

SEMESTER IV

THEORY:

S.No	Subject Name	L	P	M
1.	Algorithms and Data Structure	4	0	100
2.	Transducer Engineering	4	0	100
3.	Electronic Circuits	4	0	100
4.	Fiber Optics and Laser Instruments	4	0	100
5.	Electrical Measurements and Instruments	4	0	100
6.	Communication Engineering	4	0	100

PRACTICALS:

S.No	Subject Name	L	P	M
1.	Data Structure Laboratory	0	3	100
2.	Transducer Laboratory	0	3	100

SEMESTER IV

ALGORITHMS AND DATA STRUCTURES

1. PRINCIPLES OF ALGORITHM ANALYSIS

9

Properties of algorithms – deterministic & non-deterministic, polynomial & exponential, iterative and recursive algorithm, Mathematical proof techniques –proof by contradiction, proof by mathematical induction, estimating.

2. ALGORITHM ANALYSIS AND TOOLS

9

Best, Worst and average case analysis of algorithmic complexity –Time Space complexities, asymptotic analysis-upper & lower bounds, space bounds, analyzing the correctness of an algorithm, Tools-sub-goals, Hill climbing, working backward, heuristic, NP-hard and NP-complete problems.

3. DATA STRUCTURES

9

Philosophy of data structures, data structures vs. control constructs, need for data structures, abstract data types and data structures, Lists-array based and linked lists, comparison, stacks-array based and linked stacks, implementing recursion using stacks, queues –array based & linked queues.

4. TREES AND GRAPHS

9

Binary trees – definition, properties, Binary tree traversals, implementations, heaps and priority queues, general trees – definition and properties, general trees traversals, implementation, K-array trees, graphs-representation, implementation, graph traversals, spanning tree algorithms.

5. INFORMATION PROCESSING AND RETRIEVAL

9

Sorting – algorithms Binary search tree, Binary tree sorting algorithm, External sorting, Merging, searching – hashing.

Total Hours: 45

TEXT BOOK

- 1.HorowitzE. Sahni.S.Fundamentals of Computer algorithm, Golgotha, 1990.
- 2.Goodman.S.E, & Hedetniemi.S.T.Introduction to the design and analysis of algorithms, McGraw-Hill , 1995.
- 3.Tanenbaum, A.S.Data structures Using C.Prentice Hall of India, 1995

REFERENCES

1. Trembly & Sorrensen, An Introduction to Data Structures with application, Tata McGraw Hill, 1995.
2. Weiss, M.A. Data Structures and algorithm analysis in C++, Benjamin Publications Inc, 1994.
3. Shaffer. C.A. A practical Introduction to Data Structures and algorithm analysis, Prentice Hall, NJ, 1998

SEMESTER IV

TRANSDUCER ENGINEERING

1. SCIENCE OF MEASUREMENT 9

Units and standards – calibration methods – static calibration – classification of errors – error analysis – statistical methods – odds and uncertainty.

2. CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – accuracy, precision, sensitivity, and linearity etc. – mathematical model of transducers – zero, first-order and second-order transducers – response to impulse, step, ramp and sinusoidal inputs.

3. VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire anemometer, piezo resistive sensors and humidity sensors.

4. VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Induction potentiometer – variable reluctance transducers – EI pick up – LVDT – capacitive transducers – variable air gap type – variable area type – variable permittivity type – capacitor microphone.

5. OTHER TRANSDUCERS 9

Piezoelectric transducer – magnetostrictive transducer – IC sensor – digital transducers – smart sensor – fiber optic transducers.

Total Hours 45

TEXT BOOK

1. Renganathan, S., Transducer Engineering, Allied Publishers, Chennai, 1999.

REFERENCES

1. Neubert, H.K.P. Instrument Transducers, Clarendon Press, Oxford, 1988.

2. Doebelin, E.O., Measurement Systems, McGraw-Hill Book Co., 1998.
3. Patranabis, D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
4. Murthy, D.V.s., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.

SEMESTER IV

ELECTRONIC CIRCUITS (Common to EEE, EIE & BME)

1 BIASING AND STABILIZATION 9

Transistor biasing -DC equivalent model-criteria for fixing operating point-methods of bias- stabilization techniques(Fixed bias, Collector to base bias, self bias)-Stabilization factors-Compensation techniques- thermal run way- condition to avoid thermal run away.

2 AMPLIFIERS. 9

Small single low frequency transistor amplifier circuits-cascading transistor amplifier-Darlington connections-analysis of class A, Band C power amplifier-FET amplifier-FET-and their analysis.

3 FEED BACK AMPLIFIER AND OSCILLATORS . 9

Concept of feedback, Classification of feedback amplifiers- General characteristics of negative feedback amplifiers-voltage/current., series/shunt feedback. Positive feed back-condition for oscillations-Barkhausen criterion- RC-phase shift oscillators with transistors- Hartley- Colpitts and crystal oscillator-, wein bridge oscillator. -.

4 PULSE CIRCUITS 9

RC wave shaping circuits-diode clippers and clampers - schmit triggers – multivibrators-types, ujt and transistor sawtooth oscillators

5 RECTIFIERS AND POWER SUPPLIES. 9

Single phase Half wave, Full wave rectifier-Filter-inductor filters-capictor filters-L section and Π section filters-design of Zener voltage regulators-series and shunt voltage regulators-Switched mode power supplies.

Total Hours 45

TEXT BOOKS

1. Millman and Halkias "Electronic Devices and Circuits", McGraw-Hill, 1991
Reprint 2004

REFERENCES

1. Millman and Halkias "Integrated Electronics", McGraw-Hill, ISE, 1990
2. Millman and Taub, pulse, "Digital and Switching Waves forms" McGraw-Hill, 1991

SEMESTER IV

FIBER OPTICS AND LASER INSTRUMENTS

1. OPTICAL FIBERS AND THEIR PROPERTIES 12

Principles of light propagation through a fiber – different types of fibers and their properties transmission characteristics of optical fiber – absorption losses – scattering losses – dispersion – optical fiber measurement – optical sources – optical detectors – LED – LD – PIN and APD

2. INDUSTRIAL APPLICATION OF OPTICAL FIBERS 9

Fiber optic sensors – fiber optic instrumentation system – different types of modulators – detectors – application in instrumentation – interferometric method of measurement of length – moiré fringes – measurement of pressure, temperature, current, voltage liquid level and strain – fiber optic gyroscope – polarization maintaining fibers.

3. LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – three level and four level lasers – properties of laser – laser modes – resonator configuration – Q-switching and mode locking – cavity dumping – types of lasers : gas lasers, solid lasers, liquid lasers and semi conductor lasers

4. INDUSTRIAL APPLICATION OF LASERS 6

Laser for measurement of distance, length velocity, acceleration, current, voltage and atmospheric effect – material processing – laser heating, welding melting and trimming of materials – removal and vaporization.

5. HOLOGRAM AND MEDICAL APPLICATION 9

Holography – basic principle; methods; holographic interferometry and applications, holography for non – destructive testing – holographic components – medical applications of lasers; laser and tissue interaction – laser instruments for surgery, removal of tumors of vocal cords, brain surgery, plastic surgery, gynecology and oncology

Total Hours 45

TEXT BOOKS

1. John and Harry, Industrial lasers and their applications, McGraw Hill, 1974
2. Senior J.M., Optical Fiber Communication Principles and Practice, Prentice Hall, 1985

REFERENCES

1. John F Read, Industrial applications of lasers, Academic Press, 1978
2. MonteRoss, Laser applications, McGraw Hill, 1968
3. Keiser G., Optical Fiber Communication, McGraw Hill, 1991
4. Jasprit Singh, Semi conductor optoelectronics, McGraw Hill, 1995

SEMESTER IV

ELECTRICAL MEASUREMENTS & INSTRUMENTS

1. DIFFERENT TYPES OF AMMETERS AND VOLTMETERS

9

Galvanometers – principle of operation, construction and sources of errors and compensation in PMMC & moving iron instruments – dynamometer and rectifier type ammeter and voltmeters.

2. WATTMETERS AND ENERGY METERS

9

Electrodynamic type wattmeter – theory and its errors – methods of correction – LPF wattmeter – phantom loading – induction type Kwh meter – theory and adjustments – calibration of wattmeters and energy meters.

3. POTENTIOMETERS AND INSTRUMENT TRANSFORMERS

9

Student type potentiometer L and N type potentiometer – precision potentiometer – polar and co-ordinate type – A.C. potentiometers – their applications – construction and theory of operation C.T. and V.T. – phasor diagrams - characteristics – applications.

4. RESISTANCE MEASUREMENT

9

Measurement of low, medium and high resistances – ammeter – voltmeter method – Wheatstone bridge-precision form of Wheatstone bridge – Kelvin double bridge – Ductor Ohmmeter – series and shunt type ohmmeters – high resistance measurement – Megger – direct deflection methods – Price’s Guard wire method – Megohm bridges – loss of charge method – earth resistance measurement.

5. IMPEDANCE MEASUREMENT

9

A.C.Bridges – measurement of inductance, capacitance – Q of coil – Maxwell bridge – Maxwell wien bridge – Hey’s bridge – Schering bridge – Anderson bridge – Campbell bridge to measure mutual inductance – errors in A.C. bridge methods and their compensations – detectors – excited field a.c.Galvanometer – vibration galvanometer.

Total Hours 45

TEXT BOOK

1. Sawhney A.K., A Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai and Sons, New Delhi, 1995.

REFERENCES

1. Stout M.B. Basic Electrical measurements, Prentice Hall of India, New Delhi, 1990.
2. Golding E.W. and Widdis F.E., Electrical measurements and measuring instruments, Sir Issac Pitman and Sons Pvt., Ltd., 1985.

SEMESTER IV

COMMUNICATION ENGINEERING

1. RADIO COMMUNICATION SYSTEMS

15

Frequency spectrum – Principle of AM and FM – AM and FM transmitters and receivers – introduction to microwave communication systems – principle of satellite communication.

2. PULSE COMMUNICATION SYSTEMS

5

PAM, PPM, PDM, PCM –delta modulation – differential PCM – merit and demerits – comparison of pulse modulation schemes.

3. DATA TRANSMISSION

10

Base band signal receiver – error probability – optimum and matched filter techniques coherent reception – digital modulation systems – FS, PSK – comparison of data transmission systems.

4. TRANSMISSION MEDIUM

10

Characteristics of cables – optical fibers – effects of EM radiation – bandwidth and noise restrictions – statistical measurements of random noise – concept of multiplexing – FDM and TDM.

5. TELEVISION

5

Scanning methods – B/W and color systems – Camera and picture tubes – synchronization – transmitters and receivers.

Total Hours 45

TEXT BOOKS

1. Kennedy, G., 'Electronic Communication Systems', McGraw Hill, 4th Edition, 1987.
2. Taub and Schilling, 'Principles of Communication Systems', Second Edition, McGraw-Hill, 1987.

REFERENCE

3. Simon Haykins, 'Communication Systems', 3rd Edition, John Wiley, Inc., 1995.
4. Bruce Carlson A., 'Communication Systems', 3rd Edition, Tata McGraw-Hill, 1986.
5. Roddy and Coolen, 'Electronic Communication', 4th Edition Prentice Hall of & India, 1999.

SEMESTER IV

DATA STRUCTURE LABORATORY

1. DEVELOPMENT OF ALGORITHM

8

Notations analysis, storage structures for arrays – sparse matrices structures and arrays of structures – stacks and queues – representation and applications.

2. LINKED LISTS

9

Single linked lists – linked stacks and queues – doubly linked list – circularly linked list – dynamic storage management – garbage collection and compaction – random number generation.

3 BINARY TREES

9

Binary search trees – general trees – tree traversing – operations on binary – trees – expression manipulations – symbol table construction – graphs – representation of graphs – path matrix – BFS – DFS – disconnected graphs.

4. SORTING TECHNIQUES

9

Selection – double – inversion – merge – heap – quick radix – topological sort – linear searching – binary searching.

5. DESIGN TECHNIQUES

10

Domain independence techniques – divide and conquer method – greedy method; dynamic programming – back tracking – branch and bound and bound game trees.

Total Hours 60

TEXTBOOK

- 1.D.F.Knuth – Fundamental algorithms, Narosa Publishing Company, New Delhi, 1991.
- 2.Thomas H.Cormen – Introduction to algorithms, Addison Wesley, USA, 1993.

REFERENCES

1. Ronald L. Rivest – Algorithms, Data structures and Programs, Prentice Hall International, New Jersey, 1994.
2. Tremblay and Sorenson – An introduction to Data structures with applications, McGraw Hill International edition, USA, 1996.

SEMESTER IV

TRANSDUCER LABORATORY

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Strain gauge characteristics.
3. Load cell characteristics.
4. Photoelectric tachometer.
5. Hall effect transducer.
6. Characteristics of LVDT.
7. Characteristic of LDR, thermistor and thermocouple.
8. Ramp response characteristic of filled in system thermometer.
9. Step response characteristic of RTD and thermocouple.
10. Flapper nozzle system.
11. P/I and I/P converters.
12. Study of smart transducers.

Total Hours 45