Minutes of the meeting of Board of Studies in Electronics held on 29th September, 2010 at 10:00 a.m. in Room No. 209, AIM & ACT, Banasthali Vidyapith.

External Member

1. Prof. Vineet Sahula

Present Internal members

1. Dr. Seema Verma
2. Mr. C.P. Jain
3. Ms Shailly Sharma
4. Mr. Amit Rathi
5. Mr. C.M.S Negi
6. Ms Shivani
7. Mr. Manu Sharma
8. Mr Virendra
9. Dr. Ritu Vijay (Convener)

Special Invitee :

1. Mr. Pradeep Kumar Sharma
2. Ms Aastha Mishra
3. Mrs. Shalini Jharia
4. Mr. Kamal Kumar Jain

Note : Dr. Ranjan Maheshwari (External), Mr. Anurag Singh Baghel(Internal) could not attend the meeting.

Before proceeding to discuss the agenda of the meeting, convener accorded a cordial welcome to all members who were present in the meeting.

1. BOS took up the confirmation of its last meeting held on 25th January, 2010 and no comments were received from the members, the Board resolved that the minutes of its last meeting be confirmed.

2. BOS updated the exiting panel of examiners in each panel of undergraduate and postgraduate examination of Electronics in accordance to the Byelaws15:03:2002 of the university. The list of examiners has been sent to the secrecy.

3.The semester wise scheme of examination and course of study Curricula of the following examination

I B.Sc. Examination

i. First Semester Examination, December, 2011
ii. Second Semester Examination, April/May, 2012
iii. Third Semester Examination, December, 2012
iv. Fourth Semester Examination, April/May, 2013
v. Fifth Semester Examination, December, 2013
vi. Sixth Semester Examination, April/May, 2014

There is no change in the course structure of B.Sc.

II M.Sc. (Electronics) Examination

i. First Semester Examination, December, 2010
ii. Second Semester Examination, April/May, 2011
iii. Third Semester Examination, December, 2011
iv. Fourth Semester Examination, April/May, 2012

The Board reviewed the existing course of M.Sc. (Electronics) examination and recommended few changes in the scheme and syllabi. The changed scheme and syllabi are enclosed as Annexure I (Page No 3 -31)

M.Tech (VLSI Design)

i. First Semester Examination, December, 2010
ii. Second Semester Examination, April/May, 2011
iii. Third Semester Examination, December, 2011
iv. Fourth Semester Examination, April/May, 2012

The Board reviewed the existing course of M.Tech (VLSI Design) examination and recommended few changes in the syllabus of ASIC Design. The changed syllabi is enclosed as Annexure II (Page No 32-36)

4. The board proposed the B.Tech Program in the following streams

1. Electronics and Electrical Engineering(EEE)
2. Electronics and Instrumentation(EI)

The scheme and syllabi for the above mentioned streams is enclosed as Annexure III (Page No 37-93) and Annexure IV (Page no 94-147) .

5 The list of journals of Category A, B and C for Bliss document has been prepared and enclosed as **Annexurex V** (Page No147-150)

6 The board considered the report of examiners in various examination of 2009-2010. Most of the examiners found the content of the answers satisfactory or good and overall were quite satisfied with the performance of the students.

7. BOS has thoroughly analysed the quality of the session 2009-2010 question paper keeping the following points in mind

- Percentage of analytical based question
- Percentage of descriptive questions
- Percentage of numerical based questions

In most of the paper, it has been found that there has been a judicious balance of all these components in the papers.

The meeting ended with vote of thanks.

Annexure-I

DETAILED SEMESTER-WISE COURSES OF STUDY FOR M.Sc. (ELECTRONICS)

I Semester [July 2011-December 2011]

Paper	Contact Hours/week		Cont. Ass. Marks		Ann. Ass. Marks		Total Marks		
	T	P	T	P	T	P	T	P	
1. Solid state electronics Devices	4	4	20	10	40	20	60	30	
2. Digital Electronics	4	4	20	10	40	20	60	30	
3. Analog Circuit	4	2	20	5	40	10	60	15	
4. Network Analysis	4	2	20	5	40	10	60	15	
5. Computer Programming	4	4**	20	10	40	20	60	30	
	20	16	100	40	200	80	300	120	**=420**

** Programming in 'C'

II Semester [January 2011- May 2011]

Paper	Contact Hours/week		Cont. Ass. Marks		Ann. Ass. Marks		Total Marks		
	T	P	T	P	T	P	T	P	
1. Digital signal Processing	4	2	20	5	40	10	60	15	
2. Electronic Measurement & Instrumentation	4	2	20	5	40	10	60	15	
3. VLSI Design	4	2	20	5	40	10	60	15	
4.Data Structures & Object Oriented Programming	4	4*	20	10	40	20	60	30	
5. Fiber Optics & Communication	4	2	20	5	40	10	60	15	
6. Communication skills	2	-	10	-	20	-	30		
	22	12	110	30	220	60	330	90=	**420**

* Data Structures in 'C++' programming

III Semester [July 2011 - December 2011]

Paper	Contact Hour/week		Cont. Ass. Marks		Ann. Ass. Marks		Total Marks		
	T	P	T	P	T	P	T	P	
1. Microwave Engineering	4	2	20	5	40	10	60	15	
2. Microprocessors & Microcomputer Applications	4	2	20	5	40	10	60	15	
3. Analog & Digital Comm.	4	2	20	5	40	10	60	15	
4. Control Systems	4	2	20	5	40	10	60	15	
5. Data Communication and Network	4		20		40		60		
6. Project		4		20		40		60	
7. Seminar	-	2		15	-		-	15	
	20	14	100	55	200	80	300	135	**=435**

IV Semester [January 2012 - June 2012]

	Max. Marks
1. Reading Elective	30
2. UIL Project (i) Project, Dissertation & Seminar	170
(ii)Continuous Assessment	50
(iii) Viva-Voce	75
Total	325

Grand Total = 1600

M.Sc. Electronics Syllabus

Solid State Electronics Devices

SECTION-A

Intrinsic and Extrinsic Semiconductors, mobility of carriers, mobility and conductivity, Hall effect, Effective mass, Direct and Indirect semiconductors, Conductivity modulation, generation and recombination of charges, diffusion, the continuity equation, Injected minority carrier charge, the potential variation within a graded semiconductor four probe method of resistivity measurement.

P-N Junction relation, types of junctions, P-N junction diode, voltage current relationship, width of depletion region, junction capacitance, junction breakdown, switching of the diode, types of diode.

SECTION B

Bipolar junction transistor; Types, Current Components, CB,CC,CE configuration, DC and AC analysis, Hybrid model, current gain, voltage gain, input and output resistances, approximation model, High frequency model (Just reference),switching of transistors, load line concept, Basic concept of thermal stability of transistor.

Junction field effect transistor and MOSFET; Types, V-I characteristics, operation methods, low and High frequency model (Just Reference)

SECTION C

Four layer diode (P-N-P-N), SCR, Principle of operation, transistor analogy, methods of Turning On and Turning Off (Just reference), Gate characteristics, DIAC, TRIAC, light activated thyristor, Applications of SCR in the following areas: Over voltage protection, Zero voltage switch, Logic and Digital Circuits, Pulse circuits.

Text/Reference Books :

1. Integrated Electronics by J. Millaman and C. Halkias, McGraw Hill, New York, 1972
2. Electronic Devices and circuits by Malvino
3. Solid State Electronic Devices and Integrated Circuits(PHI) by Ben. G. Sterectman, Prentice Hall Inc., 1995
4. Physics of Semiconductors Devices by S.M. Sze (John Wiley & Sons, 1999).

Basic Electronics Practical

1. Familiarization to Electronics components and apparatus.
2. To study VI Characteristics of p-n junction.
3. To study VI Characteristics of Zener diode
4. To study VI Characteristics of LED.
5. To study of various types of Clippers circuits.
6. To study of various types of Clampers circuits.
7. To study frequency response of single stage amplifier.
8. To study Colpitts & Hartley oscillator.
9. To study Wein bridge & crystal oscillator
10. To study the behavior of V I characteristics of UJT.
11. To study the output and transfer characteristics of a FET.
12. To measure the input and output characteristics of BJT.
13. To draw the V-I characteristics of a DIAC.
14. To draw the V-I characteristics of a TRIAC.
15. To draw the V-I characteristics of a SCR.
16. To draw the V-I characteristics of an Optocoupler.
17. To study and plot the characteristics of Photo-Diode.

DIGITAL ELECTRONICS

Section-A

Number system (binary, octal, decimal, hexadecimal) bits & bytes, representation of integers, real, positive and negative numbers. Binary Arithmetic, Simple concept of theorems of Boolean Algebra.
Representation of characters : BCD, ASCII, EBCDIC Codes. Weighted codes, self-complementary codes, Error detecting codes and error correcting codes (Parity, Gray, Hamming codes).
Logic Gates : Logic Gates and Boolean Algebra Representation and Simplification of functions by Karnaugh Maps. Combinational Circuits design. Combinational circuits - adder, sub tractor, decoder, demultiplexer, encoder, multiplexer, comparator.

Section-B

Sequential Logic Circuit & Design - flip flop, shift register, asynchronous and synchronous counters.
Digital Logic Families and Their Characteristics: RTL, DTL, TTL, Schottky TTL, ECL, MOS and CMOs, Fan in, Fan out.

Section-C

Semiconductor Memories: RAM, ROM, PROM, EPROM, BJTRAM Cell, MOS RAM Cell, Organization of RAM, Charge Coupled devices (CCD), storage of charge and transfer of charge in CCD.
D/A Converter: Weighted resistance D/A, R-2R Ladder Converter. DAC 0800 D/A Chip, D/A Converter specification.

A/D Converter: Analog to Digital Converter, Parallel Comparator Converter, Counting Converter, Successive Approximation Converter, Dual Slop converter A/D converter specification, sampling and hold circuit, ADC 0804 Converter chip.

Text/Reference Books:

1 Digital Principles and Applications by Malvino C.P., Leach D.P.; Tata Mc-Graw Hill, 1985.
2. Digital Computer Fundamentals:Bartee, T.C.
3. Computer System Architecture: Mano, M.M., Prentice Hall, 1988
4. Computer Architecture and Organization : Hayes John P., Mc- Graw Hill 1988 (International Edition)
5. Introduction to Computer Architecture Stone s., Galgotia Publications 1986.
6. Microprocessors, Architecture, Programming & Applications R. Gaonkar, Wiley Eastern - 1987.

Digital Lab.

1. The study & verification of parameter of active & passive component.
2. To verify the truth table of various logic (AND, OR, NOT, NAND, XOR)
3. Verify the various theorems Boolean algebra.
4. Verify D' Morgan's theorem.
5. Implementation the Boolean expression and verify the truth table.
6. Design the various combinational circuits Half Adder, Half sub tractor, Full Adder, full sub tractor, parity Generator, parity Checker.
7. Design the advanced combinational circuits Multiplexer, Demultiplexer, Encoder Decoder.
8. Design the various code converters & verify the truth table - Binary to BCD converter, Binary to gray code and binary to EX-3.
9. Design the weighted code converter,
10. Design the flip-flop and verify the truth table R-S, D, J-K, T and Master slave.
11. Design the various resisters using flip flop - Serial in serial out, Serial in Parallel out, parallel in serial out, Parallel in parallel out.
12. Design the various synchronous counters using flip-flop - Binary up, Binary down and Mod-10.
13. Design the various asynchronous counters using flip-flop - Benary up, Binary down and Mod-10.
14. Design the special counters - Ring counter and twisted ring counter.
15. To study A/D & D/A converters also calculate resolution & error percentage in observation.
16. To design an Astable Multivibrator using 555 Timer.
17. To desing a Bitable Multivibrator using 555 Timer.
18. To design a Monostable Multivibrator using 555 Timer.

NETWORK ANALYSIS

Section-A

Introduction of circuit elements (R, L, C), energy sources & their transformation, Dot convention for coupled circuits, series & parallel resonance.

Network theorems: Superposition, Reciprocity, Thevenin, Norton, Maximum Power Transfer, Star - Delta (Vice Versa) transformation & Tellengen's theorem.

Section-B

Initial Conditions in elements & Network, Laplace transforms & inverse Laplace transforms: - Basic theorems and circuit analysis using Laplace transformations, Initial & Final Value theorem.

Concept of complex frequency, Transform impedance & transform circuit. Series & Parallel combination of elements.

Section-C

Two port networks: Open circuit, short circuit, hybrid, Transmission parameters & their equivalent model, Relationship parameters set, Reciprocity & Symmetry of two port networks, Equivalent T & Section representation, Terminated two-Two port network, Output impedance, Image Impedance.

Network Topology: Graph of network, trees, loops, and cut set, Tie set, loop currents analysis of network and duality.

Text Books:

. Van Valkenburg M.E., "Networks & Analysis" , PHI Pvt. Ltd.New Delhi 3rd Edition 1998

2. Choudhary D Roy, "Network & System" , New Age International (P) Ltd.1st Ed. 1991

3. Edminister Joseph A., "Theory and problem of Electrical circuits in SI units"

4. A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.

NETWORK LABORATORY

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify withmtheoretical values

Analog Circuits

Section A

Operational amplifier: Differential amplifier, DC & AC analysis of differential amplifier, concept of ideal op-amp, offset voltage, bias current, slew rate, CMMR, current mirror biasing & current mirror loading, frequency response of OP-AMP, Differential Mode in an OP-AMP, characteristics of standard IC OP-AMP, classification of standard IC OP-AMP, classification and characteristics of amplifiers :class A,B & AB, Feedback in Transistors.

Section B

Linear applications of OP-AMP-Voltage amplifiers. current amplifiers, current boosters for voltage amplifiers, summing amplifiers, current sources, differential and instrumentation amplifiers, Active filters, advantages over passive filters, low pass, high pass, band pass, band reject, gyrator, design of Integrator and differentiator.

Section C

Active diode circuits-half wave rectifier, peak detector, clipper, clamper, Comparators, Waveform generation, Schmitt trigger, 555 IC counter timer, Voltage to frequency and frequency to voltage conversion. Phase locked loop, operating principle, phase detector, PLL565 and its applications-frequency multiplier, frequency shift keying, demodulator.

Text Books:

1. Gayakwad Ramakant A. "OP-AMP & Linear Integrated circuits" New Delhi (Prentice Hall) 3rd Edition 1994.
2. Sedra & Smith, "Microelectronics" Oxford University Press.

Analog Circuits

1. To design the Astable Multivibrator using 555
2. To design the Monostable Multivibrator using 555
3. To design summer using 741 IC
4. To design Integrator using 741 IC
5. To design Schmitt Trigger using 741/555 IC
6. To design Differentiator using 741 IC.
7. To design peak detector using 741 IC.
8. To design scalar using 741 IC
9. To study active filters: LPF, HPF, BPF.
10. To design Voltage to frequency converter.
11. To study phase locked loop.
12. To study frequency shift keying using PLL 565.

COMPUTER PROGRAMMING

Section-A

Concepts of good programming: from problems to programs, abstract data types, data types, running time of a program, an efficient program, concept of structured programming (control flow, top-down programming)

C programming: C program structure, data types and type conversion, operators, expressions, Input/Output statements. Control statements-sequencing, conditional and unconditional branching and looping.

Section-B

Single and multi-dimensional arrays. Searching (linear binary), sorting (exchange, bubble, selection and insertion) and merging. User defined data types. Structures and union. Functions, function as a parameter.

Section-C

Pointers and data types, address arithmetic, arrays and pointers, pointer to function (call by value, call by reference), pointers to structures and union. File handling, command line arguments.

Text/Reference Books :

1. Programming with C, Byron S. Gottfried, Schaum's outline Series, Tata McGraw-Hill, New Delhi.
2. Kanetkar Yashwant, Let us C, 3rd Edition, BPB Publications
3. Kanetkar Yashwant, Pointers in C, BPB Publications

Laboratory Practices

1. Computer Programming (25 exercises for 2 Hrs. each)

DIGITAL SIGNAL PROCESSING

SECTION A

Introduction of Signals, Systems and Signal Processing, Classification of Signals and Systems. Signal Models - Continuous Time versus Discrete time signals, Periodic and Aperiodic Signals, Phasor Signals and Spectra, Energy and Power Signals, System Modeling Concepts, The superposition integral for Fixed and Linear Systems, Impulse Response of a Fixed and Linear System - Fourier Series - Trigonometric Series- Exponential Fourier Series-Symmetry Properties of the Fourier Coefficients. Fourier Integral, Energy Spectral Density, Fourier Transforms in the Limit, Fourier Transform Theorems and Pairs, System Analysis with Fourier Transform. Convolution, correlation and characteristics of linear time invariant systems

SECTION B

Discrete Time Signals and Systems - Review of Sampled Data Systems, Time Domain Representations of Discrete Time Signals, Frequency Domain Representation of Discrete Time Signals, Discrete Time Signals obtained by sampling, Discrete Fourier Transform. Z-Transform - Definition and Examples, Inverse Z-Transform, Properties of the Z-Transform, Introduction to Realization of Digital Systems - Block Diagrams and Signal Flow Graphs. Introduction to Realization of an IIR and FIR systems, Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT).

SECTION C

Design of Digital Filters: Introduction to Filters, A comparison of IIR and FIR Digital Filters. Design of IIR Digital Filters -Impulse Invariant Transformation, Bilinear Transformation, Design of Digital Butter worth and Chebyshev Filters. Design of FIR Digital Filters - Windowing and Rectangular Window, Filter Designs using Windows, Frequency Sampling Technique. DSP tools and DSP techniques in various applications.

Text Books:

1. Johnson Johnny R.: **Introduction to Signal Processin:** Prentice-Hall of India, 1998.
2. Oppenheim V. Alan: **Signal & Systems:** Prentice-Hall of India, 1995.
3. Proakis G.John,: **Digital Signal Processing:** Prentice-Hall of India, 3rd edition, 2002.

Electronic Instrumentation & Measurements

Section A

Measurements, Elements of Measurements, Mathematical Models of Measurements system, Performance, Characteristics, Static and dynamic, resolution, sensitivity, accuracy and precision, Reproducibility, drift, linearity, Dead time & dead zone, Signification figures. Noise: Types, sources. Measurements errors, types, analysis, Standard and calibration, curve fitting.

Section B

Transducers: Classification, resistive, capacitive, inductive, Pips-electric, thermoelectric, photoelectric, Hall effect, tachometer, Measurements of displacement (linear & rotational), Strain guage, LVDT,RVDT, velocity, Electric tachometer, load cell, temperature (Resistance thermometer, semiconductor thermometer, RTD, Thermistor, thermocouple, Radiation pyrometer), electromagnetic flow meter, hot wire anemometer, ultra sonic flow meter.

Section C

Measuring Instruments: Galvanometer, PMMC instruments, DC & AC voltmeters, ammeters, ohmmeters, Digital multimeter, Measurements of Mutual inductance, self-inductance and capacitance using AC bridges. Measurements of power, energy, frequency and phase, Q meters. Detailed description of CRO, Function generator.

Text Books:

1. Cooper, W.D: Modern Electronics instrumentation and Measurements, PHI.
2. Doeblin, Ernest O: Measurement system: Application and Design, Mc Graw Hill New York, 4th edition 1990.

Reference Books:

1. Jones, Barney E: Instrumentation measurement and Feedback, TMH, edition 1978, reprint 2004.
2. Sawhney, A.K.: A Text Book on Electrical and Electronics measurements and Instrumentation, Dhanpat Rai & Sons, 4th edition 1968. Reprint 2004.

EIM Practical

1. To study Hall effect.
2. To study principle of Thermocouple.
3. To study principle of Load cell.
4. To study Radiation Pyrometer.
5. To study principle of Thermometer
6. To study principle of Thermistor.
7. To study principle of strain guage.
8. To study Principle of LVDT
9. To study De sauty bridge and Schering bridge.
10. To study Wein AC bridges and wheat stone AC bridge.
11. To study CRO circuitry in details
12. To calculate the frequency and phase with lissajous figure pattern.

VLSI Design

SECTION A

Recapitulation of basics, semiconductor devices, orientation effect, impurities, defects, Fabrication: Crystal growth & wafer preparation, Epitaxial growth, oxidation, photo-lithography, etching technology (wet & dry), Diffusion Fick's law, chemical vapor deposition, CVD reactors, ion implantation, metallization & patterning, photo resistive material, packaging.

SECTION B

Overview of VLSI methodologies, VLSI design flow, type of ICs (monolithic, thick film, thin film, hybrid), Fabrication steps involve in, different type of resisters, capacitor, diode, transistor (Darlington etc), JFET, MOSFET, isolation technique used in fabrication, fabrication of typical circuits.

SECTION C

Digital CMOs circuit, MOS devices, V-I characteristics, Design & detailed analysis of MOS inverters (resistive load, enhancement load, depletion load, CMOS), delay & power analysis, Design layout of simple CMOS gates.

Circuit implementation of combinational circuit, circuit implementation of sequential circuits - FFs, SRAM, DRAM.

Text Books:

1. Sze, S.M.: **VLSI Technology:** TMH
2. Kang S.M. Leblebici Y,: **CMOS digital Integrated Circuits: Analysis & Design** : Mc. Graw Hill

Reference Books:

1. Botker B.R.,: **Microelectronics:**
2. Gandhi, S.K. : **VLSI Fabrication Principle :**
3. Plummer J., Deal M., Griffin P.,: **Silicon VLSI Technology** : Prentice Hall
4. Sarrafazadeh M. & Wong C.K.: **An introduction to VLSI Physical Design:** Mc Graw Hill.
5. Martin Ken: **Digital Integrated Circuits:** Oxford press.
6. Neil H.E. Weste & Kamran Eshraghian: **Principle of CMOS VLSI Design**

Data Structures and Object Oriented Programming

Section-A

Concept of good Programming : from problems to programs. Data structures, Abstract data type, running time of a program, an efficient program and big O notation.

List processing : Linear data structures, linked lists, implementation of singly, doubly & circular linked list, static and dynamic implementation of stacks and queues, recursive and non recursive procedure using stack, simple applications.

Section-B

Dynamic memory management : fixed block storage, first fit, best fit, worst fit, data compaction, garbage collection and buddy system.

Non linear data structures : trees, basic terminology, binary tree, binary search tree and their implementation, implementation of various operations on Binary Search Tree (tree traversal, searching, insertion and deletion), balanced tree, application of tree.

Section-C

Concepts of Object oriented Programming, objects and classes, constructors and destructors, data encapsulation, polymorphism, operator overloading and function overloading dynamic binding, Inheritance. Other characteristics : Pointer to objects, virtual functions, friend function, static function, this pointer, and templates.

Text Books:

1. Tremblay, Jean-Paul, *An Introduction to data structures with applications*, Tata McGraw-Hill.
2. Venugopal, K. R. *Mastering C++,* Tata McGraw-Hill.

Reference Books:

1. Aho, Alfred V., *Data structures and algorithms*, Pearson Education.
2. Berman, A. Michael, *Data structures via C++ objects by evolution*, Oxford University Press.
3. Horowitz, Ellis, *Fundamentals of data structures in C*, Galgotia.
4. Langsam, Augenstein, Tenenbaum Aaron M., *Data structures using C and C++*,Prentice Hall.
5. Balagurusamy,E., *Object-Oriented programming with C++*, Tata McGraw-Hill.
6. Lipschutz,Seymour, *Schaum's outline of theory and problems of data structures*, McGraw-Hill.
7. Kanetkar,Yashavant P., *Let us C++*, BPB Publications.
8. Rowe,Glenn W., *Introduction to data structures and algorithms with C++*, Prentice- Hall
9. Aho, Alfred V., *The design and analysis of computer algorithms*, Addison-Wesley Longman (Singapore).

Laboratory Practices

Data Structures & Programming in C++

Contact hours: 100 (64 labs each of 2 hours)

Lab Number	**Problems**
L1-L10	Programs based on static implementation of stacks and its application
L11-L18	Programs based on static implementation of queues (simple, circular, priority, dequeue) .
L19-L30	Operations on Singly, Doubly & Circular Linked lists. Dynamic implementation of stacks and queues.
L31-L40	Operations on Binary tree, binary search tree
L41-L45	Implementation of simple problems with the Objects and class. Understanding of private, public and protected access using problem, Implementation of static variable & static member function. Constructors & destructors. Problems using friend function.
L46– L48	Implementation of polymorphism.
L49–L53	Implementation of inheritance
L54-L57	Implementation of operator overloading to overload various operators: unary operators (+, -, *, % etc) and binary operators: +, *, [ ], >> and << operators on vectors
L58-L60	Problem related with dynamic binding. Problems using this pointer
L61-L64	Problems related with the templates function and template classes.

Note :L1 –L40 to be implemented with C or C++

L23 –l50 to be implemented with C++

Fiber Optics & Communication

Section-A

Light propagation- total internal reflection, Acceptance angle and Numerical aperture. Fiber materials and Fabrication, Mechanical properties of Fiber, Fiber cables, comparison of Fiber cables with conventional metallic cables. Optical Fibers- step index, single and multimode, graded index. Fiber losses and dispersions.

Section-B

Light Emitting diodes- spontaneous emission – surface emitting LED, edge emitters, semiconductor diode LASER- stimulated emission, Double hetero structure LASER, drivers for LED and LASER, Photo conductive – photo voltaic effect, Solar cells- p-n homojunction, heterojunction and amorphous Solar cells. Fiber end preparations, Fiber splicing, Fiber connector, connection losses, Fiber couplers.

Section-C

Photo detectors- characteristics of photo detectors- photoconductor, p-n photodiode, PIN photodiode Scotty barrier photodiode, Avalanche photodiode, Phototransistor. Integrated optics, Fiber Optic communication system- applications of Fiber Optics- long haul communications, local area network, under sea communication, sensors, medical applications.

Text Books:

1. Optical Fiber communication: John M. Senior., PHI, 2nd Ed.1992.
2. Fiber Optic communication: D.C. Agrawal, Wheeler Pub.2nd Ed.1993.
3. Optical Fiber communication: Gowar, PHI,1995.
4. Semiconductor optoelectronics devices: Pallab Bhattacharya, PHI 2nd Ed.2002.
5. Optical Fiber communication: Gerd Keiser, McGraw Hill,2nd Ed.c1991

Fiber Optics & Communication Practical

1. To study up a fiber optics analog and digital link.
2. To study the losses in fiber optics
3. To study numerical aperture of optical fiber
4. To study the characteristics a optical fiber LED and photo detector.
5. To study the time division multiplexing.
6. To study framing in TDM.
7. To study maker in TDM
8. To study Manchester coding and decoding.
9. To study PCM voice coding and frequency response of CODEC.

COMMUNICATION SKILLS

Type of Communication-oral communication, written communication-formal, informal, Business letters - types of letter, writing letters, business correspondence, applying for job, Resume writing, filling out employment application.

Report writing-Defining and determining reports purpose, Report Planning, collecting information, Developing an outline, sections of report, types of report, Making reports writing effective, Drafting circular, notice, agenda and Minutes of meetings.

Suggested Readings :

1. Lesiker : Basic Business Communication
2. Sharma R. C., Krishan Mohan, Business Correspondence and report writing.
3. A shley A : Handbook of commercial correspondence.
4. Effective Business Communication : Asha Kaul
5. Parag Diwan and L. N. Aggarwal : Business Communication.

Microwave Engineering

Section-A

Transmission Lines: Introduction to Microwaves & its applications. **Transmission Lines:** General equation, input independence characteristic independence, Reflection & reflection coefficient, standing wave ratio, resonant and anti resonant line impedance matching, smith chart & its applications, coaxial, twin, strip & micro strip lines & baluns.

Section-B

Wave Guides: Wave propagation in rectangular & circular wave-guides, wave-guide modes, Q of wave-guides, wave-guide coupling. Microwave Passive Components: s-parameter representation and analysis of microwave component such as tees, two hole direction coupler attenuators, phase shifter, Rectangular cavity resonator, circulator & isolator.

Section-C

Microwave Tube Devices: Conventional Vacuum tubes at microwave, O type device - Klystron (two cavity & reflex). M type device magnetron, Introduction to TWT (Traveling Wave Tubes). Microwave Semiconductor Devices IMPATT, TRAPATT & Gum Devices.

Text Books:

1. Microwave Circuits & passive devices, Sisodia-Raghuvanshi (Wiley-eastern).1st edition.1987

2. Microwave devices & circuits, S.Y. Liao (Prentice Hall).1st Edition 1995,

3. Foundation of microwave engineering, Collins (Mc Graw Hill) 2nd Edition 1992

4. Microwave P.A. Rizzi, (Prentice Hall). 1st Edition 1998

Microwave Lab

1. Determine the operating frequency of reflex klystron.
2. Draw the VI characteristics of Reflex klystron
3. Draw the characteristics of attenuator
4. To verify the wave-guide law.
5. To study the directivity and coupling coefficient of Directional Coupler.
6. To study the properties of magic Tea and also determine isolation and coupling coefficient.
7. To Measure the VSWR of (i) Short circuit (ii) Open circuit (iii) Matched Load (iv) Unmatched Load.
8. To study the properties of E-plane and H-plane Tea. Determine isolation and coupling coefficient

CONTROL SYSTEM

SECTION A

Open loop and closed loop systems, mathematical model of systems, differential equations and transfer functions; Block diagram algebra, signal flow graphs; +ve and -ve feedbacks, effects of feedback servo- components, , Tachogenerators, synchors, stepper motor, op-amp, potentiometer as an error detector; comparison of AC and DC servomechanism.

SECTION B

Standard test signals, time response of first and second order systems, steady state errors and error constants, Design specifications of second order systems, Effects of derivative and integral error compensation, velocity feedback; PID controller, Design considerations for higher order systems in brief, performance indices.

Concept of stability, necessary conditions for stability, Routh Hurwitz stability criterion, relative stability criterion, relative stability in terms of Routh Hurwitz criterion; Root-locus technique.

SECTION C

Correlation between time and frequency response specifications; Frequency domain plots, polar plots, bode plot, log magnitude versus phase plots; Gain-margin, Phase-margin, Nyquist stability criterion; Constant-M and constant-N circles; closed loop frequency response from these.**.** Preliminary considerations of classical design, cascade and feedback compensation, time-domain design using lag, lead and lag lead compensation, frequency domain design using lag.

Text/Reference Books:

1. I.J. Nagrath and M. Gopal: **Control System & Engineering 2nd Ed.:** Wiley Eastern Ltd.,1985.
2. Katsushiko Ogata: **Modern Control Engineering 3nd Ed.**: Prentice Hall of India Pvt. Ltd., 2001.

Control Systems Practical

1. To study and controlling action using PID controller and calculate the first overshoot temperature and plot the graph.

2. To study the DC position controller and find out the tachometer gain.

Software based experiments (Use MATLAB, LABVIEW software etc.)

3. To determine time domain response of a second order system for step input and obtain performance parameters.
4. To convert transfer function of a system into state space form and vice-versa.
5. To plot root locus diagram of an open loop transfer function and determine range of gain 'k for stability.
6. To plot a Bode diagram of an open loop transfer function.
7. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the system.

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Microprocessors & Microcomputer Applications

Section A

Introduction: Microcomputers, Microprocessors, Bus structure of Microprocessor System. Microprocessor Architecture and Microcomputer Systems: Microprocessor architecture & operation with example of 8085 Microprocessor, architecture, Timing and sequencing, memory, I/O Memory and I/O synchronization, memory speed requirements, interfacing devices, logic levels, loading and buffering. 8085/8080 - A Based Microcomputer systems: 8085 Microprocessor, Bus timings, De-multiplexing the Bus (AD7-AD8), Generating control signals, 8080 - A Microprocessor, Instructions and timing, instructions (8 bit & 16 bit), Data transfer operations, arithmetic operations, logic operations, Branch operations, counter & timing delays, stack & subroutines.

Section-B

Interfacing peripherals, I/O, Memory and Applications: Interfacing output display, input keyboard, memory, memory mapped I/O, Interrupts and DMA : 8085/8080 - A interrupts structure types and masking, priority interrupt structure, real time clock and internal times, consideration for using interrupts, DMA & 8257 DMA controller.

Programmable interface devices. Programmable Peripheral devices. Parallel communication, 8255 Programmable Peripheral Interface, Serial Communication, RS-232-C interface, Data communication with TTY using SOD & SID lines.

Section-C

Software model of the 8086/8088 microprocessor, Memory address space & data organization, Segment registers & Memory segmentation, Dedicated & general use of memory, Instruction pointer, Data registers, Status register, Generating a memory address, stack, I/O address space, Addressing modes of 8088. The 8086/8088 instruction set, Data transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instruction, Jump instructions, Subroutine & the subroutine handling instructions. Loop & loop handling instructions.

Text/Reference Books:

1. Microprocessor architecture, Programming & applications with the 8085/8080-A, R.S. Gaonker; Wiley Eastern Limited ISBN 085226, 2973, 1988.

2. Microprocessor and Programmed Logic, K.L. Short; Prentice Hall of India Pvt. Ltd. 1988. 2nd edition ISBN-0-87692-515-8.

3. Microprocessor and Interfacing, Douglas V. Hall, Mc-Graw Hill Book Company, 1987 ISBN-0-07-100462-9.

Microprocessor Programming Lab.

1.Write a program to calculate the addition of 16-bit No.

2.Write a program to calculate the addition of 32-bit No.

3.To transfer the content of one memory location to other memory location.

4. To exchange the content of one memory location to other memory location.

5. To find out the maximum of N given nos.

6. To generate the fibonacci series.

7. To find location of given nos.

8.To find out the multiplication of two 16-bit nos.

9.To find out the minimum of N given.

ANALOG & DIGITAL COMMUNICATION

SECTION A

Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super
hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing
Angle Modulation:
Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM
Signals Generation and detection of frequency modulation

SECTION B

sampling process, Analog Pulse Modulation Systems-Pulse Amplitude Modulation, , Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation , Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and non coherent, ASK,FSK and PSK, comparison of above digital techniques.

SECTION C

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques
Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin," **Communication Systems**" John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,"**Electronic Communication Systems**" 4th Edition, Tata McGraw Hill
3. Simon Haykin, "**Digital Communications**" John Wiley & Sons

Reference Books:

1.B.P. Lthi, "**Modern Analog & Digital Communication Systems**" Oxford University Press.
2.Taub & Schilling, "**Communication System: Analog and Digital**" Tata Mc Graw Hill
3.R.P.Singh & S.D. Sapre, "**Communication Systems Analog and Digital**" Tata McGraw Hill.

Practical List:

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study sampling and reconstruction of Pulse Amplitude modulation system.
5. To study Pulse Width Modulation and Pulse Position Modulation.
6. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
7. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
8. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
9. Study of Amplitude shift keying modulator and demodulator.
10. Study of Frequency shift keying modulator and demodulator.
11. Study of Phase shift keying modulator and demodulator.

Data Communication and Networks

Section-A

Data Communication model, tasks of a communication system, networking, analog and digital transmission, different transmission media.

Data encoding : digital data digital signals, digital data analog signals (ASK, PSK, FSK), analog data digital signals (PCM, Delta modulation), analog data analog signals (AM, FM, PM), modems, interfacing RS-232C, multiplexing (TDM, FDM).

Section-B

Principles and purpose of layered approach, OSI model, ARPANET model, protocol architecture (OSI, TCP/IP) Data link control : frame Synchronization - synchronization and synchronous ; flow control- stop and wait, sliding window, go-back-N protocols; error detection- CRC, error control - ARQ schemes.

Network switching - circuit switching, packet switching ; routing and congestion control; introduction to frame relay and ATM.

Section-C

Radio, satellite and local networks, high speed LANs; network management ; Internetworking, the Internet Protocol, DNS and URL; transport protocols - transport services, TCP, UDP; Remote Procedure Call; Network Security - Encryption. Decryption and data compression, applications - virtual terminal, file transfer, email (Telnet, FTP, SMTP, HTTP); Introduction to ISDN and broadbond ISDN.

Text Book:

1. Stallings William , *Data and Computer Communications*. Prentice Hall of India.

References Books:

1. Tanenbaum ,*A. S, Computer Networks* . Prentice Hall of India.
2. Forouzon, A. Behrouz, *Data communications & Networking,* McGraw Hill.

Existing syllabus of ASIC Design
Note All Design Will Be Based On VHDL

SECTION-A

Introduction: Full Custom with ASIC, Semi custom ASICS, Standard Cell based ASIC, Gate array based ASIC, Channeled gate array, Channel less gate array, structured get array, Programmable logic device, FPGA design flow, ASIC cell libraries

Data logic cells: Data Path Elements, Adders, Multiplier, Arithmetic Operator, I/O cell, Cell Compilers

ASIC library Design: Logical effort: practicing delay, logical area and logical efficiency logical paths, multi stage cells, optimum delay, optimum no. of stages, library cell design.

Low-level design entry: Schematic Entry:

Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectored instances and buses, Edit in place attributes, Netlist, screener, Back annotation

SECTION-B

Programmable ASIC logic cell, ASIC I/O cell **(DC output, AC output, DC input AC Input, Clock input. Power input, Xilinx I/O black, other I/O block).**

A **brief** introduction to low-level design language, EDIF, PLA Tools, an introduction to CFI designs representation.

SECTION-C

ASIC Construction Floor planning and placement and routing: Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods.

Floor planning tools, I/O and power planning, clock planning, placement algorithms, iterative placement improvement, Time driven placement methods.

Physical Design flow, global Routing, Local Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

Text Book (s):

1. Mohammed Ismail, Terri Fiez, "Analog VLSI signal and Information processing", McGraw-Hill International Editions, 1994.

2. M.J.S. Smith, - "Application - Specific Integrated Circuits" - Addison -Wesley Long man Inc., 1997

Reference Book (s):

1. Malcom R.Haskard, Lan C.May, "Analog VLSI Design - NMOS and CMOS" Prentice Hall, 1998.

2. Randall L Geiger, Phillip E. Allen, "Noel K.Strader, VLSI Design Techniques for Analog and Digital Circuits", Mc Graw Hill International Company, 1990.

3. Jose E.France, Yannis Tsividis, "Design of Analog-Digital VLSI Circuits for Telecommunication and signal processing", Prentice Hall, 1994.

4. Andrew Brown, - "VLSI Circuits and Systems in Silicon", McGraw Hill, 1991.

5. S.D. Brown, R.J. Francis, J. Rox, Z.G. Uranesic, "Field Programmable Gate Arrays"- Kluwer Academic Publishers, 1992.

6. Mohammed Ismail and Terri Fiez, “Analog VLSI Signal and Information Processing “, Mc Graw Hill, 1994.

7. S. Y. Kung, H. J. Whilo House, T. Kailath, “VLSI and Modern Signal Processing”, Prentice Hall, 1985.

8. Jose E. France, Yannis Tsividis, “Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing”, Prentice Hall, 1994.

Proposed Syllabus of ASIC DESIGN

Note all design will be based on VHDL

SECTION-A

Introduction: Full Custom with ASIC, Semi custom ASICS, Standard Cell based ASIC, Gate array based ASIC, Channeled gate array, Channel less gate array, structured get array, Programmable logic device, FPGA design flow, ASIC cell libraries

Data logic cells: Data Path Elements, Adders, Multiplier, Arithmetic Operator, I/O cell, Cell Compilers

ASIC library Design: Logical effort: practicing delay, logical area and logical efficiency logical paths, multi stage cells, optimum delay, optimum no. of stages, library cell design.

Low-level design entry: Schematic Entry:

Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectored instances and buses, Edit in place attributes, Net list , screener, Back annotation

Section-B

A brief introduction to low level design language. An introduction to EDIF, PLA Tools, and an introduction to CFI designs representation. Half gate ASIC.

Programmable ASIC:FPGA Basic Logic Cells**:** Actel Act: Shannon's expansion theorem, ACTI, ACT2, ACT3 logic Modules

Xilinx LCA : XC3000 CLB, XC4000 series., XC 5200 series

Altra FLEX : FLEX 8000 series logic expenders, timing model, and comparison chart of logic cells.

FPGA interconnect: Actel ACT: Routing recourses, Elmore's constant, RC delay in Antifuse connection, ACT2 ACT 3 interconnect xilinx LCA, xilinx EPLD, Altera MAX 5000 and 7000, Altera max 9000, Altera FLEX.

Section –C

Programmable I/O cells: DC output, AC output, DC input AC Input, Clock input. Power input, Xilinx I/O black, other I/O block.

FPGA design software: Design systems. Xilinx, Altera

Introduction to synthesis and simulation.

Text Books :

1. Mohammed Ismail, Terri Fiez, "Analog VLSI signal and Information Processing", McGraw-Hill International Editons, 1994.
2. M.J.S .Smith, - "Application - Specific Integrated Circuits" - Addison -Wesley Longman Inc., 1997.

References :

1. Malcom R.Haskard, Lan C.May, " Analog VLSI Design - NMOS and CMOS" Prentice Hall, 1998.
2. Randall L Geiger, Phillip E. Allen, " Noel K.Strader, VLSI Design Techniques for Analog and Digital Circuits", Mc Graw Hill International Company, 1990.
3. Jose E.France, Yannis Tsividis, "Design of Analog-Digital VLSI Circuits for Telecommunication and signal Processing", Prentice Hall, 1994.
4. Andrew Brown, - "VLSI Circuits and Systems in Silicon", McGraw Hill, 1991.
5. S.D. Brown, R.J. Francis, J. Rox, Z.G. Uranesic, " Field Programmable Gate Arrays"- Kluever Academic Publishers, 1992.
6. Mohammed Ismail and Terri Fiez, " Analog VLSI Signal and Information Processing ", Mc Graw Hill, 1994.
7. S. Y. Kung, H. J. Whilo House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1985.
8. Jose E. France, Yannis Tsividis, "Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994.

Section	Existing	Proposed	remarks
B	Programmable ASIC logic cell, ASIC I/O cell **(DC output, AC output, DC input AC Input, Clock input. Power input, Xilinx I/O black, other I/O block).** A **brief** introduction to low-level design language, EDIF, PLA Tools, an introduction to CFI designs representation	A brief introduction to low level design language. An introduction to EDIF, PLA Tools, and an introduction to CFI designs representation. Half gate ASIC. **Programmable ASIC:**FPGA Basic Logic Cells**:** Actel Act: Shannon's expansion theorem, ACTI, ACT2, ACT3 logic Modules Xilinx LCA : XC3000 CLB, XC4000 series., XC 5200 series Altra FLEX : FLEX 8000 series logic expenders, timing model, and comparison chart of logic cells. FPGA interconnect: Actel ACT: Routing recourses, Elmore's constant, RC delay in Antifuse connection, ACT2 ACT 3 interconnect xilinx LCA, xilinx EPLD, Altera MAX 5000 and 7000, Altera max 9000, Altera FLEX.	Added
C	ASIC Construction Floor planning and placement and routing: Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clock planning, placement algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow, global Routing, Local Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.	**Programmable I/O cells**: DC output, AC output, DC input AC Input, Clock input. Power input, Xilinx I/O black, other I/O block. **FPGA design software**: Design systems. Xilinx, Altera Introduction to synthesis and simulation.	Shifted from section B Added

Annexure III

B. Tech. – Electrical & Electronics Engineering
(II Year)

Electrical Engineering papers

Yr	Third Semester					Fourth Semester				
	Course Code	**Course Name**	**L**	**T**	**P**	**Course Code**	**Course Name**	**L**	**T**	**P**
	3.1	Mathematics III	3	1	-	4.1	Mechanics	3	1	
	3.2	Network Analysis	3	1	2	4.2	Mathematics IV	3	1	-
	3.3	Data Structures	3	1		4.3	Electrical & Electronics Engineering Materials	3	1	
	3.4	Electromagnetic Field Theory	4		-	4.4	Electronics Instruments & Measurements	3	1	2
	3.5	Electrical Machines-I	4	-	2	4.5	Object Oriented Programming	3	1	2
	3.6	Digital Electronics	4	-	2	4.6	Electrical Machines-II	4	-	2
	3.7	Electrical Simulation & MATLAB Programming Lab			2					
	F 3.1	Selected writing of Great Authors I (SWGA I)	2	-	-	F 4.1	Selected writing of Great Authors II (SWGA II)	2	-	-
		Total	**23**	**3**	**8**		Total	**22**	**4**	**6**

B. Tech. – Electrical & Electronics Engineering
(III Year)

Yr	Fifth Semester					Sixth Semester				
	Course Code	**Course Name**	**L**	**T**	**P**	**Course Code**	**Course Name**	**L**	**T**	**P**
III	5.1	Principles of Management/ Economics For Engineers	3	-	-	6.1	Economics For Engineers/ Principles of Management	3	-	-
	5.2	Analog Electronics	4		2	6.2	Analog & Digital Communication	4		
	5.3	Microprocessors & Microcomputer Applications	3	1	2	6.3	Linear Integrated Circuits	3	1	2
	5.4	Power Electronics	4		2	6.4	Power System Analysis	4		2
	5.5	Elements of Power System	4		-	6.5	Power System Operation and Control	3	1	-
	5.6	Control Systems	4		2	6.6	Digital signal processing	3	1	2
	5.7	Seminar	2	-		6.7	Project			8
	F 5.1	Women in Indian Society (WIS) / Parenthood and Family Relationship	2	-	-	F 6.1	Parenthood and Family Relationship / Women in Indian Society (WIS)	2	-	-
		Total	**26**	**1**	**8**		Total	**22**	**3**	**14**

B. Tech. – Electrical & Electronics Engineering
(IV Year)

Yr	Seventh Semester					Eight Semester				
	Course Code	Course Name	L	T	P	Course Code	Course Name	L	T	P
IV	7.1	University-Industry / Institution Linkage B. Tech. Project	**20**			8.1	VLSI Design	4		2
	7.2	Reading Elective (Self Study)	**2**			8.2	Electric Drives And Their Control	4		2
		Total	**22**			8.3	Switch Gear and Protection	4		
						8.4	Departmental Elective-I	4		-
						8.5	Departmental Elective-II	4		-
							Total	**20**		**4**

S.No.	Departmental Electives	Reading Elective (Self Study)
1.	Digital Control System	Reliability Engineering
2.	Special Electrical Machines	Electronic Commerce
3.	Embedded Systems	Remote Control & Telemetry
4.	Mechatronics	Enterprise And Resource Planning (ERP)
5.	Advanced Microprocessors And Microcontrollers	Client-Server Computing & Applications
6.	Biomedical Instrumentation	AI & Neural Networks
7	Energy Efficiency And Conservation	Illumination Technology
8	Electrical Machine Design	
9	***Pattern Recognition & Image Processing***	
10	HVDC Transmission	

B. Tech. – Electrical & Electronics Engineering
(II Year) III Sem.

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EEE 3.1	Mathematics III	3	1		20		40		60	
EEE 3.2	Network Analysis	3	1	2	20	5	40	10	60	15
EEE 3.3	Data Structures	3	1	-	20	-	40	-	60	-
EEE 3.4	Electromagnetic Field Theory	4	-	-	20	-	40	-	60	-
EEE 3.5	Electrical Machines-I	4	-	2	20	5	40	10	60	15
EEE 3.6	Digital Electronics	4	-	2	20	5	40	10	60	15
EEE 3.7	Electrical Simulation & MATLAB Programming Lab			2		5		10		15
F 3.1	Selected writing of Great Authors I	2	--	-	10	-	20	-	30	-
	Total	**23**	**3**	**8**	**130**	**20**	**260**	**40**	**390**	**60**
									T+P= 450	

B.Tech. II Year (IV Sem.)

EEE 4.1	Mechanics	4	-	-	20	-	40		60	
EEE 4.2	Mathematics IV	4	-	-	20	-	40	-	60	-
EEE 4.3	Electrical & Electronics Engineering Materials	3	1	-	20	-	40	-	60	-
EEE 4.4	Electrical & Electronic Measurements	3	1	2	20	5	40	10	60	15
EEE 4.5	Object Oriented Programming	3	1	2	20	5	40	10	60	15
EEE 4.6	Electrical Machines-II	4	-	2	20	5	40	10	60	15
F-4.1	Selected writing of Great Authors II	2	--		10	--	20	--	30	--
	Total	**22**	**3**	**8**	**130**	**15**	**260**	**30**	**390**	**45**
									T+P=435	

B. Tech. – Electronics & Electrical Engineering

B.Tech. EEE III Year (V Sem.)

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EEE 5.1	Principle of Management/ Economics For Engineers	3			15		30		45	
EEE 5.2	Analog Electronics	4	-	2	20	5	40	10	60	15
EEE 5.3	Microprocessors and Microcomputer Applications	3	1	2	20	5	40	10	60	15
EEE 5.4	Power Electronics	4		2	20	5	40	10	60	15
EEE 5.5	Elements of Power System	4		-	20	-	40	-	60	-
EEE 5.6	Control Systems	4		2	20	5	40	10	60	15
EEE 5.7	Seminar	2				30				30
F 5.1	Women in Indian Society (WIS)/ Parenthood and Family Relationship	2			10		20		30	
	Total	**26**	**1**	**8**	**125**	**50**	**250**	**40**	**375**	**90**
									T+P=465	

B.Tech. III Year (VI Sem.)

EEE 6.1	Economics For Engineers/ Principle of Management	3			15		30		45	
EEE 6.2	Analog & Digital Communication	4			20		40	10	60	
EEE 6.3	Linear Integrated Circuits	3	1	2	20	5	40		60	15
EEE 6.4	Power System Analysis	4		2	20	5	40	10	60	15
EEE6.5	Power System Operation And Control	3	1	-	20	-	40	-	60	-
EEE 6.6	Digital signal processing	3	1	2	20	5	40	10	60	15
EEE 6.7	Project			8		20		40		60
F 6.1	Parenthood and Family Relationship / Women in Indian Society (WIS)	2	--		10		20		30	
	Total	**22**	**3**	**14**	**125**	**35**	**250**	**70**	**375**	**105**
									T+P=480	

B. Tech. – Electronics & Electrical Engineering

B.Tech. IV Year (VII Sem.)

EEE 7.1	UIL Project (i) Project, Dissertation (ii) Seminar (iii) Continuous Assessment (iv) Viva Voce	20								300
EEE 7.2	Reading Elective (Self Study)	2								30
	Total	22								
									T+P=330	

B.Tech IV Year (VIII Sem.)

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EEE 8.1	VLSI Design	4		2	20	5	40	10	60	15
EEE 8.2	Electric Drives And Their Control	4		2	20	5	40	10	60	15
EEE 8.3	Switch Gear and Protection	4			20		40		60	
EEE 8.4	Departmental Elective I	4		--	20		40		60	
EEE 8.5	Departmental Elective II	4		--	20		40		60	
	Total	**20**	**0**	**4**	**100**	**10**	**200**	**20**	**300**	**30**
									T+P=330	

B.TECH III SEMESTER

MATHEMATICS III

Section A

Vector spaces. Inner products. Matrices and determinants, linear transformations. Systems of linear equations. Gauss elimination, rank of a matrix. Inverse of a matrix. Bilinear and quadratic forms. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices.

Section B

Numerical methods for solving systems of linear equations. III-conditioning. Methods of Gauss and least squares. Inclusion of matrix eigenvalues. Finding eigenvalues by iteration.

Section C

Vector fields, surface integrals, line integrals, independence of path, conservative fields, divergence, curl, Green's theorem. Divergence theorem of Gauss, Stokes's theorem and applications of these theorems. Transformations of coordinate systems and vector components. Invariance of divergence and curl. Curvilinear coordinates.

Texts/References:

1 E. Kreyszig, "**Advanced Engineering mathematics**", 5th ed., Wiley Eastern, 1985.

2 V. Krishnamurty, V.P. Mainra and J.L. Arora, "**An Introduction to Linear Algebra**", Affiliated East-West, 1976.

3 T.M. Apostol, "**Calculus**", Vol. II, 2nd ed., Wiley Eastern, 1980.

NETWORK ANALYSIS

Section-A

Introduction of circuit elements (R, L, C), energy sources & their transformation, Dot convention for coupled circuits, series & parallel resonance.

Network theorems: Superposition, Reciprocity, Thevenin, Norton, Maximum Power Transfer, Star - Delta (Vice Versa) transformation & Tellengen's theorem.

Section-B

Initial Conditions in elements & Network, Laplace transforms & inverse Laplace transforms: - Basic theorems and circuit analysis using Laplace transformations, Initial & Final Value theorem.

Concept of complex frequency, Transform impedance & transform circuit. Series & Parallel combination of elements.

Section-C

Two port networks: Open circuit, short circuit, hybrid, Transmission parameters & their equivalent model, Relationship parameters set, Reciprocity & Symmetry of two port networks, Equivalent T & Section representation, Terminated two- Two port network, Output impedance, Image Impedance.

Network Topology: Graph of network, trees, loops, and cutset, Tie set, loop currents analysis of network and duality.

Text Books:

1. Van Valkenburg M.E., "**Networks & Analysis**" , PHI Pvt. Ltd.New Delhi 3rd Edition 1998
2. Choudhary D Roy, "**Network & System**" , New Age International (P) Ltd.1st Ed. 1991
3. Edminister Joseph A., "**Theory and problem of Electrical circuits in SI units**"
4. A.Chakrabarti, "**Circuit Theory**" Dhanpat Rai & Co.

NETWORK LABORATORY

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values

Section-A

Open loop and closed loop systems, servomechanism, mathematical model of systems, differential equations and transfer functions; Block diagram algebra, signal flow graphs; positive and negative feedbacks, effects of feedback servo-components, DC and AC servomotors, Tachogenerators, synchros, stepper motor, op-amp, potentiometer as an error detector; comparison of AC and DC servomechanism.

Section-B

Standard test signals, time response of first and second order systems, steady state errors and error constants, Design specifications of second order systems, Effects of derivative and integral error compensation, velocity feedback; PID controller, Design considerations for higher order systems in brief, performance indicies.

Concept of stability, necessary conditions for stability, Routh Hurwitz stability criterion, relative stability criterion, relative stability in terms of Routh Hurwitz criterion; Root-locus technique.

Section-C

Correlation between time and frequency response specifications; Frequency domain plots, polar plots, bode plot, log magnitude versus phase plots; Gain-margin, Phase-margin, Nyquist stability criterion; Constant-M and constant-N circles; closed loop frequency response from these.

Preliminary considerations of classical design, cascade and feedback compensation, time-domain design using lag, lead and lag lead compensation, frequency domain design using lag.

Text Books:

1. Nagrath I J and Gopal M., " Control System & Engineering" 2nd Ed.,Wiley Eastern Ltd., 1985.
2. Ogata Katsushiko, " Modern control Engg." 3rd Ed. Printice Hall of India Pvt. Ltd. 2001.

Reference Books:

1. Choudhury D.Roy, " Modern control Engineering", PHI, 2005
2. Jairath, "Problem & solution of control system"

ELECTROMAGNETIC FIELD THEORY

Section A

Elements of Vector calculus:- Cartesian coordinate system, Circular-Cylindrical coordinate system, Spherical coordinate system (dot product, cross product, divergence & curl). **Electrostatics:-** Electric Flux Density, Coulomb's law, Gauss' law and their applications, Energy in electrostatic fields, capacitance of parallel plate and coaxial cable, Fields in dielectrics, Boundary conditions, dipole, Lap lace's and Poisson's equations and their applications.

Section – B

Magnetostatics:- Ampere's law, Bios wart's law and their applications, Stock's theorem, Energy in magnetic field, Boundary conditions. Maxwell's Equation:- Maxwell's equations in integral & differential form (Gauss' law in electric and magnetic field, Ampere's circuital law, Faraday's law), Maxwell's equations for time varying field.

Section – C

Uniform Plane Waves:- Wave equation and its solutions, Pointing vector, propagation through various media-free space, conductor & dielectric, Reflection and Refraction in conductors & Dielectrics with normal and oblique incidence, Phase & Group velocity, Skin depth. Transmission Lines:- General equation, input impedance, characteristics impedance, Reflection and reflection coefficient, Standing wave ratio, resonant and resonant line impedance matching, Smith chart and its applications, practical problems in transmission lines.

Text Books: -

1. William H. Hayt, "**Engineering Electromagnetic**", Tata Mc Graw Hill.

Reference books:-

1. Jordan and Balmain, "**Electromagnetic waves and Radiating Systems**", PHI.
2. J.D. Kraus and Fleisch, "**Electromagnetic with Applications**", Mc Graw Hill.

ELECTRICAL MACHINES-I

Section-A

ELECTROMECHANICAL ENERGY CONVERSION: Basic principles of Electromechanical energy conversion. Basic aspects and physical phenomena involved in energy conversion. Energy balance. **DC GENERATORS:** Construction, Types of DC generators, emf equation, lap & wave windings, equalizing connections, armature reaction, commutation, methods of improving commutations, demagnetizing and cross magnetizing mmf, interpoles, characteristics, parallel operation. Rosenberg generator.

Section-B

DC MOTORS: Principle, back emf, types, production of torque, armature reaction & interpoles, characteristics of shunt, series & compound motor, DC motor starting. Speed Control of DC Motor: Armature voltage and field current control methods, Ward Leonard method. Braking, losses and efficiency, direct & indirect test, Swinburne's test, Hopkinsion test, field & retardation test, single-phase series motor.

Section-C

TRANSFORMERS: Construction, types, emf equation. No load and load conditions. Equivalent circuits, Vector diagrams, OC and SC tests, Sumpner's back-to-back test, efficiency. Voltage regulation, effect of frequency, parallel operation, autotransformers, switching currents in transformers, separation of losses. **POLYPHASE TRANSFORMERS:** Single unit or bank of single-phase units, polyphase connections, Open delta and V connections, Phase conversion: 3 to 6 phase and 3 to 2 phase conversions, Effect of 3-phase winding connections on harmonics, 3-phase winding transformers, tertiary winding.

Text Books:

1 I.J. Nagrath & D.P.Kothari," **Electrical Machines**", Tata McGraw Hill

2 Husain Ashfaq ," **Electrical Machines**", Dhanpat Rai & Sons
3 A.E. Fitggerald, C.Kingsley Jr and Umans,"**Electric Machinery**" 6th EditionMcGraw Hill, International Student Edition.
4 B.R. Gupta & Vandana Singhal, "**Fundamentals of Electrical Machines**, New Age International.

Reference Books:
5 Irving L.Kosow, "**Electric Machine and Tranformers**", Prentice Hall of India.
6 M.G. Say, "**The Performance and Design of AC machines**", Pit man & Sons.
7 Bhag S. Guru and Huseyin R. Hizirogulu, "Electric Machinery and Transformers" OxfordUniversity Press, 2001

ELECTRICAL MACHINES-I LAB

1 To obtain magnetization characteristics of a d.c. shunt generator
2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded
3 To obtain efficiency of a dc shunt machine using Swinburn's test
4 To perform Hopkinson's test and determine losses and efficiency of DC machine
5 To obtain speed-torque characteristics of a dc shunt motor
6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/ Static Ward –Leonard method.
8 To study polarity and ratio test of single phase and 3-phase transformers
9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11 To obtain 3-phase to 2-phase conversion by Scott connection.
12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

DIGITAL ELECTRONICS

Section-A

Review of Number Systems, Binary arithmetic & codes. **Logic Gates:** Logic Gates and Boolean Algebra Representation and Simplification of functions by Karnaugh Maps. Combinational Circuits design. Combinational circuits - adder, subtractor, decoder, demultiplexer, encoder, multiplexer, comparator.

Section-B

Sequential Logic Circuit & Design - flip flop, shift register, asynchronous and synchronous counters. Digital Logic Families and Their Characteristics: RTL, DTL, TTL, Schotlky TTL, ECL, MOS and CMOs, Fan in, Fan out.

Section-C

Semiconductor Memories: RAM, ROM, PROM, EPROM, BJTRAM Cell, MOS RAM Cell, Organization of RAM, Charge Coupled devices (CCD), storage of charge and transfer of charge in CCD. **D/A Converter:** Weighted resistance D/A, R-2R Ladder Converter. DAC 0800 D/A Chip, D/A Converter specification. **A/D Converter:** Analog to Digital Converter, Parallel Comparator Converter, Counting Converter, Successive Approximation Converter, Dual Slop converter A/D converter specification, sampling and hold circuit

Text/Reference Books:

1 **Digital Principles and Applications** by Malvino C.P., Leach D.P.; Tata Mc-Graw Hill, 1985.
2. **Digital Computer Fundamentals**:Bartee, T.C.
3. **Computer System Architecture**: Mano, M.M., Prentice Hall, 1988

4. **Computer Architecture and Organization** : Hayes John P., Mc- Graw Hill 1988 (International Edition)
5. **Introduction to Computer Architecture Stone** s., Galgotia Publications 1986.
6. **Microprocessors, Architecture, Programming & Applications** R. Gaonkar, Wiley Eastern - 1987.

DIGITAL ELECTRONICS PRACTICAL

1. To verify the truth table of various Logic gates.
2. To implement the functions of various Logic gates with the help of Universal Gates.
3. Verification of theorems of Boolean algebra
4. Study of Binary Adder (Half and Full)
5. Study of Binary Subtractor (Half and Full)
6. Study of Multiplexer and Demultiplexer circuits
7. Study of BCD to Decimal Decoder and Encoder.
8. Study and designing with the help of gates of flip-flops (SR, D, JK, T).
9. Study and designing with the help of gates modulo –N Synchronous counter for a given value of N.
10. Study and designing with the help of gates of circuit of given Binary Up and Down synchronous counter.
11. Study and designing with the help of gates of circuit of a asynchronous counter.
12. Study and designing with the help of gates of circuit of Ring and Johnson counter.

ELECTRICAL SIMULATION & MATLAB PROGRAMMING LAB

(List of Experiments (PSPICE based)

Electrical Simulation

1. Study of various commands of PSPICE.
2. To determine node voltages and branch currents in a resistive network.
3. To obtain Thevenin's equivalent circuit of a resistive network.
4. To obtain transient response of a series R-L-C circuit for step voltage input.
5. To obtain transient response of a parallel R-L-C circuit for step current input.
6. To obtain transient response of a series R-L-C circuit for alternating square voltage waveform.
7. To obtain frequency response of a series R-L-C circuit for sinusoidal voltage input.
8. To determine line and load currents in a three phase delta circuit connected to a 3-phase
balanced ac supply.
9. To plot magnitude, phase and step response of a network function.

MATLAB PROGRAMMING LAB

1 Basics of MATLAB matrices and vectors, matrix and array operations, Saving and loading data, plotting simple graphs, scripts and functions, Script files, Function files, Global Variables, Loops, Branches, Control flow, Advanced data objects,

Multidimensional matrices, Structures, Applications in linear algebra curve fitting and interpolation. Numerical
integration, Ordinary differential equation. (All contents is to be covered with tutorial sheets)

2 **Simulink:** Idea about simulink, problems based on simulink. (All contents is to be covered with tutorial sheets)

IV SEM.

MECHANICS

Section A

System of forces, Fundamental laws of mechanics, Composition of forces, Free body diagram, Lami's theorem. Moments and couple, Varignon's theorem, condition of equilibrium, Types of support and loading, reaction, Analysis of simple trusses by methods of joints and method of sections. ?Laws of Coulomb fraction, Ladder, Wedges, Belt friction and rolling, ?Principle of virtual work and its applications

Section B

Location of centroid and center of gravity, area moment of inertia, mass moment of Inertia ?Law of machines, Variation of mechanical advantages, efficiency, reversibility of Machine ?Pulleys, wheel and axle, wheel and differential axle, ?Transmission of power through belt and rope, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia - Mass moment of inertia of composite bodies.

Section C

Kinematics of Particle: ?Rectilinear motion, plane curvilinear motion, Projectile motion, constrained motion of connected particles.

Dynamics of Particle and Rigid Body: Newton's law of motion, D'Alembert's principle

Work and Energy: Work, energy (Potential, Kinetic and Spring), Work – Energy relation, Law of conservation of energy, **Impulse and Momentum:** Impulse, momentum, ?Impulse – Momentum relation, Impact, **Vibration:** ? Definitions, Concepts - Simple Harmonic motion - free vibrations - Simple and compound pendulums - torsional vibrations.

Text & Reference Books:

1. Sharma: **Mechanics:** Pearson, 20009
2. Marwal, Sharma: **Engineering Mechanics:** CBH, 2009
3. Kumar, D.S.**: Engineering Mechanics:** Laxmi Pubications. 2009
4. Sharma, A.D.**: Engineering Mechanics**, CBC, 2009

MATHEMATICS-IV

Section A

Complex Functions, Continuity, Differentiability, Analytic Function, Cauchy-Riemann Equations: In Cartesian & Polar Coordinates, Conformal Mapping, Conformal mapping by Elementary Functions, Transformations $W = Z^n, W = Z^2, W = \sqrt{Z}$, $W = e^Z, W = \sin Z$ and $W = \log Z$, Bilinear Transformation.

Section B

Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions, Power Series, Taylor's Series, Laurent Series, Singularities, Residue, Residue Theorem, Evaluation of Real Integrals.

Section C

Finite Differences, Relation between Difference and Derivatives, Differences of Polynomials, Interpolation, Newton's Formula for Forward and Backward Interpolation, Divided Differences, Newton's General Interpolation Formula, Lagrange's Interpolation Formula,

Error in Interpolation, Numerical Differentiation, Numerical Integration Newton's Cotes Quadrature Formula, Simpson's, Weddle's and Trapezoidal rules, Gauss Quadrature Formula, Root finding for Nonlinear Equations (Transcendental & Algebraic Equations), Iterative method, Bisection method, Regula-Falsi Method, Newton Raphson's Method, Order of Convergence. Numerical solution of first and second order Differential Equations, Euler's Method, Picard's Method, Runge-Kutta's Method .

Text Books:

1. Ramana B.V.: **Higher Engineering Mathematics:** TMH Publications, New Delhi.
2. Kreyszig E.: **Advanced Engineering Mathematics:** 8th ed., Wiley Eastern.
3. Grewal B.S.: **Higher Engineering Mathematics:** 40th ed., Khanna Publishers.

ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

Section A

CRYSTAL STRUCTURE OF MATERIALS: A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth Crystal growth, zone refining, Degenerate and non degenerate semiconductors, Direct and indirect band gap semiconductors. Electronic properties
of silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon carbide**B.** Energy bands in solids, classification of materials using energy band

Section B

DIELECTRIC & MAGNETIC MATERIALS: Polarization phenomenon, spontaneous polarization, dielectric constant and loss, piezo and Ferro electricity application.
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism,AntiferromagnetismandFerrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Section C

CONDUCTIVE & SUPERCONDUCTIVE MATERIALS: Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, s. Superconductor

phenomenon, Type I and Type II superconductors and their applications. Properties and applications of electrical conducting and insulating materials, mechanical properties of metals materials.

Text Books :

1 A.J. Dekker,"**Electrical Engineering Materials**" Prentice Hall of India
2 R.K. Rajput," **Electrical Engg. Materials**," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S.Chand & Co.

References :

4 Solymar, "**Electrical Properties of Materials**" Oxford University Press.
5. Ian P. Hones," **Material Science for Electrical and Electronic Engineering**," Oxford University Press.
8 G.P. Chhalotra & B.K. Bhat, "**Electrical Engineering Materials**" Khanna Publishers.
9 T. K. Basak, "**Electrical Engineering Materials**" New age International

ELECTRONIC INSTRUMENTATION & MEASUREMENTS

Section A

Measurements, Elements of Measurements, Mathematical Models of Measurements system, Performance, Characteristics, Static and dynamic, resolution, sensitivity, accuracy and precision, Reproducibility, drift, linearity, Dead time & dead zone, Signification figures. Noise: Types, sources. Measurements errors, types, analysis, Standard and calibration, curve fitting.

Section B

Transducers: Classification, resistive, capacitive, inductive, Pips-electric, thermoelectric, photoelectric, Hall effect, tachometer, Measurements of displacement (linear & rotational), Strain guage, LVDT,RVDT, velocity, Electric tachometer, load cell, temperature (Resistance thermometer, semiconductor thermometer, RTD, Thermistor, thermocouple, Radiation pyrometer), electromagnetic flow meter, hot wire anemometer, ultra sonic flow meter.

Section C

Measuring Instruments: Galvanometer, PMMC instruments, DC & AC voltmeters, ammeters, ohmmeters, Digital multimeter, Measurements of Mutual inductance, self-inductance and capacitance using AC bridges. Measurements of power, energy, frequency and phase, Q meters. Detailed description of CRO, Function generator.

Text Books:

1. Cooper, W.D: **Modern Electronics instrumentation and Measurements**, PHI.

2. Doeblin, Ernest O: **Measurement system: Application and Design**, Mc Graw Hill New York, 4th edition 1990.

Reference Books:

1. Jones, Barney E: **Instrumentation measurement and Feedback**, TMH, edition 1978, reprint 2004.
2. Sawhney, A.K.: A Text Book on **Electrical and Electronics measurements and Instrumentation**, Dhanpat Rai & Sons, 4th edition 1968. Reprint 2004.

EIM PRACTICAL

1. To study Hall effect.
2. To study principle of Thermocouple.
3. To study principle of Load cell.
4. To study Radiation Pyrometer.
5. To study principle of Thermometer
6. To study principle of Thermistor.
7. To study principle of strain guage.
8. To study Principle of LVDT
9. To study De sauty bridge and Schering bridge.
10. To study Wein AC bridges and wheat stone AC bridge.
11. To study CRO circuitry in details
12. To calculate the frequency and phase with lissajous figure pattern

OBJECT ORIENTED PROGRAMMING

SECTION A

Basic Concept of Object Oriented Programming: Need of OOP, advantage over other programming paradigms, Tokens, Keywords, Identifiers and Constants, Basic Data Types, Control Structures.

Functions: Call by Value, Call by Reference, Function Overloading.

Class & Objects: Concepts of Objects & Classes, declaring multiple objects, array of objects, Friend Functions.

SECTION B

Constructors and Destructors: Introduction, Default, Parameterized and Copy Constructor, Concept and use of destructors.

Operator Overloading: Overloading Unary Operators, Overloading Binary Operators.

Inheritance: Derived and Base Class, Public, Private, Protected, Multiple and Multilevel Inheritance, Function Overriding.

Pointers: Pointers to Objects, this Pointer, Virtual Functions, Polymorphism.

SECTION C

Console I/O: Concept of Streams, Hierarchy of Console stream Classes, Unformatted and formatted I/O Operations, Managing Output with Manipulators

Templates: Class and function templates, overloading of function templates

File Handling: Classes for file stream operations, open and close a file, EOF, file modes, file pointers and their manipulators, sequential I/O operations, updating a file-Random access, Error Handling During File Operation

Text Books

1. E. Balagurusami: **Object Oriented Programming with C++:**.
2. Herbert Schildt: **C++ Complete Reference:** , Tata Mcgraw Hill

Reference Books:

1. Robert Lafore: **Object Oriented Programming in Turbo C++:**
2. Bjarne Stroustrup : **C++ Programming Language:**.
3. K. Kumar : **Programming with C++ Made Simple**:
4. Venugopal: **Mastering C++** :
5. Subburaj : **Object Oriented Programming in C++:**
6. Sarang : **Object Oriented Programming in C++:**

Laboratory Practices(OBJECT ORIENTED PROGRAMMING)

Lab Number	**Problems**
1-8	Implementation of simple problems with the Objects and class. Understanding of private, public and protected access using problem, Implementation of static variable & static member function. Constructors & destructors. Problems using friend function.
9	Implementation of polymorphism.
10	Implementation of inheritance
11-16	Implementation of operator overloading to overload various operators: unary operators (+, -, *, % etc) and binary operators: +, *, [ ], >> and << operators on vectors
17-18	Problem related with dynamic binding. Problems using this pointer
19-20	Problems related with the templates function and template classes.

Electrical Machines-II

SECTION A

Introduction: General equation of inducted emf, AC armature windings: concentric and distributed winding, chording, skewing, effect on induced emf. Armature and field mmf, effect of power factor and current on armature mmf, harmonics. Rotating fields. Induction Motors: Construction of squirrel cage & slip ring induction motor, basic principles, flux and emf waves, induction motor as a transformer. Equivalent circuits, torque equation, torque-slip curves, no load & block rotor tests, circle diagram, performance calculation. Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator.

SECTION B

Starting & Speed Control of Induction Motors: Various methods of starting & speed control of squirrel cage & slip ring motor, cascade connection, braking. Single-Phase Induction Motor: Revolving field theory, starting methods, equivalent circuits.

SECTION C

Synchronous Generator: Construction, types, excitation systems, principles. Equation of induced emf, flux and emf waves, theory of cylindrical rotor and salient pole machines, two reactance theory, phasor diagrams, power developed, voltage regulation, OC & SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, parallel operation, hunting and its prevention. Synchronous Motors: types, construction, principle, phasor

diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, synchronous induction motor

Text Books:

1. D.P.Kothari & I.J.Nagrath, "**Electric Machines**", Tata Mc Graw Hill
2. Ashfaq Hussain"**Electric Machines**" Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans"**Electric Machinery**", MC Graw Hill.

Reference Books:

4. P.S.Bimbhra, "**Electrical Machinery**", Khanna Publisher
5. P.S. Bimbhra, " **Generalized Theory of Electrical Machines**", Khanna Publishers

Lab Electrical Machines-II

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor
and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
(i) Torque -speed characteristics
(ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor byKeeping V/f ratio constant
5. To study speed control of three phase induction motor by varying supply voltage.
6. To perform open circuit and short circuit tests on a three phase alternator and determine
voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i)
EMF method (ii) MMF method.
7. To determine V-curves and inverted V-curves of a three phase synchronous motor.
8. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test
and draw the power-angle curve.
9. To study synchronization of an alternator with the infinite bus by using:
(i) dark lamp method (ii) two bright and one dark lamp method

Software based experiments (Develop Computer Program in 'C' language or use MATLAB
or other commercial software)

10. To determine speed-torque characteristics of three phase slip ring induction motor and
study the effect of including resistance, or capacitance in the rotor circuit.
11. To determine speed-torque characteristics of single phase induction motor and study the
effect of voltage variation.
12. To determine speed-torque characteristics of a three phase induction motor by (i) keeping
v/f ratio constant (ii) increasing frequency at the rated voltage.
13. Draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and
determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
14. To determine steady state performance of a three phase induction motor using equivalent
circuit.

B. Tech. V Sem
Electrical & Electronics Engineering
Principle of Management

SECTION A

What is management? Scientific approach-Taylor's contribution, administrative approach-Henry Fayol's contribution, human relation approach-Elton Mayo's contribution, system approach. Planning: Need and process, types of plans-goals, objectives, policies and strategies; decision making-situations and process.

SECTION B

Organizing: Organization structure, departmentation, centralization v/s decentralization, span of management, delegation and power of authority. Motivation-importance, theories of motivation-Maslow, McClleland Herzberg, theories.

SECTION C

Theories and styles of leadership-Trait, behavioral. Communication: Process and principles, types of communication, barriers to communication. Control: Process of evaluation & control, method of control.

References:

1. Agarwal R.D.: **Organization and Management**. Tata Mcgraw Hill, New Delhi.
2. Koontz O. Donnel: **Principles of Management.** Tata Mcgraw Hill, New Delhi.
3. Gupta C.B.: **Management: Theory and Practice**.
4. Tripathi P.C. & Reddy P.N.: **Principles of Management.** Tata Mcgraw Hill, New Delhi.
5. Robbins & D.Cenzo: **Fundamentals of Management**. Pearson Education.

ANALOG ELECTRONICS

SECTION-A

FEEDBACK AMPLIFIERS & OSCILLATORS: The general feedback structure, properties of negative feedback, feedback topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of series-shunt, series-series, shunt-shunt and shunt-series feedback amplifier. Stability criterion. Classification, Criterion for oscillation. Tuned collector, Hartley, Colpitts, LC and crystal oscillators.

SECTION-B

HIGH FREQUENCY & TUNED AMPLIFIERS: Biasing in BJT amplifier Circuits, small signal operations and models, single stage BJT CE amplifier BJT internal capacitances and high frequency model, frequency response of CE amplifier. Tuned amplifiers: Basic principle. Inductor losses, use of transformers, amplifier with multiple tuned circuits, synchronous tuning, stagger tuning.

SECTION-C

OUTPUT STAGES & POWER AMPLIFIERS: Classification of output stages, Class A output stages, class B output stage and class AB output stages, biasing the class AB circuit, class C amplifiers, push pull amplifiers with and without transformers. Power BJTs, variations on the class AB configurations, Complementary symmetry & quasi complementary symmetry amplifiers, Power amplifier circuits, IC power amplifiers.

Text Books/ Reference Books:

1. Sedra & Smith: **Microelectronic Circuits:** Oxford University Press.
2. Boylsted Robert, "**Electronic Devices**", PHI publication.

ANALOG ELECTRONICS LAB

1 Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2 Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3 Plot and study the characteristics of small signal amplifier using FET.
4 Study of push pull amplifier. Measure variation of output power & distortion with load.
5 Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator
frequency.
6 Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.
7 Study the following oscillators and observe the effect of variation of C on oscillator frequency: (a) Hartley (b) Colpitts.
8. Study of a Digital Storage CRO and store a transient on it.
9. To plot the characteristics of UJT and UJT as relaxation.
10. To plot the characteristics of MOSFET and CMOS.

Microprocessors & Microcomputer Applications

SECTION A

Introduction: Microcomputers, Microprocessors. Bus structure of Microprocessor System. Microprocessor Architecture and Microcomputer Systems: Microprocessor architecture & operation with example of 8085 Microprocessor, architecture, Timing and sequencing, memory, I/O Memory and I/O synchronization. Memory speed requirements, interfacing devices, logic levels, loading and buffering. 8085/8080A Based Microcomputer systems: 8085 Microprocessor, Bus timings, Demultiplexing of Bus (AD0-AD7), Generating control signals, 8080 A Microprocessor: Instructions and timing, instructions (8 bit & 16 bit), Data transfer operations, arithmetic operations, logic operations, Branch operations, counter & timing delays, stack & subroutines.

SECTION B

Interfacing peripherals, I/O, Memory and Applications: Interfacing output display, input keyboard, memory, memory mapped I/O, Interrupts and

DMA : 8085/8080A ,interrupts structure types and masking, priority interrupt structure, real time clock and internal times, consideration for using interrupts, DMA & 8257 DMA controller. Programmable interface devices. Programmable Peripheral devices, Parallel communication, 8255 Programmable Peripheral Interface, Serial Communication, RS-232-C interface, Data communication with TTY using SOD & SID lines.

SECTION C

Software model of the 8086/8088 microprocessor, Memory address space & data organization, Segment registers & Memory segmentation, Dedicated & general use of memory, Instruction pointer, Data registers, Status register, Generating a memory address, stack, I/O address space, Addressing modes of 8088. The 8086/8088 instruction set, Data transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instruction, Jump instructions, Subroutine & the subroutine handling instructions. Loop & loop handling instructions.

Text/Reference Books:

1. R.S. Gaonker: **Microprocessor Architecture, Programming & Applications With The 8085/8080-A:** Wiley Eastern Limited ISBN 085226, 2973, 1988.
2. K.L. Short: **Microprocessor and Programmed Logic:** Prentice Hall of India Pvt. Ltd. 1988. 2nd edition ISBN-0-87692-515-8.
3. Douglas V. Hall: **Microprocessor and Interfacing:** Mc-Graw Hill Book Company, 1987 ISBN-0-07-100462-9.

Microprocessors Practical

1. Write a program to calculate the addition of 16-bit No.
2. Write a program to calculate the addition of 32-bit No.
3. To transfer the content of one memory location to other memory location.
4. To exchange the content of one memory location to other memory location.
5. To find out the maximum of N given nos.
6. To generate the Fibonacci series.
7. To find location of given nos.
8. To find out the multiplication of two 16 –bit nos.
9. To find out the minimum of N given

POWER ELECTRONICS

SECTION A

Need of power electronics, Introduction to power electronics devices (static and dynamic characteristics) power diodes, power transistor, power MOSFETS, IGBT, MCT, GTOs, Triac. Thyristor SCR: Operational characteristics, Turn ON methods, switching characteristics, thyristor protection: over voltage protection, over current protection, gate protection, snubber circuit. Firing circuits for Thyristors, heating, series and parallel combination of Thyristors.

SECTION B

Commutation Techniques: Load commutation, resonant- pulse commutation, complementary commutation, impulse commutation, line commutation. Phase controlled rectifier: Principal of phase control, single and three phase converters. Effect of source impedance on the performance of converters, dual converter (ideal and practical) DC choppers: Principle, control strategies, step-up and step-down choppers.

SECTION C

Inverters: Single-phase voltage source inverters, 180 and 120 mode operation, Fourier analysis of single-phase inverter output voltage. Pulse width modulated inverters, Reduction of harmonics in the inverter output, single-phase current source inverters with ideal switch. Cyclo-converters: Step-up and step-down cyclo-converter, Single phase to single-phase cyclo-converters three-phase half wave cyclo-converters.

Text Books:

1. Rashid Mohammad H.: **Power Electronics Circuits, Devices And Applications:** PHI publication, 14th reprint Edition.
2. Bimbhra P.S.: **Power Electronics:** Khanna Publication, 3rd Edition.

Reference:

1. Rama Moorthy: **An Introduction To Thyristors And Their Application:** 2nd Edition, ISBN-81-85336-67-9.

POWER ELECTRONICS LABORATORY

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.

ELEMENTS OF POWER SYSTEM

SECTION A

Power System Components: Single line Diagram of Power system, Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator **Supply System:** Different kinds of supply system and their comparison, choice of transmission voltage **Transmission Lines:** Configurations, types of conductors, resistance of line, skin effect, Kelvin's law. Proximity effect.

SECTION B

Over Head Transmission Lines : Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuittransmission lines, Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading **Corona and Interference:** Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference. Electrostatic and electromagnetic interference with communication lines

SECTION C

Overhead line Insulators: Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string

efficiency **Mechanical Design of transmission line:** Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers **Insulated cables:** Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables **Neutral grounding:** Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding Practices.

Text Books

1. W. D. Stevenson, "**Element of Power System Analysis**", McGraw Hill,
2. C. L. Wadhwa, "**Electrical Power Systems**" New age international Ltd. Third Edition
3. Asfaq Hussain, "**'Power System**", CBS Publishers and Distributors,
4. B. R. Gupta, "**Power System Analysis and Design**" Third Edition, S. Chand & Co.
5. M. V. Deshpande, "**Electrical Power System Design**" Tata Mc Graw Hill.

Reference Books

6. M. V. Deshpandey, "**Elements of Power System Design**", Tata McGraw Hill,
7. Soni, Gupta & Bhatnagar, "**A Course in Electrical Power**", Dhanpat Rai & Sons,
8. S. L. Uppal, "**Electric Power**", Khanna Publishers
9. S.N.Singh, " **Electric Power Generation, Transmission& distribution**." PHI Learning

CONTROL SYSTEM

SECTION A

Open loop and closed loop systems, mathematical model of systems, differential equations and transfer functions; Block diagram algebra, signal flow graphs; +ve and -ve feedbacks, effects of feedback servo- components, , Tachogenerators, synchors, stepper motor, op-amp, potentiometer as an error detector; comparison of AC and DC servomechanism.

SECTION B

Standard test signals, time response of first and second order systems, steady state errors and error constants, Design specifications of second order systems, Effects of derivative and integral error compensation, velocity feedback; PID controller, Design considerations for higher order systems in brief, performance indices.

Concept of stability, necessary conditions for stability, Routh Hurwitz stability criterion, relative stability criterion, relative stability in terms of Routh Hurwitz criterion; Root-locus technique.

SECTION C

Correlation between time and frequency response specifications; Frequency domain plots, polar plots, bode plot, log magnitude versus phase plots; Gain-margin, Phase-margin, Nyquist stability criterion; Constant-M and constant-N circles; closed loop frequency response from these.**.** Preliminary considerations of classical design, cascade and feedback compensation, time-domain design using lag, lead and lag lead compensation, frequency domain design using lag.

Text/Reference Books:

3. I.J. Nagrath and M. Gopal: **Control System & Engineering 2nd Ed.:** Wiley Eastern Ltd.,1985.
4. Katsushiko Ogata: **Modern Control Engineering 3nd Ed.**: Prentice Hall of India Pvt. Ltd., 2001

Control Systems Practical

1. To study and controlling action using PID controller and calculate the first overshoot temperature and plot the graph.
2. To study the DC position controller and find out the tachometer gain.

Software based experiments (Use MATLAB, LABVIEW software etc.)

3. To determine time domain response of a second order system for step input and obtain performance parameters.
4. To convert transfer function of a system into state space form and vice-versa.
5. To plot root locus diagram of an open loop transfer function and determine range of gain ‘k for stability.
6. To plot a Bode diagram of an open loop transfer function.
7. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the

VI SEM.
ECONOMICS FOR ENGINEERS

SECTION A

What Economics is all about? Micro and Macro Economics. Origin and meaning of Engineering Economics, Role of Economics in Engineering, Scope of Engineering Economics. Theory of Demand: Law of Demand, Demand Function and Determinants of Demand, Types of Demand. Elasticity of Demand: Concept, Types and Measurement.

SECTION B

Production function and Laws of Production. Optimal Input combination. Cost concepts and cost output relationship. Types of market structures; Determination of equilibrium price and output under perfect competition.

SECTION C

Timevalue of Money and Project Evaluation: Interest Formulas; Cash Flow Diagram; Principles of Economic Equivalance, Evaluation of Engineering Projects using methods of Present Value and Internal Rate of Return. Capital Budgeting: Concept and significance of capital budgeting. Depreciation Analysis: Meaning and causes of depreciation; methods of calculating depreciation – straight-line and declining balance methods.

Books Recommended:

1. Gerald J. Thuesen and W.J. Fabrycky: **Engineering Economy, Ninth Edition:** PHI Learining Private Limited, New Delhi.
2. S. ParkChan: **Contemporary Engineering Economics:** 3rd Edition, Prentice Hall.
3. M. Parkin: **Economics:** 5th Edition, Addison Wesley.
4. Mahendra P. Agasty: **Engineering Economics and Costing, Second Edition:** Scitech Publications (India) Pvt. Ltd.
5. R. Panneerselvam: **Engineering Economics, Tenth Printing:** PHI Learning Private Limited, Delhi.

ANALOG & DIGITAL COMMUNICATION

SECTION A

Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super
hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing
Angle Modulation:
Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM
Signals Generation and detection of frequency modulation

SECTION B

sampling process, Analog Pulse Modulation Systems-Pulse Amplitude Modulation, , Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation , Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison ofabove digital techniques.

SECTION C

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques.
Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin,“ **Communication Systems**” John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,”**Electronic Communication Systems**” 4th Edition, Tata McGraw Hill
3. Simon Haykin, “**Digital Communications**” John Wiley & Sons

Reference Books:

1.B.P. Lthi, “**Modern Analog & Digital Communication Systems**” Oxford University Press.
2.Taub & Schilling, “**Communication System: Analog and Digital**” Tata Mc Graw Hill
3.R.P.Singh & S.D. Sapre, “**Communication Systems Analog and Digital**” Tata McGraw Hill.

LINEAR INTEGRATED CIRCUITS

SECTION A

Operational amplifier: Differential amplifier, DC & AC analysis of differential amplifier, concept of ideal op-amp, offset voltage, bias current, slew rate, CMMR, current mirror biasing & current mirror loading, frequency response of OP-AMP, Differential Mode in an OP-AMP, characteristics of standard IC OP-AMP, classification of standard IC OP-AMP.

SECTION B

Linear applications of OP-AMP Voltage amplifiers, design of Integrator and differentiator, , summing amplifiers, current sources, differential and instrumentation amplifiers, Active filters: advantages over passive filters, low pass, high pass, band pass, and band reject. OP-AMP RC Oscillator circuits: Wien-Bridge, Phase-Shift, Quadrature and active filter tuned oscillators.

SECTION C

Active diode circuits:-half wave rectifier, peak detector, clipper, clamper, Comparators, Waveform generation, Schmitt trigger, 555 IC counter timer, Voltage to frequency and frequency to voltage conversion. Phase locked loop- operating principle, phase detector, PLL565 and its applications-frequency multiplier, frequency shift keying, demodulator.

Text / Reference Books:

1. Gayakwad Ramakant A.: **OP-AMP & Linear Integrated circuits:** New Delhi (Prentice Hall) 3rd Edition 1994.
2. Sedra & Smith: **Microelectronics:** Oxford University Press.
3. Franco Sergio, "**Design with Operational Amplifiers and Analog Integrated Circuits**" Tata McGraw-Hill.

LINEAR INTEGRATED CIRCUITS LAB

1. To design Inverting & non amplifier using op-amp.
2. Plot frequency response of Op-amp and determination of Bandwidth of OP-AMP.
3. To design summer using 741 IC
4. To design subtractor using 741 IC
5. To design Integrator using 741 IC
6. To design Differentiator using 741 IC
7. To design active filters: LPF, HPF.
8. To design peak detector using 741 IC
9. To design Schmitt Trigger using 741 IC
10. To design the Astable Multivibrator using 555
11. To design the Monostable Multivibrator using 555

POWER SYSTEM ANALYSIS

SECTION A

Representation of Power System Components: Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.**Symmetrical fault analysis**: Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions**. Unsymmetrical faults**: Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations.

SECTION B

Load Flows: Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method. **Travelling Waves**: Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves

SECTION C

Power System Stability: Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.

Text Books:

1. W.D. Stevenson, Jr. " **Elements of Power System Analysis**", Mc Graw Hill.
2. C.L. Wadhwa, "**Electrical Power System**", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "**Power System Engineering**", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "**Power System Analysis**" Oxford University Press,2007.

Reference Books:

5. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International, 2006.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson, 2008.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications,2007.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

POWER SYSTEM LAB

(A) Hardware Based:

1. To determine direct axis reactance (x_d) and quadrature axis reactance (x_q) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (x_d) and sub transient quadrature axis reactance (x_q) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

(B) Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata Mc.Graw Hill.
2. T. K. Nagsarskar & M.S. Sukhija,’ Power System Analysis’ Oxford Universitry Press.

POWER SYSTEM OPERATION AND CONTROL

SECTION A

Introduction : Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability.

Economic Operation : Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms

Concept of optimal power flow

SECTION B

Load Frequency Control : Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

SECTION C

Automatic Voltage Control : Schematic diagram and block diagram representation, their controllers. **Voltage and Reactive Power control :** Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation **Flexible AC Transmission Systems:** Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers.

TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:

1. D.P. Kothari & I.J. Nagrath, "**Modern Power System Analysis**" Tata Mc Graw Hill, 3rd Edition.

2. P.S.R. Murty, "**Operation and control in Power Systems**" B.S. Publications.

3. N. G. Hingorani & L. Gyugyi, " **Understanding FACTs**" Concepts and Technology of Flexible AC Transmission Systems"

4. A. J. Wood & B.F. Wollenburg, " **Power Generation, Operation and Control** " John Wiley & Sons.

Reference Books:

1. O.I. Elgerd, "**Electric Energy System Theory**" Tata McGraw Hill.

2. P. Kundur, " **Power System Stability and Control** Mc Graw Hill.

3 M.H. Rashid, "**Power Electronics: Circuits, devices and Applications**" Prentice Hall of

India,3rd Edition.

4.T. K. Nagsarkar & M.S.Sukhiza,' **Power System Analysis'** Oxford University Press.

DIGITAL SIGNAL PROCESSING

SECTION A

Introduction of Signals, Systems and Signal Processing, Classification of Signals and Systems, Advantages of Digital over Analog Signal processing, Signal Models - Continuous Time versus Discrete time signals, Periodic and Aperiodic Signals, Phasor Signals and Spectra, Energy and Power Signals, System Modeling Concepts, The superposition integral for Fixed and Linear Systems, Impulse Response of a Fixed and Linear System - Fourier Series - Trigonometric Series- Exponential Fourier Series-Symmetry Properties of the Fourier Coefficients. Fourier Integral, Energy Spectral Density, Fourier Transforms in the Limit, Fourier Transform Theorems and Pairs, System Analysis with Fourier Transform, Lap lace Transform Theorems, Network Analysis using the Lap lace Transform.

SECTION B

Discrete Time Signals and Systems - Review of Sampled Data Systems, Time Domain Representations of Discrete Time Signals, Frequency Domain Representation of Discrete Time Signals, Discrete Time Signals obtained by sampling, Discrete Fourier Transform. Z-Transform - Definition and Examples, Inverse Z-Transform, Properties of the Z-Transform, Introduction to Realization of Digital Systems - Block Diagrams and Signal Flow Graphs. Introduction to Realization of an IIR and FIR systems, Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT).

SECTION C

Design of Digital Filters: Introduction to Filters, A comparison of IIR and FIR Digital Filters. Design of IIR Digital Filters -Impulse Invariant Transformation, Bilinear Transformation, Design of Digital Butter worth and Chebyshev Filters. Design of FIR Digital Filters - Windowing and Rectangular Window, Filter Designs using Windows, Frequency Sampling Technique. DSP tools and DSP techniques in various applications.

Text Books:

4. Johnson Johnny R.: **Introduction to Signal Processin:** Prentice-Hall of India, 1998.
5. Oppenheim V. Alan: **Signal & Systems:** Prentice-Hall of India, 1995.
6. Proakis G.John,: **Digital Signal Processing:** Prentice-Hall of India, 3rd edition, 2002.

DSP LAB

LIST OF EXPERIMENTS USING MATLAB

1. Verification of Samplling theorem.
2. Impulse response of a given system
3. Linear convolution of two given sequences.
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence and verification of its properties.
6. Cross correlation of given sequences and verification of its properties.
7. Solving a given difference equation.
8. Computation of N point DFT of a given sequence and to plot magnitude and phase spectrum.
9. Linear convolution of two sequences using DFT and IDFT.
10. Circular convolution of two given sequences using DFT and IDFT
11. Design and implementation of FIR filter to meet given specifications.
12. Design and implementation of IIR filter to meet given specifications.

REFERENCE BOOKS:

1. **Digital signal processing using MATLAB -** Sanjeet Mitra, TMH, 2001
2. **Digital signal processing using MATLAB** - J. G. Proakis & Ingale, MGH, 2000

B.TECH-IV YEAR

VLSI DESIGN

SECTION A

Recapitulation of basic, semiconductor devices, orientation effect, impurities, defects, Fabrication principle: Crystal growth & wafer preparation, Epitaxial growth, oxidation, photo-lithography, etching technology (wet & dry), Diffusion Fick,s law, chemical vapour deposition, CVD reactors, ion implantation, metallization & patterning, photo resistive material, packaging.

SECTION B

Overview of VLSI methodologies, VLSI design flow, type of Ics (monolithic, thick film, thin film, hybrid), Fabrication steps involve in, different type of resisters, capacitor, diode, transistor (Darlington etc), JFET, MOSFET, isolation technique used in fabrication, fabrication of typical circuits.

SECTION C

Digital CMOs circuit, MOS devices, V-I characteristics, Design & detailed analysis of MOS inverters (resistive load, enhancement load, depletion load, CMOS), delay & power analysis, Design layout of simple CMOS gates. Circuit implementation of combinational circuit, circuit implementation of sequential circuits - FFs, SRAM, DRAM.

Text Books:

3. Sze, S.M.: **VLSI Technology:** TMH
4. Kang S.M. Leblebici Y,: **CMOS digital Integrated Circuits: Analysis & Design** : Mc. Graw Hill

Reference Books:

7. Botker B.R.,: **Microelectronics:**
8. Gandhi, S.K. : **VLSI Fabrication Principle :**
9. Plummer J., Deal M., Griffin P.,: **Silicon VLSI Technology** : Prentice Hall
10. Sarrafazadeh M. & Wong C.K.: **An introduction to VLSI Physical Design:** Mc Graw Hill
11. Martin Ken: **Digital Integrated Circuits:** Oxford press
12. Neil H.E. Weste & Kamran Eshraghian: **Principle of CMOS VLSI Design:**

VLSI LAB

1. **DESIGN, SIMULATION AND ANALYSIS OF FOLLOWING CIRCUITS USING CIRCUIT SIMULATOR ORCAD**)
   I. PUSH PULL AMPLIFIER.
   II. DIFFERENTIAL AMPLIFIER
   III. NMOS AND CMOS INVERTER
   IV. TWO INPUT NAND GATE
   V. TWO INPUT NOR GATE
   VI. OPERATION AMPLIFIER
   VII. COUNTER
   VIII. A/D CONVERTER
   IX. D/A CONVERTER
2. **Simulation of Following devices using HDL (XILINX ISE)**

   i. Multiplexer
   ii. Decoder – Behavior, data flow, structure
   iii. Half adder- data flow, structure
   iv. Full Adder- Behavior, data flow, structure, Mixed Style
   v. Parity Generator
   vi. Counter
   vii. Shifter unit
   viii. Swap unit
   ix. 4-bit Parallel Adder
3. **FPGA Implementation – Sparten-3E**

ELECTRIC DRIVES AND THEIR CONTROL

Section A

Dynamics of Electric Drives: Fundamental torque equations, speed-torque conventions and multi quadrant operation, equivalent values of drive parameters, nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives. **DC Drives:** Speed torque curves, torque and power limitation in armature voltage and field control, Starting, **Braking-**Regenerative Braking, dynamic braking and plugging. **Speed Control-**Controlled Rectifier fed DC drives, Chopper Controlled DC drives.

Section B

Induction Motor Drives Starting, **Braking-**Regenerative braking, plugging and dynamic braking. **Speed Control-**Stator voltage control, variable frequency control from voltage source, Voltage Source Inverter (VSI) Control. Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scherbius drive, Static Kramer drive.

Section C

Synchronous Motor Drive: Control of Synchronous Motor-Separately Controlle and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI).

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.

Reference Books:

1 M.Chilkin, "Electric Drives",Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd.
4 V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

ELECTRICAL DRIVES AND CONTROL LAB

1 Study and test the firing circuit of three phase half controlled bridge converter.
2 Study and obtain waveforms of 3 phase half controlled bridge converter with R and RL
loads.
3 Study and test the firing circuit of 3-phase full controlled bridge converter.
4 Study and obtain waveforms of 3-phase full controlled bridge converter with R and RL
loads.
5 Study and test 3-phase AC voltage regulator.
6 Control speed of dc motor using 3-phase half controlled bridge converter. Plot armature
voltage versus speed characteristic.
7 Control speed of dc motor using 3-phase full controlled bridge converter. Plot armature
voltage versus speed characteristic.
8 Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator.
9 Control speed of universal motor using AC voltage regulator. 10
Study 3-phase dual converter.
11 Study speed control of dc motor using 3-phase dual converter.
12 Study three-phase cycloconverter and speed control of synchronous motor using cycloconverter.
13 Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-
phase inverter.

SWITCH GEAR AND PROTECTION

Section A

Introduction to Protection System: Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology. **Relays:** Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay. **Relay Application and Characteristics:** Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay **Static Relays:** Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Section B

Protection of Transmission Line: Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing, **Circuit Breaking:**
Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Section C

Testing Of Circuit Breaker:
Classification, testing station and equipments, testing procedure, direct and indirect testing
Apparatus Protection: Protection of Transformer, generator and motor.
Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:
1. S. S. Rao, "**Switchgear and Protection**", Khanna Publishers.
2. B. Ravindranath and M. Chander, **Power system Protection and Switchgear**, iley Eastern Ltd.
Reference Books:
3. B. Ram and D. N. Vishwakarma, "**Power System Protection and Switchgear**", Tata Mc. Graw
Hill
4. Y. G. Paithankar and S R Bhide, "**Fundamentals of Power System Protection**", Prentice Hall of
India.
5. T.S.M Rao,"**Power System Protection: Static Relays with Microprocessor Applications**" Tata
Macgraw Hill".
6. A.R. Van C. Warringtaon , " **Protective Relays- Their Theory and Practice**, Vol. I & II" Jhon
Willey & Sons.

DIGITAL CONTROL SYSTEM

Section A

Signal Processing in Digital Control: Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modelling of sample-hold circuit., pulse transfer function, solution of difference equation by z- Transform method. **Design of Digital Control Algorithms:** Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

Section B

State Space Analysis and Design: State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

Section C

Stability of Discrete System: Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane. Lyapunou's Stability in the sense of Lyapunou, stability theorems for continuous and discrete systems, stability analysis using Lyapunor's method. **Optimal digital control :** Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "**Digital Control System**",Saunders College Publishing.
2. M.Gopal, "**Digital Control and State Variable Methods**", Tata McGraw Hill.

Reference Books:

3. R.Leigh, "**Applied Digital Control**", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "**Digital Control Systems**:Theory, hardware, Software",McGraw Hill.

SPECIAL ELECTRICAL MACHINES

Section A

Poly-phase AC Machines: Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power) **Single phase Induction Motors:** Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start capacitor-run and shaded pole motors.

Section B

Two Phase AC Servomotors: Construction, torque-speed characteristics, performance and applications. **Stepper Motors:** Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications. **Switched Reluctance Motors:** Construction; principle of operation; torque production, modes of operation, drive circuits.

Section c

Permanent Magnet Machines: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators. **Single Phase Commutator Motors**: Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "**Generalized Theory of Electrical Machines**" Khanna Publishers.
2. P.C. Sen " **Principles of Electrical Machines and Power Electronics**" John willey & Sons, 2001
3. G.K.Dubey "**Fundamentals of Electric Drives**" Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott "**Fractional and Sub-fractional horse power electric motors**" McGraw Hill
International, 1987
5. M.G. Say " **Alternating current Machines**"Pitman & Sons

EMBEDDED SYSTEMS

SECTION A

Introduction to Embedded Systems, Architectural issues: CISC, RISC, DSP architectures, memory, Component Interfacing : Interrupts, DMA, I/O Bus Structure, I/O devices. OS for Embedded systems, Real Time issues.

SECTION B

Designing Embedded Systems: Design issues, Hardware-Software Co-design, specification languages, use of UML, software design – Programming Embedded System, optimization and testing.

SECTION C

Networked Embedded Systems: Distributed embedded architectures, protocol design issues, wireless network, Introduction to embedded multimedia and telecommunication applications like Digital camera, Digital TV etc.

Text Books :

1. Berger Arnold S.: **Embedded Systems Design**
2. Sinon David E. : **An Embedded Software Primer**
3. Qing Li with Caroline Yao: **Real Time Concepts for Embedded Systems**
4. Catsoles John: **Designing Embedded Hardware**
5. D. Gajski, F. Vahid, S. Narayan and J. Gong: **Specification and Design of Embedded Systems:** Prentice Hall.
6. Jorgan Syaunstrup and W. Wolf: **Hardware Software Co-Design : Principals and Practice:** Kluwer Academic Publishers,.
7. Frank Vahid, Tony Givaris: **Embedded System Design, A unified Hardware/Software Introduction:** John Wiley & Sons, Inc., 2003.

MECHATRONICS

SECTION A

Mechatronics and its scope: Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level. Signal conditioning amplification, filtering & data acquisition. Elements of Microprocessors & Microcontrollers, Programmable **logic controllers &** Communication interface.

SECTION B

Pneumatic and Hydraulic actuation systems: Directional control valves, pressure control valves and cylinders. process control valves. Mechanical actuation system-kinematic chains, cams, geartrains. Ratchet & Pawl, dampers, bearings. Electrical actuation system. Mechanical switches- solenoid operated solid state switches, DC, AC & stepper motors. Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.

SECTION C

Case Studies of Mechatronic Systems: Industrial Robot and its control Automobile Engine Control
Electromechanical disc-control. **Vehicle suspension Control:** Micro mechanical systems. Computer Printer, VCR, Fax Machine, NC Machine.

References:

1. Rolf Isennann, " **Mechatronics Systems**", Springer, 2005.
2. W. Bolten, "**Mechatronics",** Pearson Education 2003.

ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

SECTION A

Mode of operation of higher order processors: Real mode and protected mode
Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS. Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors. Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

SECTION B

Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts. Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

SECTION C

Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers. **8-bit microcontrollers INTEL 8051:** Internal Architecture, signals, memory organization and interfacing, Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming. **16-bit microcontrollers INTEL 8096:** Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:

1. Ray, A.K. & Burchandi, K.m., "**Advanced Microprocessors and Peripherals: Architeacture,**
Programming and Interfacing" Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, "**Advanced Microprocessors and Microcontrollers**" New Age International.
3. Krishna Kant,"**Microprocessors and Microcontrollers**" PHI Learning.
4. Brey, Barry B. "**The INTEL Microprocessors**" Pearson Education.

Reference Books:

5. Ayala, "**The 8051 Micro Controller**", Centage Learning.
6. Mazidi M.A., Maizidi J.G. Mckinlay R.D., "**The 8051 Microcontroller and Embedded Systems"**
Pearson Education.
7. Rajkamal, "**The concept and feature of microcontrollers 68HC11, 8051 and 8096**", S.Chand Publisher,
New Delhi
8. Peatman John, "**Design with microcontroller**", Mc.-Graw Hill Publishing.

BIOMEDICAL INSTRUMENTATION

SECTION A

Electrode electrolyte interface, half-cell potential, polarization and non- polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipette. Ag/AgCl electrodes Microelectrodes, skin surface electrode, and lead for EG, ECG, EMG. Transducer for biomedical applications, factors governing the selection of transducer, pressure, temperature, flow, biomedical ultrasonic transducer.

SECTION B

Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope. pH, PO_2, PCO_2, $pHCO_3$, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyzer.

SECTION C

Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O_2, CO_2 measurements. Measurement of blood pressure, blood flow, and heart sound, cardiograph: Phonocardiography, vector cardiograph, Echocardiography pacemaker, defibrillators, Ventilator, Computer patient monitoring system.

Text Book:

1. Leslie Cromwell: "**Biomedical Instrumentation and measurement**", Prentice hall of India, New Delhi 1997.

REFERENCES

1. John G. Webster, "**Medical Instrumentation Application and Design**", John Wiley and sons, New York 1998.
2. Khandpur R.S, "**Handbook of Biomedical Instrumentation**", Tata McGraw-Hill, New Delhi, 1997.

ENERGY EFFICIENCY AND CONSERVATION

SECTION A

Energy conservation:-Principles of Energy Conservation, Energy conservation Planning, Energy conservation in small scale industries, Large scale industries and in electrical generation, transmission and distribution. Energy conservation Legislation.
Energy Audit:-Aim of energy Audit, Strategy of Energy Audit, Energy management Team Considerations in implementing energy conservation Programme, Instruments for energy audit, Energy audit of Electrical System, HVAC, Buildings, Economic analysis.

SECTION B

Demand Side Management:- Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues.National and International Experiences with DSM. **Voltage and Reactive power in Distribution System:-** Voltage and reactive power calculations and control: Voltage classes and nomenclature, voltage drop calculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing.

SECTION C

Efficiency in Motors and Lighting system:- Load scheduling/shifting, Motor drives-motor efficiency testing, energy efficient motors, and motor speed control. Lighting-lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows.UPS selection, Installation operation and maintenance. Indian Electricity Act 1956, Distribution Code and Electricity Bill 2003

Text / Reference Books

1. Tripathy S. C., "**Electric Energy Utilization and conservation**", Tata McGraw Hill.
2. **Industrial Energy Conservation Manuals**, MIT Press, Mass, 1982.
3. "**The Efficient Use of Energy**", Edited by I.G.C.Dryden, Butterworths, London, 1982.
4**. Energy Management Handbook**, Edited by W.C.Turner, Wiley, New York, 1982.
5. L.C.Witte, "**P.S.Schmidt, D.R. Brown, Industrial Energy Management and Utilization**",
HemispherePubl, Washington, 1988
6. **Power Capacitor Handbook**, Butterworth & Co (Publishers) Ltd, 1984.
7. **Electrical Systems Analysis and Design for Industrial Plants**, McGraw-Hill Book Company.

ELECTRICAL MACHINE DESIGN

Section A

Basic design principles and approaches, specification, Magnetic and electric loading, out put equations and output coefficients, Main imensions. Ratings, Heating cooling and temperature rise. Transformer : Magnetic circuit, core construction and design, winding types, insulation, Loss allocation and estimation, Reactance, Temperature rise.

Section B

D C Machine: No. of poles and main dimensions, armature, windings, Magnetic circuit and Magnetisation curve, Commutator and brushes. Induction Machine-3 phase: Rating specifications, standard frame sizes, Main dimensions specific loadings,

Section C

Design of stator windings, Rotor design – slots and windings, calculations of equivalent circuit parameters. Computer assisted design of above machines.

Text Books:

1. Sawhney A K; A Course in **Electrical Machine Design**; Dhanpat Rai & Co.
2. Clayton A E & Hancock N N : **The Performance and Design of Direct Current Machines** ; CBS Publishers and Distributors
3. Say M G : **The Performance and Design of Alternating Current Machines**; CBS Publishers and Distributors.
4. Sen S K : **Principles of Electrical Machine Design with Computer Programs** ; Oxford & IBH Pub. Co.
5. Norton, **Machine design**, Pearson Education

PATTERN RECOGNITION & IMAGE PROCESSING

SECTION-A

Image processing: introduction, linear systems, the Fourier transform, matrix theory results. Image perception, image sampling, Quantisation: the optimal mean square (Lloyd-max quantiser), visual quantizaiton. Image transforms: two dimensional orthogonal and unitary transforms, properties, one dimensional discrete Fourier transform (DFT), two dimensional DFT, cosine transform, sine transform.

SECTION-B

Image enhancement : point operation, histogram modeling, spatial operations, transform operation, multispectral image enhancement, false color and pseudocolor, color image enhancement. Image filtering: image observation models, inverse and Wiener filtering, finite impulse response (FIR) wiener filtering, other Fourier domain filters.

SECTION-C

Image Analysis: Feature extraction, Edge detection, Scene segmentation and labeling. Pattern recognition: Introduction, Recognition process, Statistical decision making (Bayes' theorem), Nonparametric decision making (Nearest neighborhood classification tech), clustering.

Text Books:

1. **Fundamentals of digital image Processing**, A. K. Jain, PHI Publications.
2. **Digital Image Processing**, Gozalez Rafel, Richard Woods, 2nd Edition, Pearson Education.

Reference Books:

1. **Rosenfield, A and Kak A. C, Picture Processing**, Academic Press N.Y. 1982
2. Pratt, W. K., **Digital Image Processing**, John Willey and sons, New York, 1978.
3. Duda R., Hart Peter, Stork D., **Pattern Classification**, Willey Interscience Publication.
4. Manahem Friedman, Abraham Kandel, **Introduction to Pattern Recognition**, World Scientific.
5. **Introduction to Artificial Intelligence** E. Charniak, D. Mcdermott

HVDC TRANSMISSION

SECTION-A

AC/DC Conversion - Hg. Arc, SCR, Bridge rectifier and inverter circuits. Recent trends of HVDC valves. Principles of grid control, firing angle control, harmonic analysis, commutation failure, starting and stopping of DC Link.

SECTION-B

Reactive Power requirement, types of forced commutation. Corona and Radio interference, protective devices. Smoothing reactors - Functions, double commutation failure, consequent commutation failure - their prevention.

SECTION-C

Simulation of HVDC systems, Parallel operation of HVDC and AC systems, multiterminal DC systems. Stability of AC/DC interconnected systems.

Text Books:

1. Chakraborty A, Kothari D P, Mukhopadhyay A K - **The Performance, Operation and Control of EHV Power Transmission**
Systems; Wheeler Pub.
2. Das Begamudre R - **The E H V A C Transmission** - New Age International.

RELIABILITY ENGINEERING

SECTION A

Introduction: Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.
Reliability Mathematics :
Definition of probability, laws of probability , conditional probability, Bay's theorem; various
distributions; data collection, recovery of data, data analysis procedures, empirical reliability
calculations.

SECTION B

Reliability: Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

SECTION C

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance. **Reliability Testing:** Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Text Books :
1. R.Billintan & R.N. Allan,"**Reliability Evaluation of Engineering and Systems**", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson,"**Reliability in Engineering and Design**", John Wiely and Sons.
Reference Books:
3. S.K. Sinha & B.K. Kale,"**Life Testing and Reliability Estimation**", Wiely Eastern Ltd.
4. M.L. Shooman, "**Probabilistic Reliability, An Engineering Approach**", McGraw Hill.
5. G.H.Sandler,"**System Reliability Engineering**", Prentice Hall.

ELECTRONIC COMMERCE

SECTION A

Whats and hows of Internet: Development and growth, DNS, Commercialisation of internet. Introduction to e~commerce: e-commerce, Opportunities, Framework, Recent Developments. Planning for Network Infrastructure & Web Architecture, Recent trends.

SECTION B

Introduction to Internet Protocols: Layers and Networking, Internet Protocol suite, Desk topTCP/IP, Mobile TCPIIP based Networking, Multicast IP.
Principles of Web Site Hosting and Promotion : Decision on Website Design, Legal issues, Domain Name Registration, Site Hosting,Web Site Registration, Offline & online web site promotion.

SECTION C

E-commerce Business Models: Brokerage, Advertising,' Infomediary, Merchant, Manufacturer, Affiliate, Community, Subscription, Utility, Tried and True models. Auctions as a price setting mechanism, Pricing Information, Versioning Infonnation: Cyberlaws, Electronic payment systems: Digital cash.

Text/ReferenceBooks:

1. Turban: **E-Commerce:** Pearson, 'New Delhi.
2. Kalakota and Whinston: **Frontiers of E-commerce:** Pearson, New Delhi.
3. **Web Sites** (Bababazaar.com, yahoo.com, Indiainfoline.com, buyorbid. com, amazon.com, pitara.com, fabmartcom etc.)

REMOTE CONTROL & TELEMETRY

SECTION A

Introduction : 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.

SECTION B

Multiplexing-time division multiplexers and demultiplexers-theory and circuits, scanning procedure; frequency division multiplexing with constant bandwidth and proportional bandwidth, demultiplexing.

SECTION C

Data acquisition and distribution system. Fundamentals of audio-telemetry system - R.F. links. Telemetry design system. Standard for telemetry e.g. JRIG etc. Microwave links. Pulse code modulation (PCM) techniques. Practical telemetry system - pipe line telemetry,
power system telemetry, supervisory telecontrol systems. Introduction to ISDN.

ENTERPRISE AND RESOURCE PLANNING (ERP)

SECTION A

ERP Overview, Benefit, Business Process Reengineering (BPR), data ware housing, Data mining, OLAP, Supply chain Management (SCM), MRP, Expert system.

SECTION B

ERP-A Manufacturing Perspective, ERP Module, ERP Market, ERP implementation life cycle, options of various paradigms, identification of suitable platforms, Role of SDLC/SSAD, Object oriented architecture. ERP implementation, Hidden costs, Vendors, Consultant, Employees, Human Resource.

SECTION C

ERP& E-Commerce, Future Directives in ERP, ERP and Internet, Critical Factors Guiding, Selection and evaluation, Strategies for successful implementation, Impediments and initiatives to achieve success, Critical Success and factors, Integrating ERP into organizational culture. Using ERP tool: Either SAP or ORACLE formats to case study.

Text/Reference Books :

1. A.Lexis Leon: Enterprise Resource Planning: TMH
2. Brady,Manu,Wegner: Enterprise Resource Planning: TMH
3. Jacobs: Why ERP? A Premier on SAP Implementation: McGraw Hill.

CLIENT-SERVER COMPUTING & APPLICATIONS

SECTION A

Evolution of PC, Introduction to Local Area Network, PC LANS, Mainframe Computers, PC Connected to mainframes.

SECTION B

Distributed Systems and database. Client Server Computing model, Client-Server Hardware and software need, issues in Client Server Computing – shared access, connectivity, security advantages of client server computing. Examples UNIX & Windows NT.

SECTION C

Client Server Applications: Database Server Networks, Gateways, Video Conferencing and multimedia applications. Client – server architectures: segmentation, switched FDDI, Peer-to-Peer architecture.

Text Books:

1. Dewire: **Client Server Computing**: Edition I, Tata McGraw Hill.

References:

1. Alex Berson: **Client Server Architecture:** McGraw Hill, 1992 ISBN 0-07-005076-7
2. Robert Orfali, Dan Harkey, Jevi Edward: **Client Server Survival Guide, Edition III:**

Mukesh Trivedi, Mamta Khanna: **Client Server Computing:** Book Publishing Co. Pvt. Ltd

AI & Neural Networks

SECTION A

Machine Learning & AI - Introduction, hierarchical perspective and foundations. Rote Learning, Learning by advice, Learning in problem solving inductive learning, explanation based learning, learning from observation and discovery, learning by analogy, introduction to formal learning theory.

SECTION B

Biological neurons and brain, models of biological neurons, artificial neurons and neural networks, Early adaptive nets Hopfield nets, back error propagation competitive learning lateral inhibition and feature maps, Stability - Plasticity and noise saturation dilemma. ART nets, cognition and recognition.

SECTION C

Neural nets as massively parallel, connectionist architecture, Application in solving problems from various are as e.g., AI, Computer Hardware, networks, pattern recognition sensing and control etc.

Text Books:

1. P H Winston - Artificial Intelligence - Pearson Education
2. Bishop, Neural Networks for Pattern Recognition, OUP
3. Cohen, Empirical Methods for AI, PHI
4. Haykin, Neural Network, Pearson Education/PHI
5. E Charniak and W Midermott - Introduction to Artificial Intelligence - Pearson Education.
6. Hagan, Neural Network Design , Vikas
7. Shivanandan, Artificial Neural Network, Vikas
8. Bose - Neural Network Fundamentals with graphs, Algorithms and Applications - TMH.

ILLUMINATION TECHNOLOGY

SECTION A

Sources of light: Day light, artificial light sources, energy radiation, visible spectrum of radiation, black body radiation and fullradiator. Incandescence, dependence of light o/p on temperature. Theory of gas discharge and production of light. Perception of

lightand colour, optical system of human eye, eye as visual processor. Reflection, refraction and other behaviour of light.

SECTION B

Perception of lightand colour, optical system of human eye, eye as visual processor. Reflection, refraction and other behaviour of light. Measurement of light - radiometric and photometric quantities, units of measurement, standardization. Measurement of light distribution, direct and diffused reflection, fundamental concepts of colourimentry and measurement of colour. Types of lamps: GLS, Tungsten - halogen, Discharge, low pressure sodium vapour fluorescent, metal - halide, IR and VV lamps - their construction, filament material, theory of operation, life, characteristics and application.

SECTION C

Design, objectives and specifications of lighting and systems; design of luminance, electrical circuits and auxiliaries, basic lighting design, consideration and lighting parameters for extension lighting, interior lighting and day lighting. Energy conservation in lighting.

Text Books:

1. Wadha C L: **Utilization of Electric Power** - New Age International Ltd.
2. Wadha C L: **Generation, Distribution and Utilization of electrical energy** - New Age International Ltd.
3. Singh, **Electric Power Generation, Transmission & Distribution**, PHI
4. Partab H: **Art and Science of Utilization of Electrical Energy**, Dhanpat Rai & Sons.

Annexure IV

B. Tech. – Electronics & Instrumentation Engineering
(II Year)

Yr	Third Semester					Fourth Semester				
	Course Code	**Course Name**	**L**	**T**	**P**	**Course Code**	**Course Name**	**L**	**T**	**P**
	3.1	Mathematics III	3	1	-	4.1	Mathematics IV	4	-	-
	3.2	Network Analysis	3	1	2	4.2	Analog and Digital Communication	4	-	2
	3.3	Data Structure	3	1	-	4.3	Object Oriented Programming	4	-	2
	3.4	Digital Electronics	4	-	2	4.4	Electrical Machines	4	-	2
	3.5	Electromagnetic Field Theory	3	1	-	4.5	Electrical Engineering material & Process	4	-	-
	3.6	Electrical & Electronics Measurements	4	-	2	4.6	Transducers	4	-	2
	F 3.1	Selected writing of Great Authors I (SWGA I)	2	-	-	F 4.1	Selected writing of Great Authors II (SWGA II)	2	-	-
		Total	**22**	**4**	**6**		Total	**26**	**-**	**8**

B. Tech. – Electronics & Instrumentation Engineering
(III Year)

Yr	Fifth Semester					Sixth Semester				
	Course Code	**Course Name**	**L**	**T**	**P**	**Course Code**	**Course Name**	**L**	**T**	**P**
	5.1	Principles of Management/ Economics For Engineers	3	-	-	6.1	Economics For Engineers/ Principles of Management	3	-	-
	5.2	Analog Electronics	3	1	2	6.2	Control Systems	3	1	2
	5.3	Microprocessors & Microcomputer Applications	3	1	2	6.3	Analytical Instrumentation	4	-	2
	5.4	Biomedical Instrumentation	3	1	-	6.4	Power Electronics	4	-	2
	5.5	Fiber Optic & Laser Instrumentation	4	-	2	6.5	Virtual Instrumentation	4	-	-
	5.6	Digital signal processing	4	-	-	6.6	Industrial Measurement & Instrumentation	4	-	-
	5.7	Seminar	2	-	-	6.7	Project	-	-	8
						6.8	Lab View Lab	-	-	2
	F 5.1	Women in Indian Society (WIS) / Parenthood and Family Relationship	2	-	-	F 6.1	Parenthood and Family Relationship / Women in Indian Society (WIS)	2	-	-
		Total	**24**	**3**	**6**		Total	**24**	**1**	**16**

B. Tech. – Electronics & Instrumentation Engineering
(IV Year)

S. No.	Departmental Electives	Reading Elective (Self Study)
1.	Energy Efficiency & Conservation	Reliability Engineering
2.	Robotics And Automation	Electronic Commerce
3.	Special Electrical Machines	Telemetry And Data Transmission
4.	Computer Aided Design Of Electrical Machines	ERP
5.	Audio & Video Systems	Operating Systems
6.	Mechatronics	Pattern recognition & image processing
		Indicator, Recorder & Controller

Yr	Seventh Semester					Eight Semester				
	Course Code	Course Name	L	T	P	Course Code	Course Name	L	T	P
	7.1	University-Industry / Institution Linkage B. Tech. Project	**20**	-	-	8.1	Artificial Neural Networks & Fuzzy logic Control	4	-	-
	7.2	Reading Elective (Self Study)	**2**	-	-	8.2	Microcontrollers & Embedded Systems	4	-	2
		Total	**22**	-	-	8.3	VLSI Design	4	-	2
						8.4	Departmental Elective I	4	-	-
						8.5	Elective II	4	-	-
							Total	**24**	-	**4**

B. Tech. – Electronics & Instrumentation Engineering
(II Year)

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EI 3.1	Mathematics III	3	1	-	20	-	40	-	60	-
EI 3.2	Network Analysis	3	1	2	20	5	40	10	60	15
EI 3.3	Data structure	3	1	-	20	-	40	-	60	-
EI 3.4	Digital Electronics	4	-	2	20	5	40	10	60	15
EI 3.5	Electromagnetic Field Theory	3	1	-	20	-	40	-	60	-
EI 5.6	Electrical & Electronic Measurements	4	-	2	20	5	40	10	60	15
F 3.1	Selected writing of Great Authors I	2	-	-	10	-	20	-	30	-
	Total	**22**	**4**	**6**	**130**	**15**	**260**	**30**	**390**	**45**
									T+P= 435	

B.Tech. II Year (IV Sem.)

EI 4.1	Mathematics IV	4	-	-	20	-	40	-	60	-
EI 4.2	Analog & Digital Communication	4	-	2	20	5	40	10	60	15
EI 4.3	Object Oriented Programming	4	-	2	20	5	40	10	60	15
EI 4.4	Electrical Machines	4	-	2	20	5	40	10	60	15
EI 4.5	Electrical Engineering Material & Process	4	-	-	20	-	40	-	60	-
EI 4.6	Transducers	4	-	2	20	5	40	10	60	15
F-4.1	Selected writing of Great Authors II	2	-	-	10	-	20	-	30	-
	Total	**26**	**-**	**8**	**130**	**20**	**260**	**40**	**390**	**60**
									T+P=450	

B. Tech. – Electronics & Instrumentation Engineering
(III Year)

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EI 5.1	Principle of Management/ Economics For Engineers	3	-	-	15	-	30	-	45	-
EI 5.2	Analog Electronics	3	1	2	20	5	40	10	60	15
EI 5.3	Microprocessors & Microcomputer Applications	3	1	2	20	5	40	10	60	15
EI 5.4	Biomedical Instrumentation	3	1	-	20	-	40	-	60	-
EI 5.5	Fiber Optics & Laser Instrumentation	4	-	2	20	5	40	10	60	15
EI 5.6	Digital Signal Processing	4	-	-	20	-	40	-	60	-
EI 5.7	Seminar	2	-	-	-	30	-	-	-	30
F 5.1	Women in Indian Society (WIS)/ Parenthood and Family Relationship	2	-	-	10	-	20	-	30	-
	Total	**24**	**3**	**6**	**125**	**45**	**250**	**30**	**375**	**75**
									T+P=450	

B.Tech. III Year (VI Sem.)

EI 6.1	Economics For Engineers/ Principle of Management	3	-	-	15	-	30	-	45	-
EI 6.2	Control Systems	3	1	2	20	5	40	10	60	15
EI 6.3	Analytical Instrumentation	4	-	2	20	5	40	10	60	15
EI 6.4	Power Electronics	4	-	2	20	5	40	10	60	15
EI 6.5	Virtual Instrumentation	4	-	-	20	-	40	-	60	-
EI 6.6	Industrial Measurements & Instrumentation	4	-	-	20	-	40	-	60	-
EI 6.7	Project	-	-	8	-	20	-	40	-	60
EI 6.7	Lab View Lab	-	-	2	-	5	-	10	-	15
F 6.1	Parenthood and Family Relationship/ Women in Indian Society (WIS)	2	--	-	10	-	20	-	30	-
	Total	**24**	**1**	**16**	**125**	**40**	**250**	**80**	**375**	**120**
									T+P=495	

B. Tech. – Electronics & Instrumentation Engineering
(IV Year)

B.Tech. IV Year (VII Sem.)

EI 7.1	UIL Project (v) Project, Dissertation (vi) Seminar (vii) Continuous Assessment (viii) Viva Voce	20	-	-	-	-	-	-	-	300
EI 7.2	Reading Elective (Self Study)	2	-	-	-	-	-	-	-	30
	Total	22	-	-	-	-	-	-	-	-
									T+P=330	

B.Tech IV Year (VIII Sem.)

Course No.	Course Title	Contact Hours / week			Assessment				Total Marks	
					Cont.		Sem			
		L	T	P	T	P	T	P	T	P
EI 8.1	Artificial Neural Networks & Fuzzy logic Control	4	-	-	20	-	40	-	60	-
EI 8.2	Microcontrollers & Embedded Systems	4	-	2	20	5	40	10	60	15
EI 8.3	VLSI Design	4	-	2	20	5	40	10	60	15
EI 8.4	Departmental Elective I	4	-	-	20	-	40	-	60	-
EI 8.5	Departmental Elective II	4	-	-	20	-	40	-	60	-
	Total	**20**	**0**	**4**	**100**	**10**	**200**	**20**	**300**	**30**
									T+P=330	

B. Tech. – Electronics & Instrumentation Engineering
III SEMESTER

MATHEMATICS III

Section A

Vector spaces. Inner products. Matrices and determinants, linear transformations. Systems of linear equations. Gauss elimination, rank of a matrix. Inverse of a matrix. Bilinear and quadratic forms. Eigenvalues and eigenvectors. Similarity transformations. Diagonalization of Hermitian matrices

Section B

Numerical methods for solving systems of linear equations. III-conditioning. Methods of Gauss and least squares. Inclusion of matrix eigenvalues. Finding eigenvalues by iteration.

Section C

Vector fields, surface integrals, line integrals, independence of path, conservative fields, divergence, curl, Green's theorem. Divergence theorem of Gauss, Stokes's theorem and applications of these theorems. Transformations of coordinate systems and vector components. Invariance of divergence and curl. Curvilinear coordinates.

Texts/References:

E. Kreyszig, "Advanced Engineering mathematics", 5th ed., Wiley Eastern, 1985.

V. Krishnamurty, V.P. Mainra and J.L. Arora, "An Introduction to Linear Algebra", Affiliated East-West, 1976.

T.M. Apostol, "Calculus", Vol. II, 2nd ed., Wiley Eastern, 1980.

NETWORK ANALYSIS

Section-A

Introduction of circuit elements (R, L, C), energy sources & their transformation, Dot convention for coupled circuits, series & parallel resonance.

Network theorems: Superposition, Reciprocity, Thevenin, Norton, Maximum Power Transfer, Star - Delta (Vice Versa) transformation & Tellengen's theorem.

Section-B

Initial Conditions in elements & Network, Laplace transforms & inverse Laplace transforms: - Basic theorems and circuit analysis using Laplace transformations, Initial & Final Value theorem.

Concept of complex frequency, Transform impedance & transform circuit. Series & Parallel combination of elements.

Section-C

Two port networks: Open circuit, short circuit, hybrid, Transmission parameters & their equivalent model, Relationship parameters set, Reciprocity & Symmetry of two port networks, Equivalent T & Section representation, Terminated two- Two port network, Output impedance, Image Impedance.

Network Topology: Graph of network, trees, loops, and cutset, Tie set, loop currents analysis of network and duality.

Text Books:

1. Van Valkenburg M.E., "Networks & Analysis" , PHI Pvt. Ltd.New Delhi 3rd Edition 1998
2. Choudhary D Roy, "Network & System" , New Age International (P) Ltd.1st Ed. 1991
3. Edminister Joseph A., "Theory and problem of Electrical circuits in SI units"
4. A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.

NETWORK LABORATORY

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify withmtheoretical values

ELECTROMAGNETIC FIELD THEORY

Section A

Elements of Vector calculus:- Cartesian coordinate system, Circular-Cylindrical coordinate system, Spherical coordinate system (dot product, cross product, divergence & curl). **Electrostatics:-** Electric Flux Density, Coulomb's law, Gauss' law and their applications, Energy in electrostatic fields, capacitance of parallel plate and coaxial cable, Fields in dielectrics, Boundary conditions, dipole, Lap lace's and Poisson's equations and their applications.

Section – B

Magnetostatics:- Ampere's law, Bios wart's law and their applications, Stock's theorem, Energy in magnetic field, Boundary conditions. Maxwell's Equation:- Maxwell's equations in integral & differential form (Gauss' law in electric and magnetic field, Ampere's circuital law, Faraday's law), Maxwell's equations for time varying field.

Section – C

Uniform Plane Waves:- Wave equation and its solutions, Pointing vector, propagation through various media-free space, conductor & dielectric, Reflection and Refraction in conductors & Dielectrics with normal and oblique incidence, Phase & Group velocity, Skin depth. Transmission Lines:- General equation, input impedance, characteristics impedance, Reflection and reflection coefficient, Standing wave ratio, resonant and resonant line impedance matching, Smith chart and its applications, practical problems in transmission lines.

Text Books: -

1. William H. Hayt, "Engineering Electromagnetic", Tata Mc Graw Hill.

Reference books:-

1. Jordan and Balmain, "Electromagnetic waves and Radiating Systems", PHI.
2. J.D. Kraus and Fleisch, "Electromagnetic with Applications", Mc Graw Hill.

DIGITAL ELECTRONICS

Section-A

Review of Number Systems, Binary arithmetic & codes. **Logic Gates:** Logic Gates and Boolean Algebra Representation and Simplification of functions by Karnaugh Maps. Combinational Circuits design. Combinational circuits - adder, subtractor, decoder, demultiplexer, encoder, multiplexer, comparator.

Section-B

Sequential Logic Circuit & Design - flip flop, shift register, asynchronous and synchronous counters. Digital Logic Families and Their Characteristics: RTL, DTL, TTL, Schotlky TTL, ECL, MOS and CMOs, Fan in, Fan out.

Section-C

Semiconductor Memories: RAM, ROM, PROM, EPROM, BJTRAM Cell, MOS RAM Cell, Organization of RAM, Charge Coupled devices (CCD), storage of charge and transfer of charge in CCD. **D/A Converter:** Weighted resistance D/A, R-2R Ladder Converter. DAC 0800 D/A Chip, D/A Converter specification. **A/D Converter:** Analog to Digital Converter, Parallel Comparator Converter, Counting Converter, Successive Approximation Converter, Dual Slop converter A/D converter specification, sampling and hold circuit

Text/Reference Books:

1 Digital Principles and Applications by Malvino C.P., Leach D.P.; Tata Mc-Graw Hill, 1985.
2. Digital Computer Fundamentals:Bartee, T.C.
3. Computer System Architecture: Mano, M.M., Prentice Hall, 1988
4. Computer Architecture and Organization : Hayes John P., Mc- Graw Hill 1988 (International Edition)
5. Introduction to Computer Architecture Stone s., Galgotia Publications 1986.
6. Microprocessors, Architecture, Programming & Applications R. Gaonkar, Wiley Eastern - 1987.

Digital Electronics Practical

1. To verify the truth table of various Logic gates.
2. To implement the functions of various Logic gates with the help of Universal Gates.
3. Verification of theorems of Boolean algebra
4. Study of Binary Adder (Half and Full)
5. Study of Binary Subtractor (Half and Full)
6. Study of Multiplexer and Demultiplexer circuits
7. Study of BCD to Decimal Decoder and Encoder.
8. Study and designing with the help of gates of flip-flops (SR, D, JK, T).
9. Study and designing with the help of gates modulo –N Synchronous counter for a given value of N.
10. Study and designing with the help of gates of circuit of given Binary Up and Down synchronous counter.
11. Study and designing with the help of gates of circuit of a asynchronous counter.
12. Study and designing with the help of gates of circuit of Ring and Johnson counter.

Data Structures

SECTION A

Concept of good programming: From problems to programs, Concept of Data types, Abstract data type and data structure, Running time of program, Asymptotic notations and Efficient program.

Linear data structures: Array, stack, queue and their array implementation and simple applications.

SECTION B

Linked Lists: Linear Linked list, doubly linked list, circular linked list, dynamic implementation of stack and queue, simple applications, recursive and non-recursive procedure using stack.

Dynamic memory management: Fixed block storage allocation techniques (First fit, Next fit, Best fit and Worst fit), Data compaction and garbage collection and buddy system.

SECTION C

Non-linear data structures: Tree, basic terminology, general tree, binary tree, Binary search tree and their implementation, tree traversal, searching, insertion and deletion, Applications of binary tree, Balance tree..

Text Books:

1. A.M. Tanenbaum: **Data structure using C & C++, :** Prentice Hall of India.

References:

1. Tremblay Jean-Paul & Sorenson P.G,: **An Introduction to Data Structures with Application:** Mc. Graw Hill, 1985
2. Horowitz E. and S. Sahni: **Fundamentals of data structures**: University Press, 2009.
3. A.V. Aho, J.E. Hopecraft & J.D. Ullman: **Data structure and Algorithms:** Addition –Wesley Publishing Co., 1987.

ELECTRICAL & ELECTRONIC MEASUREMENTS

SECTION A

Measurements, Elements of Measurements, Characteristics- Static and dynamic, resolution, sensitivity, accuracy and precision, Reproducibility, drift, linearity, Dead time & dead zone, Scale & Span, Repeatability, Significant figures. Noise: Types, sources. Measurements errors, types, analysis, Standard and calibration, **Measuring Instruments:** Principle of operation, constructional details, torque equation, scale shapes, uses and errors in moving coil, moving iron, electrodynamic, electrostatic, induction instruments for the measurement of voltage, current and power.

S E C T I O N B

MEASUREMENT OF RESISTANCES: Classification of resistances, Methods for Measurement of low Resistance - Ammeter voltmeter method, Kelvin's double bridge method, potentiometer method. Methods for Measurement of Medium Resistance : Ammeter- voltmeter method, substitution method, Wheat stone bridge method, ohmmeter method. Methods for Measurement of High Resistance- Direct deflection method, loss of charge method, Meggar. Measurement of Earth Resistance and Soil resistivity.

A.C. BRIDGES: Generalized treatment of four arm a.c. bridges. Sources and detectors. Measurement of self inductance - Maxwell's inductance bridge, Maxwell's inductance capacitance bridge, Hay's bridge, Anderson's bridge. Measurement of Capacitance- De Sauty's bridge, Schering bridge.Measurement of Frequency - Wein's bridge.

SECTION C

Galvanometer, PMMC instruments, DC & AC voltmeters, ammeters, ohmmeters, Digital multimeter, Q meters. Detailed description of CRO and its applications: Cathode Ray Tube, Deflection Amplifiers, Oscilloscope Time Base, Dual-Trace Oscilloscopes, Oscilloscope Controls, Oscilloscope Probes, Delayed time base oscilloscope, Digital Storage Oscilloscope, Function generator.

Text Books:

1. Doeblin, Ernest O: Measurement system: **Application and Design:** Mc Graw Hill New York, 4th edition 1990.
2. Sawhney, A.K.: **A Text Book on Electrical and Electronics measurements and Instrumentation:** Dhanpat Rai & Sons, 4th edition 1968. Reprint 2004

Reference Books:

1. Jones, Barney E: **Instrumentation measurement and Feedback:** TMH, edition 1978, reprint 2004.
2. Cooper, W.D: **Modern Electronics instrumentation and Measurements:** PHI.

Electrical & Electronic Measurements Laboratory

1. Measure unknown capacitance using De sauty bridge and Schering bridge.
2. Measure unknown frequency using Wein AC bridges.
3. CRO circuitry in details.
4. Measure unknown inductance using Anderson Bridge.
5. Measure the low resistance by kelvin’s double bridge.
6. Calibrate an Ammeter using D.C. slide wire potentiometer.
7. Plot the V-I characteristic of a Solar Panel.

SEMESTER- IV

MATHEMATICS-IV

SECTION A

Complex Functions, Continuity, Differentiability, Analytic Function, Cauchy-Riemann Equations: In Cartesian & Polar Coordinates, Conformal Mapping, Conformal mapping by Elementary Functions, Transformations $W = Z^n, W = Z^2, W = \sqrt{Z}, W = e^Z, W = \sin Z$ and $W = \log Z$, Bilinear Transformation.

SECTION B

Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivative of Analytic Functions, Power Series, Taylor's Series, Laurent Series, Singularities, Residue, Residue Theorem, Evaluation of Real Integrals.

SECTION C

Finite Differences, Relation between Difference and Derivatives, Differences of Polynomials, Interpolation, Newton's Formula for Forward and Backward Interpolation, Divided Differences, Newton's General Interpolation Formula, Lagrange's Interpolation Formula, Error in Interpolation, Numerical Differentiation, Numerical Integration Newton's Cotes Quadrature Formula, Simpson's, Weddle's and Trapezoidal rules, Gauss Quadrature Formula, Root finding for Nonlinear Equations (Transcendental & Algebraic Equations), Iterative method, Bisection method, Regula-Falsi Method, Newton Raphson's Method, Order of Convergence. Numerical solution of first and second order Differential Equations, Euler's Method, Picard's Method, Runge-Kutta's Method .

Text Books:

4. Ramana B.V.: **Higher Engineering Mathematics:** TMH Publications, New Delhi.
5. Kreyszig E.: **Advanced Engineering Mathematics:** 8th ed., Wiley Eastern.
6. Grewal B.S.: **Higher Engineering Mathematics:** 40th ed., Khanna Publishers.

ELECTRICAL ENGINEERING MATERIAL & PROCESS

Section A: DIELECTRIC MATERIALS : Polarisation phenomenon, spontaneous polarisation, dielectric constant and loss, piezo and ferro electricity.

MAGNETIC MATERIALS: Dia, para, ferro-ferrimagnetism; soft and hard magnetic materials and their applications.

SEMI CONDUCTOR MATERIALS : Crystal growth, zone refining, Degenerate and nondegenerate semiconductors, Direct and indirect band gap semiconductors. Electronic properties of
silicon, Germanium, Compound Semiconductor, Gallium Arsenide, gallium phosphide & Silicon
carbide.

Section B: CONDUCTIVE & SUPERCONDUCTIVE MATERIALS : Electrical properties of conductive and resistive materials. Important characteristics and electronic applications of specific conductor & resistance materials. Superconductor phenomenon, Type I and Type II superconductors and their applications.

Section C: PASSIVE COMPONENETS & PCB FABRICATION: Brief study of fabrication methods of fixed and variable type of resistors; capacitors, Inductors, solenoid and toroid, air core, iron core and Ferro core conductors. Printed Circuit Boards – Types, Manufacturing of copper clad laminates, PCB Manufacturing process, Manufacturing of single and double sided PCBs. Surface mount devices – advantages & limitations.

Text Books :

1 A.J. Dekker,"Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S.Chand & Co.

References :

4 Solymar, "Electrical Properties of Materials" Oxford University Press.
5. Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
8 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
9 T. K. Basak, "Electrical Engineering Materials" New age International

OBJECT ORIENTED PROGRAMMING

SECTION A

Basic Concept of Object Oriented Programming: Need of OOP, advantage over other programming paradigms, Tokens, Keywords, Identifiers and Constants, Basic Data Types, Control Structures.

Functions: Call by Value, Call by Reference, Function Overloading.

Class & Objects: Concepts of Objects & Classes, declaring multiple objects, array of objects, Friend Functions.

SECTION B

Constructors and Destructors: Introduction, Default, Parameterized and Copy Constructor, Concept and use of destructors.

Operator Overloading: Overloading Unary Operators, Overloading Binary Operators.

Inheritance: Derived and Base Class, Public, Private, Protected, Multiple and Multilevel Inheritance, Function Overriding.

Pointers: Pointers to Objects, this Pointer, Virtual Functions, Polymorphism.

SECTION C

Console I/O: Concept of Streams, Hierarchy of Console stream Classes, Unformatted and formatted I/O Operations, Managing Output with Manipulators

Templates: Class and function templates, overloading of function templates

File Handling: Classes for file stream operations, open and close a file, EOF, file modes, file pointers and their manipulators, sequential I/O operations, updating a file-Random access, Error Handling During File Operation

Text Books

1. E. Balagurusami: **Object Oriented Programming with C++:**.
2. Herbert Schildt: **C++ Complete Reference:** , Tata Mcgraw Hill

Reference Books:

1. Robert Lafore: **Object Oriented Programming in Turbo C++:**
2. Bjarne Stroustrup : **C++ Programming Language:**.
3. K. Kumar : **Programming with C++ Made Simple**:
4. Venugopal: **Mastering C++** :
5. Subburaj : **Object Oriented Programming in C++:**
6. Sarang : **Object Oriented Programming in C++:**

Laboratory Practices (OBJECT ORIENTED PROGRAMMING)

Lab Number	**Problems**
1-8	Implementation of simple problems with the Objects and class. Understanding of private, public and protected access using problem, Implementation of static variable & static member function. Constructors & destructors. Problems using friend function.
9	Implementation of polymorphism.
10	Implementation of inheritance
11-16	Implementation of operator overloading to overload various operators: unary operators (+, -, *, % etc) and binary operators: +, *, [ ], >> and << operators on vectors
17-18	Problem related with dynamic binding. Problems using this pointer
19-20	Problems related with the templates function and template classes.

Electrical Machines

Section A : Basic concept of rotating machines: Elementary machines synchronous machines, dc machine, generated emf, rotating magnetic field, torque in round rotor machines.

DC Machine: Introduction, emf equation, torque equation, power balance, linear magnetization, circuit model, generating mode, motoring mode armature reaction, compensating winding, commutation, method of excitation, characteristics of dc shunt, series and compound motors and generators. Starting of dc motor, speed control of dc motor, breaking of dc motor.

Section B : Synchronous machines: Introduction of basic synchronous machine model, circuit model of synchronous machine, determination of armature reaction ampere turn and leakage reactance of synchronous machine, synchronizing to infinite bus bar, operating characteristics, power flow equations, parallel operation of synchronous generators, hunting in synchronous machines

Section C : Induction Motor: Introduction, construction, flux and mmf phasor in induction motors, slip and frequency of rotor currents, rotor emf, power, induction motor phasor diagram, torque slip characteristics, determination of equivalent circuit parameters, circle diagram, starting of induction motor, speed control.

Single Phase Motors: Introduction, types of single phase motor, single phase induction motor, split phase motors, single phase commutator motor, single phase synchronous motor, stepper motor.

Text/Reference Books:

1. B. L. Theraja: **"A Text Book of Electrical Technology",** Vol.-II, S. Chand Publications
2. V. K. Mehta: **"Principle of Electrical Technology"**, S. Chand Publications

ELECTRICAL MACHINES LAB

1. To obtain magnetization characteristics of a d.c. shunt generator
2. To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded
3. To obtain efficiency of a dc shunt machine using Swinburn's test
4. To perform Hopkinson's test and determine losses and efficiency of DC machine
5. To obtain speed-torque characteristics of a dc shunt motor
6. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7. To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/ Static Ward –Leonard method.
8. To study polarity and ratio test of single phase and 3-phase transformers
9. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11. To obtain 3-phase to 2-phase conversion by Scott connection.
12. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O

ANALOG & DIGITAL COMMUNICATION

SECTION A

Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing **Angle Modulation:** Basic definitions Narrow band

and wideband frequency modulation, transmission bandwidth of FM Signals Generation and detection of frequency modulation

SECTION B

sampling process, Analog Pulse Modulation Systems-Pulse Amplitude Modulation, , Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation , Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison ofabove digital techniques.

SECTION C

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques **Introduction to Information Theory:** Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin," Communication Systems" John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,"Electronic Communication Systems" 4th Edition, Tata McGraw Hill
3. Simon Haykin, "Digital Communications" John Wiley & Sons

Reference Books:

1.B.P. Lthi, "Modern Analog & Digital Communication Systems" Oxford University Press.
2.Taub & Schilling, "Communication System: Analog and Digital" Tata Mc Graw Hill
3.R.P.Singh & S.D. Sapre, "Communication Systems Analog and Digital" Tata McGraw Hill.

Practical List:

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study sampling and reconstruction of Pulse Amplitude modulation system.
5. To study Pulse Width Modulation and Pulse Position Modulation.
6. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
7. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
8. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
9. Study of Amplitude shift keying modulator and demodulator.
10. Study of Frequency shift keying modulator and demodulator.
11. Study of Phase shift keying modulator and demodulator.

TRANSDUCERS

Section-A

Transducers: Classification of Transducer ,Principle of Transduction, Characteristics & Choice of Transducer, Factor Influencing the choice of transducers,

Variable Resistance Transducer: Potentiometer Loading Effects ,Construction Of Potentiometer .
Variable capacitance Transducers: Air Gap & dielectric filled, Differential Arrangement, Applications.
Variable inductance Transducers : LVDT , RVDT

Section-B

Frequency Generating Digital Transducer : Digital encoder Classification, Construction
Piezoelectric Transducers: Modes of Operation, equivalent Ckt and Impulse Response and Applications
Vibration Pick Up: Measurement Methods , Vibrometer, measuring monitoring and Blancing.
Speed Pick Up: Techometer : mechanical and Electrical , Contacless strobospoes.
Photo Detector: Photo Diode , Photo transistor, Photo Multiplier , Solar Cell
Acceleration Pick Up: accelerometers, Seizmic Accelerometer Calibration

Section –C

Temperature measurement: Standards & calibration; thermal expansion methods- bimetallic thermometers, liquid-in-glass thermometers, thermoelectric sensor (thermocouple) – common thermocouple, reference junction considerations, special materials, configuration & techniques; resistance thermometers, thermistors, digital thermometers. Radiation Methods – radiation fundamentals, radiation detectors: thermal and photon, automatic null-balance radiation thermometers, monochromatic brightness radiation thermometers, two colour radiation thermometers,.

Text Books:
1. R.K Jain ," Mechanical industrial Measurements " Khanna Publishers.
2. A.K. Sawhney,"Electrical and Electronics Measurements and Instrumentation " Dhanpat Rai & Sons.
3. BentLex, "Principle of Measurements System" Pearson Education.

Reference Books:
1. D Patranabis, Sensors and Transducers, PHI, 2nd ed.
2. E. A. Doebelin, Measurement Systems: Application and Design
Mc Graw Hill, New York
3. H. K. P. Neubert, Instrument Transducers, Oxford University Press, London and Calcutta
4. E. DOEBELIN and D. N. Manik, "Measurement systems application and design", 5th Ed., TMH, 2007, New Delhi.

TRANSDUCER LAB

1. To draw the characteristics of following temperature transducers :-
(a) PT 100 (b) Thermistor (c) Thermocouple
2. To perform experiment on ultrasonic depth meter.
3. To draw the characteristics of K type thermocouple.

4. Water level measurement kit.
(a) To draw I/P vs O/P characteristics.
(b) Study of water level indication.
(c) To plot the curve between error and different measured water level.
5. Load Cell Kit.
(a) To perform experiment and plot curve between load and strain.
(b) To study about excitation.
(c) To plot error curve at different loads.
6. To study Piezo electric vibration pickup.
7. LVDT kit.
(a) To study excitation and balancing network.
(b) To study phase difference.
(c) To plot curve between displacement and output voltage.
8. Torque measurement kit.
(a) To study about unbalanced strain.
(b) To plot the curve between torque vs strain.
9. To draw characteristics of speed vs voltage on various transducers (For e.g. Magnetic pickup,Hall
effect,Inductive pickup,).
10. To draw characteristics of LDR.
11. To Draw characteristics of variable capacitance type transducer.
12. To draw characteristics of variable Inductance type transducer.
13. To study various pressure sensors like Bourdon tube, Diaphragms, Pressure switches, bellows etc.

B. Tech. – Electronics & Instrumentation Engineering
V Sem
Principle of Management

SECTION A

What is management? Scientific approach-Taylor's contribution, administrative approach-Henry Fayol's contribution, human relation approach-Elton Mayo's contribution, system approach. Planning: Need and process, types of plans-goals, objectives, policies and strategies; decision making-situations and process.

SECTION B

Organizing: Organization structure, departmentation, centralization v/s decentralization, span of management, delegation and power of authority. Motivation-importance, theories of motivation-Maslow, McClleland Herzberg, theories.

SECTION C

Theories and styles of leadership-Trait, behavioral. Communication: Process and principles, types of communication, barriers to communication. Control: Process of evaluation & control, method of control.

References:

1. Agarwal R.D.: **Organization and Management**. Tata Mcgraw Hill, New Delhi.
2. Koontz O. Donnel: **Principles of Management.** Tata Mcgraw Hill, New Delhi.
3. Gupta C.B.: **Management: Theory and Practice**.
4. Tripathi P.C. & Reddy P.N.: **Principles of Management.** Tata Mcgraw Hill, New Delhi.
5. Robbins & D.Cenzo: **Fundamentals of Management**. Pearson Education.

ANALOG ELECTRONICS

SECTION-A

FEEDBACK AMPLIFIERS & OSCILLATORS: The general feedback structure, properties of negative feedback, feedback topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of series-shunt, series-series, shunt-shunt and shunt-series feedback amplifier. Stability criterion. Classification, Criterion for oscillation. Tuned collector, Hartley, Colpitts, LC and crystal oscillators.

SECTION-B

HIGH FREQUENCY & TUNED AMPLIFIERS: Biasing in BJT amplifier Circuits, small signal operations and models, single stage BJT CE amplifier BJT internal capacitances and high frequency model, frequency response of CE amplifier. Tuned amplifiers: Basic principle. Inductor losses, use of transformers, amplifier with multiple tuned circuits, synchronous tuning, stagger tuning.

SECTION-C

Operational amplifier & its Applications concept of ideal op-amp, offset voltage, bias current, slew rate, CMMR, , characteristics of standard IC OP-AMP, design of Integrator and differentiator, , summing amplifiers, differential and instrumentation amplifiers, Active filters, low pass, high pass, band pass, and band reject. OP-AMP RC Oscillator circuits: Wien-Bridge, Phase-Shift, .precision rectifier, Schmitt trigger, 555 IC counter timer.

Text Books/ Reference Books:

1. Sedra & Smith: **Microelectronic Circuits:** Oxford University Press.
2. Boylsted Robert, "Electronic Devices", PHI publication.
3. Gayakwad Ramakant A.: **OP-AMP & Linear Integrated circuits:** New Delhi (Prentice Hall) 3rd Edition 1994.

ANALOG ELECTRONICS LAB

1. Plot gain-frequency characteristics of BJT amplifier with and without negative feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.
2. Study of series and shunt voltage regulators and measurement of line and load regulation and ripple factor.
3. Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator
   frequency.
4. To design Inverting & non amplifier using op-amp.
5. To design summer using 741 IC
6. To design subtractor using 741 IC
7. To design Integrator using 741 IC
8. To design Differentiator using 741 IC
9. To design active filters: LPF, HPF.
10. To design Schmitt Trigger using 741/555 IC
11. To design the Astable Multivibrator using 555
12. To design the Monostable Multivibrator using 555

Microprocessors & Microcomputer Applications

SECTION A

Introduction: Microcomputers, Microprocessors. Bus structure of Microprocessor System. Microprocessor Architecture and Microcomputer Systems: Microprocessor architecture & operation with example of 8085 Microprocessor, architecture, Timing and sequencing, memory, I/O Memory and I/O synchronization. Memory speed requirements, interfacing devices, logic levels, loading and buffering. 8085/8080A Based Microcomputer systems: 8085 Microprocessor, Bus timings, Demultiplexing of Bus (AD0-AD7), Generating control signals, 8080 A Microprocessor: Instructions and timing, instructions (8 bit & 16 bit), Data transfer operations, arithmetic operations, logic operations, Branch operations, counter & timing delays, stack & subroutines.

SECTION B

Interfacing peripherals, I/O, Memory and Applications: Interfacing output display, input keyboard, memory, memory mapped I/O, Interrupts and DMA : 8085/8080A ,interrupts structure types and masking, priority interrupt structure, real time clock and internal times, consideration for using interrupts, DMA & 8257 DMA controller. Programmable interface devices. Programmable Peripheral devices, Parallel communication, 8255 Programmable Peripheral Interface, Serial Communication, RS-232-C interface, Data communication with TTY using SOD & SID lines.

SECTION C

Software model of the 8086/8088 microprocessor, Memory address space & data organization, Segment registers & Memory segmentation, Dedicated & general use of memory, Instruction pointer, Data registers, Status register, Generating a memory address, stack, I/O address space, Addressing modes of 8088. The 8086/8088 instruction set, Data transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instruction, Jump instructions, Subroutine & the subroutine handling instructions. Loop & loop handling instructions.

Text/Reference Books:

1. R.S. Gaonker: **Microprocessor Architecture, Programming & Applications With The 8085/8080-A:** Wiley Eastern Limited ISBN 085226, 2973, 1988.
2. K.L. Short: **Microprocessor and Programmed Logic:** Prentice Hall of India Pvt. Ltd. 1988. 2nd edition ISBN-0-87692-515-8.
3. Douglas V. Hall: **Microprocessor and Interfacing:** Mc-Graw Hill Book Company, 1987 ISBN-0-07-100462-9.

Microprocessors Practical

1. Write a program to calculate the addition of 16-bit No.
2. Write a program to calculate the addition of 32-bit No.
3. To transfer the content of one memory location to other memory location.
4. To exchange the content of one memory location to other memory location.
5. To find out the maximum of N given nos.
6. To generate the Fibonacci series.
7. To find location of given nos.
8. To find out the multiplication of two 16 –bit nos.
9. To find out the minimum of N given

Biomedical Instrumentation

Section A: Human Body Subsystems- Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.

Transducers And Electrodes- Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.

Biopotentials- Electrical activity of excitable cells, ENG, EMG, ECG, ERG, ECG. Neuron potential.

Cardiovascular System Measurements-

Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.

Section B: INSTRUMENTATION FOR CLINICAL LABORATORY- Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O_2 and CO_2 concentration in blood, GSR measurement. Instrumentation for clinical laboratory: Spectrophotomentry, chromatography, Hematology,

MEDICAL IMAGING: Diagnostic X-rays, CAT, MRI, thermography, ultrasonography, medical use of isotopes, endoscopy.

PATIENT CARE, MONITORING AND SAFETY MEASURES Elements of Intensive care monitoring basic hospital systems and components, physiological effects of electric current shock hazards from electrical equipment, safety measures, Standards & practices.

Section C: COMPUTER APPLICATIONS AND BIOTELEMETRY: Real time computer applications, data acquisition and processing, remote data recording and management.

THERAPEUTIC AND PROSTHETIC DEVICES - Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hem dialysis, Applications of Laser.

Text Book:

1. Leslie Cromwell: "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 1997.

REFERENCES

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, "introduction to Biomedical equipment Technology", John Wiley and sons, New York, 1997.

FIBER OPTIC & LASER INSTRUMENTATION

Section A: OPTICAL FIBERS- Introduction, Ray theory, Optical fibers: multimode, single mode, step index, graded index, plastic & glass fibers.

Transmission Characteristics of Optical Fibres - Introduction, Attenuation, Material absorption loss, Fibre bend loss, Dispersion (intermodal & intramodal)

Section B: OPTICAL FIBER SOURCES & CONNECTION - Light Emitting Diode - Structure, Material,

Characteristics, Power & Efficiency. Fiber Alignment, Fiber splices, Fiber connectors, Expanded beam connectors,
OPTICAL DETECTORS - Optical detection principles, quantum efficiency, responsivity, PIN
photo diode, Avalanche photo diodes, Noise in Detectors, Photo Diode Materials.
OPTICAL FIBER MEASUREMENTS - Measurements of Fiber Attenuation, Dispersion,
Refractive Index Profile, Cut off Wave Length, Numerical Aperture & Diometer.

Section C: LASER - Emission and absorption of radiation, Einstein relation, Absorption of radiation,
Population inversion, Optical feed back, Threshold condition. Population inversion and threshold Working of three level & four level laser. Basic idea of solid state, semiconductors, gas & liquid laser. Basic concept of Q-switching & mode locking.Laser applications for measurement of distance, Velocity, Holography.

Text Books:
1. John M. Senior: optical Fiber Communication, PHI Publication.
2. Wilson howkes: Opto Electronics, PHI Publication**.**
3. B.B Land: Laser and Non Linear Optics, willey Eastwern.Publication

Reference Books:

1. Gerd keiser:-Optical Fiber Communication, McGraw Hill Publication.
2. Palais: Fiber Optics Communication, Pearson education Publication
3. Mxnbaen- : Fiber Optics Communication, Pearson education Publication

Lab Practicals
1. To study up a fiber optics analog and digital link.
2. To study the losses in fiber optics
3. To study numerical aperture of optical fiber
4. To study the characteristics a optical fiber and LED
5. To study V I Characteristics of photo detector.
6. To study operation of Optical power meter.
7. Fiber Optic Temperature Sensor.
8. Micro bending / pressure sensor
9. Optical Time□Domain Reflectometry (OTDR)
10. Characterization of LASER.

DIGITAL SIGNAL PROCESSING

SECTION A

Introduction of Signals, Systems and Signal Processing, Classification of Signals and Systems. Signal Models - Continuous Time versus Discrete time signals, Periodic and Aperiodic Signals, Phasor Signals and Spectra, Energy and Power Signals, System Modeling Concepts, The superposition integral for Fixed and Linear Systems, Impulse Response of a Fixed and Linear System - Fourier Series - Trigonometric Series- Exponential Fourier Series-Symmetry Properties of the Fourier Coefficients.

Fourier Integral, Energy Spectral Density, Fourier Transforms in the Limit, Fourier Transform Theorems and Pairs, System Analysis with Fourier Transform. Convolution, correlation and characteristics of linear time invariant systems

SECTION B

Discrete Time Signals and Systems - Review of Sampled Data Systems, Time Domain Representations of Discrete Time Signals, Frequency Domain Representation of Discrete Time Signals, Discrete Time Signals obtained by sampling, Discrete Fourier Transform. Z-Transform - Definition and Examples, Inverse Z-Transform, Properties of the Z-Transform, Introduction to Realization of Digital Systems - Block Diagrams and Signal Flow Graphs. Introduction to Realization of an IIR and FIR systems, Discrete Fourier Transforms (DFT) and Fast Fourier Transform (FFT).

SECTION C

Design of Digital Filters: Introduction to Filters, A comparison of IIR and FIR Digital Filters. Design of IIR Digital Filters -Impulse Invariant Transformation, Bilinear Transformation, Design of Digital Butter worth and Chebyshev Filters. Design of FIR Digital Filters - Windowing and Rectangular Window, Filter Designs using Windows, Frequency Sampling Technique. DSP tools and DSP techniques in various applications.

Text Books:

1. Johnson Johnny R.: **Introduction to Signal Processin:** Prentice-Hall of India, 1998.
2. Oppenheim V. Alan: **Signal & Systems:** Prentice-Hall of India, 1995.
3. Proakis G.John,: **Digital Signal Processing:** Prentice-Hall of India, 3rd edition, 2002.

VI Semester

ECONOMICS FOR ENGINEERS

SECTION A

What Economics is all about? Micro and Macro Economics. Origin and meaning of Engineering Economics, Role of Economics in Engineering, Scope of Engineering Economics. Theory of Demand: Law of Demand, Demand Function and Determinants of Demand, Types of Demand. Elasticity of Demand: Concept, Types and Measurement.

SECTION B

Production function and Laws of Production. Optimal Input combination. Cost concepts and cost output relationship. Types of market structures; Determination of equilibrium price and output under perfect competition.

SECTION C

Timevalue of Money and Project Evaluation: Interest Formulas; Cash Flow Diagram; Principles of Economic Equivalance, Evaluation of Engineering Projects using methods of Present Value and Internal Rate of Return. Capital Budgeting: Concept and significance of capital budgeting. Depreciation Analysis: Meaning and causes of depreciation; methods of calculating depreciation – straight-line and declining balance methods.

Books Recommended:

1. Gerald J. Thuesen and W.J. Fabrycky: **Engineering Economy, Ninth Edition:** PHI Learining Private Limited, New Delhi.
2. S. ParkChan: **Contemporary Engineering Economics:** 3rd Edition, Prentice Hall.
3. M. Parkin: **Economics:** 5th Edition, Addison Wesley.
4. Mahendra P. Agasty: **Engineering Economics and Costing, Second Edition:** Scitech Publications (India) Pvt. Ltd.
5. R. Panneerselvam: **Engineering Economics, Tenth Printing:** PHI Learning Private Limited, Delhi.

ANALYTICAL INSTRUMENTATION

Section A:

SPECTROSCOPIC ANALYSIS- Absorption and reflection techniques, Atomic techniques-emission,
absorption and fluorescence, X-ray spectroscopy, Photo acoustic spectroscopy, Microwave spectroscopy, Mass spectrometers.

GAS ANALYSIS - Infrared and ultraviolet absorption analyzers, Paramagnetic oxygen analyzers,
Thermal conductivity analyzers and Chemiluminescence analyzers.

Oxygen Analysis:
(a) Paramagnetic method
(b) Thermomagnetic method
(c) Zirconia cell type
(d) Continuous oxygen analysis with micro electrodes.
Spectroscopic methods: IR radiation absorption type, IR sources and detectors, their comparison, single channel and dual channel IR methods, Dispersive spectrometry using monochromaters, FT-IR Spectrometers.

Section B:

Liquid Analysis:
(a) Electrodes-Ion selective, Molecular selective types- their variations and application.

(b) Dissolved oxygen analysis cells
(c) pH electrodes-pH analysis with circuits and applications
(d) Conductivity cells – standards, circuits, applications
(e) Polarography- apparatus, circuits and techniques-pulse polarography, applications
(f) Absorption spectrometry in UV and visible range, sources and their spectral ranges,
detectors, monochromaters
(g) Colorimetry
(h) Atomic spectral methods

Section C:

CHROMATOGRAPHY- Paper and thin layer chromatography. Basic parts of gas chromatography,
Types of columns, Detection systems- thermal conductivity, Flame ionization, Electron capture detector.
Types of liquid chromatography, Liquid chromatography, Column and detection systems.

ENVIRONMENTAL POLLUTION MONITORING- Air pollutants, Air pollution monitoring instrumentscarbon
mono oxide, sulpher dioxide, nitrogen oxide, hydro carbon & ozone. Smoke monitor, Dust monitor,
Visible emission monitoring system.
Noise Pollution & its Monitoring.

Text Books:
1. Jones E.B: **Instrumentation technology**.
2. Jain R.K: **Mechanical & Industrial Measurements:** Khanna Publications.
3. R.S. Khandpur, Handbook of Analytical Instruments, TMH, New Delhi

Reference Books:

1. D. A. Skoog, Principles of Instrumental Analysis, Saunders College Publishing, Philadelphia
2. H. H. Willard, L.L. Merrit, J. A, Dean and F. A. Settle, Instrumental methods of Analysis, CBS
Publishers, Delhi
3. D. Patranabis, Principles of Industrial Instrumentation, TMH, New Delhi

ANALYSTICAL INSTRUMENTATION LAB

1. To measure pH value of given solution using pH meter.
2. To determine suspended particular matter using right volume air samples.
3. Find out concentration of (Na or K) by flame photo meter in the given sample.
4. To measure transmittance and absorption of a solution using Single beam spectro photo meter.
5. To study water analysis kit & measure pH, temperature, conductivity, dissolved O2 of a given solution.
6. To measure the conductivity of solution indicator controller.
7. To study the analysis of flue gases.
8. To study ion selective electrode.

9. To study pH monitor and controller.
10. To study silica analyzer and zirconia based oxygen analyzer.
11. To study gas/ liquid chromatograph.

INDUSTRIAL MEASUREMENTS & INSTRUMENTATION

Section A: TEMPERATURE MEASUREMENTS - Bimetallic thermometers, Resistance thermometers, Thermocouples, Thermistors. Radiation pyrometers, Optical pyrometers
PRESSURE MEASUREMENTS - Manometers, bourdon tubes , Diaphragms, Bellow's, Electrical pressure transducers - Strain gauge pressure transducer, Potentiometric pressure transducer, Capacitive pressure transducers, Piezo electric pressure transducers, Differential pressure transmitters.

Section B: FLOW MEASUREMENTS - Differential pressure flow meter, Orifice plates, Venturi tubes, Flow nozzles, Pitot tubes, Rotameters. Electromagnetic and ultrasonic flow meters, Vortex flow meters, Mass flow type meters. Shunt flow meters.
LEVEL MEASUREMENTS - Float type, Hydrostatic type, Differential pressure method, Electrical conductivity method, Capacitance level, Ultrasonic and nucleonic gauges. Capacitance probes.
DENSITY MEASUREMENTS - Hydrometers,
Introduction of PLC, SCADA, & DCS Systems

Section C: PROCESS INDUSTRIES INSTRUMENTATION –
Process industries instrumentation, C&I IN CHEMICAL REACTORS – Classifications, Temperature Control Schemes, Reactor, Temperature Control, Reactor Temperature Control with recirculation. Cascade Temperature Control with heating & cooling capability.
C& I IN HEAT EXCHANGERS - Classifications, Steam Heaters. Control Schemes – Feedback control of steam heated exchanger, Control valve in condensate line, Pumping traps, Steam trap replaced by level control, By pass control.

Text Books:-

1. Bela G. Liptak: “Instrumentation in the processing Industries”, Chilton Book Company
2. M. Douglas Considine & S. P. Ross: “Hand Book of Applied Instrumentation”, McGraw Hill.
3. Jain R. K. ; “Mechanical & Industrial measurements”, Khanna Publishers
4. Jones : “Instrumentation Technology”, Vol-1, Butterworth
5. A. K. Sawhney : “Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai & sons.

POWER ELECTRONICS

SECTION A

Need of power electronics, Introduction to power electronics devices (static and dynamic characteristics) power diodes, power transistor, power MOSFETS, IGBT, MCT, GTOs, Triac. Thyristor SCR: Operational characteristics, Turn ON methods, switching characteristics, thyristor protection: over voltage protection, over current protection, gate protection, snubber circuit. Firing circuits for Thyristors, heating, series and parallel combination of Thyristors.

SECTION B

Commutation Techniques: Load commutation, resonant- pulse commutation, complementary commutation, impulse commutation, line commutation. Phase controlled rectifier: Principal of phase control, single and three phase converters. Effect of source impedance on the performance of converters, dual converter (ideal and practical) DC choppers: Principle, control strategies, step-up and step-down choppers.

SECTION C

Inverters: Single-phase voltage source inverters, 180 and 120 mode operation, Fourier analysis of single-phase inverter output voltage. Pulse width modulated inverters, Reduction of harmonics in the inverter output, single-phase current source inverters with ideal switch. Cyclo-converters: Step-up and step-down cyclo-converter, Single phase to single-phase cyclo-converters three-phase half wave cyclo-converters.

Text Books:

1. Rashid Mohammad H.: **Power Electronics Circuits, Devices And Applications:** PHI publication, 14th reprint Edition.
2. Bimbhra P.S.: **Power Electronics:** Khanna Publication, 3rd Edition.

Reference:

1. Rama Moorthy: **An Introduction To Thyristors And Their Application:** 2nd Edition, ISBN-81-85336-67-9.

POWER ELECTRONICS LABORATORY

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without freewheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. . To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.

Virtual Instrumentation

Section A

Virtual Instrumentation: Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, and comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Section B

Data acquisition basics: Introduction to data acquisition on PC, Sampling fundamentals, Input/ Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

VI Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB.

Section C

Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

Networking basics for office & Industrial applications, VISA and IVI.

VI toolsets, Distributed I/O modules. Application of Virtual Instrumentation: Instrument Control, Development of process database management system.

Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

TEXT BOOKS:

1. Gary Johnson, LabVIEW Graphical Programming, 2nd edition, McGraw Hill, Newyork, 1997.

2. Lisa K. wells & Jeffrey Travis, Lab VIEW for everyone, Prentice Hall, New Jersey, 1997.

REFERENCES:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.

CONTROL SYSTEM

SECTION A

Open loop and closed loop systems, mathematical model of systems, differential equations and transfer functions; Block diagram algebra, signal flow graphs; +ve and -ve feedbacks, effects of feedback servo- components, synchors, stepper motor, potentiometer as an error detector; comparison of AC and DC servomechanism.

SECTION B

Standard test signals, time response of first and second order systems, steady state errors and error constants, Design specifications of second order systems, Effects of derivative and integral error compensation, velocity feedback; PID controller, Design considerations for higher order systems in brief, performance indices.

Concept of stability, necessary conditions for stability, Routh Hurwitz Stability criterion, relative stability criterion, relative stability in terms of Routh Hurwitz criterion; Root-locus technique.

SECTION C

Correlation between time and frequency response specifications; Frequency domain plots, polar plots, bode plot, log magnitude versus phase plots; Gain-margin, Phase-margin, Nyquist stability criterion; Constant-M and constant-N circles; closed loop frequency response from these.. Preliminary considerations of classical design, cascade and feedback compensation, time-domain design using lag, lead and lag lead compensation, frequency domain design using lag.

State variable representation and solution of state equation of LTI control systems.

Text/Reference Books:

1. I.J. Nagrath and M. Gopal: **Control System & Engineering 2nd Ed.:** Wiley Eastern Ltd.,1985.
2. Katsushiko Ogata: **Modern Control Engineering 3nd Ed.**: Prentice Hall of India Pvt. Ltd., 2001

Control Systems Practical

3. To study and controlling action using PID controller and calculate the first overshoot temperature and plot the graph.
4. To study the DC position controller and find out the tachometer gain.

Software based experiments (Use MATLAB, LABVIEW software etc.)

5. To determine time domain response of a second order systems for step input and obtain performance parameters.
6. To convert transfer function of a system into state space form and vice-versa.
7. To plot root locus diagram of an open loop transfer function and determine range of gain 'k for stability.
8. To plot a Bode diagram of an open loop transfer function.
9. To draw a Nyquist plot of an open loop transfer functions and examine the stability of the

ABVIEW LAB EXPERIMENTS

Exercise 1 – Examine the Signal Generation and Processing VI and run it.
Exercise 2 – Complete the following steps to create a VI that takes a number representing degrees Celsius and converts it to a number representing degrees Fahrenheit.
Exercise 3 – Understanding of Sub VI.
Exercise 4 – Complete the following steps to build a VI that uses the Formula Node to perform a complex mathematical operation and graphs the results.
Exercise 5 – To use a While Loop and a waveform chart to acquire and display data.
Exercise 6 – Use shift registers on For Loops and While Loops to transfer values from One loop iteration to the next.
Exercise 7– Understanding of using waveform graphs.
Exercise 8 – Understanding of Error clusters.
Exercise 9 – Create a VI using state machine architecture that simulates a simple test sequence
Exercise 10 – To use the Format Into String, Concatenate Strings, and String Length functions.
Exercise 11–Temperature Data Acquisition (DAQ) and display.

B. Tech. – Electronics & Instrumentation Engineering
VIII Sem
Microcontroller & Embedded System

Section A

THE 8051 MICROCONTROLLER**:** Introduction, The 8051 microcontroller hardware, I/O pins, Port, External memory, Counters and Timers, Serial data. Interrupts.

8051 ASSEMBLY LANGUAGE PROGRAMMING**:** Addressing modes, External data moves, push and pop opcodes, Logical operations, Byte level and bit level logical operations. Arithmetic operations, Jump and call instructions, Interrupts &

returns.

Section B

REAL TIME CONTROL**:** Interrupts, Multiple sources of interrupts, Non maskable sources of interrupts, Interrupt structure in 8051,Timers,Free running counter & Real Time control .

SYSTEM DESIGN: Serial I/O interface, Parallel I/O ports interface, Digital and Analog interfacing methods, LED array, keyboard, Printer, Flash memory interfacing.

Section C

INTRODUCTION TO EMBEDED SYSTEM: Application of Microcontrollers in interfacing, Robotics, MCU based measuring instruments. Real Time Operating System for System Design, Multitasking System, Task Definition in a Multitasking System, Round Robin Scheduling, Full Pre-emptive Scheduling, Basic study and Features of Commercial RTOS : WINCE and Embedded Linux.

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition.
2. Chhabra Bhupendra Singh, "Microcontrollers & its Applications" Dhanpat Rai Publishing Company
3. Berger Arnold S.: **Embedded Systems Design**
4. Sinon David E. : **An Embedded Software Primer**

Reference Book:

1. Ayala Kenneth, "The 8051 Microcontroller", Cengage Learning, 3rd Edition
2. Shah Satish, " 8051 Microcontrollers MCS 51 Family and its variants", Oxford
3. Ghoshal Subrata, " 8051 Microcontroller Internals, Instructions, Programming and Interfacing"
Pearson
4.Qing Li with Caroline Yao: Real Time Concepts for Embedded Systems
5.Catsoles John: Designing Embedded Hardware
6.D. Gajski, F. Vahid, S. Narayan and J. Gong: Specification and Design of Embedded Systems: Prentice Hall.
7. Jorgan Syaunstrup and W. Wolf: Hardware Software Co-Design : Principals and Practice: Kluwer Academic Publishers,.
8. Frank Vahid, Tony Givaris: Embedded System Design, A unified Hardware/Software Introduction: John Wiley & Sons, Inc., 2003

Programs based on 8051

1. Implement given boolean function using 8051.

2. Interface 8 bit ADC with microcontroller.

3. Generate a square wave with 50% duty cycle by using data transfer and branching instructions.

4. Realise a full adder using microcontroller.

5. Configure timer of 8051 for preliminary studies of a timer.

6. To study internal and external interrupts used in 8051.

VLSI Design

SECTION A

Recapitulation of basics, semiconductor devices, orientation effect, impurities, defects, Fabrication: Crystal growth & wafer preparation, Epitaxial growth, oxidation, photo-lithography, etching technology (wet & dry), Diffusion Fick's law, chemical vapor deposition, CVD reactors, ion implantation, metallization & patterning, photo resistive material, packaging.

SECTION B

Overview of VLSI methodologies, VLSI design flow, type of ICs (monolithic, thick film, thin film, hybrid), Fabrication steps involve in, different type of resisters, capacitor, diode, transistor (Darlington etc), JFET, MOSFET, isolation technique used in fabrication, fabrication of typical circuits.

SECTION C

Digital CMOs circuit, MOS devices, V-I characteristics, Design & detailed analysis of MOS inverters (resistive load, enhancement load, depletion load, CMOS), delay & power analysis, Design layout of simple CMOS gates.

Circuit implementation of combinational circuit, circuit implementation of sequential circuits - FFs, SRAM, DRAM.

Text Books:

1. Sze, S.M.: **VLSI Technology:** TMH
2. Kang S.M. Leblebici Y,: **CMOS digital Integrated Circuits: Analysis & Design** : Mc. Graw Hill

Reference Books:

1. Botker B.R.,: **Microelectronics:**
2. Gandhi, S.K. : **VLSI Fabrication Principle :**
3. Plummer J., Deal M., Griffin P.,: **Silicon VLSI Technology** : Prentice Hall
4. Sarrafazadeh M. & Wong C.K.: **An introduction to VLSI Physical Design:** Mc Graw Hill.
5. Martin Ken: **Digital Integrated Circuits:** Oxford press.
6. Neil H.E. Weste & Kamran Eshraghian: **Principle of CMOS VLSI Design**

VLSI LAB

1. DESIGN, SIMULATION AND ANALYSIS OF FOLLOWING CIRCUITS USING CIRCUIT SIMULATOR ORCAD)

I. PUSH PULL AMPLIFIER.
II. DIFFERENTIAL AMPLIFIER
III. NMOS AND CMOS INVERTER
IV. TWO INPUT NAND GATE
V. TWO INPUT NOR GATE

VI. OPERATION AMPLIFIER
VII. COUNTER
VIII. A/D CONVERTER
IX. D/A CONVERTER

2. Simulation of Following devices using HDL (XILINX ISE)

i. Multiplexer
ii. Decoder – Behavior, data flow, structure
iii. Half adder- data flow, structure
iv. Full Adder- Behavior, data flow, structure, Mixed Style
v. Parity Generator
vi. Counter
vii. Shifter unit
viii. Swap unit
ix. 4-bit Parallel Adder

3. FPGA Implementation – Sparten-3E

ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC CONTROL

Section A

: **NEURAL NETWORKS** - Introduction Motivation, Biological neural networks and simple models, The artificial neuron model, Hopfield nets, Perceptrons & threshold logic devices, Single and multilayer networks, applications.
LEARNING ALGORITHMS- Supervised and unsupervised learning, Hebbian learning, delta learning, competitive learning. Back propagation and feedforward methods, Recent trends and future directions.

Section B

FUZZY LOGIC- Introduction -Uncertainty & precision, Statistics and random process, Uncertainty in information, Fuzzy sets and membership.
MEMBERSHIP FUNCTIONS: Features of membership function. Standard forms and boundaries, Fuzzification, Membership value assignment – Intuition, Inference, Neural networks.
FUZZY TO CRISP CONVERSIONS: Maximum membership principle.

Section C

DEFUZZIFICATION METHODS- Centroid method, Weighted average method, Mean max membership.
FUZZY RULE BASED SYSTEMS: Natural language, linguistic hedges, Rule based system – Canonical rule forms, Decomposition of compound rules, Likelihood and truth qualification Aggregation of Fuzzy rules. Graphical techniques of reference.
FUZZY CONTROL SYSTEM- Simple Fuzzy Logic controller, General FLC, Special forms of FLC system models, Industrial application.

TEXT BOOKS:

1. Timothy J. Ross- Fuzzy logic with engineering applications, McGraw Hill Publication.
2. Yagya Narayana- Artifical Neural Networks,PHI Publication.

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

Departmental Electives

ENERGY EFFICIENCY AND CONSERVATION

SECTION A

Energy conservation:-Principles of Energy Conservation, Energy conservation Planning, Energy conservation in small scale industries, Large scale industries and in electrical generation, transmission and distribution. Energy conservation Legislation. **Energy Audit:-**Aim of energy Audit, Strategy of Energy Audit, Energy management Team Considerations in implementing energy conservation Programme, Instruments for energy audit, Energy audit of Electrical System, HVAC, Buildings, Economic analysis.

SECTION B

Demand Side Management:- Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM. **Voltage and Reactive power in Distribution System:-** Voltage and reactive power calculations and control: Voltage classes and nomenclature, voltage dropcalculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing.

SECTION C

Efficiency in Motors and Lighting system:- Load scheduling/shifting, Motor drives-motor efficiency testing, energy efficient motors, and motor speed control. Lighting-lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows.UPS selection, Installation operation and maintenance. Indian Electricity Act 1956, Distribution Code and Electricity Bill 2003

Text / Reference Books

1. Tripathy S. C., “Electric Energy Utilization and conservation”, Tata McGraw Hill.
2. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.
3. “The Efficient Use of Energy”, Edited by I.G.C.Dryden, Butterworths, London, 1982.
4. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
5. L.C.Witte, “P.S.Schmidt, D.R. Brown, Industrial Energy Management and Utilization”,
HemispherePubl, Washington, 1988
6. Power Capacitor Handbook, Butterworth & Co (Publishers) Ltd, 1984.
7. Electrical Systems Analysis and Design for Industrial Plants, McGraw-Hill Book Company.

AUDIO VIDEO SYSTEMS

SECTION A

AUDIO SYSTEMS: Types of microphones and speakers, Monophonic, stereophonic and quadraphonic audio systems.

DISC AND MAGNETIC RECORDING & REPRODUCTION: Monophonic and stereophonic disc recording and reproducing systems, Magnetic recording , playback, Biasing & equalization, Recording medium, Magnetic heads-replay & eraser heads, Audio cassettes, Tape speed, Maximum usable frequency, Tape transport mechanism, Distortion & noise aspects, Hi-Fi stereo system.

SECTION B

VIDEO CASSETTE RECORDERS: Video recording requirements, Video tape formats. Modulation-up conversion and down conversion of video signal, Servo systems, Functional Block diagram of VCR: video recording & playback.

COMPACT DISC RECORDING & REPRODUCTION: advantages of Compact disc, & its Specifications, CD player, optical recording, CD technology & manufacturing, CDROM, CD video.

SECTION C

VIDEO CAMERAS: Image conversion principle, Plumbicon, Sidicon camera tubes, three tubes colored camera, Block diagram of color camera tube.

TV ENGINEERING: Scanning process, Interlaced scanning, Composite video signals, Principle of black & white TV, color TV, Primary colours, Chrominance & luminance signals.

Recommended Books:

1. S.P. Bail & R. Bali: **Audio Video systems:** Khanna Book Publishing Co. Delhi.
2. Ajay Sharma: **Audio and Video Systems:** Dhanpat Rai & Co.
3. R.G. Gupta: **Audio and Video Systems:** Tata Mc-Graw Hill.

SPECIAL ELECTRICAL MACHINES

Section A

Poly-phase AC Machines: Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power) **Single phase Induction Motors:** Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start capacitor-run and shaded pole motors.

Section B

Two Phase AC Servomotors: Construction, torque-speed characteristics, performance and applications. **Stepper Motors:** Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications. **Switched Reluctance Motors:** Construction; principle of operation; torque production, modes of operation, drive circuits.

Section C

Permanent Magnet Machines: Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators.**Single Phase Commutator Motors**: Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen " Principles of Electrical Machines and Power Electronics" John willey & Sons, 2001
3. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001

Reference Books:

1. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
2. M.G. Say " Alternating current Machines"Pitman & Sons

MECHATRONICS

SECTION A

Mechatronics and its scope: Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level. Signal conditioning amplification, filtering & data acquisition. Elements of Microprocessors & Microcontrollers, Programmable **logic controllers &** Communication interface.

SECTION B

Pneumatic and Hydraulic actuation systems: Directional control valves, pressure control valves and cylinders. process control valves. Mechanical actuation system-kinematic chains, cams, geartrains. Ratchet & Pawl, dampers, bearings. Electrical actuation system. Mechanical switches- solenoid operated solid state switches, DC, AC & stepper motors. Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.

SECTION C

Case Studies of Mechatronic Systems: Industrial Robot and its control Automobile Engine Control Electromechanical disc-control. **Vehicle suspension Control:** Micro mechanical systems. Computer Printer, VCR, Fax Machine, NC Machine.

References:

1. Rolf Isennann, " Mechatronics Systems", Springer, 2005.
2. W. Bolten, "Mechatronics", Pearson Education 2003.

ROBOTICS AND AUTOMATION

SECTION A

BASIC CONCEPTS- Automation and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system, Dynamic stabilization of Robotics.
POWER SOURCES AND SENSORS- Hydraulic, Pneumatic and electric drivers – Determination HP of motor and gearing ratio, variable speed arrangements, Path Determination - Machinery Vision – Ranging – Laser – Acoustic, Magnetic Fiber Optic and Tactile Sensor

SECTION B

MANUPULATORS- Construction of Manupulators, Manupulator Dynamic and Force Control, Electronic and Pneumatic manupulators.
ACTUATORS AND GRIPPERS- Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits, End Effecter, Various types of Grippers, Design consideration.
Differential transformation and manipulators, Jacobians – problems.Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

SECTION C

KINEMATICS- Forward and Inverse Kinematic Problems, Solutions of Inverse Kinematic problems, Multiple Solution, Jacobian Work Envelop – Hill Climbing Techniques.
PATH PLANNING- Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.
CASE STUDY- Multiple Robots – Machine Interface – Robots in Manufacturing and Non-Manufacturing applications – Robot Cell Design Selection of a Robot.

TEXT BOOKS:
1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics / Fu K S/ McGraw Hill.

REFERENCES:
1. Robotics, CSP Rao and V.V. Reddy, Pearson Publications (In press)
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.
3. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
4. Robotic Engineering / Richard D. Klafter, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
6. Introduction to Robotics / John J Craig / Pearson Edu.
7. Robot Dynamics and Control by Mark W. Spong and M. Vidyasagar, John Wiley & Sons

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

Section A:

1) Single Line Diagrams of generating stations and substations, layout of power plants – Hydel, Thermal & Nuclear.

2) Electrical Machine Assembly Drawing using Design Data and sketches
Transformer: Assembly and Sectional views of single phase and three phase Core and Shell Types.

Section B:

DC Machine: Assembly and Sectional views of yoke, field systems, armature and commutator of DC machine dealt separately.
Alternator: Assembly and Sectional views of Stator and Rotor dealt separately

Winding Diagram:
a)Developed Winding Diagram for DC machines: Simplex and duplex, Lap and Wave Single and Double Layer.

Section C:

Developed winding diagram for AC machines:
Integral slot single layer and double layer full-pitched lap and wave winding.
Integral slot single layer and double layer fractional pitched lap and wave winding.
Fractional slot lap and wave winding

Study of auto CAD graphics package. Exercises on computer aided electrical drawing - single line diagram for a typical substation, simplex single layer, lap and wave DC armature winding, sectional views of single-phase core type transformer.

Text Books:

1. **Electrical Drafting -**Devalapur, S. F., Eastern Book Promoters, Belgaum, 2006.
2. **Electrical Engineering Drawing -**Bhattacharya, S. K., Wiley Eastern Ltd (Part A).
3. **Introduction to Auto CAD 2000-**Mark Dix Paul Riley, Pearson Education.

Reference Books:

1. **Electrical Engineering Drawing -**Naranga, K. L., Satya Prakashan, ND Publications.
2. **Principles of Interactive Computer Graphics -**Newman, and Sporule, TMH Publishers.
3. **Teach yourself Auto- CAD –**Gibbs.
4. **Auto-CAD -**Cohn, TMH.

Reading Electives (Self Study)

RELIABILITY ENGINEERING

SECTION A

Introduction: Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.
Reliability Mathematics: Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations.

SECTION B

Reliability: Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set

methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

SECTION C

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance. **Reliability Testing:** Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Text Books :

1. R.Billintan & R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.

Reference Books:

3. S.K. Sinha & B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

Electronic Commerce

SECTION A

Whats and hows of Internet: Development and growth, DNS, Commercialisation of internet. Introduction to e~commerce: e-commerce, Opportunities, Framework, Recent Developments. Planning for Network Infrastructure & Web Architecture, Recent trends.

SECTION B

Introduction to Internet Protocols: Layers and Networking, Internet Protocol suite, Desk topTCP/IP, Mobile TCPIIP based Networking, Multicast IP.

Principles of Web Site Hosting and Promotion : Decision on Website Design, Legal issues, Domain Name Registration, Site Hosting,Web Site Registration, Offline & online web site promotion.

SECTION C

E-commerce Business Models: Brokerage, Advertising,' Infomediary, Merchant, Manufacturer, Affiliate, Community, Subscription, Utility, Tried and True models. Auctions as a price setting mechanism, Pricing Information, Versioning Infonnation: Cyberlaws, Electronic payment systems: Digital cash.

Text/ReferenceBooks:

1. Turban: **E-Commerce:** Pearson, 'New Delhi.
2. Kalakota and Whinston: **Frontiers of E-commerce:** Pearson, New Delhi.

Enterprise and Resource Planning (ERP)

SECTION A

ERP Overview, Benefit, Business Process Reengineering (BPR), data ware housing, Data mining, OLAP, Supply chain Management (SCM), MRP, Expert system.

SECTION B

ERP-A Manufacturing Perspective, ERP Module, ERP Market, ERP implementation life cycle, options of various paradigms, identification of suitable platforms, Role of SDLC/SSAD, Object oriented architecture.

ERP implementation, Hidden costs, Vendors, Consultant, Employees, Human Resource.

SECTION C

ERP& E-Commerce, Future Directives in ERP, ERP and Internet, Critical Factors Guiding, Selection and evaluation, Strategies for successful implementation, Impediments and initiatives to achieve success, Critical Success and factors, Integrating ERP into organizational culture.
Using ERP tool: Either SAP or ORACLE formats to case study.

Text/Reference Books :

1. A.Lexis Leon: **Enterprise Resource Planning:** TMH
2. Brady,Manu,Wegner: **Enterprise Resource Planning:** TMH
3. Jacobs: **Why ERP? A Premier on SAP Implementation:** McGraw Hill.

PATTERN RECOGNITION & IMAGE PROCESSING

SECTION-A

Image processing: introduction, linear systems, the Fourier transform, matrix theory results. Image perception, image sampling, Quantisation: the optimal mean square (Lloyd-max quantiser), visual quantizaiton. Image transforms: two dimensional orthogonal and unitary transforms, properties, one dimensional discrete Fourier transform (DFT), two dimensional DFT, cosine transform, sine transform.

SECTION-B

Image enhancement : point operation, histogram modeling, spatial operations, transform operation, multispectral image enhancement, false color and pseudocolor, color image enhancement. Image filtering: image observation models, inverse and Wiener filtering, finite impulse response (FIR) wiener filtering, other Fourier domain filters.

SECTION-C

Image Analysis: Feature extraction, Edge detection, Scene segmentation and labeling. Pattern recognition: Introduction, Recognition process, Statistical decision making (Bayes' theorem), Nonparametric decision making (Nearest neighborhood classification tech), clustering.

Text Books:

1. Fundamentals of digital image Processing, A. K. Jain, PHI Publications.

2. Digital Image Processing, Gozalez Rafel, Richard Woods, 2nd Edition, Pearson Education.

Reference Books:

1. Rosenfield, A and Kak A. C, Picture Processing, Academic Press N.Y. 1982
2. Pratt, W. K., Digital Image Processing, John Willey and sons, New York, 1978.
3. Duda R., Hart Peter, Stork D., Pattern Classification, Willey Interscience Publication.
4. Manahem Friedman, Abraham Kandel, Introduction to Pattern Recognition, World Scientific.
5. Introduction to Artificial Intelligence E. Charniak, D. Mcdermott

TELEMETRY AND DATA TRANSMISSION

SECTION A

Sampling Fundamentals: Introduction to sampling theorem and sampling process, convolution, computing minimum sampling rate. Alising Errors.
Digital Modulation Techniques: Review of PCM, DPCM, Methods of binary data transmission, Data Formats, DM code converters, PSK, QPSK, FSK, probability of error,phase ambiguity resolution and differential encoding, error detection, error correction, error correction codes.

SECTION B

Data Handling System: Block schematic, Sensors, Signal conditioners, Multiplexing- high level and low level, ADC- range and resolution, Word Format, Frame format, Frame synchronizer codes, R. F. links, X24, RS 422, RS423, RS 232C interfaces, Multi terminal configuration, Multiplier & Concentrator, Data Modems, Data transmission over telephone lines. **Data Reception Systems:** Bit synchronizers, frame synchronizers, subframe synchronizers, PLL, Display systems.

SECTION C

Remote Control:
Communication based processing control systems, pipelines, Operational security systems components, Pipeline control, Power system control, Programmable controllers for factory
automation. **Command:** Tone command system, Tone digital command system, ON/OFF command and data commands. **Aerospace Telemetry:** Signal formation and conversion, Multiplexing techniques in tele-control, Industrial Tele-control installations, reliability in telecontrol installations.

Text Books:

1. Patranabis," Telemetry Principles: Tata Mcgrew Hill.
2. Schweber," Data Communication " Mcgraw Hill.
3. Berder & Menjewlse," Telemetry Systems".

INDICATORS, RECORDERS & CONTROLLERS

SECTION A

Indicators- Single point indicators, Multipoint, Multi-range indicators, Analog & Digital Indicators

Recorders- Analog Recorders, operating mechanism, chart drive mechanism, strip chart Recorders, circular chart Recorders, XY Recorders, Single point Recorders, multipoint Recorders, Null type Recorders, Magnetic tape Recorders, Data loggers

SECTION B

Computer control systems: Computer in control systems, Data Acquisition Systems, Supervisory control, direct digital control, programmable logic control, Hierarchy concept, distributed digital control
Pneumatic controllers: Flapper Nozzle systems, proportional action, pneumatic relay, Integral action, Derivative action, Two action & three action controllers, interaction in control actions.

SECTION C

Hydraulic Controllers: Proportional Action, Proportional Integral Controllers.
Control Valves: Types, construction, valve sizing, electric pneumatic signal conversion, Electric, pneumatic, & hydraulic actuators, valve positioners, valve selection characterizing noise.

Text Books:

1. Sawhney, A.K.: **A Text Book on Electrical and Electronics measurements and Instrumentation:** Dhanpat Rai & Sons, 4th edition 1968. Reprint 2004
2. Jain R.K: **Mechanical & Industrial Measurements:** Khanna Publications
3. Blashke & J.M.C. Gill: **The control of industrial process by Digital Techniques**, TMH Publications
4. Cecill L. Smith: **Digital Computer Process Control, Intect Educational Publishers**, 1972

OPERATING SYSTEMS

SECTION A

INTRODUCTION – History, Operating system services, types, responsibilities, generations, LINUX, WINDOWS.
PROCESS MANAGEMENT- Operations on process, Process state, Scheduling, Criteria, scheduling algorithms, Evaluation, Synchronization, Semaphores, Monitors.

SECTION B

MEMORY MANAGEMENT- Swapping, Continuous memory allocation, Paging, Pure paging, Demand paging, Page-replacement algorithms, thrashing, Example-Pentium, Disk Scheduling.
INFORMATION MANAGEMENT- File and directory concept, Access methods, Protection, Free space management, Efficiency and performance, Access matrix, Capability-based systems, Program-
threats, User authentication, Firewall.

SECTION C

DEAD LOCKS- System model, Dead lock characterization, Deadlock prevention, Avoidance, Detection, Recovery, Classic problems of synchronization

Annexure V

List of Journals

Category A_1 (Impact Factor >1.25)

S.No.	Name of Journal	Impact Factor (I.F)
1.	IEEE TRANSACTIONS ON ELECTRON DEVICES	1.630
2.	ELECTRON DEVICE LETTERS	1.610
3.	MICROELECTRONIC ENGINEERING **(ELSEVIER)**	1.583
4.	SOLID STATE COMMUNICATIONS **(ELSEVIER)**	1.537
5.	MATHEMATICS OF CONTROL, SIGNALS, AND SYSTEMS **(SPRINGER)**	1.5
6.	DIGITAL SIGNAL PROCESSING **(ELSEVIER)**	1.486
7.	SOLID STATE ELECTRONICS **(ELSEVIER)**	1.422
8.	INTERNATIONAL JOURNAL OF ADAPTIVE CONTROL AND SIGNAL PROCESSING (**WILEY INTERSCIENCE**)	1.403
9.	SEMICONDUCTOR SCIENCE AND TECHNOLOGY	1.389
10.	OPTICS COMMUNICATIONS **(ELSEVIER)**	1.314
11.	ALL IEEE JOURNALS HAVING IMPACT FACTOR >1**	>1.25

*** *For Example**

S.No.	Name of Journal	Impact Factor (I.F)
1.	IEEE MICROWAVE AND WIRELESS COMPONENTS LETTERS	1.725
2.	IEEE TRANSACTIONS ON MOBILE COMPUTING	1.716
3.	IEEE COMMUNICATION MAGAGINE	1.704
4.	IEEE TRANSACTIONS ON SIGNAL PROCESSING	1.64
5.	IEEE NETWORK MAGAZINE	1.609
6.	IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY-B	1.436
7.	IEEE TRANSACTIONS ON COMMUNICATIONS	1.302

Category A_2 (Impact Factor 0.75-1.25)

S.No.	Name of Journal	Impact Factor (I.F)
1.	JOURNAL OF ELECTRONIC MATERIALS	1.238
2.	IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES	1.004
3.	ADVANCED MATERIALS FOR OPTICS AND ELECTRONICS	0.957
4.	NEURAL PROCESSING LETTERS **(SPRINGER)**	0.942
5.	DESIGN AUTOMATION FOR EMBEDDED SYSTEMS **(SPRINGER)**	0.909
6.	SIGNAL PROCESSING: IMAGE COMMUNICATION **(ELSEVIER)**	0.836
7.	IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION	0.806
8.	SOLID-STATE ELECTRONICS	0.759
9.	OPTICAL ENGINEERING **(SPIE)**	0.757
10.	ALL IEEE JOURNALS HAVING IMPACT FACTOR <1***	0.75-1.25

***For Example**

S.No.	Name of Journal	Impact Factor (I.F)
1	IEEE COMMUNICATIONS LETTERS	0.869
2	IEEE TRANSACTIONS ON VERY LARGE SCALE INTEGRATION (VLSI) SYSTEMS	0.707

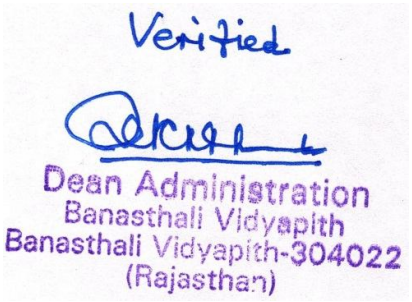
Category B (Impact Factor 0.25-0.75)

1.	MICROWAVE AND OPTICAL TECHNOLOGY LETTERS **(WILEY INTERSCIENCE)**	0.743
2.	IEEE PROCEEDINGS-OPTOELECTRONICS	0.727
3.	OPTICAL AND QUANTUM ELECTRONICS **(SPRINGER)**	0.718
4.	MICROELECTRONICS JOURNAL **(ELSEVIER)**	0.609
5.	ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING **(SPRINGER)**	0.591
6.	IEEE TRANSACTIONS ON POWER SYSTEMS	0.577
7.	SOLID STATE TECHNOLOGY	0.571
8.	IET OPTOELECTRONICS	0.490
9.	TELECOMMUNICATION SYSTEMS **(SPRINGER)**	0.423
10.	INTEGRATION, THE VLSI JOURNAL **(ELSEVIER)**	0.463

11.	INTERNATIONAL JOURNAL OF ELECTRONICS **(TAYLOR & FRANCIS)**	0.459
12.	MICROELECTRONIC ENGINEERING	0.414
13.	SIGNAL PROCESSING	0.440
14.	JOURNAL OF COMMUNICATIONS TECHNOLOGY AND ELECTRONICS **(SPRINGER)**	0.26
15.	INTERNATIONAL JOURNAL OF COMMUNICATION SYSTEMS **(WILEY INTERSCIENCE)**	0.257

Category C (Impact Factor <0.25)

1.	ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING	0.239
2.	MICROWAVE JOURNAL	0.213
3.	ELECTRONICS WORLD & WIRELESS WORLD	0.021
4.	TELECOMMUNICATIONS AND RADIO ENGINEERING	0.017



Banasthali Vidyapith

Minutes of the Board of Studies in B.Tech.

(CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE) 03.01.2019 at 11.00 A.M in the CMS Conference Hall, Banasthali Vidyapith

1. The Board took up the minutes of its last meeting held on **May 2, 2013** and resolved that the minutes to be confirmed.

2. The board examined and reviewed the existing panel of examiners for B.Tech. (CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE) examination keeping in view the byelaw 15.03.2002 of the Vidyapith and panel of examiners will be submitted to the secrecy section.

3. The board reviewed the courses of study, curricula and scheme of examination for the following examination.

B.Tech. Examination (CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE)

- First Semester Examination, December, 2019
- Second Semester Examination, April/May, 2020
- Third Semester Examination, December, 2020
- Fourth Semester Examination, April/May, 2021
- Fifth Semester Examination, December, 2021
- Sixth Semester Examination, April/May, 2022
- Seventh Semester Examination, December, 2022
- Eighth Semester Examination, April/May, 2023

3. I (A) B.Tech. CSE Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. CSE Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board has reviewed the existing B.Tech. curriculum in view of foundation, basic sciences, core engineering and electives courses and proposed revisions in all B. Tech. programmes by making significant changes to enhance the value based education and meet international standards.

(b) The board reviewed examination scheme of B.Tech. I Year 2017-18 (I and II Semesters) and revised the scheme in 2019-20 for all branches, i.e. B.Tech. (CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE) I Year.

(c) The board has reviewed and revised the *number of credits* of the Mathematics courses to *4* for all B.Tech. programme.

(d) Board proposed new foundation courses - *General Hindi* and *General English* for B.Tech. I Year 2019-20 and agreed to incorporate one Core Foundation course one Elective Foundation course from the session 2019-20.

(e) The board also reviewed syllabi of the courses of B.Tech. I Year (I and II Semesters) and suggested minor changes in the syllabi of *Biology* and *Measurement Techniques Lab* courses. It has been suggested by the board to incorporate learning outcomes e-resources and to use prescribed format for references and the same has been followed.

(f) The board reviewed and revised the examination scheme of B.Tech. CSE II Year 2018-19 (III and IV Semesters). Courses *Introduction to Discrete Mathematics* and *Software Engineering* have been included in B.Tech. III and IV Semesters respectively with the recommendation of the Board and to be followed from 2020-21.

(g) The board reviewed the existing examination scheme of B.Tech. CSE III Year (V and VI Semesters) and proposed the changes in the existing scheme. Two vocational courses have been proposed in B.Tech. CSE III Year by the board including one core and one elective foundation courses. Board recommended to adopt new scheme from 2021-22.

(h) The board also reviewed syllabus of the courses of B.Tech. CSE III Year (V and VI Semesters) and proposed some minor changes in the syllabi of *Data Communication and Networks* and *Operating Systems* courses. Board proposed new courses in B.Tech. CSE VI Semester: *Artificial Intelligence and Machine Learning* and *Artificial Intelligence and Machine Learning Lab*.

(i) The board reviewed the existing examination scheme of B.Tech. IV Year (VII and VIII Semesters) and proposed new scheme with discipline and open electives to be adopted for B. Tech. IV Year 2022-23.

(j) Board proposed to rename the title of the course *Pattern Recognition and Image Processing* as *Digital Image Processing*.

(k) Board proposed some new reading electives for B.Tech. CSE VII Semester.

- Agile Software Development
- Organizational Behavior
- Software as a Service
- Blockchain

(l) Board proposed to start course, *Data Analytics* with its lab in B.Tech. CSE VIII Semester and suggested following new electives for the same.

- Computer Vision
- Pattern Recognition
- Internet of Things
- Robotics and Automation
- Modeling and Simulation

Proposed examination scheme of B.Tech. CSE programme with learning outcomes and new syllabi are enclosed in **Annexure-I(A)**.

3. I (B) B.Tech. CSE Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech. CSE Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed examination scheme of B.Tech. II Year (III and IV Semesters) 2017-18 and 2018-19 (I and II Semesters) and agreed to follow the same scheme in 2019-20.

(b) The board also reviewed syllabus of the courses of B.Tech. II CSE Year (III and IV Semesters) and proposed revision in the syllabi of *Entrepreneurship* and *Technical Report Writing* courses for existing scheme i.e. 2019-20.

(c) The board reviewed the existing examination scheme of B.Tech. CSE III Year (V and VI Semesters) and proposed the changes in the existing scheme. Board recommended to adopt new scheme for sessions 2019-20 and 2020-21 for B.Tech. programmes effective from sessions 2017-18 and 2018-19.

(d) The board also reviewed syllabus of the courses of B.Tech. CSE III Year (V and VI Semesters) and agreed to include revised courses *Data Communication and Networks*, *Operating Systems*, *Artificial Intelligence and Machine Learning* and *Artificial Intelligence and Machine Learning Lab* in B.Tech. CSE III Year for sessions 2019-20 and 2020-21.

(e) The board reviewed the existing examination scheme of B.Tech. IV Year (VII and VIII Semesters) and proposed new scheme to be adopted for B. Tech. IV Year 2020-21 and 2021-22.

(f) Board agreed to include *Digital Image Processing* in B. Tech. IV year for sessions 2020-21 and 2021-22.

(g) Board also agreed to include following reading electives for B.Tech. CSE VII Semester as proposed in B. Tech. new scheme.

- Agile Software Development
- Organizational Behavior
- Software as a Service
- Blockchain

(h) Board included *Data Analytics* and *Data Analytics Lab* B.Tech. CSE VIII Semester and agreed to follow as proposed in B. Tech. new scheme.

- Computer Vision
- Pattern Recognition
- Internet of Things
- Robotics and Automation
- Modeling and Simulation

Proposed examination scheme of B.Tech. CSE programme with learning outcomes and new syllabi are enclosed in **Annexure-I(B)**.

3. I (C) B.Tech. CSE Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. CSE Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed examination scheme of B.Tech. CSE IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. However, board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. CSE programme with learning outcomes and new syllabi are enclosed in **Annexure-I(C)**.

3. II (A) B.Tech. IT Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. IT Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. IT II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2020-21 with additional one core and one elective foundation course.

(b) The board reviewed and recommended to include *Introduction to Discrete Mathematics* and *Software Engineering* have been included in B.Tech. III and IV Semesters respectively with the recommendation of the Board and to be followed from 2020-21.

(c) The board reviewed the existing examination scheme of B.Tech. IT III Year (V and VI Semesters) and proposed the changes in the existing scheme. Board suggested adopting new scheme from session 2021-22. Two vocational courses have been proposed in B.Tech. IT III Year by the board including one core and one elective foundation courses. Board recommended to adopt new scheme from 2021-22.

(d) The board recommended adopting revised courses *Data Communication and Networks*, *Internet and Web Technology*, *Operating Systems*, *Artificial Intelligence and Machine Learning* and *Artificial Intelligence and Machine Learning Lab* in B. Tech. IT III Year from 2021-22.

(e) The board reviewed the existing examination scheme of B.Tech. IV Year (VII and VIII Semesters) and proposed new scheme with discipline and open electives to be adopted for B. Tech. IV Year 2022-23.

(f) Board suggested to include revised course *Digital Image Processing* and following new courses as electives for B.Tech. IT VII Semester.

- Computer Vision
- Pattern Recognition
- Data Analytics
- Internet of Things
- Robotics and Automation
- Modeling and Simulation

(g) Board also agreed to include new reading electives for B.Tech. IT VIII Semester as proposed for B. Tech. CSE programme.

- Agile Software Development
- Organizational Behavior
- Software as a Service
- Blockchain

Proposed examination scheme of B.Tech. IT programme with learning outcomes and new syllabi are enclosed in **Annexure-II(A)**.

3. II (B) B.Tech. IT Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech. IT Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed examination scheme of B.Tech. IT II Year (III and IV Semesters) 2018-19 and agreed to follow the same scheme in 2019-20.

(b) The board agreed to include revised *Entrepreneurship* and *Technical Report Writing* courses for proposed scheme 2019-20.

(c) The board reviewed the existing examination scheme of B.Tech. IT III Year (V and VI Semesters) and proposed the changes in the existing scheme. Board recommended to adopt new scheme for sessions 2019-20 and 2020-21 for B.Tech. programmes effective from sessions 2017-18 and 2018-19.

(d) The board included courses *Data Communication and Networks*, *Internet and Web Technology*, *Operating Systems*, *Artificial Intelligence and Machine Learning* and *Artificial Intelligence and Machine Learning Lab* in B. Tech. IT III Year for sessions 2019-20 and 2020-21.

(h) The board reviewed the existing examination scheme of B.Tech. IT IV Year (VII and VIII Semesters) and proposed new scheme with discipline and open electives to be adopted for B. Tech. IV Year 2020-21/2021-22.

(i) Board included revised course *Digital Image Processing* and following new courses as electives for B.Tech. IT VII Semester.

- Computer Vision
- Pattern Recognition

- Data Analytics
- Internet of Things
- Robotics and Automation
- Modeling and Simulation

(j) Board also agreed to include new reading electives for B.Tech. IT VIII Semester.

- Agile Software Development
- Organizational Behavior
- Software as a Service
- Blockchain

Proposed examination scheme of B.Tech. IT programme with learning outcomes and new syllabi are enclosed in **Annexure-II(B)**.

3. II (C) B.Tech. IT Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. IT Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed examination scheme of B.Tech. IT IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. However, board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. IT programme with learning outcomes and new syllabi are enclosed in **Annexure-II(C)**.

3.III. (A) B.Tech. ECE Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. ECE Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May, 2023	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. ECE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2020-21 with additional one core and one elective foundation course.

(b) The board reviewed the existing examination scheme of B.Tech. ECE III Year (V and VI Semesters) and proposed the changes in the existing scheme and syllabi of *Analog Communication, Analog Electronics, Microwave Engineering, Digital Communication, Control systems. Microwave Electronics* and *Analog Integrated Circuits* have been

renamed as *Microwave Engineering* and *Analog Electronics*, respectively. Board suggested adopting new scheme from session 2021-22. Two vocational courses have been proposed in B.Tech. ECE III Year by the board including one core and one elective foundation courses. Board recommended to adopt new scheme from 2021-22.

(c) The board reviewed and revised the examination scheme of B.Tech. ECE IV Year 2018-19 (VII and VIII Semesters) and agreed to follow the revised scheme in 2022-23. Board agreed to include course *Antenna Analysis* in place of *Antenna and Radar* from session 2022-23.

(d) Board has agreed to shift UIL project from VII semester to VIII semester and will be effective from session 2019-20.

(e) Board suggested and agreed to include two new elective courses *Mechatronics* and *Robotics and Automation* from the session 2022-2023 in the curriculum keeping in view of interdisciplinary approach of curriculum structure.

(f) Board proposed some new reading electives from the session 2022- 2023 in the curriculum as follows:

- *Telecommunication Switching Systems and Networks*
- *Multimedia Compression and Communication*
- *Electronic Packaging*
- *Human Values*
- *Professional Ethics.*

(g) Board proposed inclusion of few online courses as reading elective from the session 2022- 2023 in the curriculum as follows:

- *Electric Vehicles*
- *IoT Sensors and Devices*
- *Electromagnetic Compatibility.*

Proposed examination scheme of B.Tech. ECE programme with learning outcomes and new syllabi are enclosed in **Annexure-III(A)**.

3.III. (B) B.Tech. ECE Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech.ECE Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. ECE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2019-20 with additional one core and one elective foundation course.

(b) The board agreed to include revised Entrepreneurship and Technical Report Writing courses for proposed scheme 2019-20.

(c) The board reviewed and revised the existing examination scheme of B.Tech. ECE III Year (V and VI Semesters) and agreed to include revised syllabi of *Analog Communication, Analog Electronics, Microwave Engineering, Digital Communication, Control systems* from session 2019-20 and 2020-21. Board also approved the changes in the names of the courses from *Microwave Engineering* and *Analog Electronic* to *Microwave Electronics* and *Analog Integrated Circuits*, respectively from sessions 2019-20 and 2020-21.

(h) Board revised and reviewed the examination scheme of B.Tech. ECE IV Year (VII and VIII Semesters) and agreed to shift UIL project from VII to VIII Semester from sessions 2020-21 and 2021-22. Board agreed to include course *Antenna Analysis* in place of *Antenna and Radar* from session 2020-21 and 2021-22.

(i) Board suggested and agreed to include two new elective courses *Mechatronics* and *Robotics and Automation* from the session 2020-2021 and 2021-22 in the curriculum keeping in view of interdisciplinary approach of curriculum structure.

(j) Board proposed some new reading electives from the sessions 2020-2021 and 2021-22 in the curriculum as follows:

- *Telecommunication Switching Systems and Networks*
- *Multimedia Compression and Communication*
- *Electronic Packaging*
- *Human Values*
- *Professional Ethics.*

(k) Board proposed inclusion of few online courses as reading elective from the sessions 2020-2021 and 2021-22 in the curriculum as follows:

- *Electric Vehicles*
- *IoT Sensors and Devices*
- *Electromagnetic Compatibility.*

Proposed examination scheme of B.Tech. ECE programme with learning outcomes and new syllabi are enclosed in **Annexure-III(B)**.

3.III. (C) B.Tech. ECE Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. ECE Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. ECE IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. UIL project has been shifted to VIII Semester for session 2019-20 with the approval of the Board. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. ECE programme with learning outcomes and new syllabi are enclosed in **Annexure-III(C)**.

3. IV. (A) B.Tech. EIE Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. EIE Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. EIE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2020-21 with additional one core and one elective foundation course.

(b) The board reviewed the existing examination scheme of B.Tech. EIE III Year (V and VI Semesters) and agreed to follow the revised scheme from 2021-22. Board proposed the changes in the existing syllabi of Power Electronics Lab and approves the revised experiment list of the same. Board proposed that the courses *Control System* (Theory and Lab), *Transducers* (Theory and Lab) should be replaced with *Linear Control System* (Theory and Lab), *Industrial Instrumentation* (Theory and Lab) respectively. The Board discussed the proposed syllabi and approved the same. Board agreed to introduce new course Industrial *Automation* (Theory and Lab) in VI Semester.

(c) The board reviewed the existing examination scheme of B.Tech. EIE IV Year (VII and VIII Semesters) and agreed to follow the revised scheme from 2022-23. Board suggested and agreed to introduce courses *Process Control*, *Communication Engineering* and *Mechatronics Systems* in the VII Semester.

(d) Board revised the elective courses and following courses have been proposed as electives for B.Tech. EIE VII Semester.

- Artificial Neural Network and Fuzzy Logic
- Energy Efficiency and Conservation
- Non Linear Control System
- Digital Control System
- Analytical Instrumentation
- Fiber Optic and Laser Instrumentation
- Biomedical Instrumentation
- Virtual Instrumentation
- Power Plant Engineering

(e) Board suggested and agreed to include following new online reading elective courses for B.Tech. EIE VIII Semester.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems
- Electromagnetic Compatibility
- Antennas
- Introduction to Photonics

- Electromagnetic Waves in guided and wireless media
- Advanced IOT Applications
- Quality Control
- Industry 4.0
- Biomedical signal processing
- Interfacing with Arduino
- Robotica
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control
- Control Engineering
- Analyzing data with Python
- SCADA
- PLC
- Internet of Things
- Industrial Robotics
- Chemical Process Instrumentation

Proposed examination scheme of B.Tech. EIE programme with learning outcomes and new syllabi are enclosed in **Annexure-IV(A)**.

3.IV. (B) B.Tech. EIE Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech.EIE Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. EIE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2019-20.

(b) The board reviewed the existing examination scheme of B.Tech. EIE III Year (V and VI Semesters) and agreed to follow the revised scheme for sessions 2019-20 and 2020-21. Board proposed the changes in the existing syllabi of *Power Electronics Lab* and approves the revised experiment list of the same. Board proposed that the courses *Control System* (Theory and Lab), *Transducers* (Theory and Lab) should be replaced with *Linear Control System* (Theory and Lab), *Industrial Instrumentation* (Theory and Lab) respectively. The Board discussed the proposed syllabi and approved the same. Board agreed to introduce new course Industrial *Automation* (Theory and Lab) in VI Semester.

(c) The board reviewed the existing examination scheme of B.Tech. EIE IV Year (VII and VIII Semesters) and agreed to follow the revised scheme for sessions 2020-21 and 2021-22. Board suggested and agreed to introduce courses Process Control, Communication Engineering and Mechatronics Systems in the VII Semester.

(d) Board revised the elective courses and following courses have been proposed as electives for B.Tech. EIE VII Semester.

- Artificial Neural Network and Fuzzy Logic
- Energy Efficiency and Conservation
- Non Linear Control System
- Digital Control System
- Analytical Instrumentation
- Fiber Optic and Laser Instrumentation
- Biomedical Instrumentation
- Virtual Instrumentation
- Power Plant Engineering

(e) Board suggested and agreed to include following new online reading elective courses for B.Tech. EIE VIII Semester.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems
- Electromagnetic Compatibility
- Antennas
- Introduction to Photonics
- Electromagnetic Waves in guided and wireless media
- Advanced IOT Applications
- Quality Control
- Industry 4.0
- Biomedical signal processing
- Interfacing with Arduino
- Robotica
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control
- Control Engineering
- Analyzing data with Python
- SCADA
- PLC
- Internet of Things
- Industrial Robotics
- Chemical Process Instrumentation

Proposed examination scheme of B.Tech. EIE programme with learning outcomes and new syllabi are enclosed in **Annexure-IV(B)**.

3.IV. (C) B.Tech. EIE Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. EIE Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. EIE IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. EIE programme with learning outcomes and new syllabi are enclosed in **Annexure-IV(C)**.

3. V. (A) B.Tech. EEE Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. EEE Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. EIE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2020-21 with additional one core and one elective foundation course.

(b) The board reviewed the existing examination scheme of B.Tech. EIE III Year (V and VI Semesters) and agreed to follow the revised scheme from 2021-22. Board proposed the changes in the existing syllabi of *Electrical Machines-I Lab* and *Power Electronics Lab* and approves the revised experiment list of the same. Board proposed that the courses *Control System* (Theory and Lab), should be replaced with *Linear Control System* (Theory and Lab). The Board discussed the proposed syllabi and approved the same.

(c) The syllabi of Elements of *Power System* (Theory and Lab) has been modified and renamed as *Power System-I* (Theory and Lab) and syllabi of *Power System Analysis* (Theory and Lab) has been modified and renamed as *Power System-II* (Theory and Lab). The Board discussed the proposed syllabus and approved the same.

(d) The board reviewed the existing examination scheme of B.Tech. EEE IV Year (VII and VIII Semesters) and agreed to follow the revised scheme from 2022-23. Board introduced the course *Switchgear and Protection* (Theory and Lab) in B.Tech. EEE VII Semester.

(e) Board proposed to consider the following papers as elective courses in B.Tech. EEE VII Semester.

- Electric Drives and Control
- Mechatronics
- Robotics and Automation
- Process Control
- Industrial Automation

- Power System Operation and Control
- Power System Restructuring and Deregulation

(f) Board proposed following online courses with source as reading elective course for B.Tech. VIII Semester in addition to existing reading elective paper.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems
- Computer Aided Power System Analysis
- Power System Dynamics, Control and Monitoring
- Advance Power Electronics and Control
- Electromagnetic Compatibility
- Antennas
- Introduction to Photonics
- Electromagnetic Waves in guided and wireless media
- Biomedical signal processing
- Advances in UHV transmission and distribution
- Advanced IOT Applications
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control
- Control Engineering
- Chemical Process Instrumentation
- Quality Control
- Interfacing with Arduino
- Robotica
- Analyzing data with Python
- Industry 4.0
- Internet of Things
- Industrial Robotics
- SCADA
- PLC

Proposed examination scheme of B.Tech. EEE programme with learning outcomes and new syllabi are enclosed in **Annexure-V(A)**.

3.V. (B) B.Tech. EEE Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech.EEE Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. EIE II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme in 2019-20 with additional one core and one elective foundation course.

(b) The board reviewed the existing examination scheme of B.Tech. EIE III Year (V and VI Semesters) and agreed to follow the revised scheme for sessions 2019-20 and 2020-21. Board proposed the changes in the existing syllabi of *Electrical Machines-I Lab* and *Power Electronics Lab* and approves the revised experiment list of the same. Board proposed that the courses *Control System* (Theory and Lab) should be replaced with *Linear Control System* (Theory and Lab).

(c) The syllabi of Elements of *Power System* (Theory and Lab) has been modified and renamed as *Power System-I* (Theory and Lab) and syllabi of *Power System Analysis* (Theory and Lab) has been modified and renamed as *Power System-II* (Theory and Lab). The Board discussed the proposed syllabus and approved the same.

(d) The board reviewed the existing examination scheme of B.Tech. EEE IV Year (VII and VIII Semesters) and agreed to follow the revised scheme from 2020-21 and 2021-22. Board introduced the course *Switchgear and Protection* (Theory and Lab) in B.Tech. EEE VII Semester.

(e) Board proposed to consider the following papers as elective courses in B.Tech. EEE VII Semester.

- Electric Drives and Control
- Mechatronics
- Robotics and Automation
- Process Control
- Industrial Automation
- Power System Operation and Control
- Power System Restructuring and Deregulation

(f) Board proposed following online courses with source as reading elective course for B.Tech. VIII Semester in addition to existing reading elective paper.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems
- Computer Aided Power System Analysis
- Power System Dynamics, Control and Monitoring
- Advance Power Electronics and Control
- Electromagnetic Compatibility
- Antennas
- Introduction to Photonics
- Electromagnetic Waves in guided and wireless media
- Biomedical signal processing
- Advances in UHV transmission and distribution
- Advanced IOT Applications
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control

- Control Engineering
- Chemical Process Instrumentation
- Quality Control
- Interfacing with Arduino
- Robotica
- Analyzing data with Python
- Industry 4.0
- Internet of Things
- Industrial Robotics
- SCADA
- PLC

Proposed examination scheme of B.Tech. EEE programme with learning outcomes and new syllabi are enclosed in **Annexure-V(B)**.

3.V. (C) B.Tech. EEE Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. EEE Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. EIE IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. EEE programme with learning outcomes and new syllabi are enclosed in **Annexure-V(C)**.

3. VI. (A) B.Tech. MCTR Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. MCTR Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. MCTR II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme from 2020-21 with additional one core and one elective foundation course. Board suggested and approved revision in the course *Electrical Machine-I Lab*.

(b) Board reviewed and revised the examination scheme of B.Tech. MCTR III Year (V and VI Semesters) and agreed to follow the same from 2021-22. Board suggested and

proposed the course *Robotics and Control* in B.Tech. MCTRVI Semester and *Robotics and Automation* as elective courses for other B. Tech. programmes.

(c) The board reviewed the existing examination scheme of B.Tech. MCTR IV Year (VII and VIII Semesters) and agreed to follow the revised scheme from 2022-23.

(d) Board proposed following online courses with source as reading elective course for B.Tech. MCTR VII Semester.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems distribution
- Advanced IOT Applications
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control
- Control Engineering
- Chemical Process Instrumentation
- Quality Control
- Interfacing with Arduino
- Robotica
- Analyzing data with Python
- Industry 4.0
- CNC Machining Turning
- Solar PV Technology
- Internet of Things
- Autocad
- Industrial Robotics
- SCADA
- PLC

(e) Board proposed and agreed to introduce the course Mechatronics Systems in B.Tech. MCTR VIII Semester and one elective course Mechatronics for other B. Tech. programmes. Board also proposed the course *Computer Integrated Manufacturing System* (Theory and Lab) and approved the same.

(f) Board proposed to consider the following papers as elective courses in B.Tech. MCTR VIII Semester.

- Biomedical Instrumentation
- Energy Efficiency and Conservation
- Power Plant Engineering
- Operation Research
- Industrial Engineering
- Manufacturing Science
- Production Technology

Proposed examination scheme of B.Tech. MCTR programme with learning outcomes and new syllabi are enclosed in **Annexure-VI(A)**.

3.VI. (B) B.Tech. MCTR Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech. MCTR Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed and revised the examination scheme of B.Tech. MCTR II Year 2018-19 (III and IV Semesters) and agreed to follow the revised scheme for session 2019-20. Board suggested and approved revision in the course *Electrical Machine-I Lab*.

(b) Board reviewed and revised the examination scheme of B.Tech. MCTR III Year (V and VI Semesters) and agreed to follow the same for sessions 2019-20 and 2020-21. Board suggested and proposed the course *Robotics and Control* in B.Tech. MCTRVI Semester and *Robotics and Automation* as elective courses for other B. Tech. programmes.

(c) The board reviewed the existing examination scheme of B.Tech. MCTR IV Year (VII and VIII Semesters) and agreed to follow the revised scheme for sessions 2020-21 and 2021-22.

(d) Board proposed following online courses with source as reading elective course for B.Tech. MCTR VII Semester.

- Fundamental of Semiconductor Devices
- Principles of Signals and Systems distribution
- Advanced IOT Applications
- Mathematical methods and techniques in signal processing
- Electronics Modules for industrial applications using Opamp
- Industrial Automation and Control
- Control Engineering
- Chemical Process Instrumentation
- Quality Control
- Interfacing with Arduino
- Robotica
- Analyzing data with Python
- Industry 4.0
- CNC Machining Turning
- Solar PV Technology
- Internet of Things
- Autocad
- Industrial Robotics
- SCADA
- PLC

(e) Board proposed and agreed to introduce the course Mechatronics Systems in B.Tech. MCTR VIII Semester and one elective course Mechatronics for other B. Tech. programmes. Board also proposed the course *Computer Integrated Manufacturing System* (Theory and Lab) and approved the same.

(f) Board proposed to consider the following papers as elective courses in B.Tech. MCTR VIII Semester.

- Biomedical Instrumentation
- Energy Efficiency and Conservation
- Power Plant Engineering
- Operation Research
- Industrial Engineering
- Manufacturing Science
- Production Technology

Proposed examination scheme of B.Tech. MCTR programme with learning outcomes and new syllabi are enclosed in **Annexure-VI(B)**.

3.VI. (C) B.Tech. MCTR Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. MCTR Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. MCTR IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. MCTR programme with learning outcomes and new syllabi are enclosed in **Annexure-VI(C)**.

3. VII. (A) B.Tech. Biotechnology Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. Biotechnology Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B. Tech. Biotechnology I Year (I and II Semesters) and agreed to follow the same from 2019-20.

(b) The contents of BIO101: Biology and ENGG 102L: *Measurement Technique Lab* is proposed to be revised by adding relevant topics/experiments.

(c) The board reviewed and revised the examination scheme of B. Tech. Biotechnology II Year (III and IV Semesters) and agreed to follow the same from 2020-21 with additional one core and one elective foundation course.

(d) Board agreed to introduce new experiments in the course BT 204L: *Biotechnology Lab-I* of III Semester.

(e) Board proposed and approved revised courses BT 203: *Biophysics and Structural Biology* and BT 205L: *Biotechnology Lab-II*. *Seminar* (BT 208S) is proposed to be shifted from the V semester to the III semester from the permission of the Board.

(f) The board reviewed and revised the examination scheme of B. Tech. Biotechnology III Year (V and VI Semesters) and agreed to follow the same from 2021-22. In the V Semester, the course '*Probability and Statistics'* is proposed to be introduced. Some experiments of the course BT 303L: *Biotechnology Lab-III* are proposed to be incorporated in the IV Semester laboratory course.

(g) In the VI semester, some modifications are proposed in the topics of the course BIN 301: *Basic Bioinformatics*. The course BT 305: *Cell and Tissue Culture Technology* is proposed to be dropped and contents incorporated in other relevant courses. The contents of the course BT 311: *Recombinant DNA Technology*, CHEM 301: *Analytical Techniques* and BT 304L: *Biotechnology Lab-IV* are proposed to be revised and updated.

(h) The board reviewed and revised the examination scheme of B. Tech. Biotechnology IV Year (VII and VIII Semesters) and agreed to follow the same from 2022-23. In the VII Semester, the reading electives *Plant Genetic Engineering* and *Renewable Energy Resources* are proposed to be replaced with following three newly introduced and more relevant/updated reading electives:

- Molecular Diagnostics,
- Biodiversity and Conservation,
- Emerging Trends in Biofuel

Additionally, the following online reading elective courses are also proposed to be offered in the seventh semester:

- Drug Discovery
  https://www.coursera.org/learn/drug-discovery
- Proteins and Gel-Based Proteomics
  https://swayam.gov.in/course/1386-proteins-and-gel-based-proteomics
- Online course on IPR
  http://www.ili.ac.in/e-learnIPR.htm

(i) In the VIII Semester, the courses *Animal Biotechnology* and *Plant Biotechnology* and laboratory course: *Biotechnology Lab V* are proposed to be revised.

The contents of elective course *Food and Dairy Biotechnology* are proposed to be revised and updated, and a course *Geoinformatics* is proposed to be introduced by the board.

The complete lists of electives proposed to be offered in the eighth semester are as follows:

- Biomedicial Engineering,
- Food and Dairy Biotechnology,

- Genomics and Proteomics,
- Immunotechnology,
- Microbial Technology,
- Molecular Modelling and Drug Designing,
- Nanotechnology,
- Plant Secondary Metabolites,
- Geoinformatics

Additionally, the following online elective courses are also proposed to be offered in the VIII Semester:

- Bioreactor
  https://swayam.gov.in/course/1339-bioreactors
- Principles of Downstream techniques in Bioprocess
  http://nptel.ac.in/syllabus/102106048/
- Industrial Biotechnology
  https://www.coursera.org/learn/industrial-biotech

Proposed examination scheme of B.Tech. Biotechnology programme with learning outcomes and new syllabi are enclosed in **Annexure-VII(A)**.

3.VII. (B) B.Tech. Biotechnology Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech. Biotechnology Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed the examination scheme of B. Tech. Biotechnology II Year (III and IV Semesters) 2018-19 and agreed to follow the same for 2019-20.

(b) The board reviewed and revised the examination scheme of B. Tech. Biotechnology III Year (V and VI Semesters) and agreed to follow the same for sessions 2019-20 and 2020-21. In the V Semester, the course *Probability and Statistics* is proposed to be introduced. Some experiments of the course BT 303L: *Biotechnology Lab-III* are proposed to be incorporated in the IV Semester laboratory course.

(c) In the VI semester, some modifications are proposed in the topics of the course BIN 301: *Basic Bioinformatics*. The course BT 305: *Cell and Tissue Culture Technology* is proposed to be dropped and contents incorporated in other relevant courses. The contents of the course BT 311: *Recombinant DNA Technology*, CHEM 301: *Analytical Techniques* and BT 304L: *Biotechnology Lab-IV* are proposed to be revised and updated.

(d) The board reviewed and revised the examination scheme of B. Tech. Biotechnology IV Year (VII and VIII Semesters) and agreed to follow for sessions 2020-21 and 2021-22. In the VII Semester, the reading electives *Plant Genetic Engineering* and *Renewable Energy*

Resources are proposed to be replaced with following three newly introduced and more relevant/updated reading electives:

- Molecular Diagnostics,
- Biodiversity and Conservation,
- Emerging Trends in Biofuel

Additionally, the following online reading elective courses are also proposed to be offered in the seventh semester:

- Drug Discovery
  https://www.coursera.org/learn/drug-discovery
- Proteins and Gel-Based Proteomics
  https://swayam.gov.in/course/1386-proteins-and-gel-based-proteomics
- Online course on IPR
  http://www.ili.ac.in/e-learnIPR.htm

(e) In the VIII Semester, the courses *Animal Biotechnology* and *Plant Biotechnology* and laboratory course: *Biotechnology Lab V* are proposed to be revised.

The contents of elective course *Food and Dairy Biotechnology* are proposed to be revised and updated, and a course *Geoinformatics* is proposed to be introduced by the board.

The complete lists of electives proposed to be offered in the eighth semester are as follows:

- Biomedicial Engineering,
- Food and Dairy Biotechnology,
- Genomics and Proteomics,
- Immunotechnology,
- Microbial Technology,
- Molecular Modelling and Drug Designing,
- Nanotechnology,
- Plant Secondary Metabolites,
- Geoinformatics

Additionally, the following online elective courses are also proposed to be offered in the VIII Semester:

- Bioreactor
  https://swayam.gov.in/course/1339-bioreactors
- Principles of Downstream techniques in Bioprocess
  http://nptel.ac.in/syllabus/102106048/
- Industrial Biotechnology
  https://www.coursera.org/learn/industrial-biotech

Proposed examination scheme of B.Tech. Biotechnology programme with learning outcomes and new syllabi are enclosed in **Annexure-VII(B)**.

3.VII. (C) B.Tech. Biotechnology Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. Biotechnology Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised

ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. Biotechnology IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. Biotechnology programme with learning outcomes and new syllabi are enclosed in **Annexure-VII(C)**.

3. VIII. (A) B.Tech. CHE Examination Scheme (w. e. f. 2019-20)

S.No.	B.Tech. CHE Examination Scheme	Remarks
i.	First Semester Examination, December, 2019	Revised
ii.	Second Semester Examination, April/May, 2020	Revised
iii.	Third Semester Examination, December, 2020	Revised
iv.	Fourth Semester Examination, April/May, 2021	Revised
v.	Fifth Semester Examination, December, 2021	Revised
vi.	Sixth Semester Examination, April/May, 2022	Revised
vii.	Seventh Semester Examination, December, 2022	Revised
viii.	Eighth Semester Examination, April/May 2023	Revised

(a) The board reviewed and revised the examination scheme of B. Tech. CHE II Year (III and IV Semesters) and agreed to follow the same from 2020-21 with additional one core and one elective foundation course.

(b) The board reviewed and revised the examination scheme of B. Tech. CHE III Year (V and VI Semesters) and agreed to follow the same from 2021-22. Board proposed two new courses *Numerical Methods* and *Probability & Statistics* in III Year. *Chemical Reaction Engineering* course has been shifted from V Semester to VI Semester.

(c) The board reviewed and revised the examination scheme of B. Tech. CHE IV Year (VII and VIII Semesters) and agreed to follow the same from 2022-23.

(d) Board agreed to adopt following courses as reading electives for VII Semester.

- Membrane Separation Technology
- Corrosion Engineering
- Enzyme Engineering
- Renewable Energy Resources
- Computer Aided Process Plant Design

(e) Board agreed to introduce *Advanced Chemical Reaction Engineering*, *Optimization of Chemical Processes* and *Advanced Mass Transfer* as elective courses. B. Tech. VIII semester examination scheme will consist of two elective courses (which can be either open or disciplinary) and three compulsory courses. *Environmental Pollution Control* course has been shifted to VIII Semester. In B. Tech. VIII Semester *Chemical Plant Simulation* course has been shifted from elective to compulsory course.

(f) The complete list of elective courses are as follows:

- Petroleum Refining Technology
- Polymer Science and Technology
- Advanced Heat Transfer
- Advanced Chemical Reaction Engineering,
- Advanced Mass Transfer,
- Optimization of Chemical Processes,
- Nanoscience and Technology
- Food Processing and Engineering
- Analytical Techniques,
- Robotics and Automation,
- Artificial Intelligence
- Cloud Computing.

Proposed examination scheme of B.Tech. CHE programme with learning outcomes and new syllabi are enclosed in **Annexure-VIII(A)**.

VIII. (B) B.Tech. CHE Examination Scheme (w. e. f. 2017-18 & 2018-19)

S.No.	B.Tech. CHE Examination Scheme	Remarks
i.	Third Semester Examination, December, 2018/2019	Revised
ii.	Fourth Semester Examination, April/May, 2019/2020	Revised
iii.	Fifth Semester Examination, December,2019/ 2020	Revised
iv.	Sixth Semester Examination, April/May, 2020/2021	Revised
v.	Seventh Semester Examination, December, 2020/2021	Revised
vi.	Eighth Semester Examination, April/May 2021/2022	Revised

(a) The board reviewed and revised the examination scheme of B. Tech. CHE II Year (III and IV Semesters) 2018-19 and agreed to follow the same in 2019-20.

(b) The board reviewed and revised the examination scheme of B. Tech. CHE III Year (V and VI Semesters) and agreed to follow the same for sessions 2019-20 and 2020-21. Board proposed two new courses *Numerical Methods* and *Probability & Statistics* in III Year. *Chemical Reaction Engineering* course has been shifted from V Semester to VI Semester.

(c) The board reviewed and revised the examination scheme of B. Tech. CHE IV Year (VII and VIII Semesters) and agreed to follow the same for sessions 2020-21 and 2021-22.

(d) Board agreed to adopt following courses as reading electives for VII Semester.
- Membrane Separation Technology
- Corrosion Engineering
- Enzyme Engineering

- Renewable Energy Resources
- Computer Aided Process Plant Design

(e) Board agreed to introduce *Advanced Chemical Reaction Engineering*, *Optimization of Chemical Processes* and *Advanced Mass Transfer* as elective courses. B. Tech. VIII semester examination scheme will consist of two elective courses (which can be either open or disciplinary) and three compulsory courses. *Environmental Pollution Control* course has been shifted to VIII Semester. In B. Tech. VIII Semester *Chemical Plant Simulation* course has been shifted from elective to compulsory course.

(f) The complete list of elective courses are as follows:

- Petroleum Refining Technology
- Polymer Science and Technology
- Advanced Heat Transfer
- Advanced Chemical Reaction Engineering,
- Advanced Mass Transfer,
- Optimization of Chemical Processes,
- Nanoscience and Technology
- Food Processing and Engineering
- Analytical Techniques,
- Robotics and Automation,
- Artificial Intelligence
- Cloud Computing.

Proposed examination scheme of B.Tech. CHE programme with learning outcomes and new syllabi are enclosed in **Annexure-VIII(B)**.

3.VIII. (C) B.Tech. CHE Examination Scheme (w. e. f. 2016-17)

S.No.	B.Tech. CHE Examination Scheme	Remarks
i.	Seventh Semester Examination, December, 2019	Revised
ii.	Eighth Semester Examination, April/May 2020	Revised

(a) The board reviewed and revised examination scheme of B.Tech. CHE IV Year (VII and VIII Semesters) 2018-19 and agreed to follow the same scheme in 2019-20. The board has recommended to include learning outcomes, suggested books and e-resources in prescribed format as discussed in the meeting.

Proposed examination scheme of B.Tech. CHE programme with learning outcomes and new syllabi are enclosed in **Annexure-VIII(C)**.

4. The BOS received and reviewed the reports of examiners for different examination from 2014 onwards. All the reports were found to be with good remarks. Only some reports were having poor remarks. The information about such reports has been conveyed to the respective Heads for necessary action. Analysis of reports will be submitted by the concerned Heads.

5. The board critically analyzed the question papers of B.Tech. (CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE) and observed that all the question papers were balanced on the basis of desired parameters (Analytical, Descriptive, Thought provoking and Application based) and considering the nature of individual courses.

6. Board reviewed UIL Project Guidelines-2011 (**Annexure-IX**). Board gave consensus on the existing guidelines except the submission of synopsis in the hard copy. Board suggested submission of synopsis in soft copy may also be accepted. Guidelines for UIL project also require fresh look considering Choice Based Credit System and accordingly proposed evaluation scheme of semester project of B.Tech.(CSE/IT/ECE/EIE/EEE/MCTR/BT/CHE) students given in **Annexure-X**.

Name of Programme: B.Tech. (Electronics and Instrumentation Engineering)

The Bachelor of Technology (B.Tech.) program in Electronics and Instrumentation Engineering (EIE) has a strong blend of Measurement, Control and Automation. The program deals with control and monitoring of sophisticated real world problems. The area introduced by the department includes Electronic Measurement, Process Control, Robotics, Automation, Control System Design and Optimization. The program was started in 2011 and progressing on high growth path with best practices focusing on student centric approach. The department is a blend of dynamic and well experienced faculties. The main aim of this programme is to transform the student into professionally competent and socially sensitive engineers capable of working in multicultural global environment through quality education in the field of Electronics and Instrumentation Engineering.

The programme will enhance learning and research spirit in the students by making them acquaintance with modern technologies in Electronics and Instrumentation to operate the growing needs of the industries. The motive is to inculcate continuous practical knowledge through skill based learning approach using team works and leadership qualities. The course will bestow students, the capability to provide cost effectiveness solutions for social needs with deliberationsurrounding.

Program Educational Objectives

- To acquaint technical skills in the students for designing engineering systems by using instrumentation and related field of electronics.
- To create professional abilities that nurtures them for new employment opportunities in advanced areas of Electronics and Instrumentation as well as Electronics Engineering.
- To adorn with skills for solving technical problems related to Robotics, Embedded system, Biomedical, FiberOptics, Digital Control system, Virtual Instrumentation, Analytic Instrumentation, Process control.
- To develop overall personality having attributes of ethical and moral values using women empowerment,humanities, and sociological courses.

Programme Specific Outcomes

A graduate in Electronics and Instrumentation Engineering will be able to: -

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Demonstrate their technical ability to design and analyze Electronics and Instrumentation circuits, computer based programs through Programmable Logic Controller (PLC), MATLAB, Lab-VIEW, AUTOCAD and Arduino and IOT.
6. **The Engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
13. **Self learning and entrepreneurship:**Graduate will be able to participate and succeed in campus placements and competitive examinations like Public sector, GATE, GRE etc.An understanding of the industry needs through direct exposure with the industries under the Entrepreneurship Development Cell.
14. **Higher education and research:**An ability to take interest in higher education, research avenues through various trainings and research laboratory exposure.

Programme Scheme:

B. Tech. (Electronics and Instrumentation)
Proposed Scheme (2019-20)
B.Tech (I Year) (Common to all Branches)

First Semester						Second Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
BVF 002/BVF003	Environment Studies/Indian Heritage	2	-	-	2	BVF 003/BVF002	Indian Heritage/ Environment Studies	2	-	-	2
MATH 103/107	Calculus/Linear Algebra	3	1	-	4	MATH 107/103	Linear Algebra/Calculus	3	1	-	4
PHY 101/ 106	Optics/Modern Physics	3	1	-	4	PHY 106/ 101	Modern Physics/Optics	3	1	-	4
CHEM 101/ BIO 101	Chemistry/Biology	3	1	-	4	BIO 101/ CHEM 101/	Biology /Chemistry	3	1	-	4
CHE 101/ PHY 105	Thermodynamics/ Mechanics	3	1	-	4	PHY 105/ CHE 101	Mechanics/Thermodynamics	3	1	-	4
CS 109/EEE 101	Computer Fundamentals & Programming/Electrical Engineering	4	-		6	EEE 101/CS 109	Electrical Engineering / Computer Fundamentals & Programming	4	-		6
CS 109L/EEE 101L	Computer Fundamentals & Programming Lab/Electrical Engineering Lab	-	-	4	2	EEE 101L/CS 109L	Electrical Engineering Lab/ Computer Fundamentals & Programming Lab	-	-	4	2

ENGG 101L/ENGG 102L	Engineering Drawing & Graphics/ Measurement Techniques Lab	--	-	6	3	ENGG 101L/ENGG 102L	Measurement Techniques Lab /Engineering Drawing & Graphics	--	-	6	3
	Total	**18**	**4**	**10**	**27**		**Total**	**18**	**4**	**10**	**27**
	Total Credits	**27**					**Total Credits**	**27**			

B.Tech (II Year)(Electronics and Instrumentation)
(2019-20)

Third Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
BVF 007R	Selected Writings for Self study I	2	0	0	2
	Course Choice -1	3/4	0	0	3/4
	Course Choice -2	4	0	0	4
	Course Choice -3	3	0	0	3
CS 209	Data Structures	4	0	0	4
EEE 203	Network Analysis and Synthesis	4	0	0	4
ELE 201	Digital Electronics	4	0	0	4
CS 209L	Data Structures Lab	0	0	4	2
EEE 203L	Network Analysis and Synthesis Lab	0	0	2	1
ELE 201L	Digital Electronics Lab	0	0	2	1
ELE 203S	Seminar	0	0	2	1
	Total	**24/25**	**0**	**10**	**29/ 30**

Fourth Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
BVF 008R	Selected Writings for Self Study II	2	0	0	2
	Course Choice -4	4/3	0	0	4/3
	Course Choice -5	4	0	0	4
	Course Choice -6	3	0	0	3
CS 214	Object Oriented Programming	4	0	0	4
EIE 202	Electrical and Electronics Measurements	4	0	0	4
MCTR 201	Pneumatic Engineering	4	0	0	4
CS 214L	Object Oriented Programming Lab	0	0	4	2
EIE 202L	Electrical and Electronics Measurements Lab	0	0	2	1
MCTR 201L	Pneumatic Engineering Lab	0	0	2	1
	Total	**25/24**	**0**	**8**	**28/29**

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 1					
MATH 207	Complex Variables	3	0	0	3
MATH 208	Differential Equations	4	0	0	4

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice –4					
MATH 208	Differential Equations	4	0	0	4
MATH 207	Complex Variables	3	0	0	3

Course Choice - 2					
ENGG 201	Structure and Properties of Materials	4	0	0	4
ENGG 202	Basic Electronics	4	0	0	4
Course Choice - 3					
MGMT 209	Entrepreneurship	3	0	0	3
TSKL 203	Technical Report Writing	3	0	0	3

Course Choice –5					
ENGG 202	Basic Electronics	4	0	0	4
ENGG 201	Structure and Properties of Materials	4	0	0	4
Course Choice –6					
TSKL 203	Technical Report Writing	3	0	0	3
MGMT 209	Entrepreneurship	3	0	0	3

B.Tech (Semester V) (Electronics and Instrumentation) (2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
FC 5.1	Course Choice -1	3	0	0	3
EI 5.1	Course Choice -2	3	0	0	3
EI 5.2	Communication Engineering	4	0	0	4
	Communication Engineering Lab	0	0	2	1
EI 5.3	~~Transducers~~	4	0	0	4
	~~Transducers Lab~~	0	0	2	1
EI 5.4	Analog Integrated Circuits	4	0	0	4
	Analog Integrated Circuits Lab	0	0	2	1
EI5.5	Microprocessor & Microcontroller	4	0	0	4
	Microprocessor & Microcontroller Lab	0	0	2	1
EI 5.6	Seminar	4	0	0	4
EI 5.7	Digital Signal Processing	0	0	4	2
	Total	**26**	**0**	**10**	**32**

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
	Course Choice -1	3	0	0	3
	Course Choice -2	3	0	0	3
	Course Choice -3	2/3	1	0	3/4
ELE 301	Analog Integrated Circuits	3	1	0	4
ELE 306	Microprocessor & Microcontroller	4	0	0	4
EIE 308	Industrial Instrumentation	4	0	0	4
EIE 309	Linear Control System	3	1	0	4
ELE 301L	Analog Integrated Circuits Lab	0	0	2	1
ELE 306L	Microprocessor & Microcontroller Lab	0	0	2	1
EIE 308L	Industrial Instrumentation Lab	0	0	2	1
EIE 309L	Linear Control System Lab	0	0	2	1
	Total	**22/23**	**3**	**08**	**29/30**

***Communication Engineering and Communication Engineering Lab shifted to VII Sem.**
****Seminar shifted to III sem.**
***** Digital Signal Processing shifted to VI sem.**

Annexure-VIII

Course Code	Course Name	L	T	P	C
Course Choice - 1					
FC 5.1	Parenthood and Family Relation	3	0	0	3
FC 5.1	Women in Indian Society	3	0	0	3
Course Choice - 2					
EI 5.1	Economics for Engineers	3	0	0	3
EI 5.1	Principles of Management	3	0	0	3

Course Code	Course Name	L	T	P	C
Course Choice –1					
	Parenthood and Family Relation	3	0	0	3
	Women in Indian Society	3	0	0	3
Course Choice –2					
	Economics for Engineers	3	0	0	3
	Principles of Management	3	0	0	3
Course Choice –3					
	Numerical Methods	2	1	0	3
	Probability and Statistical Methods	3	1	0	4

B.Tech (Semester VI) (Electronics and Instrumentation) (2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
FC 6.1	Course Choice -3	3	0	0	3
EI 6.1	Course Choice -4	3	0	0	3
EI 6.2	Power Electronics	4	0	0	4
	Power Electronics Lab	0	0	2	1
EI 6.3	Biomedical Instrumentation	4	0	0	4
EI 6.4	~~Control Systems~~	0	0	2	1
	~~Control Systems Lab~~	4	0	0	4
EI 6.5	Fiber Optics & Laser Instrumentation	0	0	2	1
	~~Fiber Optics & Laser Instrumentation Lab~~	4	0	0	4
EI 6.6	~~Lab View Lab~~	4	0	0	4
EI 6.7	Virtual Instrumentation	0	0	2	1

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
	Course Choice - 4	3	0	0	3
	Course Choice - 5	3	0	0	3
	Course Choice - 6	3/2	1	0	4/3
	Robotics and Control	4	0	0	4
EEE 304	Power Electronics	4	0	0	4
EIE 307	Industrial Automation	4	0	0	4
ELE 304	Digital Signal Processing	3	1	0	4
	Robotics and Control Lab	0	0	2	1
EEE 304L	Power Electronics Lab	0	0	2	1
EIE 307L	Industrial Automation Lab	0	0	2	1

EI 6.8	Project	0	0	4	2
	Total	**26**	**0**	**12**	**32**

ELE 304L	Digital Signal Processing Lab	0	0	2	1
	Project	0	0	4	2
	Total	**24/23**	**2**	**12**	**32/31**

***Control System and its Lab is replaced with Linear Control System with lab and shifted in V sem.**
****Virtual Instrumentation is shifted to Department Elective.**
***** Biomedical Instrumentation is shifted to Department Elective.**
****** Fiber Optics & Laser Instrumentation is shifted to Department Elective.**

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 3					
FC 6.1	Women in Indian Society	3	0	0	3
FC 6.1	Parenthood and Family Relation	3	0	0	3
Course Choice - 4					
EI 6.1	Principles of Management	3	0	0	3
EI 6.1	Economics for Engineers	3	0	0	3

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice –4					
	Women in Indian Society	3	0	0	3
	Parenthood and Family Relation	3	0	0	3
Course Choice –5					
	Principles of Management	3	0	0	3
	Economics for Engineers	3	0	0	3
Course Choice –6					
	Probability and Statistical Methods	3	1	0	4
	Numerical Methods	2	1	0	3

Annexure-VIII

B.Tech (Semester VII) (Electronics and Instrumentation) (2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
EI 7.1	Analytical Instrumentation	4	0	0	4
	~~Analytical Instrumentation Lab~~	4	0	0	4
EI 7.2	~~Process Control and instrumentation~~	0	0	2	1
EI 7.3	~~VLSI Design~~	4	0	0	4
	~~VLSI Design Lab~~	0	0	2	1
EI 7.4	Departmental Elective-I	4	0	0	4
EI 7.5	~~Departmental Elective-II~~	4	0	0	4
	Total	**20**	**0**	**4**	**22**

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
EIE 310	Process Control	4	0	0	4
ECE 302	Communication Engineering	4	0	0	4
	Mechatronics Systems	4	0	0	4
EIE 310L	Process Control Lab	0	0	2	1
	Mechatronics Systems Lab	0	0	4	2
	Elective	4	0	0	4
	Open Elective*	4	0	0	4
	Total	**20**	**0**	**6**	**23**

Departmental Electives I & II

Course No.	**Course Name**	**L**	**T**	**P**	**C**
1	Artificial Neural Network and Fuzzy Logic	4	0	0	4
2	Energy Efficiency and Conservation	4	0	0	4
3	Special Electrical Machines	4	0	0	4
4	Digital Control Systems	4	0	0	4
5	Audio and Video Systems	4	0	0	4
6	CAD of Electric Machines	4	0	0	4
7	Mechatronics	4	0	0	4
8	Robotics and Automation	4	0	0	4
9	Geoinformatics	4	0	0	4

Elective

Course Code	**Course Name**	**L**	**T**	**P**	**C**
	Artificial Neural Network and Fuzzy Logic	4	0	0	4
	Energy Efficiency and Conservation	4	0	0	4
	Non-linear Control system	4	0	0	4
	Digital Control Systems	4	0	0	4
EIE 401	Analytical Instrumentation	4	0	0	4
EIE 303	Fiber Optic and Laser Instrumentation	4	0	0	4
EIE 301	Biomedical Instrumentation	4	0	0	4
EIE 306	Virtual Instrumentation	4	0	0	4
	Power Plant Engineering	4	0	0	4

Annexure-VIII

***Subject to Approval**
****Analytical Instrumentation is shifted to Department Elective.**
***** Process Control & Instrumentation and its Lab is replaced with Process Control with lab and shifted in VII sem.**

B.Tech (Semester VIII) (Electronics and Instrumentation) (2019-20)

Existing Scheme						Proposed Scheme		
Course Cod	**Course Name**	**L**	**T**	**P**	**C**	**Course Code**	**Course Name**	**L**
EI 8.1	UIL Project	20	0	0	20	EIE 407P	UIL Project	20
EI 8.2	Reading Elective -I	2	0	0	2		Reading Elective	2
	Total	**22**	**0**	**0**	**22**		**Total**	**22**
Reading Elective-I								
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Course Code**	**Course Name**	**Source Institution**
EI 8.2	Operating Systems	2	0	0	2		Introduction to Photonics	NPTEL
EI 8.2	Pattern Recognition and Image Processing	2	0	0	2		Fundamentals of Semiconductor devices	NPTEL
EI 8.2	Indicator Recorder and Controller	2	0	0	2		Advanced IOT Applications	NPTEL
EI 8.2	Remote Control and Telemetry	2	0	0	2		Principles of Signals and Systems	NPTEL
EI 8.2	Telemetry and Data Transmission	2	0	0	2		Biomedical Signal Processing	NPTEL
EI 8.2	Reliability Engineering	2	0	0	2		Electromagnetic Waves in guided and wireless media	NPTEL
EI 8.2	Electronic Commerce	2	0	0	2		Control Engineering	Swayam
EI 8.2	Enterprise Resource Planning	2	0	0	2		Industrial Automation and Control	Swayam
							Mathematical Methods and techniques in signal processing	NPTEL
							Electronics Modules for Industrial Applications using Opamps	NPTEL
							Chemical Process Instrumentation	NPTEL

Annexure-VIII

	Quality Control	National Sugar Institute
	Interfacing with Arduino	Coursera
	Robotica	Coursera
	Analyzing Data with Python	Edx
	Industry 4.0	Edx
	Internet of Things	MSME
	Industrial Robotics	MSME
	SCADA	MSME
	PLC	MSME
	Electromagnetic Compatibility	NPTEL
	Antennas	NPTEL

Annexure-VIII

Annexure-X

Name of Programme: B.Tech (Electrical and Electronics Engineering)

Electrical and Electronics Engineering is a professional engineering discipline that deals with the development of technologies for generating and harnessing electricity for a wide range of applications. The field first became an identifiable occupation in the late nineteenth century, with the commercialization of the electric telegraph and power supply. The field now covers a range of sub disciplines, including those that deal with power, control systems, electronics, signal processing, and telecommunications.

Electrical engineering surrounds us everywhere in modern society. The electrical engineer supplies us with the ability to harness electricity which has transformed our lives. It gives us light, heat, entertainment, communication systems and comfort. Electrical engineers create and design products and information systems using scientific principles combined with natural curiosity, problem-solving and innovation.

Electrical engineers work with electricity in a variety of areas - aircraft and automobiles; broadcasting and communications systems; lighting and wiring in buildings; machinery controls; power generating and transmitting; radar and navigation systems. They can be involved with the design of new products as well as testing equipment and solving problem

Electrical engineering program offer high quality education to students for abreast of latest global industrial and research requirements and fulfill responsibility towards community.The motive of the course is totransform students into professionally competent and socially sensitive engineers capable of working in multicultural global environment through quality education in the field of Electrical and Electronics Engineering

ProgrammeEducational Objective

- To prepare undergraduate students with appropriate blend of theoretical foundations, experimentation & technical implementation to comprehend and pinpoint problems in the field of electrical engineering.
- To offer students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve electrical engineering problems and also to pursue higher

studies. Student will be able to employ her knowledge along with essential techniques & tools for modern engineering applications.

- To train students with good scientific and electrical engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems in the present electrical system.
- To inculcate professional and ethical attitude and skills like communication, teamwork, computational ability to relate electrical engineering issues to broader social context in students.
- To educate students with an academic environment aware of excellence, leadership, and the life-long learning needed for a successful professional career through independent studies, thesis, internships,*etc.*

Programme Specific Outcomes

A graduate in Electronics and Instrumentation Engineering will be able to: -

1. **Engineering knowledge**: Graduates will demonstrate knowledge of advanced mathematics, science and electrical engineering with the ability to apply the theoretical knowledge and concepts to the disciplines of electrical engineering.
2. **Problem analysis:**Graduates will demonstrate an ability to identify, formulate, pinpoint and solve Electrical engineering problems keeping in view the present day power and energy requirement and its future prospect.
3. **Design/development of solutions:**Graduate will demonstrate an ability to design and analyze electrical and power electronic circuits and conduct experiments enable to design, construct and operate complex interconnected power systems.
4. **Conduct investigations of complex problems:**Graduates will demonstrate an ability to design study and analyze the digital and analog systems and components that serve as the fundamental components of the power engineering methods being increasingly used with the new technological advances.
5. **Environment and sustainability:**Graduates will demonstrate an ability to visualize and work on laboratory and identify the theoretical models as predictors of real world

behavior. This may include evaluating, establishing of validating a relationship between data and underlying physical principles.

6. **Modern tool usage:**Graduate will demonstrate skills to use modern engineering tools, software, equipment to design, protect or assemble the system using specific methodologies with the help of appropriate tools to satisfy requirements.Graduates will demonstrate knowledge of professional and computer language skills that will eventually develop them into skilled researchers in an atmosphere that is technically advanced and conductive.
7. **Communication:**Graduate will be able to communicate effectively in both verbal and written form. They will develop a better presentation skill on academic and personal grounds that will enhance their personality in all aspects.
8. **The engineer and society:**Graduate will understand the impact of engineering solutions on the society and also be aware of contemporary issues relating to the exhausting resources and alternatives to continue uninterrupted power supply.
9. **Individual and team work:**Graduate will develop confidence, self-motivation, positive belief, consistency, perseverance and team work.
10. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Self learning and entrepreneurship:**Graduate will be able to participate and succeed in campus placements and competitive examinations like Public sector, GATE, GRE etc.An understanding of the industry needs through direct exposure with the industries under the Entrepreneurship Development Cell.
13. **Higher education and research:**An ability to take interest in higher education, research avenues through various trainings and research laboratory exposure.

Annexure-X

Programme Scheme:

B. Tech. (Electrical and Electronics)

Proposed Scheme (2019-20)

B.Tech (I Year) (Common to all Branches)

First Semester						Second Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
BVF 002/BVF003	Environment Studies/Indian Heritage	2	-	-	2	BVF 003/BVF002	Indian Heritage/ Environment Studies	2	-	-	2
MATH 103/107	Calculus/Linear Algebra	3	1	-	4	MATH 107/103	Linear Algebra/Calculus	3	1	-	4
PHY 101/ 106	Optics/Modern Physics	3	1	-	4	PHY 106/ 101	Modern Physics/Optics	3	1	-	4
CHEM 101/ BIO 101	Chemistry/Biology	3	1	-	4	BIO 101/ CHEM 101/	Biology /Chemistry	3	1	-	4
CHE 101/ PHY 105	Thermodynamics/ Mechanics	3	1	-	4	PHY 105/ CHE 101	Mechanics/Thermodynamics	3	1	-	4
CS 109/EEE 101	Computer Fundamentals & Programming/Electrical Engineering	4	-	4	6	EEE 101/CS 109	Electrical Engineering / Computer Fundamentals & Programming	4	-	4	6
ENGG 101L/ENGG 102L	Engineering Drawing & Graphics/ Measurement Techniques Lab	--	-	6	3	ENGG 101L/ENGG 102L	Measurement Techniques Lab /Engineering Drawing & Graphics	--	-	6	3
	Total	**18**	**4**	**10**	**27**		**Total**	**18**	**4**	**10**	**27**
	Total Credits	**27**					**Total Credits**	**27**			

Annexure-X

B.Tech (II Year)(Electrical and Electronics)

(2019-20)

Third Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
BVF 007R	Selected Writings for Self study I	2	0	0	2
	Course Choice -1	3/4	0	0	3/4
	Course Choice -2	4	0	0	4
	Course Choice -3	3	0	0	3
CS 209	Data Structures	4	0	0	4
CS 209L	Data Structures Lab	0	0	4	2
ELE 202	Electromagnetic Field Theory	3	1	0	4
ELE 201	Digital Electronics	4	0	0	4
ELE 201L	Digital Electronics Lab	0	0	2	1
ELE 203S	Seminar	0	0	2	1
	Total	**23/24**	**1**	**8**	**28/ 29**

Fourth Semester					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
BVF 008R	Selected Writings for Self Study II	2	0	0	2
	Course Choice -4	4/3	0	0	4/3
	Course Choice -5	4	0	0	4
	Course Choice -6	3	0	0	3
CS 214	Object Oriented Programming	4	0	0	4
EIE 202	Electrical and Electronics Measurements	4	0	0	4
EEE 203	Network Analysis and Synthesis	3	1	0	4
CS 214L	Object Oriented Programming Lab	0	0	4	2
EIE 202L	Electrical and Electronics Measurements Lab	0	0	2	1
EEE 203L	Network Analysis and Synthesis Lab	0	0	2	1
	Total	**24/23**	**1**	**8**	**29/28**

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 1					
MATH 207	Complex Variables	3	0	0	3
MATH 208	Differential Equations	4	0	0	4
Course Choice - 2					

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 4					
MATH 208	Differential Equations	4	0	0	4
MATH 207	Complex Variables	3	0	0	3
Course Choice - 5					

Annexure-X

ENGG 201	Structure and Properties of Materials	4	0	0	4
ENGG 202	Basic Electronics	4	0	0	4
Course Choice - 3					
MGMT 209	Entrepreneurship	3	0	0	3
TSKL 203	Technical Report Writing	3	0	0	3

ENGG 202	Basic Electronics	4	0	0	4
ENGG 201	Structure and Properties of Materials	4	0	0	4
Course Choice - 6					
TSKL 203	Technical Report Writing	3	0	0	3
MGMT 209	Entrepreneurship	3	0	0	3

B.Tech (Semester V) (Electrical and Electronics)

(2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
FC 5.1	Course Choice -1	3	0	0	3
EI 5.1	Course Choice -2	3	0	0	3
EE 5.2	Electrical Machines -I	4	0	0	4
	Electrical Machines- I Lab	0	0	2	1
EE 5.3	~~Elements of Power Systems~~	4	0	0	4
	~~Elements of Power Systems Lab~~	0	0	2	1
EE 5.4	~~Network Analysis~~	4	0	0	4
	~~Network Analysis Lab~~	0	0	2	1
EE 5.5	Power Electronics	4	0	0	4
	Power Electronics Lab	0	0	2	1
EE 5.6	Analog Integrated Circuits	4	0	0	4
	Analog Integrated Circuits Lab	0	0	2	1
EE 5.7	Seminar	0	0	4	2

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
	Course Choice -1	3	0	0	3
	Course Choice -2	3	0	0	3
	Course Choice -3	2/3	1	0	3/4
ELE 301	Analog Integrated Circuits	3	1	0	4
EEE 202	Electrical Machines -I	3	1	0	4
	Power System-I	3	1	0	4
EIE 309	Linear Control System	3	1	0	4
ELE 301L	Analog Integrated Circuits Lab	0	0	2	1
EEE 202L	Electrical Machines- I Lab	0	0	2	1
	Power System –I Lab	0	0	2	1
EIE 309L	Linear Control System Lab	0	0	2	1

	Total	**26**	**0**	**14**	**34**		**Total**	**20/21**	**5**	**08**	**29/30**

***Control System and its Lab is replaced with Linear Control System with lab and shifted in V sem.**

**** Power Electronics and its Lab is shifted in VI sem.**

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 1					
FC 5.1	Parenthood and Family Relation	3	0	0	3
FC 5.1	Women in Indian Society	3	0	0	3
Course Choice - 2					
EE 5.1	Economics for Engineers	3	0	0	3
EE 5.1	Principles of Management	3	0	0	3

Course Code	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 1					
	Parenthood and Family Relation	3	0	0	3
	Women in Indian Society	3	0	0	3
Course Choice - 2					
	Economics for Engineers	3	0	0	3
	Principles of Management	3	0	0	3
Course Choice - 3					
	Numerical Methods	2	1	0	3
	Probability and Statistical Methods	3	1	0	4

B.Tech (Semester VI) (Electrical and Electronics)

(2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
FC 6.1	Course Choice -3	3	0	0	3
EE 6.1	Course Choice -4	3	0	0	3
EE 6.2	Communication Engineering	3	1	0	4
EE 6.3	Electrical Machines-II	4	0	0	4
	Electrical Machines-II Lab	0	0	2	1
EE 6.4	~~Power System Analysis~~	4	0	0	4

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
	Course Choice - 4	3	0	0	3
	Course Choice - 5	3	0	0	3
	Course Choice - 6	3/2	1	0	4/3
ELE 306	Microprocessors and Microcontrollers	4	0	0	4
EEE 301	Electrical Machines-II	3	1	0	4

Annexure-X

	~~Power System Analysis Lab~~	0	0	2	1	EEE 304	Power Electronics	3	1	0	4
EE 6.5	~~Control Systems~~	3	1	0	4		Power System-II	4	0	0	4
	~~Control Systems Lab~~	0	0	2	1	ELE 306L	Microprocessors and Microcontrollers Lab	0	0	2	1
EE 6.6	Microprocessors and Microcontrollers	3	1	0	4	EEE 301L	Electrical Machines-II Lab	0	0	2	1
	Microprocessors and Microcontrollers Lab	0	0	2	1						
EE 6.7	Project	0	0	4	2	EEE 304 L	Power Electronics Lab	0	0	2	1
							Power System-II Lab	0	0	2	1
							Project	0	0	4	2
Total		**23**	**3**	**12**	**32**	**Total**		**23/22**	**3**	**12**	**32/31**

***Communication Engineering is shifted in VII sem.**

Course Code	**Course Name**	**L**	**T**	**P**	**C**	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
Course Choice - 3						**Course Choice - 4**					
FC 6.1	Women in Indian Society	3	0	0	3		Women in Indian Society	3	0	0	3
FC 6.1	Parenthood and Family Relation	3	0	0	3		Parenthood and Family Relation	3	0	0	3
Course Choice - 4						**Course Choice - 5**					
EE 6.1	Principles of Management	3	0	0	3		Principles of Management	3	0	0	3
EE 6.1	Economics for Engineers	3	0	0	3		Economics for Engineers	3	0	0	3
						Course Choice - 6					
							Probability and Statistical Methods	3	1	0	4
							Numerical Methods	2	1	0	3

Annexure-X

B.Tech (Semester VII) (Electrical and Electronics)

(2019-20)

Existing Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
EE 7.1	Electrical Drives and Control	4	0	0	4
	Electrical Drives and Control Lab	0	0	2	1
EE 7.2	Digital Signal Processing	3	1	0	4
	Digital Signal Processing Lab	0	0	2	1
EE 7.3	~~Microwave Electronics~~	4	0	0	4
EE 7.4	Departmental Elective-I	4	0	0	4
EE 7.5	~~Departmental Elective -II~~	4	0	0	4
	Total	**19**	**1**	**4**	**22**

Proposed Scheme					
Course Code	**Course Name**	**L**	**T**	**P**	**C**
ELE 304	Digital Signal Processing	3	1	0	4
	Switch Gear and Protection	4	0	0	4
ECE 302	Communication Engineering	4	0	0	4
ELE 304L	Digital Signal Processing Lab	0	0	2	1
	Switch Gear and Protection Lab	0	0	2	1
	Elective	4	0	0	4
	Elective Lab	0	0	2	1
	Open Elective*	4	0	0	4
	Total	**19**	**1**	**6**	**23**

Departmental Electives- I & II

Course No.	**Course Name**	**L**	**T**	**P**	**C**
1	Energy Efficiency and Conservation	4	0	0	4
2	Special Electrical Machines	4	0	0	4
3	Switch Gear and Protection	4	0	0	4
4	Digital Control Systems	4	0	0	4
5	Audio and Video Systems	4	0	0	4
6	CAD of Electric Machines	4	0	0	4
7	Mechatronics	4	0	0	4

Elective

Course Code	**Course Name**	**L**	**T**	**P**	**C**
EEE 401	Electric Drives and Control	4	0	2	5
	Mechatronics	4	0	2	5
	Robotics and Automation	4	0	2	5
EIE 307	Industrial Automation	4	0	2	5
EIE 310	Process Control	4	0	2	5
	Power System Operation and Control	4	0	2	5
	Power System Restructuring and Deregulation	4	0	2	5

Annexure-X

8	Robotics and Automation	4	0	0	4

EEE 401L	Electric Drives and Control Lab	0	0	2	1
	Mechatronics Lab	0	0	2	1
	Robotics and Automation Lab	0	0	2	1
EIE 307L	Industrial Automation Lab	0	0	2	1
EIE 310L	Process Control Lab	0	0	2	1
	Power System Operation and Control Lab	0	0	2	1
	Power System Restructuring and Deregulation Lab	0	0	2	1

***Subject to Approval**

**** Electrical Drives and control is shifted in Elective paper.**

B.Tech (Semester VIII) (Electrical and Electronics)

(2019-20)

Existing Scheme					
Course Cod	**Course Name**	**L**	**T**	**P**	**C**
EI 8.1	UIL Project	20	0	0	20
EI 8.2	Reading Elective -I	2	0	0	2
	Total	**22**	**0**	**0**	**22**

Proposed Scheme		
Course Code	**Course Name**	**L**
EEE 405P	UIL Project	20
	Reading Elective	2
	Total	**22**

Reading Elective-I

Course Code	**Course Name**	**L**	**T**	**P**	**C**
EI 8.2	Operating Systems	2	0	0	2

Course Code	**Course Name**	**Source Institution**
	Computer Aided Power System Analysis	NPTEL

EI 8.2	Pattern Recognition and Image Processing	2	0	0	2		Fundamentals of Semiconductor devices	NPTEL
EI 8.2	Indicator Recorder and Controller	2	0	0	2		Advanced IOT Applications	NPTEL
EI 8.2	Remote Control and Telemetry	2	0	0	2		Principles of Signals and Systems	NPTEL
EI 8.2	Telemetry and Data Transmission	2	0	0	2		Antennas	NPTEL
EI 8.2	Reliability Engineering	2	0	0	2		Electromagnetic Waves in guided and wireless media	NPTEL
EI 8.2	Electronic Commerce	2	0	0	2		Control Engineering	Swayam
EI 8.2	Enterprise Resource Planning	2	0	0	2		Industrial Automation and Control	Swayam
							Power System Dynamics, Control and Monitoring	NPTEL
							Advance Power Electronics and Control	NPTEL
							Introduction to Photonics	NPTEL
							Biomedical Signal Processing	NPTEL
							Interfacing with Arduino	Coursera
							Robotica	Coursera
							Analyzing Data with Python	Edx
							Industry 4.0	Edx
							Internet of Things	MSME
							Industrial Robotics	MSME
							SCADA	MSME

Annexure-X

							PLC	MSME
							Advances in UHV Transmission & Distribution	NPTEL
							Advanced IOT Applications	NPTEL
							Mathematical Methods and techniques in signal processing	NPTEL
							Electronics Modules for industrial applications using opamp	NPTEL
							Quality Control	National Sugar Institute
							Electromagnetic Compatibility	NPTEL