with circuit diagrams, compare the merits and demerits of Rectifiers - Half wave & full wave-center tapped & bridge rectifiers.
- 2.4 Derive expression for Rectifier efficiency, (Half wave & Full wave)
- 2.5 Deduce expression for Ripple factor for half wave and full wave rectifier
- 2.6 Explain voltage regulation of power supply with a circuit diagram
- 2.7 Explain the working principles of Capacitance filter, L-filter, π -filter, T-filter, showing their output wave shapes
- 2.8 Explain voltage doubler and multiplier circuits
- 2.9 Develop voltage regulator circuit.

3. BIPOLAR TRANSISTOR

- 3.1 Explain the constructional feature and operation of Junction transistor
- 3.2 Explain different current components in a transistor including leakage current
- 3.3 Describe different modes of operation of a transistor (CB, CE & CC)
- 3.4 Explain relationship between input and output current and α , β , γ of transistor in various modes. Derive an expression for relationship between them
- 3.5 Explain the working principle and compare their input and output parameters.

4. ANALYSIS OF TRANSISTOR AMPLIFIER

- 4.1 Draw and explain load line analysis and determination of Q-point
- 4.2 Explain stabilisation and methods of transistor biasing
- 4.3 Draw h-parameter equivalent circuits. Derive the model for h-parameters from the input and output characteristics
- 4.4 Explain analysis of transistor amplifier h-parameter
- 4.5 Explain characteristics of a CB, CE and CC amplifier
- 4.6 Explain gain or amplification and frequency response of a noise and phase distortion
- 4.7 Explain DC and AC equivalent circuit of a transistor amplifier also explain DC and AC load lines and multi stage amplifier.

5. AUDIO POWER AMPLIFIERS

- 5.1 Classify power amplifiers A, B, C, AB
- 5.2 Explain series fed class-A, shunt fed and transformer coupled amplifier
- 5.3 Derive expression for efficiency of class-B, class-AB and class-C push-pull amplifiers
- 5.4 Explain complementary-symmetry amplifiers
- 5.5 Explain principle and working characteristics use of a R-C coupled amplifier
- 5.6 Explain with circuit diagram the principle of operation of DC amplifier and state its use

6. FEEDBACK AMPLIFIERS

- 6.1 Explain the effect of feedback on stability
- 6.2 Explain principle of negative feedback and its effect on the performance of the amplifier
- 6.3 Draw block diagram of a feedback amplifier
- 6.4 Explain Gain of an amplifier with feedback
- 6.5 Explain emitter-follower circuit

7. OSCILLATORS

- 7.1 State and explain sinusoidal oscillation
- 7.2 Enumerate types of oscillators
- 7.3 Explain Fundamental principle of oscillators. State Barkhausen criteria
- 7.4 Describe concept of the feedback. Explain the principle of a tuned circuit.
- 7.5 Explain the function of Tuned collector oscillator. Hartly oscillator, Colpitt's oscillator, Phase shift oscillator, Wein bridge oscillator, Crystal oscillator.

8. JFET & MOSFET

- 8.1 Differentiate between BJT & JFET
- 8.2 Explain operation of JFET & JFET characteristics
- 8.3 Define JFET parameters
- 8.4 Differentiate between JFET & MOSFET
- 8.5 Explain operation of depletion MOSFET
- 8.6 Explain operation of enhancement MOSFET.

RECOMMENDED BOOKS :

(A) Text Books :

- (i) Principle of Electronics – V.K Mehta
- (ii) Electronics Devices & Circuits – Sanjeeb Gupta
- (iii) Electronics Devices and Circuits – J.B.Gupta
- (iv) Electronic Devices & Circuits by – B.L.Theraja & R.S.Sedha (S.Chand Publishers.)

(B) Reference Books :

- (i) Electronics Devices and Circuit Theory : Robert Boylestad & Lonis Nashelslay.
- (ii) Integrated Electronics – Milliman and Halkis.



ENGINEERING MATHEMATICS – III

Period/Week : 4 Hrs.
Total Period : 60

Examination : 3 Hr
Total Marks : 100
Theory : 80
IA : 20 (15 + 5)

A. RATIONALE :

The subject Engineering Mathematics – III is a common paper for engineering branches. This subject includes Matrices, Laplace transform, Fourier Series, Differential equation and Numerical methods etc. for solution of Engineering problems.

B. OBJECTIVES :

On completion of study of Engineering Mathematics – III the student will be able to :

- Apply matrices in Engineering mechanics, electrical circuits & linear programming.
- Transform Engineering problem to mathematical models with the help of differential equation & familiarise with methods of solving by analytical method, transform method, operator method & numerical method.
- Solve algebraic & transcendental equations by iterative methods easily programmable in computers.
- Analyses data & develop interpolating polynomials through method of finite difference.

C.

TOPICWISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Matrices	04
2.	Linear Differential equation	12
3.	Laplace transform	12
4.	Fourier series	12
5.	Numerical methods	04
6.	Finite difference & Interpolation	12
7.	Numerical solutions of ordinary differential equation	04
Total		60

D. COURSE CONENT :

1. MATRICES

- 1.1 Define rank of a matrix.
- 1.2 Perform elementary row transformation to determine rank of a matrix.
- 1.3 Define Rouche's Theorem for consistency of a system of linear equations in n unknowns.
- 1.4 Solve simultaneous linear equations in three unknowns testing consistency.

2. LINEAR DIFFERENTIAL EQUATION

- 2.1 Define homogeneous & non-homogeneous diff. Equations with constant co-efficient with examples.

- 2.2 Find general solution of linear differential equations in terms of C.F. & P.I.
- 2.3 Derive rules of finding C.F. & P.I. in terms of operator D.
- 2.4 Explain method of variation of parameter to solve equation of the form $y'' + py' + qy = f(x)$.
- 2.5 Describe methods of solutions of Cauchy's & Legendre's linear differential equation with variable co-efficient.
- 2.6 Define partial differential equations.
- 2.7 Form partial differential equations by eliminating arbitrary constant & arbitrary functions.
- 2.8 Solve partial differential equations of the form $Pp + Qq = R$.
- 2.9 Derive rules of finding C.F and P.I of Homogeneous linear partial differential equation with constant co-efficient.
- 2.10 Solve Engineering problems on 2.2 – 2.9.

3. LAPLACE TRANSFORM (L.T.)

- 3.1 Define Gamma function and establish $[n + 1 = n!]$ and find $[(1/2) = \sqrt{\pi}]$ (No problem)
- 3.2 Define Laplace transform of a function $f(t)$ & inverse Laplace transform.
- 3.3 Derive L.T. of standard functions and explain existence conditions of L.T.
- 3.4 Explain linearity, shifting and change of scale properly of L.T.
- 3.5 Formulate L.T. of derivatives, integrals, multiplication by t^n , division by t .
- 3.6 Derive formula of inverse L.T.
- 3.7 State and derive convolution theorem.
- 3.8 Solve linear differential equation with constant coefficients associated with initial conditions using transform method.
- 3.9 Define unit step function and derive second shifting property.
- 3.10 Solve Engineering problems on 3.3 to 3.9.

4. FOURIER SERIES (F.S.)

- 4.1 Define periodic functions.
- 4.2 State Dirichlet's conditions for the Fourier expansion of a function and its convergence.
- 4.3 Express periodic function $f(x)$ satisfying Dirichlet's conditions as a Fourier series in.
- 4.4 State Euler's formulae.
- 4.5 Obtain F.S. of continuous functions & functions having points of discontinuously.
- 4.6 Obtain F.S. of functions having arbitrary period.
- 4.7 Define even and odd functions and obtain their F.S.
- 4.8 Explain half-range series.
- 4.9 Solve problems on 4.1 to 4.8.

5. NUMERICAL METHODS

- 5.1 Appraise limitation of analytic methods of solution of algebraic & transcendental equations.
- 5.2 Derive iterative formula for finding solutions of a algebraic & transcendental equations by :
 - a. Bisection method.
 - b. Method of false position.
 - c. Newton-Raphson method.
- 5.3 Solve problems on 5.2.

6. FINITE DIFFERENCE & INTERPOLATION

- 6.1 Explain finite difference & form table for forward & backward difference.

- 6.2 Explain differences of a polynomial and express it in factorial notation.
- 6.3 Define shift operator E and establish relation between E and difference operator Δ .
- 6.4 Derive Newton's forward and backward interpolation formula for equal intervals.
- 6.5 State Lagrange's interpolation formula for unequal intervals.
- 6.6 Derive numerical differentiation using forward and backward difference.
- 6.7 Explain numerical integration and state.
 - a. Newton-Cotes's formula.
 - b. Trapezoidal rule.
 - c. Simpson's 1/3 rule.
- 6.8 Solve problems on 6.1 to 6.7.

7. NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

- 7.1 State and explain formula for solving ordinary differential equations using
 - a. Taylor's series method.
 - b. Euler's method.
 - c. Runge-Kutta method upto 4th order.

8. CLASS TEST

The three class tests to be conducted in equal interval of five contact weeks. The submission of assignments in the above topics and solution of simple problems if required to be done at the end of each chapter.

RECOMMENDED BOOKS :

Higher Engineering Mathematics by Dr. B.S.Grewal.



OPERATING SYSTEM LAB

Period/Week : 5 Hrs. (Pr.)
Total Period : 75

Total Marks : 100
End exam. 50 marks
Sessional : 50 marks
Exam. time : 4 Hours

1. OVERVIEW OF UNIX

UNIX as an Operating system, Kernel, shell and User, UNIX File System, Files and Directories, Access Permission, File system hierarchy.

2. BASIC UNIX COMMANDS

Listing of files and directories, Copying, Deleting Renaming and comparing files, Creation, Navigation and Removing directories, Access permission of files and directories, Editors in UNIX, Status of users, terminals, Date and time, Displaying blown-up message, paging & Printing of files, background jobs.

3. ADVANCED FEATURES OF UNIX

I-nodes, Tees, Pipes and Filters, Cutting, Pasting and sorting of files, searching for a pattern in a string.

4. PROGRAMMING WITH THE SHELL

System variables and shell variables, interactive Shell scripts, Shell termination, conditional statements, looping statements, Special parameters in shell computation and string handling.



3rd Semester (AE & I)

Process Instrumentation Lab – I

Pd/Wk : 5
Total Pd : 75

Total Marks = 50
End Exam = 25
Sessional = 25
Exam Time = 4 Hrs.

RATIONALE :

In this Process Instrumentation lab. Students will acquire skills of operation and testing of sensors and transducers. Besides the students will be acquainted with the operation and maintenance of fundamental Electronics measuring devices and components.

COURSE CONTENT :

1. Measurement of temperature using thermometer transducer.
2. Measurement of temperature using RTD transducer.
3. Measurement of temperature using thermocouple transducer.
4. Measurement of furnace temperature using optical pyrometer.
5. Measurement of liquid level.
6. Measurement of flow using rotameter.
7. Identification & testing of Active & Passive components.
8. To plot the characteristics of semiconductor diode.
9. Soldering Practice.
10. Construction of half wave rectifier and measurement of its output.
11. Construction of full wave rectifier and measurement of its output.
12. Construction of single stage transistor amplifier using voltage divider method of biasing.

NOTE ON PRACTICAL CLASSES :

- All the practical will be oriented towards developing psychomotor skills.
- The students will be exposed to making experimental layouts.
- They will develop work ethics and work culture.
- Develop co-operative and interpersonal relationship.
- Develop precise measurement techniques.
- Develop safety practices.
- Develop correct methods of handling equipment, machinery, tools and accessories.
- Develop the skill of assembling/fabricating circuits.



DIGITAL ELECTRONICS LAB.

Period/Week : 5
Total Period : 75

End Exam. : 25
Sessional : 25
Exam Time : 4 Hours.

RATIONALE :

In this practical work students knowledge about the Digital systems will be reinforced. They will become capable of developing and implementing. Digital Circuits. They will also be able to acquire skills of operating A/D and D/A converters, counters and display system.

COURSE CONTENT

1. Familiarization of 7400, 7402, 7404, 7408, 7432 & 7486.
2. Verify truth tables of AND, OR, NOR, NAND, XOR, XNOR gates.
3. Implement various gates by using universal properties of NAND & NOR gates verify and truth table tabulate data.
4. Verify De Morgan's theorem.
5. Implement Half adder and Full adder using minimum number of logic gates.
6. Implement Half subtracter and Full subtracter using minimum number of logic gates.
7. Implement a 4-bit Binary to gray code converter.
8. Implement a single bit digital comparator.
9. Study of Flip-flops.
10. Study of Flip-flops
 - (i) S-R flip-flop (ii) J-K flip-flop (iii) D flip-flop (iv) T flip-flop.
11. Realize a 4-bit asynchronous UP/DOWN counter with a control for up/down counting.
12. Realize a 4-bit synchronous UP/DOWN counter with a control for up/down counting.
13. Implement Mod-6, Mod-10, Mod-12 asynchronous counters.
14. Study shift registers.
 1. SISO
 2. SIPO
 3. PISO
 4. PIPO
 5. Bi-directional
15. Study 8-bit D/A and A/D conversion.
16. Study display devices, LED, LCD, segment displays.

(All the above experiments are to be conducted by through study of ICs)



TECHNICAL SEMINAR

Total Period : 30
No of period : 2 P/W

Sessional : 25
End Exam : 25

RATIONALE :

It is necessary to develop the communication skill both for verbal and written presentation of facts and data. For developing the skill of presenting the fact related to technical matter in terms of oral presentation the seminar is to be arranged. For developing the skill of presenting the report of any observed phenomena the preparation of report is needed. The job is designed in such a way that both the verbal and writing skill as well as techniques of presentation will be developed.

OBJECTIVES :

After successful completion of this seminar, the student will able to

- (i) Present the facts or data or concept through a seminar for developing oral communication skill.
- (ii) Interacting with the audience during questionnaire session.
- (iii) Write the reports containing synopsis, content and other description with suitable display items.
- (iv) Presentation will be either OHP/Power Point Presentation or chart display etc.

COURSE CONTENT INTERMS OF SPECIFIC OBJECTIVES :

Classes should be divided into smaller groups of not more than four in each group. One group should be assigned a topic for the Seminar. The topic should be usually related to their course of studies or should be of general interest. Every student of the group should prepare on a particular aspect of the main topic with active support and guidance from a teacher guide. The student should be encouraged to extensively use the library facilities and also to collect relevant material from different Technical Magazines and Journals. Each student should be usually asked to present his paper on the topic of the Seminar within 15 minutes after which a question answer session may follow for 5 minutes. The Sr. Lecturer or Sr. faculty member should preside over the Seminar and ensure its smooth conduct. The student should be encouraged to use Audio-Visual Aids and other modern teaching methods during presentation of the topics in the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. Each student at-least speaks for a minimum of two times during the semester.

The Sessional Records should be maintained and evaluated by a team of faculty members and the final marks awarded by the team.



ELECTRICAL MACHINE

Theory – 4 P/W
Total Theory – 60 P

Examination – 3 Hours
Total Marks – 100
Theory – 80

A : RATIONALE :

The application of Rotatory and Static Electrical machines find extensive use in modern industries is still in practice. The Electrical machine subject is intended to provide insight of different materials used in Electrical Engineering and the concept of different Electrical Machines with their operation and control. This subject also deals with the fundamental concept of single phase and three phase AC machines.

B : OBJECTIVE :

After Completion of the Subject student will be able to;

1. Understand properly & use of electrical conducting and insulating materials.
2. Explain working principle & construction of DC generator.
3. Explain construction & working principle of motor & speed control of DC motor.
4. Discuss AC fundamentals.
5. Explain Construction & principle of transformer.
6. Describe principle of working of three-phase Induction motor.
7. Describe principle of single-phase motor.

C : TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	ELECTRICAL MATERIAL	04
2.	D.C. GENERATOR	10
3.	D.C. MOTOR	09
4.	A.C.CIRCUITS	09
5.	TRANSFORMER	08
6.	INDUCTION MOTOR	10
7.	SINGLE PHASE INDUCTION MOTOR	08
Total		60

D : COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1. ELECTRICAL MATERIAL

04

- 1.1 Discuss properties & uses of different conducting material.
- 1.2 Discuss properties & uses of various insulating materials used in Electrical Engineering.
- 1.3 Explain various magnetic material & their uses.

2. D.C. GENERATOR

10

- 3.1. Explain construction, Principle & application of DC Generator.
- 2.2 Classify DC generator.
- 2.3 Derive EMF equation.

3.	ELECTRICAL MATERIAL	09
3.1	Explain Principle of working of a DC motor.	
3.2	Explain concept of development of torque & back EMF in DC motor	
3.3	Derive equation relating to back EMF, Current, Speed and Torque equation.	
3.4	Classified DC motors & explain characteristics, application.	
3.5	State & explain three point & four point stator/stratic of D.C. motor by solid State converter.	
3.6	Explain Speed control of D.C. motor by field control and armature control method.	
4.	A.C. CIRCUITS	09
4.1	State Mathematical representation of phasors, significance of operator “J”.	
4.2	Discuss Addition, Subtraction, Multiplication and Division of phasor quantities.	
4.3	Solve A.C. series circuits containing resistances, capacitances, Concept of active, reactive and apparent power and Q-factor of series circuits.	
4.4	Solve A.C. Parallel circuits containing Resistances, Inductance and Capacitances, Q-factor of parallel circuits.	
5.	TRANSFORMER	08
5.1	State construction & working principle of transformer.	
5.2	Derive of EMF equation of transformer, voltage transformation ratio.	
5.3	Discuss Flux, Current, EMF components of transformer and their phasor diagram under no load condition.	
5.4	Discuss Phasor representation of transformer flux, current, EMF primary and secondary voltages under loaded condition.	
6.	INDUCTION MOTOR	12
6.1	Explain construction feature, types of three-phase induction motor.	
6.2	State principle of development of rotating magnetic field in the stator.	
6.3	Establish relationship between synchronous speed, actual speed and slip of induction motor.	
6.4	Establish relation between torque, rotor current and power factor.	
6.5	Explain starting of an induction motor by using DOL and Star-Delta stator. State industrial use of induction motor.	
7.	SINGLE PHASE INDUCTION MOTOR	08
7.1	Explain constructional feature and principle of operation of capacitor type and shaded pole type of single-phase induction motor.	

Total = 60

RECOMMENDED BOOKS :

1. Fundamental of Electrical Engg. By B.L. Theraja.
 2. Principle of Electrical Engg. by Dawes VOL I & II.
 3. Electrical Technology by H.Cotton.
 4. Eelectrical Machines– by Dr. S.K.Bhattacharya
- N.B.** After completion of each topic the student are required to submit assignment of concept and application. They are also required to solve simple mathematical problems on this subject.



CIRCUIT THEORY

Period/ Week.
Total Period

Examination – 3 Hours
Total Marks – 100
End. Exam. Theory –80
Internal Assessment :

RATIONALE :

The Study of circuit theory is based on the understanding of the analysis technique of simple and complex Electrical and Electronic circuits.

The analysis of circuits are extremely important for understanding the performance and operation of active and passive electrical/ electronics components. This knowledge will help the students for understanding and analysing the performance of electronics and electrical circuits in appropriate way.

OBJECTIVES :

Students will be able to –

1. Familiarise with network elements and parameters.
2. Solve current in specific branch by using different theorems & fundamental techniques.
3. Analyze 3-phase circuits.
4. Acquaint with the concepts of ac circuits.
5. Analyze time varying response.

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Network elements	04
2.	Network theorems	15
3.	AC fundamentals	10
4.	Resonance and selectivity	08
5.	Transient response of simple circuits	06
6.	Network functions and parameters	08
7.	Filters	08
8.	Polyphase circuits	08
9.	Attenuator	08
Total		75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. NETWORK ELEMENTS

04

- 1.1 Define Network Elements.
- 1.2 Describe type of network analysis & synthesis.
- 1.3 Define Electric charge, Electric current, Electrical energy, Electrical potential, R-L-C parameters, energy sources.
- 1.4 Explain current and voltage source, their transformation & mutual inductance.

2.	NETWORK THEOREMS	15
2.1	State Explain & Prove Superposition theorem, Millman theorem, Thevenins Theorem, Nortons's theorem, substitution theorem, maximum power transfer theorem, Reciprocity theorem Star-delta conversion (Solving of typical Problems on above Theorems)	
3.	A.C. FUNDAMENTALS	10
3.1	Define frequency, Cycle, Time period, Amplitude, Average value, RMS value & Form factor of A.C Wave.	
3.2	Explain the behaviour of A.C. through resistance, inductance & capacitance.	
3.3	Explain the behavior of R-L, R-L-C series circuit	
3.4	Solve numerical problems.	
3.5	Explain the behavior of R-L, R-C, R-L-C parallel circuit (with numerical problems).	
3.6	Explain the principles of AC and DC generation.	
4.	RESONANCE & SELECTIVITY	08
4.1	State & Explain Series resonance, parallel resonance, selectivity, band width, Q factor.	
5.	TRANSIENT RESPONSE OF SIMPLE CKTS (DC)	06
5.1	Analyse and derive the equation for circuit parameters of R-L, R-C, R-L-C (Series Circuit)	
5.2	Define Time Constant of the above Circuits.	
6.	NETWORK FUNCTIONS AND PARAMETERS	08
6.1	Define Network functions for one port & two port networks :	
6.2	Define & Explain Open Circuit & Short Circuit Parameters & ABCD Parameters.	
6.3	Calculate open & Short Circuit Parameters for Simple Circuits.	
6.4	State Conversion of Parameters.	
6.5	Image Impedence & Characterstic Impedence	
7.	FILTERS	08
7.1	Classify filters; low pass , high pass, band pass, band stop filters & Study their Characteristics.	
7.2	Define and explain attenuation and gain	
7.3	Relation between DB & Napier.	
7.4	Explain concept of mderived filters.	
8.	POLY-PHASE CIRCUITS	08
8.1	Study of Star & Delta connections, their use.	
8.2	Establish the relation between line & phase quantities in their phasor representation.	
8.3	Define Active Power, Reactive power, Apparent power	
8.4	Solve the problem based on balanced three phase circuits & measure the power.	
9.	ATTENUATOR	08
9.1	Define & Classify Attenuator	
9.2	Design symmetrical I and II Attenuator.	

Total = 75

RECOMMENDED BOOKS :

(A) Text Books :

1. Network Analysis , By - G.K.Mithal
2. Circuit theory, By- Umesh Sinha
3. Electrical technology (i) , By-B.L. Thereja
4. Circuit theory, By- Chattopadhyay

(B) Reference Books

1. Network Analysis, By- Vanvalkenberg
2. Electric circuits field, By- Soni & Gupta



ELEMENTS OF INSTRUMENTATION

Period/ Week : 4+1
Total Period : 75

Examination – 3 Hours
Total Marks – 100
End. Exam. Theory –80
Internal Assessment :15+5

RATIONALE :

The subject Elements of Instrumentation will provide detail knowledge about the principle of measurements, standards and static & dynamic characteristics of instrumentation and system. The detail knowledge about the principle of operation and construction fo active and passive types of transducers, which find extensive applications in process Instrumentation, has also been dealt with. It will enable the students to develop comprehensive knowledge about this field as also to acquire adequate skills.

OBJECTIVES :

1. To become familiar with various Elements of Instrumentation systems such as measurement system, control system and other data acquisition system used in industry, for accurate measurement and control of various quantity.
2. To study about various type of Instruments such as electrical, pneumatic, hydraulic, and Optical.
3. To be familiar with International standards for measurement and control of various parameter.
4. To know about various skills of measurement, control and transmission system.

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Principle of measurement	16
2.	Unit, dimensions and standards	08
3.	Sensing elements	07
4.	Transducers	10
5.	Transmission methods	05
6.	Optical Instruments	05
7.	Eelectrical Instruments	05
8.	Fiber Optics & Nanosensors	07
Total		75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. PRINCIPLE OF MEASUREMENT

- 1.1 Define & classify the process of measurement.
- 1.2 Define the important points for selection of measuring instruments.
- 1.3 Classify measuring instruments.
- 1.4 Decribe the function of general instrumentation system with block diagram.
- 1.5 State general characteristics of measurements.
- 1.6 Define the terms used in static & dynamic characteristics

- 1.7 Define the process of calibration of measuring instruments.
- 1.8 Define error in measurements.
- 1.9 Classify errors in measurements.
- 1.10 Identify the sources of different types of error & their remedies.
- 1.11 Dynamic response of zero, first & second order instruments.

2. UNITS, DIMENSIONS AND STANDARDS.

- 2.1 Define absolute fundamental & derived units.
- 2.2 Differentiate between unit & dimension.
- 2.3 Determine the dimension of electrical & mechanical quantities in terms of ESU & EMU.
- 2.4 Derive the relation between Electrostatic & electromagnetic system of unit
- 2.5 Explain the Concept of international unit.
- 2.6 Explain the rules & abbreviations for & writing SI Units.
- 2.7 Explain Base units & Supplementary units of SI Units.

3. SENSING ELEMENTS.

- 3.1 State the Concept of sensors.
- 3.2 Classify sensors.
- 3.3 Explain the working principle of Pneumatic, Hydraulic & Electronic sensing devices.
- 3.4 Explain the function of elastic, mass, thermal, motion, force, thickness & vibration sensor with neat sketch.

4. TRANSDUCERS

- 4.1 Explain the fundamental Concept of principle Transduction.
- 4.2 Distinguish between Sensor & Transducer.
- 4.3 Explain the fundamental characteristics of transducers.
- 4.4. State classifications of transducers.
- 4.5 Explain the principle of voltage generating Analog Transducers, Piezoelectric, Thermoelectric, Photoelectric & Hall effect transducers.
- 4.6 Explain the function of variable parameter analog Transducers.
- 4.7 Variable resistance type.
- 4.8 Variable Inductance type.
- 4.9 Variable Capacitance type.
- 4.10 LVDT
- 4.11 Explain the function of Frequency generating Digital Transducer, Active & Reactive Power Transducers.

5. TRANSMISSION METHODS

- 5.1 State classification of transmitters, hydraulic methods of transmission. Pneumatic method of transmission : (i) Force transmitter – beam type and stack type, (ii) Force balance transmitter null type.

6. OPTICAL INSTRUMENTS

- 6.1 Explain the advantage of Optical instruments.
- 6.2 Explain the function of Photometric instruments, Refractometer, Fluxmeter. Simple telescope, Simple microscope, Photographic camera, Exposometer, Spectrometer. Fundamental principle of over-head projector, Slide projector.

7. ELECTRICAL INSTRUMENTS

- 7.1 Define essential characteristics of Electrical Indicating instruments.
- 7.2 Classify of electrical measuring instruments.
- 7.3 Explain the function Moving iron instruments, PMMC instruments, Dynamometer type instruments, Induction type instruments, Electrostatic instruments, Wattmeter, Energy meter (Analog type) , Power factor meter. Instrument transformer, (i) Current Transformer (ii) Potential Transformer.

8. FIBER OPTICS & NANOSENSORS

- 8.1 Define Fiber optics sensors
- 8.2 Explain its application to attenuators and refractive index measurements.
- 8.3 Nano Sensors and its application in Industry.

RECOMMENDED BOOKS :

Silicon nano wire Electrochemical sensors, Nomo pressure sensor, Noise sensitive nanosensors, Deployable nanosensors, Quantum Dot sensors.

(A) Text Books :

- (i) Mechanical and Industrial Measurements, by R.K.Jain.
- (ii) Electrical & Electronics Measurements and Instrumentation AK Sahnni.
- (iii) Electrical & Electronic Measurements & Instrumentation by R.K.Rajput (S.Chand Publisher)
- (iv) Nano Technology By Rakesh Rati, S.Chand Publication.

(B) Reference Books

- 1. Industrial instrumentation , By – S.K. Singh
- 2. Instrumentation, By – Nakna Choudhary
- 3. Industrial instrumentation, By – Patranabis



4TH SEMESTER (AE & I) SIGNAL CONDITIONING & DATA CONVERTERS

Period/ Week : 4+1
Total Period : 75

Examination – 3 Hours
Total Marks – 100
End. Exam. Theory –80
Internal Assessment :20

RATIONALE :

The students will be exposed to signal conditioning and data converter circuits using Linear ICs in detail. Mostly the Instrument controllers are based on Linear ICs. The students will be highly benefited by learning the subject with special emphasis on various data converters.

OBJECTIVES :

1. To draw different characteristics of Op-Amps
2. To verify the basic concepts of Op-Amp feedback configurations
3. To use Op-Amp as data converters
4. To use PLL as frequency multiplier
5. To construct the circuits of A/D and D/A converters.

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Introduction to Op-AMP	14
2.	Signal Converters (Using Op-Amp)	10
3.	Phase Lock Loop	08
4.	Data Acquisition System	08
5.	Digital to Analog Converter	10
6.	Analog to Digital Converter	10
Total		60

COURSE CONTENT.

1. INTRODUCTION TO OP-AMP.

- 1.1 Draw the Block diagram of Op -Amp.
- 1.2 Define Op -Amp Parameters & Characteristics.
- 1.3 Explain use of Op-Amp as inverting & non-inverting amplifier with feedback.
- 1.4 Explain use of Op-Amp as differential Amp (Using one Op-Amp)
- 1.5 Analyze Instrumentation Amplifier using Op-Amp.
- 1.6 Explain Op-Amp as summing, scaling and averaging amplifier.
- 1.7 Explain Op-Amp as Intregator & Differentiator.

2. SIGNAL CONVERTERS (USING OP-AMPS)

Draw the circuit diagram & explain the operation of the following.

- 2.1 Current to Voltage converter
- 2.2 Voltage to Current converter
- 2.3 Voltage to Frequency converter
- 2.4 Frequency to Voltage converter
- 2.5 Voltage controlled oscillator

3 PHASE LOCK LOOP

- 3.1 Phase lock loop – block diagram, working, applications
- 3.2 Definition of terms in PLL – capture range, lock range
- 3.3 Explain PLL as frequency multiplier

4. DATA ACQUISITION SYSTEM

- 4.1 Introduction to DAS
- 4.2 Draw & explain Analog Multiplexers
- 4.3 Draw & explain Digital Multiplexers
- 4.4 Draw & explain Analog & Digital De-Mux
- 4.5 Draw & explain Sample and Hold circuits

5. DIGITAL TO ANALOG CONVERTERS

- 5.1 Classify D/A converters
- 5.2 Explain the principle of R – 2R D/A converter
- 5.3 Explain the principle of Weighter resistor D/A converter
- 5.4 Explain the principle of Inverted ladder D/A converter
- 5.5 Draw pin details of DAC 0800, DAC 0808
- 5.6 Applications of the above ICs.

6. ANALOG TO DIGITAL CONVERTERS

- 6.1 Classify A/D converters
- 6.2 Explain the principle of Counter type A/D converter
- 6.3 Explain the principle of Successive Approximation type A/D converter
- 6.4 Explain the principle of Ramp type A/D converter
- 6.5 Explain the principle of Dual slope A/D converter
- 6.6 Draw pin details of ADC 0800, ADC 0801
- 6.7 Applications of the above ICs.

RECOMMENDED BOOKS :

(A) Reference Books

1. Integrated Electronics – Millman Halkias
2. Electronic devices and circuit – R.Boylestead.

(B) Text Books

1. LIC and Op-AMP – R.A. Gayakwad
2. LIC – Driscoll.



ELECTRICAL MACHINE LAB

Total period – 90

No. of Period – 6

Exam – 50

Sessional – 50

Examamination – 4 Hours

1. Study different parts of D.C. Generator.
2. Run a D.C. Shunt Generato and measiuse the no load voltage.
3. Connect and run D.C. Motor of different types.
4. Study 3 point and 4 point starter.
5. Study Speed Control of D.C. Shunt motor (field and armature voltage method).
6. Study 3 phases Alternator.
7. Study 3 phases Induction motor.
8. Study star-delta starter.
9. Indentify the terminals of a transformer.
10. Determine voltage regulation of a transformer by direct loading.
11. Construct switch board using cutout, switches, plugs, holder and two ways Switch.



CIRCUIT THEORY LAB

Period/ Week : 4
Total Period : 60

Total Marks – 100
End. Exam. – 50
Sessional – 50
Exam. Time – 4 hrs

RATIONALE :

The response of Electrical Circuit can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of circuit analysis.

COURSE CONTENT.

1. Verify Ohm's Law
2. Verify series & parallel circuits and determine the branch currents and node Voltage of series & parallel circuits respectively.
3. Verify
 - (a) Super positions theorem
 - (b) Thevenin's Theorem
 - (c) Norton's Theorem
 - (d) Miliman's Theorem
 - (e) Maximum power theorem
4. Determine resonant frequency of series R-L-C circuit
5. Study of high pass filter and determination of cut-off frequency
6. Study of low pass filter and determination of cut-off frequency
7. Study of Band Pass Filter and Band Elimination filter and determination of its cut-off frequency.
8. determination of B-H Curve and its analysis using CRO
9. Develop the circuit diagram and explain response of series resonant circuit
10. Analyse the charging and discharging of an R-C & R-L circuit with oscilloscope. Compute the time constant from the tabulated data and determine the rise time graphically.
11. Determine the time constant of R-L-C circuit and analyse the transient response (rise time, overshoot, damping factor from the oscilloscope)
12. Measurement of attenuation of T and π section.



4th Semester (AE & I)
Signal conditioning & Data Converters Lab.

Period/ Week : 6
Total Period : 90

Examination – 4 Hours
Total Marks – 100
End. Exam. – 50
Sessional – 50

1. Construct, study & verify the gain of Inverting OP-AMP with feedback.
2. Construct, study & verify the gain of Non-Inverting OP-AMP with feedback.
3. Construct, study & verify the gain of differential amplifier using one OP-AMP.
4. Construct & test OP-AMP Adder for 3 dic inputs.
5. Construct & test OP-AMP differentiator.
6. Construct & test OP-AMP integrator.
7. Construct & test V-to-I Converter using OP-AMP.
8. Construct & test I-to-V Converter using OP-AMP.
9. Construct PLL as a frequency multiplier.
10. Construct & test D/A converter using DAC 0800.
11. Construct & test A/D converter using ADC 0800.
12. Construct a signal conditioner to translate the output of thermistor/ RTD to 0-5V.



TECHNICAL SEMINAR

Total Period – 30
No of Periods – 2 P/W

Sessional – 25
Exam – 25
Total – 50

RATIONALE :

It is necessary to develop the communication skill both for verbal and written presentation of facts and data. For developing the skill of presenting the fact related to technical matter in terms of oral presentation the seminar is to be arranged for developing the skill of presenting the report of any observed phenomena the preparation of report is needed. The job is designed in such a way that both the verbal and writing skill as well as techniques of presentation/ will be developed.

OBJECTIVE :

After successful completion of this seminar, the student will able to

1. Present the facts of data or concept through a seminar for developing oral communication skill.
2. Interacting with the audience during questionnaire session.
3. Write the reports containing synopsis, content and other description with suitable display items.
4. Presentation will be either OHP/ Power Point Presentation or Chart display etc.

COURSE CONTENT.

Classes should be divided into smaller groups of not more than four in each group. One group should be assigned a topic for the Seminar. The topic should be usually related to their course of studies or should be of general interest. Every student of the group should prepare on a particular aspect of the main topic with active support and guidance from a teacher guide. The student should be encouraged to extensively use the library facilities and also to collect relevant material from different Technical Magazines and journals. Each student should be usually asked to present his paper on the topic of the Seminar within 15 minutes after which a question answer session may follow for 5 minutes. The Sr. Lecturer or Sr. Faculty member should preside over the Seminar and ensure its smooth conduct. The student should be encouraged to use Audio-Visual Aids and other modern teaching methods during presentation of the topics in the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. Each student at-least speaks for a minimum of two times during the semester.



PROCESS INSTRUMENTATION – II

Period/Week : 5 (4+1)
Total Period : 75

Total Marks : 100
End Exam. Theory : 80
Internal Assessment : 15
Exam Time : 3 Hours

RATIONALE :

The study of Process Instrumentation – II will give a detail picture to the students about measurement of some special industrial process parameters such as force, torque, stress, strain, density viscosity, humidity, PH, speed, acceleration and acoustics. This study will be useful for the students to supervise the shop-floor instrumentation work in the industries.

OBJECTIVES :

1. To know about the skill of different physical parameter measurement in terms of electrical voltage.
2. To identify different types of transducers and sensors for various physical parameters required to be measured in industry.
3. To know about the advantages, disadvantages and cost criteria of different types of measurement process used in industry.

TOPIC WISE DISTRIBUTION OF PERIODS :

Sl. No.	Topics	Periods
1.	Measurement to force, torque and shaft power	16
2.	Stress and strain measurement	16
3.	Density measurement	06
4.	Viscosity measurement	06
5.	Humidity and moisture measurement	12
6.	pH measurement	06
7.	Speed and acceleration measurement	05
8.	Acoustic measurement	08
Total		75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. MEASUREMENT OF FORCE, TORQUE, SHAFT POWER.

- 1.1 Define force, torque and shaft power.
- 1.2 Explain basic methods of measurement of force.
- 1.3 State and explain Equal and unequal arm balance.
- 1.4 Explain multiple level systems of force measurement.
- 1.5 Explain Hydraulic and pneumatic load cells.
- 1.6 Explain methods of measurement of torque using strain sensor.
- 1.7 Explain measurement of shaft power using rope break and prony break.

2. STRESS AND STRAIN MEASUREMENT

- 2.1 Define and explain strain gauge type transducers.
- 2.2 Explain strain measurement by variable resistance strain gauge.
- 2.3 Define the concept of Rosette gauges.
- 2.4 List out different types of strain sensing elements.
- 2.5 Define and explain configuration of strain gauge element.
- 2.6 List out different types of strain gauge adhesives and lead wires.
- 2.7 Distinguish between Bonded and un-bonded strain gauge.
- 2.8 Explain Instruments for strain gauge temperature compensations.
- 2.9 Explain the function of Instruments for static as well as dynamic strain measurement.
- 2.10 Describe the use of strain gauge on rotating shaft.
- 2.11 Give applications of load cell,
 - (i) Weigh bridges (Static weight measurement)
 - (ii) Belt weights (Dynamic weight measurement)

3. MEASUREMENT TO DENSITY

- 3.1 Define the concept of density.
- 3.2 Explain fundamental methods of density measurement.
- 3.3 Explain the function of Photo cell, Differential transformer and constant volume Hydrometer.
- 3.4 Explain the function of Air pressure balance method.
- 3.5 Explain the operation of Gas density detector and Gas Analyzer.

4. VISCOSITY MEASUREMENT

- 4.1 Define viscosity and Co-efficient of viscosity.
- 4.2 Distinguish between density and viscosity.
- 4.3 State and explain Stokes law.
- 4.4 Define Newtonian and non-Newtonian type fluid.
- 4.5 Explain Ostwald method of determination of viscosity.
- 4.6 Explain the function of two float viscorator.
- 4.7 Describe Torque method of determination of viscosity.

5. HUMIDITY AND MOISTURE MEASUREMENT

- 5.1 Define moisture and humidity.
- 5.2 Define absolute, relative specific humidity and dew point.
- 5.3 List out different types of humidity measuring instruments.
- 5.4 Explain the function of Wet and dry bulb psychrometer and sling psychrometer.
- 5.5 Explain the function of Hair hygrometer and Electrical type hygrometer.
- 5.6 Explain dew point measurement.
- 5.7 Explain the function of
 - (a) Conductivity moisture meter
 - (b) Dielectric moisture meter

6. pH MEASUREMENT

- 6.1 Define hydrogen ion concentration and pH value.
- 6.2 Explain pH scale.
- 6.3 Describe electrical method of pH measurement.

- 6.4 Explain the function of
- Hydrogen electrode
 - Calomel electrode
 - Glass electrode
- 6.5 Describe measurement of pH with glass electrode.

7. MEASUREMENT OF SPEED AND ACCELERATION

- 7.1 Classify speed measurement process.
- 7.2 Define speed and acceleration .
- 7.3 Explain the function of Mechanical tachometer.
- Revolution counter.
 - Centrifugal force tachometer.
 - Resonance force tachometer.
- 7.4 Explain the principle of Electrical tachometer (tacho generator)
- Electro generator type.
 - Eddy current drag type.
 - Contact less type digital tachometer.
- 7.5 Explain optical method of speed measurement by using stroboscope.
- 7.6 Explain the operation of Accelerometer :
- Piezo-electric type
 - Strain gauge type.

8. ACOUSTIC MEASUREMENT

- 8.1 Define acoustic pressure.
- 8.2 Explain characteristics of sound, sound pressure level & power levels.
- 8.3 Explain the function of typical sound system and microphone.

9. GAS ANALYSER

- 9.1 Explain the basic principle of gas analyser.
- 9.2 Describe the function of
- Infrared gas analyser.
 - Oxygen analyser.
- 9.3 Explain the measurement of gas constituents by thermal conductivity method.

RECOMMENDED BOOKS :

(A) Text Book :

- Mechanical measurements and instrumentation. By – R.K. Jain
- Electrical & Electronics Measurement & Instrumentation A.K. Sahanni
- Electrical & Electronics Measurement & Instrumentation by R.K.Rajput

(S.Chand Publisher.)

(B) Reference Books :

- Industrial instrumentation. By – Fibrance
- Instrumentation devices and system. By – Rangan, Sharmman
- Instrumentation. By – Eckman.



BIOMEDICAL INSTRUMENTATION

Period/Week : 4
Total Period : 60

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 15+5
Exam. Time : 3 Hours

RATIONALE :

The subject Biomedical and Environmentation is a very vital subject for the students at the present age, to know about Biomedical Electronic Instruments used for getting the biological information of the human being correctly for investigation.

OBJECTIVES :

1. To know different physiological variables of interest in Medical-Electronics.
2. To know different bio-electric potentials such as ECG, EEG, EMG, ERG, EOG, EGG.
3. To get acquainted with different biomedical instruments such as Pacemaker, Defibrillator, Ultrasonograph.
4. To get an exposure to bio-telemetry systems.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Periods
1.	Basic principles	08
2.	Electrodes	08
3.	Cardiovascular systems and measurements	12
4.	Diagnostic instrumentation	08
5.	Clinical instruments	08
6.	X-ray and radio isotope inst.	08
7.	Electrical safety of medical equipments	08
8.	Application of nanosensors in biomedical Instrumentation	08
9.	Bio-telemetry	07
	Total	75

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. BASIC PRINCIPLES

- 1.1 Define human parameters measurement system & explain it's components.
- 1.2 State different types of transducers for biomedical Instruments.
- 1.3 Explain sources of bio-electric potentials.
 - (a) Resting and action potential.
 - (b) Propagation of action potential
 - (c) Bio-electrical potentials.

2. ELECTRODES

- 2.1 State and explain Electrode theory.
- 2.2 Classify Bio-potential electrode and state their uses.

3. CARDIO VASCULAR SYSTEMS AND MEASUREMENT

- 3.1 Explain the operation of heart & cardio vascular system and associated Instruments.
- 3.2 Blood pressure.
- 3.3 Define the characteristics of blood flow.
- 3.4 State the types and causes of Heart sound.
- 3.5 Define Electrocardiography and explain its features.
- 3.6 Explain measurement of Blood flow & cardiac output.
- 3.7 Define and explain Plethysmography.
- 3.8 Explain Measurement of heart sound.
- 3.9 Define Pacemakers and explain its use.
- 3.10 Explain Defibrillators.

4. DIAGNOSTIC INSTRUMENTATION

- 4.1 Explain Temperature measurement.
- 4.2 Explain Principles of Ultrasonic Measurement.

5. CLINICAL LABORATORY INSTRUMENTS

- 5.1 Study blood cells.
- 5.2 Chemical test.
- 5.3 Explain the working of Blood cell counter (Conductivity method)

6. X-RAY AND RADIOISOTOPE INSTRUMENTATION

- 6.1 Describe Generation of Ionizing Radiation.
- 6.2 Describe Instrumentation for diagnostic X-ray handling of machine.

7. ELECTRICAL SAFETY OF MEDICAL EQUIPMENT

- 7.1 Describe the physiological effect of electrical currents.
- 7.2 Describe shock hazards of electrical equipments.
- 7.3 Explain methods of accident prevention.

8. APPLICATION OF NANOSENSORS IN BIOMEDICAL INSTRUMENTATION.

Bio nano materials, Nano Biology, instrumentation, replacement, Repair, Chemical Accumulation, DNA Damage, Brain Damage, Hormone Deficiency Advantages of nano materials use as Implants.

9. BIO-TELEMETRY

- 9.1 State introduction of biotelemetry.
- 9.2 State physical parameters adaptable to bio-telemetry.
- 9.3 Identify Components of bio-telemetry system.
- 9.4 Explain Temperature telemetry system.
- 9.5 Describe Multi-patient telemetry.

RECOMMENDED BOOKS :

1. Biomedical Instrumentation and Measurement. By – Leslie Cromwell.
2. A Handbook of Biomedical Instrumentation. By – R.S.Khandpur
3. Mechanical measurement and measuring instrument. By – R.K.Jain.
4. Nano Technology by Rakesh Rathi (S.Chand Publication.)



PROCESS CONTROL

Period/Week : 4
Total Period : 60
Tutorial : 15

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 15+5
Exam. Time : 3 Hours

RATIONALE :

The subject process control will give the detail knowledge to the students about different types of control system with brief idea about PLC, DCS and SCADA system. With this experience the students will satisfactorily render the duty of supervisor in the modern process industries. They can effectively measure and control the process parameters for smooth run of the system.

OBJECTIVES :

1. Students will learn basic difference between manual & automatic Control Systems with examples.
2. Students can understand easily the difference between modes of control.
3. Students will be acquainted with Pneumatic, Hydraulic & Electronic Control systems.
4. Students will learn most advanced control system like PLC, DCS & SCADA System.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl. No.	Topics	Periods
1.	Introduction to concept of automatic control	06
2.	Control action	06
3.	Two position control	06
4.	Proportional control	06
5.	Controller combination	06
6.	Pneumatic controller	06
7.	Hydraulic controller	06
8.	Final control element	04
9.	Various modes of electronic controller by using OP-AMP	10
10.	Explain brief about PLC, DCS & SCADA	05
	Total	60

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES :

1. INTRODUCTION TO CONCEPT OF CONTROL

- 1.1 Describe close loop idea.
- 1.2 Describe Manual control of temperature.
- 1.3 Describe Conversion from manual to automatic operation.
- 1.4 Describe Open loop systems.
- 1.5 Describe Closed loop systems.
- 1.6 Explain with examples of temperature and pressure control by closed loop system.

2. CONTROL ACTION

- 2.1 Explain different type of control actions.
- 2.2 Explain the Principle of ON/OFF action.
- 2.3 Explain the Principle of proportional action.
- 2.4 Explain the Principle of integral action.
- 2.5 Explain the Principle of derivative action.
- 2.6 Explain the Principle of proportional plus integral action.
- 2.7 Explain the Principle of proportional plus integral plus derivative action.

3. TWO POSITION CONTROL

- 3.1 Explain Control loops.
- 3.2 Outline of Automatic temperature control system.
- 3.3 Explain Two-position control.
- 3.4 Explain Two-position liquid level control.

4. PROPORTIONAL CONTROL

- 4.1 Analysis of Self operating proportional controller for flow.
- 4.2 Analysis of Self operating proportional controller for level.
- 4.3 Explain the ideas about proportional Band.

5. CONTROLLER COMBINATION

- 5.1 Analysis of Proportional plus reset controller combination.
- 5.2 Derive the Equation for proportional plus reset controller combination.
- 5.3 Analysis of Proportional plus rate controller combination.
- 5.4 Derive the Equation for proportional plus rate controller combination.
- 5.5 Analysis of Proportional plus reset plus rate controller.
- 5.6 Derive the Equation for proportional plus reset plus rate controller.

6. PNEUMATIC CONTROLLER

- 6.1 Explain Basic concepts of conventional pneumatic controller.
- 6.2 Analysis of Pneumatic two position controller on a pressure Application.
- 6.3 Analysis of Pneumatic proportional plus reset controller on a Pressure application.
- 6.4 Analysis of Pneumatic proportional plus reset plus rate controller on a pressure application.

7. HYDRAULIC CONTROLLER

- 7.1 Explain hydraulic controller relay.
- 7.2 Explain hydraulic proportional controller in temperature controller application.
- 7.3 Explain hydraulic proportional plus rate controller.
- 7.4 Explain hydraulic proportional plus reset plus rate controller.

8. FINAL CONTROL ELEMENTS

- 8.1 Describe Air operated valve.
- 8.2 Describe Air Diaphragm operated valve positioner.
- 8.3 Describe Air Piston actuator valve.
- 8.4 Describe Air Spring actuator for spring actuator with positioner.

8.5 Describe Air Hydraulic control valve.

8.6 Describe Air Solenoid valve, Motorized actuator for valve operation.

9. VARIOUS MODES OF ELECTRONIC CONTROLLER BY USING OP-AMPS

9.1 Derive ON/OFF control action.

9.2 Derive Proportional controller action.

9.3 Derive Proportional Plus Derivative Controller action.

9.4 Derive Proportional Plus Integral Controller action.

9.5 Derive Proportional Plus Integral Plus Derivative Controller action.

10. EXPLAIN IN BRIEF ABOUT

10.1 P. L. C.

10.2 D. C. S.

10.3 SCADA System.

RECOMMENDED BOOKS :

(A) Test Books :

Automatic control system, By – Lajoy

(B) Reference Books :

1. Modern control system. By – K.Ogata

2. Automatic control system. By – B.C.Kuo P.L.C.

3. Instrumentation hand book.

4. Control system engineering. By – Nagraj & Gopal.



INDUSTRIAL CONTROL DEVICES

Period/Week : 4
Total Period : 60

Total Marks : 100
End. Exam. Theory : 80
Internal Assessment : 15 + 5
Exam. Time : 3 Hours

RATIONALE :

The study of Industrial Control Devices will give the students detail idea about power electronics devices such as Thyristor GTO, PUT and other industrial systems like delays, synchros, servomechanism and UPS. The students will also acquire adequate knowledge about principle of the devices and mechanism. The subject will also give the idea the control of D.C. and A.C. Motors. Besides, the students will gain knowledge about drives system.

OBJECTIVES :

1. Student's must be acquainted with Power electronics devices.
2. Almost all Industrial Controls is done with the help of Power electronics Devices.
3. Student's will learn some important Power electronics Circuits Beneficial to the society..

TOPICWISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Regulated power supply	06
2.	Thyristors	06
3.	DC motor control	03
4.	Relays	05
5.	Synchros	05
6.	Servomechanism	03
7.	AC voltage regulator	09
8.	U.P.S	07
9.	Power devices	07
10.	AC motor control	04
11.	Types of different technology of Drive system	05
Total		60

COURSE CONENT IN TERMS OF SPECIFIC OBJECTIVES :

1. REGULATED POWER SUPPLY

- 1.1 Explain Ordinary D.C. power supply.
- 1.2 Classify different units of D.C. series voltage Regulators.
 - (i) Sampling units.
 - (ii) Reference units.
 - (iii) Comparison units.

- (iv) Amplifier units.
 - (v) Control units
 - (vi) Complete series and shunt voltage regulator.
- 1.3 Explain I.C. Voltage regulators. (fixed and variable)
 - 1.4 Explain Current limit and over voltage protection.
 - 1.5 Explain Switch mode power supply. (D.C & A.C.)

2. THYRISTORS

- 2.1 Discuss SCR characteristics.
- 2.2 Explain Principle of operations with two transistor analogues.
- 2.3 Discuss Methods of turning ON & OFF.
- 2.4 Explain SCR ratings specifications and nomenclatures.
- 2.5 Explain Triggering of SCR.
- 2.6 Explain Principle of operation of Triac.
- 2.7 Explain Principle of operation of Diac.
- 2.8 Discuss Application of SCR, Triac & Diac in power control.
- 2.9 3-phase rectification by using SCR.

3. D.C MOTOR CONTROL

- 3.1 Explain Speed control of dc motor by using SCR.
- 3.2 Explain Speed regulation with variation in load.
- 3.3 Explain Speed regulation with change in supply voltage.

4. RELAYS

- 4.1 Discuss Motions and operations of relays.
- 4.2 Classify electromechanical and reed relay.
- 4.3 State Types of relays.
- 4.4 Explain Open and Close circuit Relay system.
- 4.5 Explain Automatic relays.
- 4.6 Explain ON-Relay (Timer plus relay), OFF-Relay (Timer plus relay)
- 4.7 Explain Over current, over voltage, frequency relay, contactor units and time Delay relay.
- 4.8 Discuss Potential free contact.
- 4.9 Explain Relay logic development.

5. SYNCHROS

- 5.1 Explain Operation of the synchro generator and motors.
- 5.2 Explain Reversing motor and stator connections.
- 5.3 Explain the Principle of differential synchro system.
- 5.4 Explain how Differential synchro system for addition and subtraction.

6. SERVOMECHANISM

- 6.1 Explain Elements of servo systems.
- 6.2 Explain D.C and A.C servomotors and Stepper Motor.
- 6.3 Discuss Application of servomechanisms.

7. A.C. VOLTAGE REGULATORS.

- 7.1 Discuss Manual control regulators with tap changing.
- 7.2 Explain Autotransformer.
- 7.3 Explain Buck-Boost-Transformer concepts.
- 7.4 Explain Automatic step regulators.
- 7.5 Explain Automatic servo regulators.

8. UN-INTERRUPTIBLE POWER SUPPLY.

- 8.1 Explain Principle of On-line UPS.
- 8.2 Explain Principle of stand by UPS.
- 8.3 Discuss Battery chargers.
- 8.4 Explain constant voltage transformers.
- 8.5 Explain Introduction to sine wave inverter (single phase full wave) and three phase inverter. (180° conduction mode only.)
- 8.6 Discuss the operation of static by-pas switch.

9. POWER DEVICES

- 9.1 Discuss Working Mechanism of GTO.
- 9.2 Discuss Working Mechanism of PUT.
- 9.3 Discuss Working Mechanism of IGBT.
- 9.4 Discuss Working Mechanism of POWER MOSFET.
- 9.5 Explain UJT as a Control Device.
- 9.6 Explain SCS.

10. A.C. MOTOR CONTROL

- 10.1 Discuss Types of speed control Mechanism.
- 10.2 Explain AC drives/frequency converter. (Variable voltage and variable frequency drive)
- 10.3 Discuss Dynamic breaking.

11. TYPE AND DIFFERENT TECHNOLOGY OF DRIVE SYSTEM

RECOMMENDED BOOKS :

- 1. Industrial electronics. By – Paul B. Zaber.
- 2. Industrial electronics. By – G.K.Mithal
- 3. Thyristers. By – P.C.Sen.
- 4. Industrial electronics. By – Chute & Chute.
- 5. Power Electronics. By – Rashid.



MICROPROCESSOR & ITS INTERFACING

Theory & Tutorial : 5 P/W
Total Theory & Tutorial : 75 P

Examination : 3 Hr
Total Marks : 100
Theory : 80
I.A. : 15 + 5

A. RATIONALE :

The Microprocessor control has taken predominance over other types of control some time past. Starting from Electrical Power plant to consumer electronics the chip finds extensive uses. As such Microprocessors have made prevailing influence our lives. This field is developing so rapid that it is difficult to keep pace with changes. Under this subject Architecture and instruction sets of 8 bit and processor have been discussed. Some applications have also been included through interfacing chips.

B. OBJECTIVE

On completion of the subject, the students will be able to :

1. The students will be able to differentiate between 8085 & 8086 microprocessor.
2. Classify Bus.
3. Describe the Architecture of 8085 microprocessor.
4. Comprehend different instructions of 8085 microprocessor.
5. State & explain addressing modes.
6. Write instructions under different addressing modes.
7. Discuss assembler.
8. Explain basic assembler directives.
9. Describe types of assembly language programs and write programs.
10. Explain the timing diagrams of different instructions.
11. State the functions of the interfacing chips like 8255, 8259 etc.
12. Explain the delay subroutine.
13. Calculate the delay in ms by one, two or three registers.
14. Explain ADC & DAC.
15. Explain the use of ADC & DAC modules in time delay subroutine chip 0800.
16. Write a program for traffic light control.
17. Apply programming technique for stepper motor control.

C.

TOPICWISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Introductions	...
2.	Basic architecture	10
3.	Instruction set	06
4.	Branch & subroutine	07
5.	Assembly Language Programming	10
6.	Timing Diagram	06
7.	Interfacing & I/O Programming	07
8.	Case study of microprocessor	08
9.	Introduction to 8086, 8088 & 68 k (Motorola) microprocessor	08
10.	Microcontroller	05
	Total	75

D. COURSE CONENT IN TERMS OF SPECIFIC OBJECTIVES :

1. INTODUCTION

- 1.1 Discuss microprocessor
- 1.2 Distinguish between microprocessor & microcomputer
- 1.3 Discuss generation of microprocessor

2. BASIC ARCHITECTURE OF 8-BIT MICROPROCESSOR

- 2.1 Discuss Architecture.
- 2.2 State & Expalin BUS.
- 2.3 Study general Bus structure.
- 2.4 Describe address bus, data bus, control bus.
- 2.5 Describe pin structure of 8085 microprocessor.
- 2.6 Describe internal Architecture of 8085 microprocessor.
- 2.7 Describe three state register three state switches.
- 2.8 Study the data transfer using tristate registers.
- 2.9 Discuss Arithmetic logic unit.
- 2.10 Explain program counter.
- 2.11 State & explain stack pointer, stack & stack top.
- 2.12 State & explain register.
- 2.13 Distinguish between SPR & GPR.
- 2.14 Describe flag register.

3. INSTRUCTION SET.

- 3.1 Discuss instructions.
- 3.2 Explain need for addressing data.
- 3.3 Differntiate between 1-address, 2-address & 3-address instruction with examples.
- 3.4 Study different instructions of 8085 microprocessor with examples.
- 3.5 Define addressing modes.
- 3.6 Study various addressing modes of 8085 microprocessor.

4. BRANCH & SUB-ROUTISE INSTRUCTIONS

- 4.1 State & explain branch & sub-routine.
- 4.2 Study different branching instructions.
- 4.3 Classify stack, I/O machine control group instructions,
- 4.4. Study the basic assembler directives.

5. ASSEMBLY LANGUAGE PROGRAMMING

- 5.1 Discuss the concept of ALP.
- 5.2 Give examples of an execution of a simple programme.
- 5.3 Discuss assembler, distinguish between directives & labels.
- 5.4 Define structured programming.
- 5.5 Study programming examples like conditional loops.
- 5.6 State & explain sub-routine.
- 5.7 Give programming examples of sub-routines.
- 5.8 Design stack manipulation & look-up table.

6. TIMING DIAGRAMS.

- 6.1 Discuss the concept of timing diagram.
- 6.2 Differentiate between instruction cycle, machine cycle & T-state.
- 6.3 Draw op-code phase machine cycle (4 & 6 T- state) timing diagram.
- 6.4 Draw timing diagram for memory read, memory write, I/O read & I/O write machine cycles.
- 6.5 Draw for bus idle, hold & halt states.
- 6.6 Draw a neat sketch for the timing diagram for 8085 instruction (MOV, DCR, MVI, LDA)

7. INTERFACING I/O PROGRAMMING.

- 7.1 Discuss interfacing.
- 7.2 Draw the Pin diagram of 8255 (PPI chip).
- 7.3 Describe each Pin function.
- 7.4 Define Port.
- 7.5 Study universal timer chip.
- 7.6 Explain programming with I/O chips 8255.
- 7.7 Explain programming with I/O chips 8259

8. CASE STUDY OF MICROPROCESSOR.

- 8.1 Describe ADC & DAC.
- 8.2 Study ADC & DAC modules, use of time delay sub-routine.
- 8.3 Design counter (clocked) using universal timer chips.
- 8.4 Interface a traffic light control systems using 8255.
- 8.5 Write interfacing programme for stepper motor control.
- 8.6 Write programming technique for achieving time delay.
- 8.7 Explain programming technique for constructing counters.
- 8.8 Design for basic Traffic light control system.

9. INTRODUCTION TO 8086, 8088 MICROPROCESSOR

- 9.1 Describe 8086 & 8088 microprocessor with pin digram.
- 9.2 Discuss the architecture & timing diagram of 8086 microprocessor.
- 9.3 Discuss the instruction sets of 8086 microprocessors.
- 9.4 Give example of an execution of simple program.
- 9.5 Discuss the register organisation of 80-186, 286, 386, 486 & Pentium microproce.

10. MICROCONTROLLER

- 10.1 State over view of 8051 microcontroller.
- 10.2 Brief idea of microprocessor based Temperature, Pressure Control system.

RECOMMENDED BOOKS

(A) Text Books :

1. Microprocessor by Gaorkar.
2. Microprocessor by B. P. Singh
3. Microprocessor by B. Ram.
4. Microprocessor base system design by Ghosal.
5. Microprocessor and its applications by R. Theagarajan, S. Dhanasetharan and S. Dhanapal

(B) Reference Books :

1. A. P. Mathur.
2. Malvino.



5TH SEMESTER (AE & I)

Process Instrumentation Lab – II

Pd / Wk : 5
Total Pd : 75

Total Marks : 50
End Exam. : 25
Sessional : 25
Exam. Time : 4 Hrs

RATIONALE :

The students will be able to measure different types of Industrial parameters using process instruments.

COURSE CONTENT

1. To plot the characteristics of Thermistor transducer.
2. To plot the characteristics of RTD transducer.
3. To plot the characteristics of Thermocouple transducer.
4. Measurement of furnace temperature using pyrometer.
5. Measurement of displacement using LVDT.
6. Measurement of strain using strain gauge.
7. Measurement of force using load cell.
8. Measurement of pH of a given solution using pH meter.
9. Measurement of humidity by hygrometer.
10. Measurement of moisture content using moisture meter.
11. Measurement of speed of fan using stroboscope.
12. Calibration of Pressure gauge by Dead weight pressure gauge.



5TH SEMESTER (AE & I)

Process Control Lab

Pd / Wk : 06
Total Pd : 90

Total Marks : 50
End Exam. : 25
Sessional : 25
Exam. Time : 4 Hrs

RATIONALE :

The students will be have an exposure to controllers used in On-Line system. In addition to that they will be able to apply the knowledge of Power Electronics in actual fields.

COURSE CONTENT

1. To plot the characteristics of SCR.
2. To plot the characteristics of TRIAC.
3. To plot the characteristics of DIAC
4. Performance study of Electronics ON-OFF Temperature Controller.
5. Performance study of Temperature Process analyzer configured as ON-OFF Controller, P, P + I, P + I + D Controller.
6. Performance study of ON-Line Temperature Process Analyzer.
7. Performance study of ON-Line Pressure Process Analyzer.
8. Performance study of ON-Line Level Process Analyzer.
9. Performance study of ON-Line Flow Process Analyzer.
10. Performance study of DC Position Control using P-I-D control action.
11. Performance study of P to I Converter.
12. Construction of proportional & integral controller using Op-Amp.



MICROPROCESSOR & INTEREACING LAB

Pd/wk – 4
Total Period – 60

Total Marks – 50
End Exam. – 50
Sessional – 25
Examination Time – 4 Hrs.

A. GENERAL PROGRAMMING USING 8085

1. (a) 1'S Complement
(b) 2'S Complement
(c) Addition of 8-bit number
(d) Subtraction of 8-bit number
2. (a) Decimal Addition 8-bit number
(b) Decimal Subtraction 8-bit number
(c) Addition of two 8-bit & result in 16-bit.
3. (a) Comparision between two numbers
(b) Find the largest in an Array.
4. (a) Multiplication of 8-bits
(b) Division of 8-bit
5. (a) Block Transfer
(b) Inter change of Block data
6. (a) Ascending order/Descending order.
(b) Conversion (Binary to Hex/Hex to Binary).
(c) Making of Bits / Logical operator.
7. Check the execution of a programma by single step.

B. INTERFACING USING 8085

- (a) Glow of a light (Moving light / dancing light)
- (b) Display your name suing monitor display using 827
- (c) Traffic light control using 8255.
- (d) Analog to Digital conversion & vice versa
(i) ADC (ii) DAC
- (e) Generation of square wave using 8255
- (f) Steeper motor control

C. SIMPLE PROGRAMMA USING 8086

- (a) Addition
- (b) Subtraction
- (c) Multiplication
- (d) Division
- (e) Strig Manuplication

D. STUDY OF MICROCONTROLLER



TECHNICAL SEMINAR

Total Period : 30
No of period : 2 P/W

Sessional = 25
End Exam = 25

RATIONALE :

It is necessary to develop the communication skill both for verbal and written presentation of facts and data. For developing the skill of presenting the fact related to technical matter in terms of oral presentation the seminar is to be arranged. For developing the skill of presenting the report of any observed phenomena the preparation of report is needed. The job is designed in such a way that both the verbal and writing skill as well as techniques of presentation will be developed.

OBJECTIVES :

After successful completion of this seminar, the student will able to

- (i) Present the facts or data or concept through a seminar for developing oral communication skill.
- (ii) Interacting with the audience during questionnaire session.
- (iii) Write the reports containing synopsis, content and other description with suitable display items.
- (iv) Presentation will be either OHP/Power Point Presentation or chart display etc.

COURSE CONTENT INTERMS OF SPECIFIC OBJECTIVES :

Classes should be divided into smaller groups of not more than four in each group. One group should be assigned a topic for the Seminar. The topic should be usually related to their course of studies or should be of general interest. Every student of the group should prepare on a particular aspect of the main topic with active support and guidance from a teacher guide. The student should be encouraged to extensively use the library facilities and also to collect relevant material from different Technical Magazines and Journals. Each student should be usually asked to present his paper on the topic of the Seminar within 15 minutes after which a question answer session may follow for 5 minutes. The Sr. Lecturer or Sr. faculty member should preside over the Seminar and ensure its smooth conduct. The student should be encouraged to use Audio-Visual Aids and other modern teaching methods during presentation of the topics in the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. Each student at-least speaks for a minimum of two times during the semester.

The Sessional Records should be maintained and evaluated by a team of faculty members and the final marks awarded by the team.



ENTREPRENEURSHIP & INDUSTRIAL MANAGEMENT

Total Periods – 75
Periods per Week – 05

Time – 3 Hours
Full Marks – 100
Theory – 80
Internal – 15 + 5

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Periods
1.	Concept of Organization & Enterprise Management	08
2.	Entrepreneurship & Management of S.S.I.s	14
3.	Financial Accounting & Cost Control	09
4.	Stores & Financial Management	03
5.	Production management	03
6.	Sales & Marketing Management	03
7.	Human resource Management	04
8.	Industrial Sickness	04
9.	The Factories Act 1948	05
10.	Workmen's Compensation & Payment of Wages Act	08
11.	Industrial Dispute Act	04
12.	Trade Union Act	04
13.	E - Commerce	06
	Total	75

RATIONALE :

The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment. Management functions, in an organisation, coordinates various resources to allow the manufacturing activities to continue on a sustained basis. It is essential that the diploma engineers are given an exposure industrial activities.

Various statutory rules acts and regulations have been instituted in India by Central/State Govt. to ensure that the workmen are not exploited and they can earn their livelihood with respect. As a supervisor/manager has to work in an industry under binding of such rules and acts, they should have a fair idea of such rules/acts/ regulations.

OBJECTIVE :

On Completion of the course the student will be able to :

1. Understand the concept of different forms of organisation & Management function.
2. Explain the role of an entrepreneur in industrial environment & detailed idea on SSI and various related aspects.
3. Learn about financial accounting and cost control

4. Know the different areas of management relating to stores & finance, producing, sales & marketing and human resource in the organisation.
5. Understand about the industrial sickness & its remedies.
6. Have a comprehensive idea on some important legislations relating to factory, workmen's compensation, payment of wages, industrial disputes and trade union.

1. CONCEPT OF ORGANISATION & ENTERPRISE MANAGEMENT

- 1.1 Define & state the features of Business
- 1.2 Explain the components of Business
- 1.3 State the feature of different forms of Business Organisation
- 1.4 Define Management & different Management with Administration
- 1.5 Discuss the functions of Management
- 1.6 Discuss the principles of 'Scientific Management'
- 1.7 Explain organisation structure and delegation of authority & responsibility
- 1.8 State the principles of a sound organisation.

2. ENTREPRENEURSHIP & MANAGEMENT OF S.S.I.s

- 2.1 Define and state the meaning of Entrepreneurship.
- 2.2 Discuss the entrepreneurial characteristics.
- 2.3 Explain the role of an entrepreneur in industrial development.
- 2.4 Define S.S.I., Ancillary, Tiny, Cottage, Medium, & Large scale Industries.
- 2.5 Explain the features of SSI.
- 2.6 Discuss the criteria for selection of SSI.
- 2.7 Prepare a preliminary & detailed project report of a SSI.
- 2.8 Enumerate the incentives available to SSI as per IPR.
- 2.9 State the inputs required for setting up a SSI.
- 2.10 Discuss the institutional support to SSI at State and National level.
(OSFC, OSIC, ISICOL, IDCO, SIDBI, IDBI, ICICI, & Commercial Banks)

3. FINANCIAL ACCOUNTING & COST CONTROL.

- 3.1 State the different types of Accounts & explain the double entry system of book keeping.
- 3.2 Explain Journal, Ledger, Trial Balance & Cash Book.
- 3.3 Explain the components of Final Accounts and Balance-sheet.
- 3.4 Define Cost and explain its elements.
- 3.5 Prepare a simple cost sheet.
- 3.6 Explain cost - volume - profit relationship & break-even-point.

4. STORES & FINANCIAL MANAGEMENT

- 4.1 State the procedures involved in purchasing.
- 4.2 Explain the centralized & decentralized purchasing.
- 4.3 State the meaning & importance of Inventory control.
- 4.4 Explain the different stores records- Bin Card, Stores Ledger & Goods Received Note etc.
- 4.5 State the meaning & importance of Financial Management in contact with S.S.I.
- 4.6 Explain the types of capital – Fixed & Working.
- 4.7 Discuss briefly the components of Working Capital Management.

5. PRODUCTION MANAGEMENT

- 5.1 State the importance of Production, Planning, & Control.
- 5.2 Discuss the steps involved in Production Planning & Control.

6. SALES & MARKETING MANAGEMENT

- 6.1 Discuss the importance of sales & marketing management .
- 6.2 Mention & explain different selling methods.
- 6.3 Explain the product policy briefly
(Types of Product, Packaging, Branding, Pricing, Cost plus pricing, Variable Pricing policy, Price strategy).
- 6.4 Enumerate the techniques of sales promotion.
- 6.5 Explain Advertising & its media.

7. HUMAN RESOURCE MANAGEMENT

- 7.1 Mention the different sources of recruitment.
- 7.2 Explain the different methods of selection.
- 7.3 Discuss the different training methods.
- 7.4 State the need of performance appraisal.

8. INDUSTRIAL SICKNESS

- 8.1 Define & explain the meaning of Industrial sickness.
- 8.2 State the causes of sickness.
- 8.3 Explain the remedial measures to avoid Industrial Sickness.

9. THE FACTORIES ACT.

- 9.1 State the meaning & objectives of Factories Act.
- 9.2 Outline the various provisions related to Health, Safety, Welfare, Hours of Work, Holidays, Wages, Employment of Women, Accidents, Diseases, Penalties & Procedures.
- 9.3 Explain the duties of Factory Inspector.

10. WORKMEN'S COMPENSATION & PAYMENT OF WAGES ACT.

- 10.1 State the rules regarding Workmen's compensation.
- 10.2 Explain the employees liability for compensation.
- 10.3 State the obligations and rights of employer.
- 10.4 Give the meaning of Payment of Wages Act.
- 10.5 State the different rules for payment of minimum wages.
- 10.6 State the provisions of E.P.F & E.S.I.

11. INDUSTRIAL DISPUTE ACT.

- 11.1 Outline the objects & meaning of Industrial Dispute Act.
- 11.2 State the causes of Industrial Disputes.
- 11.3 Enumerate the machinery set up for settlement of Industrial Disputes.
- 11.4 Explain the measures for prevention of Industrial Disputes.

12. TRADE UNION ACT.

- 12.1 State the meaning & functions of Trade Union.
- 12.2 Explain the features of Trade Union Act.1926.

13. E. COMMERCE

Brief Idea about E-Commerce

RECOMMENDED BOOKS :

1. Industrial Engineering & Management – O.P. Khana.
2. Entrepreneurial Development – Gupta & Srivastav.
3. Small Scale Industry – Vasant Desai.
4. Business organisation – Sharma & Gupta.
5. Principles & Practice of Management – L.M. Prasad.
6. Entrepreneurship for Engineers – B.Badhei.
7. Industrial Law – N.D. Kapoor.
8. E. Commerce and E- Business – By C. S. Raidu, Himalya Publication
9. Entrepreneurship & Industrial Mangement – By Shashi K. Gupta & Neeti Gupta,

Kalyani Publishers



6th SEMESTER (AE&I)
INDUSTRIAL & INTELLIGENT INSTRUMENTATION

Pd/ Wk – 4 +1
Total Pd – 75

Time – 3 Hours
Total Marks – 100
End Exam. – 80
I.A. – 20

RATIONALE :

The study of Industrial & Intelligent Instrumentation is dealt with the clear understanding of measurement of industrial parameters and the knowledge about intelligent instrumentation. Further the students will get idea about the concept of digital instruments and filters.

OBJECTIVE :

1. To study the construction, operation & characteristics of various electronics equipments.
2. Use of electronics instruments in industry make simple the control of various parameters.
3. Explain electronics instruments used in industry for detection & protection purpose.
4. Explain various intelligent instruments used in industrial applications.

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Measurement of Voltage, Current and Resistance	08
2.	Cathode Ray Oscilloscope	12
3.	Measurement of Lumped Circuit Parameters.	09
4.	Digital Instruments	08
5.	Filters and Attenuators	12
6.	Optical Instruments	10
7.	Intelligent Instruments	16
Total		65

COURSE CONTENT.

1. MEASUREMENT OF VOLTAGE, CURRENT AND RESISTANCE

- 1.1 Discuss the principle of PMMC type multimeter – sensitivity, limitation and advantages of PMMC multimeters.
- 1.2 Discuss the principle of electronic multimeter – balanced bridge type and advantages over electromechanical type.
- 1.3 Measure AC and DC voltages, current and resistance by the help of electronic multimeter.

2. CATHODE RAY OSCILLOSCOPE

- 2.1 Draw the block diagram of CRO & explain the operation.
- 2.2 Describe CR tube.

- 2.3 Explain methods of focussing.
- 2.4 Describe methods of deflection, time base and triggering.
- 2.5 Explain measurement of AC, DC voltage, current using CRO.
- 2.6 Measure frequency with CRO.
- 2.7 Explain operation of Dual Trace Oscilloscope.
- 2.8 Explain Digital storage oscilloscope (only block diagram)

3. MEASUREMENT OF LUMPED CIRCUIT PARAMETERS.

- 3.1 State & explain Principle of Wheat stone bridge.
- 3.2 Explain principle of A.C. bridge.
- 3.3 Obtain bridge balance condition for
 - (a) Maxwell's Inductance bridge
 - (b) Hay's bridge
 - (c) De-Sauty's bridge
 - (d) Anderson' bridge

4. DIGITAL INSTRUMENTS

- 4.1 Describe the principle of Digital Voltmeter
- 4.2 Describe the principle of Digital multimeter
- 4.3 Describe the principle of Digital frequency counter

5. FILTERS AND ATTENUATORS

- 5.1 Explain the principle of various types of Active Filters
 - (a) Low pass filter
 - (b) High pass filter
 - (c) Band pass filter
 - (d) Band stop filter
 - (e) All pass filter
- 5.2 Explain principle principle of various types of attenuators (T and π)

6. OPTICAL INSTRUMENTS

- 6.1 Explain the principle of
 - (a) Alarm annunciator
 - (b) Proximity Switch
 - (c) Event counter using optocoupler
 - (d) Limit switch

7. INTELLIGENT INSTRUMENTS

- 7.1 Explain temperature dependent effects of semiconductor devices.
- 7.2 Explain the operation of two-terminal IC temp sensor.
- 7.3 Explain the operation of three-terminal IC temp sensor.
- 7.4 Explain the operation of IC pressure sensor.
- 7.5 Explain the operation of IC Magnetic field sensor.

RECOMMENDED BOOKS :

- 1. Electrical & Electronics measurement & Instrumentation – By A. K. Shawaney
- 2. Electronics Instrumentation – By W.T. Looper
- 3. Electronics Instrumentation – By H. S. Kalsi.



CONTROL SYSTEM ENGG.

Thory & Tutorial – 5 p/w
Total Theory & Tutorial – 75 P.

Examination – 3 Hours
Total Marks – 100
Theory – 80
I.A. – 15 + 5

A : RATIONALE :

In today's world manufacturing process are mostly automated in almost all industries large, medium or small. The importance of this subject for any branch of Engineering, therefore, can never be overemphasized. Because the course content deals with open loop and close loop system and analysis of their stability by applying time domain and frequency domain methods.

B : OBJECTIVE :

On completion of the subject the students will be able to

1. Explain different types of control system,
2. Apply Laplace transform, Inverse Laplace transfer to solve linear, linear timeinvariant, Differential equation.
3. Derive and simplify the block diagram of open loop & closed loop system with derivation of Transfer function.
4. Develop mathematical model for different system.
5. Explain transient response analysis & steady state error analysis.
6. Discuss impulse response function.
7. Describe 1st & 2nd order system.
8. Explain and apply R-A criterion for determining system stability.
9. Apply Root locus Method for stability anlysis with various examples.
10. State and explain frequency response analysis with the help of Bode diagram, Polar plots.
11. State and explain Nyquist stability criteria and apply to determine system stability.
12. Explain stability by state space method.

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Introduction to control system analysis	10
2.	Mathematical modelling of dynamic systems	10
3.	Transient response & steady-state error analysis	15
4.	Root locus analysis	15
5.	Frequency response analysis	15
6.	Analysis of control system in state space	10
Total		75

D: COURSE CONTENTS IN TERMS OF SPECIFIC OBJECTIVES

1. INTRODUCTION TO CONTROL SYSTEM ANALYSIS.

- 1.1 State & explain control system.
- 1.2 Give examples of control system.
- 1.3 Discuss Laplace transform & inverse Laplace transforms.
- 1.4 Solve linear, time-invariant differential equation.
- 1.5 Discuss transfer function.
- 1.6 Draw the Block diagram of closed loop & open loop systems & Determine the T.F.
- 1.7 Discuss signal flow graphs.
- 1.8 Discuss basic design principles of control system.

2. MATHEMATICAL MODELING OF DYNAMIC SYSTEMS.

- 2.1 Discuss mathematical models for the following systems.
- 2.2 Mechanical systems.
- 2.3 Electrical systems.
- 2.4 Analogous systems.

3. TRANSIT RESPONSE ANALYSIS & STEADY STATE ERROR ANALYSIS.

- 3.1 State the concepts of transient response analysis & steady state error analysis.
- 3.2 State & explain impulse response function.
- 3.3 Derive the equation for 1st order & 2nd order system.
- 3.4 State & explain Routh's stability criterion.
- 3.5 Discuss steady state error analysis.

4. ROOT LOCUS ANALYSIS.

- 4.1 State the concept of Root locus.
- 4.2 Describe different steps for plotting of Root locus with examples.
- 4.3 Discuss the general rules for constructing Root loci.
- 4.4 Explain Root locus analysis of control systems.
- 4.5 State the concepts of Root control plots.

5. FREQUENCY RESPONSE ANALYSIS.

- 5.1 State the concepts of frequency response methods.
- 5.2 Describe different steps of bode diagram.
- 5.3 Determine polar plots.
- 5.4 Compare Log magnitude vs. phase plots.
- 5.5 State & explain Nyquist stability criterion.
- 5.6 Discuss different steps of stability analysis.

6. ANALYSIS OF CONTROL SYSTEM IN STATE SPACE.

- 6.1 Define State variable.
- 6.2 Explain the state space representation of transfer function.
- 6.3 Define state equation and state matrix.
- 6.4 Explain stability of control system by state variable method.

RECOMMENDED BOOKS :

(A) Text Book.

1. Modern Control Engineering by K.Ogata.

(B) Reference Books

1. Automatic control Systems by Benjamin C. Kuo.
2. Control Systems Engineering by I.J.Nagarth & M.Gopal
3. Control Systems by S.N.Verma.



COMPUTER NETWORK AND DATA COMMUNICATION

(ELECTIVE)

Period /Week – 05

Total Period – 75

Examination – 3 Hours

Total Marks – 100

End.Exam.Theory – 80

Internal Assessment –15+5

RATIONALE :

The students will be highly benefited by the subject Computer Network and Data Communication by clearly understanding the concept of Data Communication in computer system. They will also acquire adequate knowledge about optical communication, mobile communication and different types of networking concept.

OBJECTIVES :

1. Comprehend the fundamental Idea regarding Net working and types of Networking.
2. Enumerate advantages over stand-alone PC.
Speed of Data transmission and the factors of economical transaction over worldwide.
3. State the application of Information Technology which develops the public Relation commercial Tradings, Administrative and Reseacharal activities.
4. Explain the maintenance of Information Database, paperless office work including Air lines, Buses, Banking system, postal and telegraphy with many others applications.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Periods
1.	Fundamental concepts of data transmission	7
2.	Data communication	9
3.	Communication system and networks	7
4.	Network topology	6
5.	ISO reference model of network	5
6.	Internet	9
7.	Introduction to ARPANET, SNA	5
8.	Introduction to LAN	10
9.	Modulation & Demodulation	5
10.	Optical communication	6
11.	Concepts of advance communication	6
Total		75

COURSE CONTENTS IN TERMS OF SPECIFIC OBJECTIVES :

1. FUNDAMENTAL CONCEPT OF DATA TRANSMISSION.

- 1.1 State & explain information theory.
- 1.2 Explain Coding method.

- 1.3 Describe Signal and Noise and signal to noise ratio.
- 1.4 Explain the methods of Error detection & correction.
- 1.5 Define Channel capacity & Johnman theorem.
- 2. DATA COMMUNICATION.**
 - 2.1 Explain Parallel transmission.
 - 2.2 Define Hardware interface, line multiplexing, control and data line.
 - 2.3 Explain Serial transmission.
 - 2.4 Define Stop/start bit, direct current signaling, modulated signals, methods of Modulation.
 - 2.5 Describe Synchronous and Asynchronous mode of transmission (simplex and duplex transmission).
- 3. COMMUNICATION SYSTEM AND NETWORK**
 - 3.1 Describe the various types of Hardware elements.
 - 3.2 Define Models.
 - 3.3 Explain Multiplexers.
- 4. NETWORK TOPOLOGY**
 - 4.1 Explain Start topology.
 - 4.2 Explain Mesh topology.
 - 4.3 Explain Ring topology.
 - 4.4 Explain Bus topology.
- 5. ISO REFERENCE MODEL OF NETWORK**
 - 5.1 Explain the elementary study of 7-Layer architecture of network ISO-OSI model.
- 6. INTERNET.**
 - 6.1 Define Router, Gateways, Bridges.
 - 6.2 Define Internet protocol, TCP/IP.
 - 6.3 Define FTP.
 - 6.4 Define Telnet.
 - 6.5 Define Browser.
 - 6.6 Define & explain E-mail, E-commerce, E-governance.
- 7. INTRODUCTION TO ARPANET & SNA**
- 8. INTRODUCTION TO LAN**
 - 8.1 Describe fundamental principles of LAN and its use.
 - 8.2 Describe LAN components.
 - 8.3 Describe the method of Evaluating and selecting a LAN.
 - 8.4 Explain Cost benefit analysis of LAN.
 - 8.5 Describe Planning Installation of LAN.
 - 8.6 Explain the Utilization of LAN.
 - 8.7 State the fundamental aspects of LAN database.
- 9. MODULATION & DEMODULATION.**
 - 9.1 Explain the Principle of modulation & Demodulation.
 - 9.2 Describe the functions and working principle of AM, FM, PCM, PWM & Delta Modulation.

10. OPTICAL COMMUNICATION

- 10.1 Describe the elements of Optical Communication.
- 10.2 Explain Basic concept of light propagation.
- 10.3 Explain Projecting light into the cable.
- 10.4 Describe Fiber cable construction, light acceptance.
- 10.5 Define Fiber optic cable modes.
- 10.6 Define Refractive index in fiber cones.
- 10.7 Explain Light sources.
- 10.8 Define Optical detector.
- 10.9 Explain Losses due to mechanical coupling , bending.
- 10.10 Explain additional losses in fiber cables.

11. CONCEPTS OF ADVANCE COMMUNICATION.

- 11.1 Explain Mobile communication.
- 11.2 Explain Cellular communication.
- 11.3 State brief idea about satellite communication

RECOMMENDED BOOKS :

- 1. Communication engineering , By – Taub & Shiling
- 2. Antenna and wave propagation, By – K.D. Prasad
- 3. Advance computer, By – Jain & Jain.
- 4. Radio wave engineering, By – G.K. Mithal.



DIGITAL SIGNAL PROCESSING

(ELECTIVE)

Theory & Tutorial – 5 P/W
Theory & Tutorial – 5 P

Examination – 3 Hours
Total Marks – 100
Theory – 80
I.A. – 15 +5

A : RATIONALE :

Digital signal processing is a technology driven field which dates its growth when Computers and Digital Circuitry became fast enough to process large amount of data efficiently. This subject is concerned with processing discrete – time signals or data sequences. The main objectives of this subject are to provide background and fundamental materials in discrete time system, digital signal processing technique, design procedures of digital filters and discrete Fourier transform.

OBJECTIVES :

On completion of the study the students will be able to :

1. Understand signal systems & signal processing.
2. Differentiate continuous time & discrete time signals.
3. Explain the concepts of frequency in continuous time, discrete time signals and harmonically related complex exponential.
4. Classify the signals like multi channel, multidimensional, continuous time vs. discrete time.
5. Convert analog signal to digital & vice-versa.
6. State and explain sampling theorem.
7. State and explain quantisation of continuous-amplitude signals, sinusoidal signals.
8. Analyze digital signal & system verses discrete time signals & systems.
9. Explain discrete time signals & classify discrete-time signals.
10. Describe discrete time systems will block diagrams, classification & interconnections.
11. Analyze linear invariant systems using different techniques.
12. Describe discrete time system using difference equations.
13. Apply Z-transform on LTI systems.
14. Explain discrete fourier transform, its properties & state its application.
15. Computer first fourier transform algorithm.

C :

TOPIC WISE DISTRIBUTION OF PERIODS.

Sl.No.	Topics	Periods
1.	Introduction	15
2.	Discrete time signals & systems	15
3.	The Z-transform & its application to the analysis of LTI systems.	15
4.	The discrete Fourier transform, its properties & applications	15
5.	Fast Fourier transform algorithm & digital filters.	15
Total		75

D : COURSE CONTENTS IN TERMS OF SPECIFIC OBJECTIVES :

1. INTRODUCTION.

- 1.1 Discuss Signals, Systems & Signal processing.
- 1.2 Explain basic elements of a digital signal processing system.
- 1.3 Compare the advantages of digital signal processing over analog signal processing.
- 1.4 Classify signals.
- 1.5 Multi channel & Multi dimensional signals.
- 1.6 Continuous time verses discrete time.
- 1.7 Continuous valued verses discrete valued signals.
- 1.8 Discuss the concepts of frequency in continuous time & discrete time signals.
- 1.9 Continuous-time sinusoidal signals.
- 1.10 Discrete-time sinusoidal signals.
- 1.11 Harmonically related complex exponential.
- 1.12 Discuss Analog to Digital & Digital to Analog conversion & explain the following terms.
- 1.13 Sampling of Analog signal.
- 1.14 The sampling theorem.
- 1.15 Quantisation of continuous amplitude signals.
- 1.16 Coding of quantized sample.
- 1.17 Digital to analog conversion.
- 1.18 Quantisation of sinusoidal signals.
- 1.19 Analysis of digital systems signals vs. discrete time signals systems.

2. DISCRETE TIME SIGNALS & SYSTEMS.

- 2.1 State and explain discrete time signals.
- 2.2 Discuss some elementary discrete time signals.
- 2.3 Classify discrete time signal.
- 2.4 Discuss simple manipulation of discrete time signal.
- 2.5 Discuss discrete time system.
- 2.6 Describe input-output of system.
- 2.7 Draw block diagram of discrete time system.
- 2.8 Classify discrete time system.
- 2.9 Discuss inter connection of discrete time system.
- 2.10 Discuss discrete time line time – invariant system.
- 2.11 Discuss different technique for the analysis of linear system.
- 2.12 Discuss the resolution of a discrete time signal in to impulse.
- 2.13 Discuss the response of LTI system to arbitrary I/Ps using convolution theorem.
- 2.14 Explain the properties of convolution & interconnection of LTI system.
- 2.15 Study systems with finite duration and infinite duration impulse response.
- 2.16 Discuss discrete time system described by difference equation.
- 2.17 Explain recursive & non-recursive discrete time system.
- 2.18 Determine the impulse response of linear time invariant recursive system.

3. THE Z-TRANSFORM & ITS APPLICATION TO THE ANALYSIS OF LTI SYSTEM.

- 3.1 Discuss Z-transform & its application to LTI system.
- 3.2 State & explain direct Z-transform.
- 3.3 State & explain inverse Z-transform.
- 3.4 Discuss various properties of Z-transform.
- 3.5 Discuss rational Z-transform.
- 3.6 Explain poles & zeros.
- 3.7 Determine pole location time domain behavior for causal signals.
- 3.8 Describe the system function of a linear time invariant system.
- 3.9 Discuss inverse Z-transform.
- 3.10 Determine the inverse Z-transform by counter integration.
- 3.11 Determine the inverse Z-transform by proper series expansion.
- 3.12 Determine inverse Z-transform by partial fraction expansion.
- 3.13 Discuss decomposition of rational Z-transform.

4. DISCUSS FOURIER TRANSFORM : ITS APPLICATIONS PROPERTIES.

- 4.1 Discuss discrete fourier transform.
- 4.2 Determine frequency domain sampling and reconstruction of discrete time signals.
- 4.3 State & explain discrete Fourier transformation (DFT).
- 4.4 Computer DFT as a linear transformation.
- 4.5 Relate DFT to other transforms.
- 4.6 Discuss the property of the DFT.
- 4.7 Discuss periodicity, linearity & symmetry property.
- 4.8 Explain multiplication of two DFT & circular convolution.
- 4.9 Discuss additional DFT properties.

5. FAST FOURIER TRANSFORM ALGORITHM & DIGITAL FILTERS.

- 5.1 Computer DFT & FFT algorithm.
- 5.2 Explain direct computation of DFT.
- 5.3 Explain divide & conquer approaches to compute the DFT.
- 5.4 Discuss the radix-2 & radix-4 FFT algorithms.
- 5.5 Discuss digital filters.
- 5.6 Design moving average filter.
- 5.7 Design linear-phase FIR filter using windows.

RECOMMENDED BOOKS :

(A) Text Book.

1. Digital signal processing principles algorithms & applications by J.G. Proakis & Dimitris G. Manolakis.
2. Digital Signal Processing – By Davindrer Pal Sharma, Kalyani Publishers

(B) Reference Books

1. Digital signal processing By A.V. Oppenheim & W. Schaffer.
2. Digital signal processing in communication by Markine & Freaking.
3. A Practical approach to Digital signal Processing By K. Padamanabhan, S. Ananthi and R. Vijayarajeswaran.



INDUSTRIAL AUTOMATION

(ELECTIVE)

UNIT -I ELECTRICAL DRIVERS

15Hrs.

Industrial Drive : Type of electric drives – Group drive – individual drive – Multi motor drive – selection of motors – Electrical characteristics – Mechanical characteristics – Rating of motors. Stepper motor – Application and Automation – Variable reluctance and hybrid stepper motor working – static torque characteristics. Single stepping and half stepping – drive circuits. control voltage, current force and chopper drive. Servomotor and their control. Brush less servo motor, permanent magnet servo motor, construction – brief description of DSP (digital signal processor) controller – its advantages Eddy current drive and variable frequency drive for speed control of induction motor.

UNIT -II HYDRAULICS AND PNEUMATICS

15Hrs.

Hydraulic Components – Accumulators – types – Diaphragm – Spring Loaded – Weight loaded – Pressure Intensifiers – Hydraulic Reservoirs – Heat Exchanger types – Air-cooled – Water cooled – Filters.

Pneumatics – Basic principles of pneumatics – difference between hydraulics and pneumatics – compressor types-two stage piston compressor – rotary vane compressor-rotary screw compressor – vacuum pumps – double acting pneumatic cylinder – gear motor-pressure regulator – filters-lubricators-Filter Regulator Lubricator (FRL) unit-water removal – air preparation and distribution.

UNIT -III ROBOTICS

15Hrs.

Introduction to Robo – Industrial robotics – basic concepts – robot anatomy – robotics and automation –specification of robots – resolution – respectability and accuracy of manipulator – classification of robots – industrial application robot control systems – robot drives – characteristics of end of arm tooling end effectors – sensors – tactile, proximity and range sensors – contact and non-contact sensors – velocity sensors – touch and – slip sensors – machine intelligence – Typical applications of industrial robots.

UNIT -IV DISTRIBUTED CONTROL SYSTEM

15Hrs.

Evolution of distributed control – Definition – Functional Elements of DCS – Remote located electronic unit – Central Control room instrumentation – Type of information displays – Operator station (CRT's & Keyboard) – Advantages of DCS – Selecting Distributed Control System – Different methods of communication – point to point – star network – multidrop linear high way – communication standards – physical consideration – message format – message reliability – system consideration – Architecture of any one commercial DCS.



6th Semester (AE & I)

INDUSTRIAL & INTELLIGNET INSTRUMENTATION LAB.

Pd/ Wk – 5
Total Pd – 75

Examination – 4 Hours
Total Marks – 100
End Exam – 50
Sessional – 50

1. Measure voltage with CRO.
2. Measure time interval & frequency with CRO.
3. Measure unknown signal frequency using Lissageous method.
4. Calibration of CRO.
5. Measure R-L-C parameters with a bridge.
6. Construct and test active low pass filter.
7. Construct and test active high pass filter.
8. Study proximity switch.
9. Study Alarm annunciator.
10. Measure temperature using IC temp. sensor.



6th Semester (AE & I)

PLC LAB.

Pd/ Wk – 4
Total Pd – 60

Examination – 4 Hours
Total Marks – 50
End Exam – 25
Sessional – 25

1. Familiarization of Input/Output organization in PLC and their addresses.
2. Entering & testing program in PLC.
3. Writing PLC programma for Logical Operations –
AND, OR, NOT, NAND, NOR, EX-OR & EX-NOR
4. Writing PLC programme for Combinational Operations.
OR before AND & AND before OR.
5. Writing PLC programme for On-delay Timers and Off-delay Timers.
6. Writing PLC programme for Cyclic Timers.
7. Writing PLC programme for Sequential Timers.
8. Writing PLC programme for UP Counter.
9. Writing PLC programme for DOWN Counter.
10. Writing PLC programme for Motor Start - Stop using Set-Reset function.



6th Semester (AE & I)
PROJECT WORK & SEMINAR

Pd/ Wk – 10
Total Pd – 150

Examination – 4 Hours
Total Marks – 200
End Exam – 100
Sessional – 100

Students will do any two of the following project works.

1. Construction of Single phase power conditioner.
2. Construction of speed controller of single phase motor.
3. Construction of water level controller.
4. Construction of temperature controller using ON-OFF action.
5. Construction of IC regulated power supply.
6. Construction of time controller using IC 555.
7. Construction of pressure controller using LVDT.
8. Construction of Illumination controller.
9. Implementation of PLC based Alarm annunciator.
10. Implementation PLC based Timers.
11. Implementation of PLC based Counters.
12. Implementation of PLC based Traffic light controller.

Any other Project Work selected by the students in consultaion with concerned Lecturer.



**REVISED SYLLABUS
OF
3RD SEMESTER TO
6TH SEMESTER OF**

**APPLIED ELECTRONICS
&
INSTRUMENTATION**

YEAR - 2009

TEAM LEADER :

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