UNIVERSITY OF KALYANI

PART-II TO PART-IV

SYLLABUS

for

Bachelor of Technology

on

Electronics and Instrumentation Engineering

Department of Engineering and Technological Studies

PART -II, 1ST SEMESTER (Both EIE & IT)

NO. OF THEORETICAL SUBJECT	: 06	CREDITS ON THEORETICAL SUBJECTS	: 24
NO. OF SESSIONAL SUBJECT	: 03	CREDITS ON SESSIONAL	: 06
		TOTAL SEMESTER CREDITS	: 30

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	HU 301	Industrial Management & Organizational Behavior	3	1		4	4
2.	IT 301	Data Structure and Algorithms	3	1		4	4
3.	IT 302	Numerical Methods and Programming	3	1		4	4
4.	EC 301	Digital Electronics and Logic Design	3	1		4	4
5.	EC 302	Circuit Theory and Network	3	1		4	4
6.	M 301	Discrete Structure	3	1		4	4
		Total of Theoretical Subjects				24	24
B. SESSIONAL SUBJECTS							
7.	IT 391	Data Structure Lab			3	3	2
8.	IT 392	Numerical Methods and Programming Lab			3	3	2
9.	EC 391	Digital Electronics and Logic Design Lab			3	3	2
		Total of Sessional Subjects				9	6
		Total of Semester				33	30

Subject : INDUSTRIAL MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR
Paper Code : HU301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to Principles of Management: Concepts of Management and Organization; Evolution of Scientific Management Thoughts– Principles of Taylor, Fayol, Gantt, Weber and others; Functions of management; Planning– Planning Process, Types of plans– Short Term and Long Term Plans, Single-use and Standing Plans, Policies Procedures and Rules, Strategic Planning; Organizing, Staffing, Directing, Communicating, Coordinating, Controlling, Reporting, Budgeting; Leadership– The Traitist Approach, The Behavioural Approach; Managerial Philosophy– McGregor's Theory X and Theory Y, Likhert's four management system; Leadership styles– Autocratic, Participative, Free-rein; The Ohio state studies; The Managerial Grid. Motivation– Maslow's Hierarchy of Needs, Hertzberg's Two Factor Theory.	8*L* + 1*T*
2.	Personnel Management: Functions of Personnel Management; Staffing– Human Resource Planning, Job Analysis, Job Description and Job Specification, Merit Rating, Recruitment and Selection Process; Human Resource Development and Management– Wages and Salary Administration, Employees' Welfare, Training and Career Management; Collective Bargaining– Trade Unions; Introduction to Factory Act 1948, Payment of Wages Act 1948, Trade Union Act, Provident Fund Act; Introduction to Taxes– Sales Tax, Excise Duty, VAT, Income Tax.	5*L*+ 1*T*
3.	Plant Management: Plant Location, Plant Layout; Industrial Safety; Production Process and Planning; Maintenance– Breakdown, Preventive and Predictive maintenance; Work Study and Method Study.	3*L*+ 1*T*
4.	Materials Management: Objective; Materials– Its Classification and Codification; Inventory– Different Costs associated to Inventory, Classification and Control– ABC, VED, XYZ analyses, Factor affecting Inventory Control, Economic Order Quantity– Deterministic E.O.Q. models– Basic EOQ model, EOQ model with Gradual Inventory Build-up over a certain finite time, EOQ model with Instantaneous Inventory Build-up but Variable Order Cycle, EOQ models with Price Breaks– One Price Break, More than One Price Break; Store Management and Record Keeping; Purchase Management– Roles and Duties of a Purchase Manager, Purchase Process.	5*L*+ 3*T*
5.	Financial Management: Finance and its role; Cost of a business, Cost Control, Break Even Analysis; Capital– Working Capital; Budgets and Budgetary Control; Balance Sheet, Ratio Analysis, Profit and Loss Statement.	4*L*+ 2*T*
6.	Marketing Management: Objective and Scope; Sellers and Buyers Market; Monopoly, Oligopoly, Perfectly Competitive Market; Closed, Restricted and Open Market; Market Research; Products– Classification and its Life Cycle; Launching of New Product– Market Survey, Design and Development, Pricing, Distribution and Sales, Market Feed Back; Advertising.	3*L*+ 1*T*
7.	Quality Management: Objective and Scope, Quality Control and Inspection; Methods of Quality Control, Statistical Quality Control, Control Charts– R-Chart, p-Chart, c-Chart; Sampling– Random sampling; 3-Sigma Concept; Total Quality Management– Quality Assurance– ISO 9000 and BS 14000 series procedures.	3*L*+ 2*T*
8.	Organizational Behaviour: Organization and its structure, Organizational Chart; Organizational Behavior– Definition, Objective and Elements; Departmentation– Authority and Responsibility, Division of Work and Delegation of Power, Linking Pins, Centralization and Decentralization, The Span of Management, Bureaucracy; Types of Mechanistic and Organic Structures of Organization– Line Organization, Line and Staff Organization, Functional Organization, Committee Organization; Work and Professional Ethics– Concept of ethics and Professionalism, Requirement and Code of Professional Ethics; Responsibility of the organization to the society	5*L*+ 1*T*

	and environment.	

Recommended Books:

1.	"Industrial Engineering and Management", O. P. Khanna, *Dhanpat Rai Publ.*
2.	"Industrial Engineering and Production Management", Ms Mahajan, *Dhanpat Rai Publ.*
3.	"Production, Planning and Inventory Control", S. L. Narasimhan, D. W. McLeavy, P. J. Billington, *PHI*
4.	"Production Systems: Planning, Control and Analysis", R. L. Jiggs, *John Willy*
5.	"Business, Strategy, Policy and Planning", P. K. Ghosh, *Sultan Chand Publ.*
6.	"Industrial Engineering and Management Science", T. R. Banga, *Jain Book Depot*
7.	"Principles and Practice of Management", Haynes, *Central Publ.*
8.	"Personnel Management", A. Monappa, M. S. Saiyadain, *Tata Mc-Graw Hill*
9.	"Organizational Behaviour : Human Behavior at Work", J. Newstorm, K. Devis, *Tata Mc-Graw Hill*
10.	"Organizational Behaviour", L. M. Prasad, *Sultan Chand Publ.*
11.	"Human Resource Management", L. M. Prasad, *Sultan Chand Publ.*
12.	"Marketing Management", Kotler, *EEE*
13.	"Purchasing and Materials Management", P. Gopalakrishnan, *Tata Mc-Graw Hill*

Subject : DATA STRUCTURES AND ALGORITHMS
Paper Code : IT 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact hours
1.	Definitions of Information, Data – atomic and composite, Data type and Data Structure, Abstract data Type (ADT) definition, implementation, ADT's of Stack , Queue, Rational Number.	2*L* + 1*T*
2.	Time and Space analysis of Algorithms - Order Notations	1*L* + 1*T*
3.	Recursion Tower of Hanoi, generating permutations, Tail Recursion, When not to use recursion, Removal of recursion.	2*L* + 1*T*
4.	Linear Data Structures : Sequential representations -Arrays and Lists, Stacks, Queues and Dequeues,	5*L* + 1*T*
5.	Strings, Applications. Linked Representation - Linear linked lists, Circularly linked lists. Doubly linked lists, Application – Polynomial addition, High Precision arithmetic, Handling of sparse matrix.	5*L* + 1*T*
6.	Non-linear Data Structures: Trees – Tree terminologies, Binary Trees, Binary Tree Implementation, Binary Tree Traversals – recursive and non-recursive, Generation of BST from any tree, Full & complete binary tree and relation between different degree of notes in BST. Threaded Binary Tree, Binary Search Tree, Insertion and Deletion algorithms, Height-balanced Tree (AVL tree), B-tree, B+ -tree, Application of Binary Tree.	5*L* + 2*T*
7.	Graphs – Basic Definitions, Representations – matrix and list representations, Breadth-first and Depth-first Search, Spanning Tree, Shortage fact finding using Prims and Kruskal Algorithms.	2*L* + 1*T*
8.	Sorting Techniques : Introduction, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort, Performance and Comparison analysis of different sorting techniques.	6*L* + 2*T*
9.	Searching : Sequential Search, Indexed Sequential Search, Binary Search, Hash Table and Hashing, Hash Function, Hash Collision, Collision Resolution Techniques – Open Addressing, Separate Chaining, Coalesced Chaining, Bucket Hashing.	5*L* + 1*T*
10.	File Structures - Sequential and Direct Access. Relative Files, Indexed Files - B+ tree as index. Multi-indexed Files, Inverted Files, Hashed Files.	3*L* + 1*T*

Recommended Books:

1.	Data Structures Using and C and C++–Langsam Y., Augenstein M. J. and Tanenbaum A. M., *Prentice-Hall.*
2.	Data Structures– Lipschutz, *Tata Mc-Graw Hill*

3.	Data Structures and Algorithms– Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., *Addison Wesley*
4.	Data Structure Using C– Radhakrishnan M.and Srinivasan V., *ISTE/EXCEL BOOKS*
5.	Algorithms, Data Structures, and Problem Solving with C++–Weiss Mark Allen, *Addison Wesley.*
6.	Fundamentals of Data Structures– Horowitz E. and Sahni S., *Galgotia Publications.*
7.	Data Structures and Algorithms– Drozdek, *Vikas*.
8.	Data Structures Through C– Agarwal A., *Cybertech*

Subject : NUMERICAL METHODS AND PROGRAMMING
Paper Code : IT 302 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to Numerical Methods. Introduction to programming— logical flow of computational process, programming language, floating point concept, accuracy and error, convergence. Methods for solving transcendental equations– Bisection theorem, Successive Bisection method; Regula-falsi method; Newton-Raphson method; Approximate solution of polynomial equation–Relations between roots and coefficients, Descarte's rule of signs, Horner's Method. *Study of Algorithm of the methods and solution of sample problems.*	5*L*+2*T*
2.	Solution of Linear Simultaneous equation: Direct methods of solution– Gauss elimination, Pivoting and Ill-conditioning; Iterative methods of solution– Jacobi's iteration method, Gauss-Seidel iteration method. Solution of Non-linear Simultaneous equation: Newton-Raphson method. *Study of Algorithm of the above methods and solution of sample problems*.	6*L*+2*T*
3.	Finite Differences and Interpolation: When independent variable points are equally-spaced: Forward Difference Operator and Table– Newton's Forward Difference Formula; Backward Difference Operator and Table– Newton's Backward Difference Formula; Backward Difference Table– Stirling Central Difference Formula; When independent variable points are not equally-spaced: Lagrange's formula, Divided Difference Operator and Table– Newton's Divided Difference Formula; *Study of Algorithm of the above methods and solution of sample problems.*	7*L*+3*T*
4.	Numerical Differentiation; Numerical Integration– Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's ⅓-rd rule, Simpson's ⅜-th rule; *Study of Algorithm of the above methods and solution of sample problems.*	4*L*+1*T*
5.	Numerical solution of Ordinary Differential Equations: Picard's method, Taylor's Series method, Euler's method, Modified Euler's method, Runge's method, Runge-Kutta method, Predictor-Corrector methods– Milne's method; *Solution of sample problems.* Numerical solution of Simultaneous Linear Differential Equations and Second-order Differential Equations; *Solution of sample problems*.	8*L*+2*T*
6.	Numerical solution of Partial Differential Equations: Finite Difference Approximation to derivatives; Solutions of Elliptic equations, Parabolic equations, Hyperbolic equations; *Study of Algorithm of the above methods and solution of sample problems.*	6*L*+2*T*

Recommended Books

1.	"Higher Engineering Mathematics", B. S. Grewal, *Khanna Publ.*
2.	"Numerical Methods", E. Balagurusamy, *Tata Mc-Graw Hill Publ.*
3.	"Introductory Methods of Numerical Analysis", S. S. Sastry, *Prentice Hall India*
4.	"Numerical Methods for Engineers and Scientists", J. N. Sharma, *Narosa Publ House*
5.	"Computer Oriented Numerical Methods", Rajaraman, *Prentice Hall India*
6.	"Numerical Methods for Scientists and Engineers", K. S. Rao, *Prentice Hall India*
7.	"Numerical Mathematical Analysis", J. B. Scarborough, *John Hopkins Univ. Press*
8.	"Introduction to Numerical Analysis", F. B. Hildebrand, *Tata Mc-Graw Hill Publ.*
9.	"Numerical Methods and Analysis", J. L. Buchanan and P. R. Turner, *Mc-Graw Hill*

Subject : DIGITAL ELECTRONICS AND LOGIC DESIGN
Paper Code : EC 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Number systems: Decimal, binary, octal and hexadecimal number system and conversion, binary weighted codes, signed number binary order,1's and 2's complement codes, binary arithmetic.	3*L* + 1*T*
2.	Boolean algebra: binary logic functions, Boolean laws, truth tables, associative and distributive properties, demorgan's theorems, realization of switching functions using logic gates.	3*L* + 1*T*
3.	Combinational logic: Canonical logic forms, sum of product & product of sums, don't care terms Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine McCluskey minimization techniques.	5*L* + 1*T*
4.	Analysis and design of combinational logic: Introduction to combinational circuit ,code conversion, decoder, encoder , parity-bit generator and checker, priority encoder , multiplexers and demultiplexer, subtractor, BCD adder, binary comparator, arithmetic and logic units, application of decoder, multiplayer.	5*L* + 2*T*
5.	Sequential logic: Sequential circuits, flip flops, clocked and edge triggered flipflops timing specifications, counters asynchronous and synchronous, counter design with state equations registers, serial in serial out shift registers, tristate register , register transfer timing considerations.	7*L* + 2*T*
6	Sequential circuits: State diagrams and tables, transition table, excitation table and equations, examples using flip flops , simple synchronous and asynchronous sequential circuit analysis, construction of state diagram and counter design.	5*L* + 2*T*
7.	Programmable logic: Programmable logic devices, programmable logic arrays and programmable array logic.	3*L* + 1*T*
8.	Digital integrated circuits: Digital circuit logic levels ,propagation delay times, power dissipation , fan out and fan in, noise margin for popular logic families, TTL, 1LSTTL, CMOS and ECL integrated circuits and their performance comparisons, open collector and tri state gates and buffers.	5*L* + 2*T*

Recommended Books

1.	"Digital Design", Mano M M, *Prentice Hall India*
2.	"Digital Principles And Applications", Taub and Schilling, *Tata McGraw Hill*

Subject : CIRCUIT THEORY AND NETWORK
Paper Code : EC 302 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Passive and active circuit elements, Kirchoff's Laws, Concepts of independent voltage and current sources, controlled Sources. Node equation and Loop equation Techniques.	5*L* + 2*T*
2.	Differential equation representation of passive circuits. Solution of circuit differential equations for simple circuits, concept of impedance and reactance.	5*L* + 2*T*
3.	Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer & Tellegen's Theorem etc.	5*L* + 2*T*
4.	Graph of a network. Concept of tree, concepts of loop current and node pair voltage, circuits cut-set and cut-set matrices, formulation of equilibrium equations of the loop and node basis.	6*L* + 1*T*
5.	Laplace transform with Inversion formula. Application of Laplace transform in the solution of Circuit problems. Transient and steady state responses, Initial and final value theorems.	6*L* + 2*T*

6.	Passive 1-port and 2-port networks. Terminals and terminal pairs, driving point impedance, transfer functions, poles and zeros, restrictions on pole and zero locations in s-plane.	4*L* + 1*T*
7.	Resonance, Q and bandwidth of a circuit.	2*L* + 1*T*
8.	Introduction to synthesis of passive networks deferent forms	3*L* + 1*T*

Recommended Books

1.	"Network Analysis", V. Valkanburg, *Prentice Hall India*
2.	"Introduction to Modern Network Synthesis", V. Valkanburg, *John Wiley & Sons*
3.	"Network and Systems", D. Roy Chowdhuri, *New Age Int. Pvt. Ltd*
4.	"Basic Circuit Theory", C. A. Desoer & E. S. Kuh, *Tata McGraw Hill*
5.	"Elementary Linear Circuit Analysis", L. S. Bobro, *Oxford*

Subject : DISCRETE STRUCTURE
Paper Code : M 301 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact hours
1.	Set Theory: Sets, Venn Diagrams, Set Memberships of tables; Laws of set Theory; Partitions of sets; Power sets.	4*L* + 1*T*
2.	Propositional Logic– Propositional equivalences-Predicates and quantifiers-Nested Quantifiers-Rules of inference-introduction to Proofs-Proof Methods and strategy	6*L* + 2*T*
3.	Mathematical inductions-Strong induction and well ordering-.The basics of counting-The pigeonhole principle –Permutations and combinations-Recurrence relations-Solving Linear recurrence relations-generating functions-inclusion and exclusion and applications.	7*L* + 3*T*
4.	Graphs and graph models-Graph terminology and special types of graphs-Representing graphs and graph isomorphism -connectivity-Euler and Hamilton paths	7*L* + 2*T*
5.	Algebraic system-Semi groups and monoids-Groups-Subgroups and homomorphisms-Cosets and Lagrange's theorem- Ring & Fields (Definitions and examples)	6*L* + 2*T*
6.	Partial ordering-Posets-Lattices as Posets- Properties of lattices-Lattices as Algebraic systems– Sub lattices– direct product and Homomorphism-Some Special lattices- Boolean Algebra	6*L* + 2*T*

Recommended Books

1.	"Elements of Discrete Mathematics", C. I. Liu, *Tata McGraw Hill*
2.	"Discrete Mathematical Structures", B. Kolman, R. C. Busby, S. Ross, *Prentice Hall India*
3.	"Discrete Mathematics". W. M. Dymacek & H. Sharp (Jr.), *McGraw Hill*

Subject : DATA STRUCTURE LAB.
Code : IT 391 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Recursive routines for Tower of Hanoi, Generation of permutations.
2.	Implementation of Stack and Queue in C using array and linked list, Insertion, Deletion of Stack and Queue, Application of Stack – Conversion of Infix to Postfix expression, Evaluating a Postfix expression.
3.	Implementation of linked list using dynamic memory allocation, Insertion and deletion, printing the elements, counting the number of elements in a linked list, Application of linked list – Polynomial addition, Circular linked list, Doubly linked list- Application in High precision arithmetic, Sparse matrix multiplication.

4.	Implementation of Binary Tree, Generation of Binary Search Tree, Tree traversal, Heap Generation-recursive and nonrecursive.
5.	Graph Program to be developed Using C/C++ Applications: Implementation of BFS, DFS. Prims & Kruskal Algorithm.
6.	Sorting using Merge sort, Quick sort, Heapsort.

Subject : NUMERICAL METHODS AND PROGRAMMING LAB.
Code : IT 392 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Introduction to Programming Language– FORTRAN, C++, MATLAB Programming of Successive Bisection method, Regula-falsi method, Secant method; Newton-Raphson method.
2.	Program development for the solution of Linear Simultaneous equation: Using Gauss elimination method including the modification for Pivoting and Ill-conditioning and using Gauss-Seidel iteration method.
3.	Program to interpolate the value using: a) Newton's Forward Difference formula; b) Newton's Backward Difference formula; c) Lagrange's formula, d) Newton's Divided Difference formula.
4.	Program for Numerical Integration– Trapezoidal rule, Simpson's ⅓-rd rule, Simpson's ⅜-th rule
5.	Program to solve Ordinary Differential Equations numerically using: a) Euler's method, c) Runge-Kutta method, d) Milne's method.
6.	Program to solve Partial Differential Equations numerically: Poisson's equation

Subject : DIGITAL ELECTRONICS AND LOGIC DESIGN LAB.
Code : EC 391 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	To study NAND IC chip and to realise different logic functions using only NAND gates.
2.	To study NOR IC chip and to realise different logic functions using only NAND gates.
3.	To design a full adder using IC 7486 and 7400
4.	To study 4-bit parallel adder and subtractor using IC 7483 and 7486.
5.	To design a J-K flip-flop using NAND and NOR gate and to study dual J-K master-slave flip-flop (IC 74107)
6.	To study left, right and programmable shift register
7.	To study synchronous and asynchronous counters.

PART -II, 2ND SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 06	CREDITS ON THEORETICAL SUBJECTS	: 24
NO. OF SESSIONAL SUBJECT	: 03	CREDITS ON SESSIONAL	: 06
		TOTAL SEMESTER CREDITS	: 30

Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
A. THEORETICAL SUBJECTS							
1.	EI 401	Microprocessor and Microcontroller Application	3	1		4	4
2.	EI 402	Industrial Instrumentation – I	3	1		4	4
3.	IT 401	Operation Research & Decision Technique	3	1		4	4
4.	IT 402	Computer Organization and Architecture	3	1		4	4
5.	EC 401	Analog Integrated Circuit	3	1		4	4
6.	EE 401	Electrical & Electronic Measurement	3	1		4	4
		Total of Theoretical Subjects				24	24
B. SESSIONAL SUBJECTS							
7.	EI 491	Microprocessor and Microcontroller Lab			3	3	2
8.	EC 491	Analog Lab			3	3	2
9.	EE 491	Measurement Lab			3	3	2
		Total of Sessional Subjects				9	6
		Total of Semester				33	30

Subject : MICROPROCESSOR AND MICROCONTROLLER APPLICATIONS
Code : EI 401 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	Introduction to Microprocessors: Evolution of Microprocessors, Timing and control, memory devices.	5*L* + 1*T*
2.	8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Assembly Language programming. 16-bit Microprocessors (8086): Architecture, Physical address, segmentation, memory organization, Bus cycle, Addressing modes, Assembly Language Programming of 8086.	13*L* + 4*T*
3.	Data Transfer Schemes: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Priority Controller (8259), Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications. DAC, ADC and memory Interfacing.	12*L* + 4*T*
4.	Advanced Microprocessors: Introduction to 32-bit and 64-bit microprocessors, power PC.	3*L* + 2*T*
5.	Microcontroller (8051): Introduction, Architecture, Instruction sets, Application in embedded system design.	3*L* + 1*T*

Recommended Books

1.	"Microprocessor - Architecture, Programming and Applications with the 8085 (5/e)", R. S. Gaonkar, *Penram Int. Publ. Pvt. Ltd.*
2.	"Microprocessors And Interfacing: Programming and Hardware (3/e)", D. V. Hall, *Tata McGraw Hill*
3.	"The 8051 Microcontroller", K. Ayala, *Delmar Cengage Lerning Publ.*
4.	"The 8051 Microcontroller And Embedded Systems", Md. Ali Mazidi, J. Gillispie Mazidi, *Pearson Edu.*

Subject : INDUSTRIAL INSTRUMENTATION–I
Code : EI 402 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	Static and Dynamic errors: Standard inputs and system analysis for evaluation of such errors. Definitions of precision, nonlinearity, sensitivity, speed of response, fidelity.	3*L* + 2*T*
2.	**Transducer: -** Resistive, Capacitive, Inductive and Piezoelectric transducer, for Introduction 15 their signal conditioning, filter.	5*L* + 2*T*
3.	Industrial weighing system: Link-lever mechanism, load cells – pneumatic, piezoelectric, elastic and magneto-elastic types – their mounting, pressductor, different designs of weighing systems, conveyors type, weigh feeder type. Liner and angular measurements; Measurement of straightness, roundness and roughness.	6*L* + 2*T*
4.	Measurement of displacement, velocity, acceleration (both translational and rotational). Measurement of force, torque, vibration, shock. Measurement of Pressure, flow, temperature, liquid level, PH, conductivity, viscosity, humidity. Stroboscopes, Encoders, non-contact type rpm meters (optical & magnetic), seismic accelerometer, piezoelectric accelerometer, Measurement of vibration and shock. Small displacement measurement/ Proximity measurement – Inductive / magnetic, optical, capacitive and ultrasonic techniques Flapper nozzle system- pneumatic force balance and motion balance system.	10*L* + 3*T*
5.	Pneumatic relay, filter, regulators, pneumatic transmitters, Electronic transmitter hardware/software, linearization, isolation. Reliability: definition on the basis of Gaussian and distri9bution function, MTTF, Bath tub curve, operating life and cumulative failure analysis. Instrumentation in hazardous area: site, materials and temperature classification, Intrinsic safety,	12*L* + 3*T*

	pressurization, incendiary and non- incendiary system, Combustible gas detection, enclosures – explosion proof type, other classification. Safety standards: IP and NEMA.	

Recommended Books

1.	"Principles of Industrial Instrumentation (2/e)", D. Patranabis, *Tata McGraw Hill*
2.	"Transducers And Instrumentation", D.V.S. Murthy, *Prentice Hall India*
3.	"Instrument Engineers Handbook, Vol-I and Vol-II", B.G. Liptak, *Chilton Book Co. Philadelphia*
4.	"Electronics Instruments and Instrumentation Technology", M.M.S Anand, *Prentice Hall India*
5.	"A Textbook of Instrumentation and Control", D. Patranabis, *Umesh Publ., Delhi*

Subject : OPERATIONS RESEARCH AND DECISION TECHNIQUE
Code : IT 401 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to Operations Research and Decision Technique– Application to real life situation; Modeling Approach of Operations Research (O. R.) – Deterministic model, Stochastic model; Introduction to Linear Programming (L.P.), its limitation – Formulation of a mathematical model; Introduction to Objective Function, Constraints, and Variable– slack, surplus, unrestricted; Graphical Solution Method and Sensitivity Analysis– Unit Worth of a Resource.	1*L*+1*T*
2.	Simplex solution method of L. P. Problems; Introduction to Artificial variables in L. P. problem; Solution methods– Big-M Method, Two-phase method; Revised Simplex method.	4*L*+1*T*
3.	Duality– Primal and Dual problems; Economic interpretation of duality; Relationship between the optimal solutions of Primal and Dual problems– Dual Simplex method.	2*L*
4.	Introduction to transportation problem– Generalized Mathematical Form; Balanced and Unbalanced problems; Independency and Degeneracy– Removal of degeneracy; Basic Feasible Solution, Methods of finding Initial Basic Feasible Solution– North-West Corner method, Least Cost method, Vogel's Approximation method; Optimality Test and Iterative modification of solution using MODI method (Method of Multipliers).	3*L*+2*T*
5.	Introduction to Assignment problem– Generalized Mathematical Form; Transportation and Assignment problems– their relationship and differences; Hungarian method of solution.	1*L*
6.	Network Analysis– Introduction to different terms; Minimal Spanning Tree Algorithm; Shortest Route problems– Dijkstra's Algorithm, Floyd's Algorithm; Maximal Flow Algorithm; CPM and PERT analysis– their relationship and differences, Activity and Event, Network Development, Different time elements in CPM and PERT analyses; Event Slacks and Activity Floats, Critical Path.	6*L*+2*T*
7.	Queueing Theory– Introduction to different terms and axioms; Poisson and Exponential Distributions– Pure Birth Model, Pure Death Model, Inter-arrival Time; Specialised Poisson Queues–Kendall's notation and Lee and Taha's modification; Single Server models– [(*M/M/1*):(*GD*/∞/∞)]; Multiple Server models– [(*M/M/c*):(*GD*/∞/∞)]	4*L*+1*T*
8.	Simulation– Continuous model, Discrete model– Discrete Event Simulation; Monte-Carlo Simulation; Random Number, Pseudorandom Number, Generation of Random Number– Multiplicative Congruential method.	3*L*+2*T*
9.	Dynamic Programming Concept– Deterministic Dynamic Programming; Characteristics of Dynamic Programming; Forward and Backward Recursion; Bellman's Optimality; Selected Applications of D. P.– Travel Plan Schedule model, Cargo Loading model, Equipment Replacement model.	3*L*+2*T*
10.	Integer Programming Concept; Solution of Integer Programming Problems– Cutting Plane method, Branch & Bound method.	2*L*
11.	Decision Analysis– Decision making process; Decision making under certainty– Analytic Hierarchy Approach, Determining the weights, Decision (Comparison) Matrix and Consistency analysis; Decision making under risk– Expected Utility Criterion, Expected Opportunity Loss Criterion, Decision Tree Analysis; Decision making under uncertainty– Laplace Criterion, The Maximin or Minimax Criterion, The Savage Regret Criterion; Decision making under ignorance– The Hurwicz Criterion; The Demarcation of Decisions, Decision Instability–	4*L*

	Conditionalised Expected Utility, Newcomb's Paradox.	
12.	Introduction to Game Theory– Assumptions and terminology; Concept of Dominance; Two-person-zero-sum game– Pure Strategic Game– Solution by Maximin or Minimax principle, Mixed Strategic Game– Solution processes of 2×2, 2×n games, Generalized form of Two-person-zero-sum game– Simplex method of solution.	3*L*+1*T*

Recommended Books

1.	"Operations Research– An Introduction", H A Taha, *Prentice Hall India*
2.	"Tracts in Operations Research", K Swarup, P K Gupta, M Mohan, *Sultan Chand & Sons*

Subject : COMPUTER ORGANIZATION AND ARCHITECTURE
Code : IT 403 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact hours
1.	Concepts & Terminology: Digital computer concepts; Von-Neumann concept; Hardware & Software and their dual nature, Role of operating system (OS). Features of PCs, Minis, Workstations and Mainframes.	3*L* + 1*T*
2.	Memory Unit: Memory classification, characteristics; Organization of RAM, address decoding, Registers and Stack, ROM/PROM/EEPROM basic cells: Organization and erasing schemes, Magnetic memories, recording formats & methods, Concept of memory map, memory hierarchy, Associative memory organization; Cache introduction, techniques to reduce cache misses, concept of virtual memory & paging. Bipolar and MOS storage cells. Instruction sequencing with examples. Microprogramming concept and variation in microprogramming configuration.	9*L* + 2*T*
3.	CPU Design: ALU organization, Serial & Parallel Address; implementation of high speed Address Carry Look Ahead & carry Save Address; Multiplication of signed binary numbers-Booth's algorithm; Divide algorithms- Restoring & Non-Restoring; Floating point number arithmetic; Overflow detection, status flags.	9*L* + 3*T*
4.	Control Design– Timing diagrams; T-States, Controlling arithmetic & logic instruction, control structures; Hardwired & Micro-programmed, CISC & RISC characteristics.	3*L* + 2*T*
5.	Parallel Processing: Pipelining-general concept, speed up, instruction & arithmetic pipeline; Examples of some pipeline in modern processors, pipeline hazards; Flynn's classification – SISD, SIMD, MISD, MIMD architectures-Vector and Array processors & their comparison, Concept of Multiprocessor; Centralized & distributed architectures.	9*L* + 3*T*
6.	Instruction Set Architecture- Choice of instruction set; Instruction word formats; Addressing modes. Input/output Organization: Introduction to Bus architecture, effect of bus widths, Programmed & Interrupt I/O, DMA.	3*L* + 1*T*

Recommended Books

1.	"Computer Architecture & Organization", Hayes, 3/e, *McGraw Hill*
2.	"Computer Architecture (Schaum Series)", Carter, *Tata McGraw Hill*
3.	"Computer System Architecture", Mano M. M., *Prentice Hall India*
4.	"Computer Organization & Design", Chaudhury P. Pal, *Prentice Hall India*
5.	"Computer Organization", Hamacher, 5/e, *McGraw Hill*

Subject : ANALOGUE INTEGRATED CIRCUITS
Code : EC 401 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	Operational Amplifier: Block diagram representation, Ideal op-amp, Equivalent circuit, op-amp with negative feedback, Open loop Configurations, Frequency response, Specifications and performance characteristics of some popular op-amps 741, 1458, 5532 etc.	6*L* + 2*T*

2.	Applications of op-amps: Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.	7*L* + 3*T*
3.	Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, applications of PLL.	6*L* + 2*T*
4.	Analogue and Digital Data Conversions: D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode Ladder types , A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.	9*L* + 3*T*
5.	Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator.	8*L* + 2*T*

Recommended Books

1.	"Linear Integrated Circuits", D.Roy Choudhry, Shail Jain, *New Age Int. Pvt. Ltd.*,
2.	"Analysis and Design of Analog Integrated Circuits", Gray and Meyer, *Wiley Int.*
3.	"Applications and Design with Analog Integrated Circuits", J. Michael Jacob, *Prentice Hall India*
4.	"OP-AMP and Linear IC's", Ramakant A. Gayakwad, *Prentice Hall India/Pearson Edu.*
5.	"Integrated Electronics", Millman. J. and Halkias. C. C. ', *McGraw-Hill*

Subject : ELECTRICAL AND ELECTRONIC MEASUREMENT
Code : EE 401 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Topics to be covered	Contact Hours
1.	General features – Construction and principle of operation of moving iron, Dynamometer, Thermal and Rectifier type deflecting instruments. Measurement of low, medium and high resistances, Kelvins double bridge, multimeters, megger.	6*L* + 3*T*
2.	D.C and A.C potentiometers, Measurement of voltage, current, energy, power tattoo Electronic instruments, measurement of inductances, capacitance by A.C. Bridges measurement of active power in polyphase circuits, various connections. A.C. and D.C. energy meters, AC, D.C current Probes, Extension of Instrument ranges.	10*L*+ 3*T*
3.	Charge Amplifier, programmable Gain Amplifier, Frequency synthesizer	4*L* + 1*T*
4.	True R.M.S. Voltmeter, Peak Response and rectifying type AC voltmeters, Digital Voltmeters, wave form analyzer, Electronic Ohmmeters, Q meter	5*L*+ 1*T*
5.	Current-to-voltage converter type Electronic Ammeters, Chopper stabilized amplifiers for measurement of very low voltages and currents. Electronic Measurement of power.	5*L* + 1*T*
6.	Cathode Ray oscilloscopes and its applications: Cathode Ray Tube, Defalcation Amplifiers, Oscilloscope Time Base, Dual-Trace Oscilloscopes oscilloscope controls, Oscilloscope Probes, Delayed time base Oscilloscope, Digital Storage Oscilloscope. Basic Digital Displays-LEDS and LCD panels. Display Drivers and Latches, Time Base generation with Crystal Oscillators and Dividers	4*L* + 2*T*
7.	Design and Implementation of simple Digital Frequency Meter, Errors in frequency measurement – possible remedies, Time, Phase, frequency measurement. Spectrum analyser	2*L* + 1*T*

Recommended Books

1.	"Electrical Measuring Instruments & Measurements", Golding E.W. & Wides F.C., *Wheeler*
2.	"Electrical Measurements", Harris F.K., *Wiley*
3.	"Modern Electronic Instrumentation And Measurement Techniques", Helfrick and Cooper, *Prentice Hall India*
4.	"Electronic Instrumentation", Kalsi, *Tata McGraw Hill*
5.	"Electrical and Electronic Instrumentation and Measurements", Sawhney A. K, *Dhanpat Rai and Co.,*

Subject : MICROPROCESSOR AND MICROCONTROLLER LAB.
Code : EI 491 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarization with the process of storing and viewing the contents of memory as well as registers.
2.	Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical)
3.	Familiarization with 8085 simulator on PC.
4.	Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator.
5.	Interfacing any 8-bit Latch (eg, 74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding.

Subject : ANALOGUE LAB.
Code : EC 491 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	To study op-amp based inverting and non-inverting amplifiers and voltage comparator.
2.	To study op-amp based Adder and integrator circuits.
3.	To study Op-Amp based signal generator.
4.	To study Butterworth (1st order and 2nd order) low pass and highpass filters.
5.	To study operation of IC555 as monostable and astable multivibrator.
6.	To study operation of IC NE/SE 566 voltage controlled oscillator and determine output frequency for various voltage levels.
7.	To study DAC and ADC
8.	To study a PLL circuit and determine the free running frequency

Subject : MEASUREMENT LAB.
Code : EE 491 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Study of Static characteristics of a measuring instrument
2.	Study of dynamic characteristics of a measuring instrument
3.	Acquaintance with basic structure of NMM and measurem3nt of different electrical parameters.
4.	Realization of data acquisition system.
5.	Wave and spectrum analysis using of meter
6.	Realization of V to I & I to V converter

PART -III, 1ST SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 08
		TOTAL SEMESTER CREDITS	: 28

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	IT 501	Operating System	3	1		4	4
2.	EC 501	Control Theory	3	1		4	4
3.	EC 502	Analog Communication Theory	3	1		4	4
4.	EC 503	Power Electronics	3	1		4	4
5.	EI 501	Industrial Instrumentation – II	3	1		4	4
		Total of Theoretical Subjects				20	20
B. SESSIONAL SUBJECTS							
6.	IT 591	Operating System Lab			3	3	2
7.	EC 591	Control Lab			3	3	2
8.	EC 592	Analog Communication Lab			3	3	2
9.	EC 593	Power Electronics Lab			3	3	2
		Total of Sessional Subjects				12	8
		Total of Semester				32	28

Subject : OPERATING SYSTEM
Code : IT 501 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to OS. Operating system functions, evaluation of OS, Different types of OS: batch, multi-programmed, time-sharing, real-time, distributed, parallel.	3*L* + 1*T*
2.	Computer System Operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), OS services, system calls.	2*L* + 1*T*
3.	Process management	
	Processes: Concept of processes, process scheduling, operations on processes, co-operating processes, inter-process communication.	2*L* + 1*T*
	Threads: overview, benefits of threads, user and kernel threads.	2*L* + 0*T*
	CPU scheduling: scheduling criteria, preemptive and non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, Priority), algorithm evaluation, multi-processor scheduling.	3*L* + 1*T*
	Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores.	4*L* + 1*T*
	Deadlocks: system model, deadlock characterization, methods of handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.	3*L* + 1*T*
4.	Storage Management	
	Memory Management: background, logical versus physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.	4*L* + 2*T*
	Virtual Memory: background, demand paging, performance, page replacement algorithms (FCFS, LRU, optimal), allocation of frames, thrashing.	2*L* + 1*T*
	File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.	3*L* + 1*T*
	I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.	3*L* + 1*T*
	Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.	2*L* + 1*T*
5.	Protection & Security: goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.	2*L* + 0*T*
6.	Advance Topic: Basic architectural model and working principles of distributed OS	1*L* + 0*T*

Recommended Books

1.	"Operating System Concepts", Silberschatz A., Galvin P. B. and Gagne. G., *John Wiley & Sons*
2.	"Operating System: Concept & Design", Milenkovie M., *McGraw Hill.*
3.	"Operating System Design & Implementation", Tanenbaum A. S., *Prentice Hall, NJ*
4.	"Operating System", Dhamdhere, *Tata McGraw Hill*
5.	"Operating Systems", Stalling, William., *Maxwell McMillan International edition, 1992*
6.	"An Introduction to Operating Systems", Dietel H. N., *Addision Wesley*

Subject: : CONTROL THEORY
Code : EC 501 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction: control systems, feedback and its effects, types of feedback control systems, transfer function and signal flow graph, transfer function of linear systems impulse response of linear systems, block diagram, signal formula using block diagram reduction.	6*L* + 1*T*
2.	Time domain analysis: transient response of a single input single output linear feedback control system control system, steady state error, steady state error constants dynamic error constants, proportional derivative and integral control systems.	5*L* + 1*T*
3.	State variable analysis of control system: state representation of systems, solving time invariant state equation, state transition equation and transfer function, state diagram, from state diagram to state transition equation.	5*L* + 2*T*
4.	Stability of control system: characteristic equation, methods of determining linear control systems, Routh-Hurwitz criterion, Nyquist criterion, application of Nyquist criterion, application of Nyquist criterion, effects of addition of poles and zeros of G(s), H(s) on the shape of Nyquist locus.	5*L* + 2*T*
5.	Root locus method: root locus plots, summery of general rules for construction root loci, root locus analysis of control systems.	4*L* + 1*T*
6.	Frequency domain analysis of control systems: frequency domain characteristics, peak response, repose frequency and bandwidth of a second order system, Bode plot, gain margin, phase margin, constant M locus, constant N locus, Nichol's chain.	5*L* + 2*T*
7.	Compensation techniques: lead compensation, lag compensation, lead-lag compensation.	4*L* + 2*T*
8.	Introduction to sample data (S.D.) control system, Digital control system— its transfer function, Zero Order Hold (ZOH) for S.D. control system	2*L* + 1*T*

Recommended Books

1.	"Control System", Nagraj and Gopal

Subject: : ANALOG COMMUNICATION THEORY
Code : EC 502 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Signal Transmission through Linear Systems:** Condition for distortionless transmission of signals through networks. Different types of distortion and their effect on the quality of out put signals. Transmission of transient signals, distortion analysis.	4*L* + 2*T*
2.	**Fourier transform:** Introduction, Existence of F.T. F.T. of some standard signals, properties of F.T., F.T. of a periodic signal, Analysis of Comm. System with F.T. **Amplitude Modulation:** Modulation principle and definitions, spectrum and power considerations, DSB, SSB, VSB and AM principles. Different type of modulator circuits, Square law modulator, Balanced modulator. Different circuits for generation of SSB and VSB. Basic principle of coherent detections. Square law detectors, Average envelope and peak envelope detectors. Carrier recovery.	18*L* + 4*T*
3.	**Frequency and Phase Modulation:** Principles and definitions, Relationship between frequency and phase modulations. Circuit for realization of FM and PM. Different type of demodulator, discriminator, use of PLL etc. Basic block diagram of radio transmitter (AM and FM) , basic block diagram of a radio receiver, Super-heterodyne principle, its advantages. Mixer principle and circuit, AGC.	10*L* + 4*T*

4.	**System Noise:** Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection n, Threshold effect. Signal to noise calculation for FM and threshold.	4*L* + 2*T*

Recommended Books

1.	"Analog & Digital Communication", B.P. Lathi

Subject: : POWER ELECTRONICS
Code : EC 503 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Thyristor under biased condition, Methods for triggering - Gate turn-on, Thyristor turn off, protection of Thyristor, Thyristor family, Other power electronics devices.	8*L* + 3*T*
2.	Single-phase and three-phase controlled rectifiers – Half – Full – Dual converter, Performance parameter - Rectifier efficiency - Form factor – THD.	6*L* + 2*T*
3.	Methods for AC voltage control, AC choppers, Cycloconverter– single and three phase – frequency and voltage control.	6*L* + 2*T*
4.	Commutation of Thyristors, Step-down and step-up Choppers– Quadrants of operation.	6*L* + 2*T*
5.	Classification of Inverters, Voltage source inverters– Pulse width modulated inverters, Current source inverters.	6*L* + 2*T*
6.	Uninterruptible power supplies, Induction Heating, Welding.	4*L* + 1*T*

Recommended Books

1.	"Power electronics devices, circuits and Industrial Applications", V.R. Moorthi, *Oxford Univ Press.*
2.	"Power electronics", M. Rasid, *PHI*

Subject: : INDUSTRIAL INSTRUMENTATION-II
Code : EI 501 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Humidity terms – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell – Electrolysis type hygrometer – Commercial type dew point meter – Moisture terms – Different methods of moisture measurement – Moisture measurement in granular materials, solid penetrable materials like wood, web type material.	8*L* + 3*T*
2.	Theory of fixed restriction valuable head type flow meters – Orifice plate – Venturi tube – Flow nozzle – Dall tube – installation of head flow meters – Piping arrangement for different fluids – Pitot tube.	4*L* + 1*T*
3.	Positive displacement flow meters – Constructional details and theory of operation of mutating disc, reciprocating piston, oval gear and helix type flow meters – Inferential meter – Turbine flow meter – Rotameter – Theory and installation – Angular momentum mass flow meter – Coriolis mass flow meters – Thermal mass flow meters – Volume flow meter plus density measurement – Calibration of flow meters – Dynamic weighing method.	8*L* + 3*T*
4.	Principle and constructional details of electromagnetic flow meter – Different types of excitation schemes used – Different types of ultrasonic flow meters – Laser doppler anemometer systems – Vortex shedding flow meter – Target flow meter – Solid flow rate measurement – Guidelines for selection of flow meter.	8*L* + 2*T*
5.	Gauge glass techniques coupled with photoelectric readout system – Float type level	

	indication – Different schemes – Level switches, level measurement using displacer and torque tube – Bubble system. Boiler drum level measurement – Differential pressure method – Hydra step systems – Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors.	8*L* + 3*T*

Recommended Books

1.	'Principles of Industrial Instrumentation', D. Patranabis, *Tata McGraw Hill.*
2.	'Mechanical & Industrial Measurements', R.K. Jain, *Khanna publishers.*
3.	'A Course on Mechanical Measurement, Instrumentation and Control', A.K. Sawhney and P. Sawhney, *Dhanpat Rai and Co.*

Subject : OPERATING SYSTEM LAB.
Code : IT 591 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Shell Programming: creating a script, making a script executable, shell syntax (variables, conditions, control structures, functions, and commands).
2.	Process: starting new process, replacing a process image, duplicating a process image, waiting for a process.
3.	Signal: signal handling, sending signals, signal interface, signal sets.
4.	Semaphore: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5.	Inter process Communication: pipes (use functions pipe, popen, pclose), named pipes (FIFO, accessing FIFO).

Subject : CONTROL LAB.
Code : EC 591 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Temp. Control System
2.	Liquid level system
3.	Position Control system
4.	Stability analysis by Bode Plot
5.	Stability analysis by Polar plot
6.	Application of root locus technique

Subject : ANALOG COMMUNICATION LAB.
Code : EC 592 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Amplitude modulation,

2.	Frequency modulation
3.	Position Control system
4.	Stability analysis by Bode Plot
5.	Stability analysis by Polar plot
6.	Application of root locus technique

Subject : POWER ELECTRONICS LAB.
Code : EC 593 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	**Details of the lesson**
1.	Study on UJT – UJT Relaxation Oscillator
2.	Study on Controlled Rectifiers using SCR – Half wave – Full Wave
3.	Position Control system
4.	Study on Cycloconverter
5.	Study on DC Chopper
6.	Study on Inverter

PART -III, 2ND SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 08
		TOTAL SEMESTER CREDITS	: 28

A. THEORETICAL SUBJECTS							
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	EC 601	Digital Communication	3	1		4	4
2.	EI 601	Signal and Systems	3	1		4	4
3.	EC 602	Opto Electronics & Optical Instruments	3	1		4	4
4.	EC 603	Electromagnetic Theory and Transmission Line	3	1		4	4
5.	EI 602	Digital Signal Processing	3	1		4	4
		Total of Theoretical Subjects				20	20
B. SESSIONAL SUBJECTS							
6.	EC 691	Digital Communication Lab			3	3	2
7.	EC 692	Opto Electronics Lab			3	3	2
8.	EC 693	Electromagnetic Lab			3	3	2
9.	HU 691	Group Discussion			3	3	2
		Total of Sessional Subjects				12	8
		Total of Semester				32	28

Subject : DIGITAL COMMUNICATION
Code : EC 601 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Pulse code modulation: linear and nonlinear quantization, calculation of quantization errors, inter symbol interference, eye pattern and equalization, delta modulation, calculation of quantization error, limitation of delta modulation – slop overload, adaptive delta modulation, differential PCM, linear predictive encoding.	10*L* + 2*T*
2.	Base band signal receivers, optimum filtering, matched filter, coherent reception, correlation, ASK, PSK, DPSK, FSK and MSK principles, error analysis of coherent detection of PSK and FSK signals, QPSK, MSK principle and system.	8*L* + 1*T*
3.	Time division multiplexing, pulse stuffing and word stuffing, frequency division multiplexing and concept of code division multiplexing.	8*L* + 2*T*
4.	Need for synchronization, bit synchronizer, frame synchronization	4*L* + 1*T*
5.	Fixed equalizer, linear equalizers and decision directed equalizer, partial response signaling.	4*L* + 1*T*
6.	Block codes, definitions, generator and parity check matrix error control capacity, standard array, cyclic codes – description, encoding with an (n-k) stage shift register and (k) stage shift register, syndrome calculation and error detection.	6*L* + 1*T*

Recommended Books

1.	"Analog & Digital Communication", B.P. Lathi
2.	"Digital Communication", A.B. Carlson

Subject: : SIGNAL & SYSTEMS
Code : EI 601 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Systems— Linear and non-linear, Characterization by Transfer Function/Describing Function, Typical non-linearities *e.g.* dead zone, saturation, back lash, dead zone with saturation.	4*L* + 2*T*
2.	Introduction-Signal representation: Continuous and discrete time signals: Classification of Signals – Periodic aperiodic even-odd – energy and power signals- Deterministic and random signals- complex exponential and sinusoidal signals- periodicity- properties of discrete time complex exponential unit impulse- unit step impulse functions- Transformation I independent variable of signals: time shifting	7*L* + 2*T*
3.	Continuous time Signals and Systems: Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems- Analysis and characterization of LTI systems: Computation of impulse response and transfer function convolution, co-relation, signal energy, signal power, energy spectral density, power spectral density.	7*L* + 2*T*
4.	Sampling Theorem: Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of Signal from its samples, aliasing zero-order hold ck,	4*L* + 2*T*
5.	Z – Transforms: Basic principles of z-transform definition- region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration –Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.	7*L* + 2*T*
6.	Filter: Concept of analog passive filters, LPF, HPF, BPF, BRF	7*L* + 2*T*

Recommended Books

1.	"Signals and Systems", P. Rameshbabu and R. Anadanatarajan

Subject: : OPTO ELECTRONICS & OPTICAL INSTRUMENTS
Code : EC 602 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction to Optical Communication Systems	1*L* + 0*T*
2.	Optical Fibers: a. Fiber Structures and types, Rays and Modes b. Single-mode and Multimode Fibers, Refractive Index Profiles, graded Index fiber. c. Numerical Aperture, Acceptance Angle, V-Parameter d. Loss mechanisms ini Fibers, Loss vs Wavelength Plot and Its Significance. e. Dispersion Mechanisms in Fibers: Intermodal and Intermodal (Chromatic) Dispersions, components of Intramodal Dispersions, Dispersion vs. Wavelength Plots and Their Significance	8*L* + 2*T*
3.	Optical Sources: a. Desired Features of Optical Sources for Optical Communication and Material Choices. b. LED Structure and Operating Principle c. LED Modulation Characteristics: Output Power vs. Driving current, Speed and Bandwidth d. LED Driver Circuits for Optical Transmitters e. LASER Structure and Operating Principle f. LASER Modulation Characteristics: Output Power vs. Driving Current, Threshold Current and Its Temperature Sensitivity, Speed and Bandwidth g. LASER Driver Circuits for Optical Transmitters.	8*L* + 3*T*
4.	Photodetectors: a. Desired Features rf Photodetectors b. PIN Diode as Photodetector: Structure, Operating Principle, Shot Noise c. Avalanche Photodiode (APD) as Photodetector: Structure, Operating Principle, Shot Noise, Avalanche Multiplication (Excess) Noise.	6*L* + 3*T*
5.	Optoelectronics: Introduction to LDR, Photoelectric cells, Otocoupler, CCD etc.	4*L* + 2*T*
6.	Fiber optic Sensors: Classification, Measurement of pressure, velocity, displacement, flow etc.	*8L* + 2*T*

Recommended Books

1.	"Optical Fiber Communiucations", Senior
2.	"Optical Fiber Communiucations", Gerd Keiser

Subject : ELETROMAGNETIC THEORY AND TRANSMISSION LINE
Code : EC 603 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction: review of vector analysis, gradient, divergence and curl in different coordinate systems	7*L* + 2*T*
2.	Electrostatics: Coulomb's and Gauss's law and their application, energy in electrostatic fields, capacitance of parallel plate and coaxial cables, fields in dielectrics, boundary conditions Laplace and Poisson equations and their applications.	7*L* + 3*T*
3.	Magnctostatics: Ampere's and Biot-Savart's laws and their applications, energy in magnetic field, boundary conditios.	8*L* + 3*T*
4.	Maxwell's equations: Maxwell's equations in differential and integral form	5*L* + 1*T*
5.	Uniform plane waves: wave equations, solution for free space, solution for conducting medium, surface impedance, pointing vector, power flow, reflection and refraction of uniform waves in conductors and dielectrics with normal and oblique incidence.	9*L* + 3*T*

Recommended Books

1.	Electromagnetic Theory– Sadiku, *Oxford Publisher*

Subject: : DIGITAL SIGNAL PROCESSING
Code : EI 602 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Basic elements of digital signal Processing, Concept of frequency in continuous time and discrete time signals, Sampling theorem, Discrete time signals. Discrete time systems, Analysis of Linear time invariant systems, Z-transform, Convolution and correlation.	9*L* + 4*T*
2.	Introduction to DFT, Efficient computation of DFT Properties of DFT, FFT algorithms– Radix-2 and Radix-4 FFT algorithms– Decimation in Time– Decimation in Frequency algorithms.	8*L* + 2*T*
3.	Structure of IIR filter, System Design of Discrete time IIR filter from continuous time filter, IIR filter design by Approximation derivatives– Impulse Invariance– Bilinear transformation– Matched Z-transform, Realization of digital filters– Direct form I– Direct form II– Transposed structure– Cascade form– Parallel form.	9*L* + 3*T*
4.	Symmetric & Antisymmetric FIR filters, Linear phase filter, Fourier series method of designing FIR filter - Windowing technique, Frequency sampling techniques, Structure for FIR systems.	6*L* + 2*T*
5.	Application of DSP – Model of Speech Wave Form, Vocoder.	4*L* + 1*T*

Recommended Books

1.	"Digital Signal Processing Principles, Algorithms and Application", John G Proakis and Dimtris G Manolakis, *PHI/Pearson Education.*
2.	" Digital Signal Processing", P. Ramesh Babu, *Scitech Publication Pvt. Ltd.*

Subject : DIGITAL COMMUNICATION LAB
Code : EC 691 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	ASK
2.	PSK
3.	FSL
4.	PCM
5.	PAM
6.	ASK

Subject : OPTOELECTRONICS LAB
Code : EC 692 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Experiments on LED
2.	Experiments on Photodiode
3.	Experiments on LDR
4.	Experiments on Phototransistor
5.	Experiments on Solar Cell
6.	Experiments on LED

Subject : ELECTROMAGNETIC LAB
Code : EC 693 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Return loss measurement of an antenna
2.	Radiation pattern measurement
3.	Establishing LOS link
4.	Isolator

Subject : GROUP DISCUSSION
Code : HU 691 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Discussion Topic will be given in the class.

PART -IV, 1ST SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 10
		TOTAL SEMESTER CREDITS	: 30

A. THEORETICAL SUBJECTS								
Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
1.	EC 701	VLSI Design	3	1		4	4
2.	EC 702	Process Control	3	1		4	4
3.	HU 701	Engineering Economics & Financial Management	3	1		4	4
4.	IT 701	Internetworking	3	1		4	4
5.	IT 702	JAVA Programming and Web Technology	3	1		4	4
Total of Theoretical Subjects						16	20
B. SESSIONAL SUBJECTS							
6.	EI 791	Digital Signal Processing Lab			3	3	2
7.	IT 791	Internetworking Lab			3	3	2
8.	IT 792	JAVA Programming and Web Technology Lab			3	3	2
9.	EI 792	Project			6	6	4
Total of Sessional Subjects						15	10
Total of Semester						31	30

Subject : VLSI DESIGN
Code : EC 701 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Issues and challenges in Digital IC Design: general overview of design hierarchy, layers of abstraction, integration density and Moore's law. VLSI design styles, MOSFET fabrication: basic steps of fabrication, CMOS p-well processes, layout design rules, Bi-CMOS fabrication process; Latch-up immune designs;	7*L* + 2*T*
2.	CMOS Inverter: MOS device model with sub-micron effects, VTC parameter (DC characteristics), CMOS propagation delay, Parasitic capacitance estimation, Layout of an inverter Switching, Short-circuit and leakage Components of Energy and Power;	7*L* + 2*T*
3.	Interconnects: Resistance, "Capacitance Estimation, delays, Buffer chains, Low swing drivers, Power distribution, and performance optimization of digital circuits by logical effort sizing:	6*L* + 2*T*
4.	Combinational logic design: Static CMOS construction, Ratioed logic, Pass transistor, Transmission gate logic, DCVSL, Dynamic logic design considerations, Noise considerations in dynamic design, Power dissipation in CMOS logic, and multipliers (serial – parallel, Booth's and systolic array multipliers:	6*L* + 2*T*
5.	Semiconductor memories: non-volatile and volatile memory devices, flash memories, SRAM cell design, Differential sense amplifiers, DRAM design,	5*L* + 2*T*
6.	Single ended sense amplifier: Testing in VLSI: Defects, Fault models, Path sensitization, Scan, Built-in-self Test (BIST), IDDQ	5*L* + 2*T*

Recommended Books

1.	"CMOS VLSI Design: A Circuits And Systems Perspective", Neil H. E. Weste, David Harris, Ayan Banerjee, *Pearson Education*
2.	"VLSI Technology", Sze S M, *Tata McGraw Hill*
3.	"Basic VLSI Design", Pucknell A Douglas, Eshraghian Kamran, *Prentice Hall India*
4.	"Microelectronics", Jacob Millman and Arvin Grabel, *Tata McGraw Hill*
5.	"Fundamentals of Microelectronics", Behzad Razavi, *Willey*

Subject : PROCESS CONTROL
Code : EC 702 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Introduction; control loop study with disturbance, offset and its analysis.	3*L* + 2*T*
2.	Controllability; proportional control factor, DRF, PRC, self regulation, case studies, stability-different techniques, bode plots, application of controllability and stability studies, GB product, error criteria- their significance in process control systems.	9*L* + 3*T*
3.	Control action and controller; on-off, proportional, reset, rate, programmed controllers, design parameter adjustment using GB product, PRC and frequency response characteristics, Ziegler-Nichols rule, effectof dead time, controllers-pneumatic, electrical, ultrasonic, hydraulic, electro-hydraulic, digital, multiloop, ratio, cascade, feed forward, split-range selector.	8*L* + 3*T*
4.	Basic concepts of multivariable control, control elements, R, L, C elements in pneumatic, hydraulic and electrical systems, flow control, pressure level and temperature control.	8*L* + 2*T*
5.	Plants and processes; modeling and system equations, final control elements, control valves, selection, sizing, service materials, electrical and electro-hydraulic actuators,	8*L* + 2*T*

	introduction to digital computer process control.	

Recommended Books

1.	"Process Control Instrumentation Technology", Johnson Curtis, *Prentice Hall India*
2.	"Principles of Process Control", D. Patranabis, *Tata McGraw Hill*
3.	"Instrumentation and Control", D. Patranabis, *Prentice Hall India*

Subject : ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT
Code : HU 701 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
Gr.-A : Engineering Economics		
1.	An Introduction of Economics— Definition of Economics; Nature of Economic Problem and Production Possibility Curve; Production— Interaction between Economic Theory and Production; Concepts of Firm, Industry and Economy	2*L* + 0*T*
2.	Demand and Supply Analysis— Demand and its determinants, Demand Function, Law of demand, Demand curve, Factors influencing demand curve, Elasticity of demand; Different concepts of Revenue; Supply and its determinants, Law of supply, Supply Function, Supply curve.	3*L* + 0*T*
3.	Theory of Costs— Classification of cost; Concepts of Total Cost, Average Cost and Marginal Cost.	2*L* + 1*T*
4.	Concepts of Competition and Markets— Introduction to Perfect Competition; Short run and Long run equilibrium under perfect competition; Classification of Market— Monopoly and Oligopoly Markets; Equilibrium under monopoly and oligopoly; Price and output determination under monopoly.	3*L* + 1*T*
5.	Theory of Production— Factors of production; Production Function; Laws of Returns; Returns to Scale; Cobb-Douglas production function and its properties.	3*L* + 2*T*
6.	Product Pricing— Price Leadership model; Average Cost Pricing; Cost-plus or Mark-up Pricing; Marginal Cost Pricing and Variable Cost Pricing.	3*L* + 1*T*
7.	Nature of Indian Economy— Introduction to Indian Economy; Concepts of Public Sector, Privatization and Globalization — Their merits and demerits; Basic concepts of GATT, WTO and TRIPS.	2*L* + 0*T*
Gr.-B : Financial management		
8.	Basic Concept— Meaning and definition of Financial Management; Financial Planning and Capitalization.	2*L* + 0*T*
9.	Financial Statement— Meaning of Financial Analysis— Ratio Analysis	2*L* + 0*T*
10.	Theory of Costs— Classification of cost; Concepts of Total Cost, Average Cost and Marginal Cost.	2*L* + 1*T*
11.	Capital Budgeting— Concept, importance and Process of Capital Budgeting; Nature of Investment Decision— Investment Criterion; Payback period; Accounting and Discounting; Different methods used— Rate of Return method, Fund Flow method, Net Present Value method, Internal Rate of Return method, Cost-Ratio method.	3*L* + 2*T*
12.	Management of Working Capital— Concepts of Working Capital and its management; Importance of Working Capital; Financing and Investment Analysis; Cost of Capital.	3*L* + 1*T*
13.	Budgeting Control Techniques— Concepts of budget, budgeting and budgeting control— its objectives, functions, merits and demerits; Master Budget and Report.	3*L* + 1*T*
14.	Financial Control— Posting of Ledgers and Preparation of Trial Balance; Preparation of Balance Sheet; Preparation of Profit and Loss Accounts; Controlling other departments by Financial Accounting	3*L* + 2*T*

Recommended Books

1.	"Macroeconomics", Paul Samuelson, William Nordhaus, Sudip Chaudhuri, *Tata McGraw Hill*

2.	"Economics for Engineers", T.R. Jain, M.L. Grover, V.K. Ohri and O.P. Khanna, *V.K. Enterprise*
3.	"Engineering Economy", W.G.Sullivan, *Pearson Education*
4.	"Engineering Economics and Costing", S. Mishra, *Prentice Hall India*
5.	"Engineering Economics", R. Panneerselvam, *Prentice Hall India*
6.	"Economics", Campbell McConnell, Stanley Brue, Sean Flynn, *Tata McGraw Hill*
7.	"Microeconomics", D. N. Dwivedi, 2011, *Pearson Education*
8.	"Financial Management Theory and Practice"< Prasanna Chandra, *Tata McGraw Hill*
9.	"Financial Management Text and Problems", Khan and Jain, *Tata McGraw Hill*

Subject : INTERNETWORKING
Code : IT 701 **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Introduction**: The need for computer network and Internet, Internet services, Internet protocols and standardization, Review of Network technologies, Wired and Wireless LAN, MAN, WAN	3*L* + 0*T*
2.	**Internetworking Concepts:** Architectural model introduction, Application level interconnection, Network level interconnection, Properties of the Internet, Internet Architecture, Interconnection through IP Gateways or routers, Internet and Intranet, Multiplexing, Transmission Media, Multiple Access	7*L* + 2*T*
3.	**Internet Address:** Introduction, Universal identifiers, Three primary classes of IP addresses, Classless IP address, Network and Broadcast addresses, Mapping internet addresses to physical addresses (ARP), ARP protocol format, Transport Gateways and subnet addressing, Multicast addressing, IPv_4, IPv_6.	5*L* + 2*T*
4.	**Internet Protocol:** Internet Architecture and Philosophy, The concept of unreliable delivery, Connectionless delivery system, The Internet Datagram, Routing direct and indirect delivery, Table driven IP routing, Protocol layering, Reliable stream transport, TCP performance, Bootstrap protocol (BOOTP).	5*L* + 2*T*
5.	**Routing:** The origin of Gateway routing tables, Original Internet Architecture and Cores, Core Gateways, Automatic route propagation, Vector distance (Bellman-Ford), routing, Gateway to Gateway Protocol (GGP), Autonomous system concept, Exterior Gateway Protocol (EGP), Interior Gateway Protocol (RIP, OSPF, HELLO), Routing Information Protocol (RIP), Combining RIP, HELLO, and EGP, Routing with partial information.	5*L* + 2*T*
6.	**Enterprise Networking:** Corporate networking, Broadband at the Metropolitan area level, High speed dedicated WAN services and switched WAN services, ISDN, BISDN and ATM services, Frame relay technology and services, Virtual private network concepts PPTP protocol.	5*L* + 2*T*
7.	**Internet Servers:** DNS, DHCP Servers, FTP, TELNET, E-Mail	3*L* + 1*T*
8.	**Firewall & Networking:** Introduction, Implementation of Firewall, Activities of Firewall, Configuration of firewall, Firewalls & SSL, SSL implementation, Bit implementation of SSL, Use of SSL.	3*L* + 1*T*

Recommended Books

1.	"Computer Networks and Internets", Douglas E. Comer; *Pearson Edition*.
2.	"Data Communications and Networking (3rd Ed.)", Behrouz A. Forouzan, *Tata McGraw Hill*
3.	"Internetworking with TCP / IP" Douglas E .Comer, *Pearson Edition*.
4.	"TCP/IP protocol suite", Behrouz A. Forouzan, *Tata McGraw Hill*
5.	"The Complete reference of Networking", Craig Zacker, *Tata McGraw Hill*
6.	"Data and Computer Communication (5th Ed.)", William Stallings, *Prentice Hall India*.
7.	"Computer Networks", Andrew S. Tanenbaum, *Prentice Hall India*.

Subject : JAVA PROGRAMMING AND WEB TECHNOLOGY
Code : IT 702 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	**Object oriented programming in Java:** Object, class, message passing, encapsulation, polymorphism, Inheritance, aggregation, threading, applet programming, difference between OOP and other conventional programming-advantages and disadvantages. **Java Script:** Data types, variables, operators, conditional statements, array object, date object, string object.	15*L* + 4*T*
2.	**Static Web Pages**: Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWW-Basic concepts, web client and web server, http protocol (frame format), universal resource locator (URL), HTML different tags, sections, image & pictures, listings, tables, frame, frameset, form. **Dynamic Web Pages:** The need of dynamic web pages; an overview of DHTML, cascading style sheet (css), comparative studies of different technologies of dynamic page creation. **Active Web Pages:** Need of active web pages; java applet life cycle.	4*L* + 2*T*
3.	**Java Servlet**: Servlet environment and role, HTML support, Servlet API, The servlet life cycle, Cookies and Sessions. **JSP:** JSP architecture, JSP servers, JSP tags, understanding the layout in JSP, Declaring variables, methods in JSP, inserting java expression in JSP, processing request from user and generating dynamic response for the user, inserting applets and java beans into JSP, using include and forward action, comparing JSP and CGI program, comparing JSP and ASP program; Creating ODBC data source name, introduction to JDBC, prepared statement and callable statement. **J2EE:**An overview of J2EE web services, basics of Enterprise Java Beans, EJB vs. Java Beans, basics of RMI, JNI. **XML:** Extensible Markup Language (XML), basics of XML, elements and attributes, document type definition, XML parsers, sequential and tree approach.	12*L* + 4*T*
4.	**Applications:** Introduction to .Net, .NET framework, CLR, CTS, CLS, garbage collection, namespace, Introduction VB.NET, C#.NET, ASP.NET. Developing windows program using VB.NET. Developing Web based application using VB.NET and ASP.NET.	5*L* + 2*T*

Recommended Books

1.	"Web Technologies", A. S. Godbole and A. Kahate, *Tata McGraw Hill.*
2.	"Web Technology & Design" C. Xavier, *New Age Int. Publ.*
3.	"Java Server Programming, J2EE edition. (VOL I and VOL II)", *WROX Publ.*
4.	"Win32 API Programming With VB", S.P.D. Roman, *O'Reilly Media, Inc.*
5.	"Learn Microsoft VB 6.0 Now", Halvorson, *PHI/MSP*
6.	"JAVA Server Pages", Hans Bergstein, *O'Reilly Media, Inc.*
7.	"Web Technology & Design", Xavier C., *New Age Int. Publ.*

Subject : DIGITAL SIGNAL PROCESSING LAB
Code : EI 791 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Generation of Signals
2.	Linear and circular convolution of two sequences

3.	Sampling and effect of aliasing
4.	Design of FIR filters
5.	Design of IIR filters
6.	Calculation of FFT of a signal

Subject : INTERNETWORKING LAB.
Code : IT 791 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Implementation of protocols (eg. Sliding window, Go-back-N etc. using rmi / TCP/UDP socket Programming).
2.	Implementation of Routing algorithms (eg. Flooding, Distance-vector Routing, Linkstate Routing etc.).
3.	Configuration of DNS, DHCP, FTP.
4.	Implementation of firewall & proxy server (Winproxy)/ SQUID.
5.	Configuration of firewall.
6.	Telnet connection and chatting between two clients.
7.	Web server configuration and Host (PWS/IIS4).
8.	Control of access privilege in server.
9.	Browser configuration

Subject : JAVA PROGRAMMING AND WEB TECHNOLOGY LAB.
Code : IT 792 **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl. No.	Details of the lesson
1.	Assignments on developing interfaces- multiple inheritances, extending interfaces
2.	Assignments on creating and accessing packages
3.	Assignments on multithreaded programming, handling errors and exceptions, and graphics programming
4.	Web Programming languages such as JAVA, ASP, JSP
5.	Basic use of html tag, linking image table, frame, form design.
6.	DHTML- inline styles, creating style sheets with the style element, linking external style sheet, Positioning elements, user style sheet.
7.	Creating event handler that respond to mouse and keyboard event: On load, on mouse over, on mouse out, on focus, on blur, on submit, on result, on click, on change.
8.	Structuring data with xml, xml parser, extensible style language (xsl); customizing markup language.
9.	Configuring apache-tomcat server.
10.	Building simple JSP: Declaring variables and methods in JSP, inserting java expression in JSP,
11.	Processing request from user, generating dynamic response for the user. Accessing database from JSP, inserting applet into JSP.
12.	Development of Web site
13.	Creation of Dynamic Web Pages using different tools
14.	Development of an experimental search engine

PART -IV, 2ND SEMESTER (EIE)

NO. OF THEORETICAL SUBJECT	: 05	CREDITS ON THEORETICAL SUBJECTS	: 20
NO. OF SESSIONAL SUBJECT	: 04	CREDITS ON SESSIONAL	: 10
		TOTAL SEMESTER CREDITS	: 30

Sl. No.	Subject Code	Subject Name	Contacts (Periods/Week)				Credits
			L	T	P	Total	
A. THEORETICAL SUBJECTS							
1.	EI 801	Advanced Sensors	3	1		4	4
2.	EI 802	Telemetry and Remote Control	3	1		4	4
3.	EI 803	Elective – I (EI 803A/ EI 803B/ EI 803C/ EI 803D)	3	1		4	4
4.	EI 804	Elective – II (EI 804A/ EI 804B/ EI 804C/ EI 804D)	3	1		4	4
		Total of Theoretical Subjects				16	16
B. SESSIONAL SUBJECTS							
5.	EI 891	Elective – I Lab (EI 891A/ EI 891B/ EI 891C/ EI 891D)			3	3	2
6.	EI 892	Elective – II Lab (EI 892A/ EI 892B/ EI 892C/ EI 892D)			3	3	2
7.	EI 893	Grand Viva			–	–	2
8.	EI 894	Project with Presentation and Interaction			6	6	4
		Total of Sessional Subjects			12	12	10
		Total of Semester				28	26

Elective – I	Elective – II
EI 803A: Microwave Theory and Technique	EI 804A: Soft Computing
EI 803B: Digital System Design using VHDL	EI 804B: Biomedical Instrumentation
EI 803C: Multimedia Techniques	EI 804C: Embedded System
EI 803D: Power Plant Instrumentation	EI 804D: Parallel Processing

Subject : ADVANCED SENSORS
Code : EI 801 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Micro mechanical sensing and actuating structures: SAW micro sensors, Resonant micro sensors, micro accelerators, Pressure micro sensors, micro actuators and micro motors, semiconductor strain gauges, Piezo resistive elements.	12*L* + 4*T*
2.	Temperature and Light Sensitive Microstructures: Solid state temperature sensors – silicon resistive temperature sensors, Transistor based sensors, Integrated thermocouple, Photo detectors, Pneumatic detectors, Pyro electric detectors, Photo emissive, Photo conductive, Schottky, CCDs, Radiation detectors, Fiber optic sensors: Pressure, Temperature and Phase modulated, Gyroscopes.	16*L* + 6*T*
3.	Miscellaneous Miniature Sensors: Magnetic sensors, Solid-state, chemical sensors: silicon based, Metal oxide based, Catalyst.	8*L* + 2*T*

Recommended Books

1.	
2.	

Subject : TELEMETRY AND REMOTE CONTROL
Code : EI 802 **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Basic classification of telemetry systems; voltage, current, position, frequency and time components of telemetering and remote control systems, quantization theory, sampling theorem, sample and hold, data conversion, coding, for conversion.	8*L* + 2*T*
2.	Multiplexing; time division multiplexers and demultiplexer theory, scanning procedures, frequency division multiplexers with constant and proportional bandwidth, demultiplexers.	6*L* + 2*T*
3.	Data acquisition and distribution system; telemetry system design.	5*L* + 2*T*
4.	Fundamentals of radio-telemetry system, RF link system design, IRIG and CCITT standards.	5*L* + 2*T*
5.	Pulse code modulation; methods and circuits.	5*L* + 2*T*
6.	Practical telemetry systems; pipeline telemetry; power system telemetry; supervisory tele-control system.	7*L* + 2*T*

Recommended Books

1.	"Telemetry Principles", D. Patranabis, *Tata McGraw-Hill*
2.	"Telemetry And Data Transmission", R. N Baral, *S. K. Kataria & Sons*

Subject : ELECTIVE – I MICROWAVE THEORY AND TECHNIQUE
Code : EI 803A **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Propagation of electromagnetic wave, electromagnetic wave equation, electromagnetic energy and power flow, pointing theorem, boundary conditions, polarization of waves, plane waves in unbounded medium, plane wave in lossy and lossless dielectric, plane waves in good conductor, reflection from and refraction through a plane interface	12*L* + 4*T*
2.	Microwave transmission lines, coaxial line, circular and rectangular wave guide, VSWR, impedance transform and matching, smith chart	7*L* + 2*T*
3.	Microwave solid state device, microwave bipolar junction transistor, tunnel diode, gunn diode, varactor diode, IMPATT diode, TRAPTT diode, parametric amplifier	8*L* + 2*T*
4.	Microwave vacuum device; isolator, circulator, directional coupler, klystron amplifier and oscillator, magnetron.	7*L* + 2*T*
5.	Application of microwaves	2*L* + 2*T*

Recommended Books

1.	"Microwave Engineering", David M. Pozar, *John Wiley & Sons*
2.	"Microwave Devices and Circuits", Samuel Y. Liao, *Pearson Education India*

Subject : ELECTIVE – I DIGITAL SYSTEM DESIGN USING VHDL
Code : EI 803B **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.		12*L* + 4*T*
2.		7*L* + 2*T*
3.		8*L* + 2*T*
4.		7*L* + 2*T*
5.		2*L* + 2*T*

Recommended Books

1.	
2.	

Subject : ELECTIVE – I EMBEDDED SYSTEM
Code : EI 803C **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks	*Assumed total contact hours in a semester: 48*	
Sl. No.	**Details of the lesson**	**Contact Hours**
1.		12*L* + 4*T*
2.		7*L* + 2*T*
3.		8*L* + 2*T*
4.		7*L* + 2*T*
5.		2*L* + 2*T*

Recommended Books

1.	
2.	

Subject : ELECTIVE – I POWER PLANT INSTRUMENTATION
Code : EI 803D **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.		12*L* + 4*T*
2.		7*L* + 2*T*
3.		8*L* + 2*T*
4.		7*L* + 2*T*
5.		2*L* + 2*T*

Recommended Books

1.	
2.	

Subject : ELECTIVE – II SOFT COMPUTING
Code : EI 804A **Subject Category: Theoretical**
Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]
Contact Hours per week = 3L + 1T *Credits: 4*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	**Details of the lesson**	**Contact Hours**
1.	**Genetic Algorithm:** Genetic algorithms(GAs),Evolution strategies(ESs), Evolutionary programming(EP), Genetic Programming(GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models, constrain handling, multi-objective and multimodal optimization.	9*L* + 3*T*
2.	**Fuzzy Logic:** Introduction to Fuzzy Logic, Classical and Fuzzy Sets, Overview of	

	Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets, Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy rule based systems, Fuzzy control systems.	9*L* + 3*T*
3.	**Neural Networks:** History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms: Supervised, Unsupervised and reinforcement Learning, ANN training Algorithm perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonen self organizing networks, Hebbian learning, Hopfield Networks, Feed forward and feedback networks.	9*L* + 3*T*
4.	**Applications:** Overview of different application areas of Soft computing in engineering, science, business, economics, biology, robotics, hardware	9*L* + 3*T*

Recommended Books

1.	"Neuro-Fuzzy and Soft computing", Jang, Sun, Mizutani, *Pearson*
2.	"Neural networks: a comprehensive foundation", Haykin, *Pearson*
3.	"Genetic Algorithms", Goldberg, *Pearson*
4.	"Fuzzy Sets & Fuzzy Logic", G.J. Klir & B. Yuan, *PHI*.
5.	"An Introduction to Neural Networks", Anderson J.A., *PHI*.
6.	"Principle of Soft Computing", 2nd edition, S. N. Sivanandam, S. N. Deepa.

Subject : ELECTIVE – II BIOMEDICAL INSTRUMENTATION
Code : EI 804B **Subject Category: Theoretical**

Full Marks : 100 [End Semester Examination: 70 Marks + Internal Assessment: 30Marks]

Contact Hours per week = 3L + 1T *Credits: 4*

Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 48*

Sl. No.	Details of the lesson	Contact Hours
1.	Cell and its structure – Resting and Action Potential – Nervous system: Functional organization of the nervous system – Structure of nervous system, neurons - synapse –transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo electric, ultrasonic transducers – Temperature Measurements - Fibre optic temperature sensors.	7*L* + 2*T*
2.	Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers –Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current- Instruments for checking Safety parameters of biomedical equipments	8*L* + 3*T*
3.	Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analyzers : pH of blood –measurement of blood pCO^2, pO^2, finger-tip oxymeter - ESR, GSR measurements.	7*L* + 3*T*
4.	Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography –Endoscopy – Thermography – Different types of biotelemetry	7*L* + 2*T*

	systems and patient monitoring – Introduction to Biometric systems	
5.	Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart –Lung machine – Audio meters – Dialysers – Lithotripsy	7*L* + 2*T*

Recommended Books

1.	"Hand Book of Bio-Medical instrumentation", R.S.Khandpur, *Tata McGraw Hill*
2.	"Bio-Medical Instrumentation and Measurements II edition", Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, *Pearson Education, 2002 / PHI*.
3.	"Bio-Medical Instrumentation", M. Arumugam, *Anuradha Agencies, 2003*
4.	"Principles of Applied Bio-Medical Instrumentation", L.A. Geddes and L.E.Baker, *John Wiley &Sons, 1975.*

Subject : ELECTIVE – I MICROWAVE THEORY AND TECHNIQUE LAB.
Code : EI 891A **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	
2.	
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6.	

Subject : ELECTIVE – II SOFT COMPUTING LAB.
Code : EI 892A **Subject Category: Sessional**
Full Marks : 100
Contact Hours per week = 3P *Credits: 2*
Duration of the semester: 12 weeks *Assumed total contact hours in a semester: 36*

Sl No.	Details of the lesson
1.	Implement GA for the suitable problem
2.	Assignment on Fuzzy applications
3.	Assignment on Neural Network applications