UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTION AND EVALUATION (R2007)
COURSE B.E. (ELECTRONICS ENGINEERING)

SEMESTER:V

Sr. No.	Subjects	No.of periods of 1 Hour			Duration Of Theory Paper in Hours	Marks				Total
						Theory Paper	Term work	Practical /Oral	Oral	
1	Continuous Time Signal & System	4	2	--	3	100	25	--	25	150
2	Microprocessor and Microcontroller-1	4	2	-	3	100	25	25	--	150
3	Electromagnetic Engineering	3	--	1	3	100	25	--	--	125
4	Linear Integrated Circuits and Design	4	2	--	3	100	25	25	--	150
5	Digital Communication and Coding Techniques	4	2	--	3	100	25	--	25	150
6	EVS	2		1#	2	50	25	--	--	75
7	Electronics Workshop II	--	4	--	--	--	--	--	50	50
	Total	21	12	2	--	550	150	50	100	850

 # Class wise tutorial

T.E. (ELECTRONICS) SEMESTER V

Continuous Time Signal & System

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks Oral Exam:25 Total:150**

Objective

1. To introduce the student to the idea of signals and systems analysis and characterization in continuous domain.
2. To provide a foundation to numerous other courses that deal with signal and system concepts directly or indirectly: viz: communication, control, statistical signal processing etc

Pre-requisite: Basic knowledge of Fourier analysis ,Laplace Transform and sampling theorem

Hours 10

1 Introduction to signals & Systems

Definition of Signal
Elementary Continuous Time (CT) signals like unit step, Impulse, ramp, exponential, sinusoidal etc.
Operations on signal like shifting, flipping, scaling, addition, multiplication
Breaking of a CT signal in different basic components
Concept of system
Classification of system on the basis of linearity, time variance, causality, memory ,stability, invertibilty etc
System representation by a differential equation

Hours 06

2.Convolution and correlation

Concept of Impulse Response
Convolution integral and system response in CT domain
Properties, Autocorrelation and its property. Relation of autocorrelation to signal energy, power, ESD, and PSD. Cross correlation and its property**.**

Hours 12

3. **Fourier Series (FS) & Fourier Transform (FT) for CT systems**

Review of Trigonometric series, Exponential series
properties and uses
Amplitude & phase spectra
Power Spectral Density
Parseval's relation, Relation between Trigonometric and Exponential Fourier series,
Gibbs Phenomenon
The Fourier Transform (FT)
FT of basic signals
Properties of FT and derivations
FT of periodic signals
Conceptual introduction to C.T. short time Fourier Transform (STFT)
Energy Spectral Density
Analog to Digital conversion & its Reconstruction

Hours 06

4. **Fundamentals of Random processes**

Introduction, concept of random variable, PDF of uniform, Gaussian and exponential random variable. Properties of Mean, variance and moments. Two or more random variables , Random processes

Hours08

5. **Laplace transform analysis of signals and systems**

Definition & properties of Two-sided & one-sided Laplace Transform.
Region of Convergence (ROC)
inverse Laplace transform
Relationship with Fourier Transform & mapping
BIBO stability and ROC
Pole-zero diagram
Impulse response of a system, and impulse response of cascade and parallel systems
Time domain analysis for first and second order systems
Solution to differential equations and system behavior.
Zero state & zero input responses
System response to complex exponential inputs.

Hours06

6. **State -Variable Techniques**

State –Variable concepts and state variable model ,
TF from state variable model and vice versa.
Digonalization
State equations & their time domain and frequency domain solutions
State transition matrix
System state equations

Text- Books:

1. S. Haykin, Signals and Systems , Wiley Eastern Publication
2.M J. Roberts, Fundamentals of Signals and Systems, second reprint, Tata McGraw-Hill, 2008
3.J.G. Proakis, D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and applications, Prentice Hall of India, 1995
4.Ashok Ambardar, Analog and Digital Signal Processing, Thomson Learning, second edition, 2001
5.B.P.Lathi, linear systems and signals Oxford University Press second Indian Impression, 2007
6.D.D. Shah & A.C. Bhagali, Signals and systems, MPH publication.

Additional Reading:

1.R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998
2.A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prenice Hall, 1983.
3.R.A.Gabel,Signals and linear systems,John wiley and Sons.
4.chen,Signals and Systems Oxford University Press Third Indian Impression, **2007**
5.I J Nagrath, S N Sharma, R Ranjan, and S Kumar , “Signals and Systms”, Tata Mcgraw Hill

Suggested list of simulations

1. Generation and transformations of basic C.T. signals(2 simulations)
2. Verification of sampling theorem
3. Impulse and step response of a C.T. system
4. Demonstration of Fourier series coefficients
5. Demonstration of Fourier transform of signals
6. Demonstration of Laplace transform of signals
7. Finding Mean, variance and standard deviation of random data
8. State space to TF and TF to state space conversion

T.W. / Oral Examination:

Term work:

The term work shall consists of at least four assignments and six MATLAB or C simulations covering the whole of syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage of ten marks.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks.

Test (at least one) : 10 marks.

Attendance (Practical and Theory) : 05 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1. Question paper will be comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module

T.E. (ELECTRONICS) SEMESTER V

Microprocessor and Microcontroller-I

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Practical Exam: 3 marks:25** **Term work: 25 marks Total:150**

Objective: Objective of this course is to introduce to the students the fundamentals of microprocessor and microcontroller.

Pre-Requisite: Concept of Basic Electronics and Digital Logic Systems.

Hours 08

1. **Basics 8085:**

Basic 8085 microprocessor architecture and its functional blocks. 8085 microprocessor IC pin outs and signals, address, data and control buses. 8085 features. Interrupt system of 8085. Stack and subroutine. Types of memory and memory interfacing. Decoding techniques-absolute and partial. Mapping techniques -I/ O mapped I /O and memory mapped-I/O. Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SOD and SID.

Hours 09

2. **Programming with 8085:**

Basic instruction set, timing states, machine cycles and instruction cycles. Instruction timing diagram and, interrupt process and timing diagram of interrupt instruction execution. Writing assembly language programs. Looping, counting and indexing operations related programs. Stacks and subroutines operations related programs. Conditional call and return instructions operations related programs. Debugging programs.

Hours06

3. Study and Interfacing of peripherals 8155, 8255, 8253/8254, 8259 with 8085.

Hours08

4. **Basics of 8051:**

Comparison of microprocessor and microcontroller. Architecture and pin functions of 8051 chip controller. CPU timing and machine cycles. Internal memory organization. Program counter and stack. Input/output prots. Counters and timers. Serial data input and output interrupts. Power saving modes.

Hours09

5. **Programming with 8051:**

Instruction set, addressing modes. Immediate, registers, direct and indirect data movement and exchange instructions. Push and pop op-codes. Arithmetic and logic instructions, bit level operations, jump and call instructions, input/output port programming, programming timers, asynchronous serial data communications and hardware interrupt service routines interfacing of LCD display hex keyboard ADC0808. DAC0808 and stepper motor with 8051 current trends in microprocessors and practical implementation.

Hours08

6.**Introduction to ARM Processor**

1.ARM family architecture, register architecture, memory access and addressing modes, arithmetic and logical instructions, branching instructions.

Comparative study of salient features of 8051 and its derivatives like 89C51, 89C52, 89C2051 and 89C2052. Current processor and controller survey. (cost, availability, popularity)

Recommeded Books:

1.Mazidi & Mazidi, The 8085 microcontroller & embedded system, using assembly and C, 2nd edi, pearson edu.
2.Microprocessor and interfacing 8085, Douglas V Hall, Tata Mc Gram Hill.
3.Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
4.Crisp, introduction to microprocessor & microcontrollers, 2e Elsevier, 2007.
5.ARM system-on-chip architecture, 2e pearson education.
6.Calcut, 8051 microcontrollers: An applications based introduction, Elsevier.
7.DV kodavade, S.Narvadkar, 8085-86 microprocessors Architecture progg and interfaces, wiley.
8.Udyashankara V., Mallikarjunaswamy, 8051 microcontroller, TMH.
9.Han-way Huang, using The MCS-51 microcontroller, Oxford university press.
10.Ayala, 8051 microcontroller, cengage(Thomson).
11.Rout, 8085 microcontroller-architecture, programming and application, 2nd edi, penram international.

term-work

The distribution of marks for term work shall be as follows,
Tutorials : 10 marks.
Test (at least one) : 10 marks.
Attendance (Tutorials and Theory) : 05 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of Tutorials work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. **In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.**
6. No question should be asked from pre-requisite module.

T.E. (ELECTRONICS) SEMESTER V

Electromagnetic Engineering

Lectures: 3 per week	**Theory Paper: 3 hours and 100 marks**
Tutorial: 1 (each of 60min)	**Term work: 25 marks Total:125**

Objective: Electromagnetic Field Theory deals with electric and magnetic field vectors, whereas circuit theory deals with voltages and currents that are the integrated effects of electric and magnetic fields. An understanding of Electromagnetic is a must to appreciate Wave Propagation, Antenna Theory, Microwave and Optical Fiber System.-

Pre-requisite: Vector Algebra

Hours06

1. **Basics of Electromagnetics**

Co-ordinate systems, line, Surface & Volume Integral, Curl, Divergence & Gradient, Electric Charge, Coulomb's law, Charge distribution, Electric Field Intensity, field due to distributed charges, Electric Flux, Gauss's law, Divergence Theorem, Electric Potential & Potential Gradient, Ampere's Law, Magnetic Flux, Faraday's Law, Poisson & Laplace's Equations

Hours06

2. **Maxwell Equations:**

Formation of Maxwell's Equations

Derivation of various basic electro magnetic laws using Maxwell's Equations, Conditions at Boundary Surfaces

Hours05

3. **Electromagnetic Waves**

The wave equation for free space & conducting medium, Uniform Plane wave, Intrinsic Impedance, Helmoltz Equations, Propagation characteristics of Electromagnetic Wave, Polarization, Poynting's Theorem, Instantaneous, Average & Complex Poynting vector

Hours06

4. **The uniform plane wave Propagation**

plane wave reflection and dispersion, reflection of uniform plane waves at normal incidence, standing wave ratio, wave reflections from multiple interfaces, plane wave propagation in general directions, plane wave reflection at oblique incidence angles, total reflection and total transmission of obliquely incident waves, wave propagation in dispersive media, pulse broadening in dispersive media.

Hours06

5. **The uniform plane wave Propagation**

plane wave reflection and dispersion, reflection of uniform plane waves at normal incidence, standing wave ratio, wave reflections from multiple interfaces, plane wave propagation in general directions, plane wave reflection at oblique incidence angles, total reflection and total transmission of obliquely incident waves, wave propagation in dispersive media, pulse broadening in dispersive media.

Hours05

6. **The uniform plane wave Propagation**

plane wave reflection and dispersion, reflection of uniform plane waves at normal incidence, standing wave ratio, wave reflections from multiple interfaces, plane wave propagation in general directions, plane wave reflection at oblique incidence angles, total reflection and total transmission of obliquely incident waves, wave propagation in dispersive media, pulse broadening in dispersive media.

Text Books:

1.E. C. Jordan & K. G. Balmain-Electromagnetic Waves & Radiating Systems,2e, PHI, 1988.
2.G.S.N.Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2e, 2008
3.R.K.Shevgaonkar, Electromagnetic Waves, Tata McGraw-Hill,2006

Additional Reading:

1.John D Krauss, Engineering Electromagnetics, McGraw-Hill, 6e, 2001.
2.Edminister, Engineering Electromagnetics, Schaum series, Tata McGraw-Hill, 2e, 1992.
3.Samuel Liao, Microwave Devices and Circuits ,Prentice Hall publication, 3e - 1994
4.Edgar Hund., Microwave Communication Components & Circuits,Glencoe/ 3e,Mc-Graw- Hill
5.Nannapaneni Narayana Rao, Elements of Engineering Electromagnetics, 6e, Pearson Education
6.Ashutosh Pramanik, Electromagnetism- Theory & Applications, PHI, 2e-2004
7.David K. Cheng, Field and Wave Electromagnetics, 2e,Pearson Education

Tutorials:

- At least eight tutorials based on the above syllabus out of which one tutorial should based on transmission line problems using Smith Chart only.
- Student shall write some simple Electromagnetic Fields Related simulation programs using MATLAB/SCILAB to demonstrate the applications of field theory.

Term-work:

A journal shall be consisting of solved problems in tutorials based on teachings in the lectures, in addition to assignments along-with some simple Electromagnetic Fields Related Simulation programs using MATLAB/SCILAB which will demonstrate the applications of field theory. A test based on the above contents shall be conducted and the test paper shall be attached to the journal as a part of term-work

The distribution of marks for term work shall be as follows,
Tutorials : 10 marks.
Test (at least one) : 10 marks.
Attendance (Tutorials and Theory) : 05 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of Tutorials work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. **In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.**
6. No question should be asked from pre-requisite module

T.E. (ELECTRONICS) SEMESTER V

Linear Integrated Circuit and Design

Lectures: 4 per week	Theory Paper: 3 hours and 100 marks
Practical: 2 (each of 60min)	Practical exam: 3hours Marks 25 Term work: 25 marks Total:150

Objective: To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals. Also to introduce a few special function integrated circuits such as Regulator ICS, Waveform generator etc.

Pre-requisite: Passive circuit analysis and transistor behavior. single or two stage amplifier, Diff-Amp and Current Mirror concepts

Hours08

1. **Operational Amplifier Fundamentals**

Basic Op Amp Configurations,
Ideal Op Amp Circuits Analysis,
Simplified Op Amp Circuits Diagram,
Input Bias and Offset Currents,
Low-Input-Bias-Current Op Amps,
Input Offset Voltage,
Low-Input-Offset-Voltage Op Amps,
Input Offset-Error Compensation,
Maximum Ratings.
Open-Loop Response,
Closed-Loop Response
Input and Output Impedances
Transient Response
Effect of Finite GBP on Integrator Circuits
Effect of Finite GBP on Filters
Current-Feedback Amplifiers
The Stability Problem,
Stability in Constant-GBP Op Amps Circuits,
Internal Frequency Compensation
External Frequency Compensation
Stability in CFA Circuits
Composite Amplifiers
Op Amp Powering.
Slew rate and methods of improving slew rate.

Hours 08

2. **Linear Applications of OP-AMP**

Current shunt feedback (Inverting Amplifier)
Current Series feedback (Non-Inverting Amplifier)
Summing Amplifier, Averaging Amplifier
Difference Amplifier,
Instrumentation Applications,
Integrator/Differentiator using OP-AMP

Current-to-Voltage Converters,
Voltage-to-Currents Converters,
Grounded load V/I Converter
V-F and F-V Converters.
Sample-and-Hold Amplifiers
Hours08

3. **Active Filter**

The Transfer function,
First-Order Active Filters,
Audio Filter Applications,
Standard Second- Order Responses, KRC Filters,
Multiple-Feedback Filters,
State-Variable and Biquad Filters,
Sensitivity, Filter approximations,
Cascade design,
Generalized impedance converters,
Direct design,
Switched capacitor filters.
Hours08

4. **Non Linear Applications of OP-AMP**

Voltage Comparators
Comparator Application
Schmitt Triggers,
Precision Rectifier
Peak Detectors
Mono-shot Multi-vibrator
Astable Multi-vibrator
Triangular /saw-tooth waveform Generator
Hours10

5. **Data Converters and Regulators**

Analog Switches
A-D Conversion Techniques
D-A Conversion Techniques
Integrated ICs employing above techniques and their applications
Functional block diagram of Voltage Regulators
Fixed voltage Regulators(78XX and 79XX)
Variable Voltage Regulators (LM317 and CA723)
Hours06

6. **6.Waveform Generators and synthesizers**

Oscillators using OP-AMP (RC –Phase shift and Wien Bridge oscillators)
Monolithic Timer – NE555
Phase-Locked Loops, Monolithic PLLs

Text Books:

1.Sergio Franco, Design with operational amplifiers and analog integrated circuits, Third edition, McGraw Hill International edition, 2002.

2.Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3.Robert Coughlin and F Driscoll, Operational Amplifiers and Linear Integrated circuits, sixth edition, Pearson Education Asia, 2001
4.D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.
2. James M. Fiore, Op Amps and Linear Integrated circuits, First reprint, Thomson Asia Pte. Ltd., 2001
3. K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.

Additional Reading:

1.Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International edition 2001
2. James M. Fiore, Op Amps and Linear Integrated circuits, First reprint, Thomson Asia Pte. Ltd., 2001
3.K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.

Practical/ Oral Examination:

Practical Examination will be based on experiments performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Termwork:

The term-work shall consist of at least six laboratory experiments covering the whole of syllabus, duly recorded and graded as well as at least four computer simulations using EDA tools like PSPICE duly recorded and graded. This will carry a weightage of Ten marks. A test shall be conducted and will carry a weightage of ten marks.
The distribution of marks for term work shall be as follows
Laboratory work (Experiments and Journal) : 10 marks.
Test (at least one) : 10 marks.
Attendance (Practical and Theory) : 05 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module.

T.E. (ELECTRONICS) SEMESTER V

Digital Communication and Coding Techniques

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Oral Exam: 25marks,Term work: 25 marks Total:150**

Objective: The increase in demand for data transmission coupled with the availability of wideband communication channels and sophisticated integrated circuits have led to the development of efficient and reliable digital communication systems. This course emphasizes impact of the channel limitations and characteristics on data transmission using digital data.

Pre-Requisite:Concepts of basic communication techniques – Modulation and Demodulation, Sampling, Fourier Transform.

Hours03

1.Concept of Probability Theory in communication systems

Random variables, Mean and Variance of Random variables and sum of random variables,

Useful PDFs & CDFs : Gaussian , ,Rayleigh pdf & Rician Distribution , Binomial and Poisson Distributions, Central-Limit Theorem.

Hours05

2. **Information Theory and Source Coding**

Measure of Information, Entropy, Information rate, Channel capacity, Capacity of a Gaussian channel, Bandwidth - S/N trade-off, Source. coding theorem, Coding to increase the average information per bit - Huffman coding, Lempel Ziv coding. Examples and application of source coding.

Hours13

3. **Error Control Codes**

Channel coding theorem. Rationale for coding and types of codes, Discrete memoryless channel , some Algebraic concepts - code efficiency and Hamming bound , linear block codes, Cyclic codes, Convolutional codes , Code tree, state and Trellis diagram. Decoding of convolutional codes using Viterbi algorithm.

Hours06

4. **Pulse Shaping for optimum transmission**

Concept of Inter channel and Inter symbol Interference, Eye Pattern, Nyquist's Criterion for distortion less Baseband Binary Transmission, Correlative Coding.

Hours15

5. **Digital Modulation Techniques**

Digital Modulation formats , coherent and non modulation. Digital modulation techniques-BPSK, Modifications of BPSK, QPSK,M-ary PSK,ASK, QAM, BFSK, M-ary FSK and MSK – Transmitter- Receiever, Power spectra, Bandwidth efficiency, Euclidian distance.

Integrate and dump receiver, Matched filter, correlator. The optimum Receiver.

Hours06

6. Spread Spectrum Modulation – Spread Spectrum Modulation –Pseudo noise Sequences, Processing Gain and Jamming Margin, Direct-sequence spread spectrum, Frequency –hop Spread Spectrum. Application of spread spectrum : DS-CDMA

Text Books:

1. Simon Haykin- Communication Syatem, , John Wiley and sons
2. Taub Schilling & Saha - Principles of communication systems - Tata McGraw Hill, Third edition.
3. Bernad Sklar,-Digital Communication, Pearson Education , 2nd ed
4. Amitabha Bhattacharya,-Digital communication , Tata McGraw Hill
5. Lan A. Glover, Peter M. Grant -Digital Communications, Pearson education, econd edition.
6. Simon Haykin Digital communication, John Wiley and sons

Reference Books:

7. John G. Proakis,- Digital Communications, McGraw Hill , 5th ed
8. William D. Stanley & John m. Jeffords, Electronic Communications Principles and Systems, Cengage Learning.
9. Lathi B.P.,- Modern Digital and Analog communications systems - PRISM Indian edition
10. PROAKIS & SALEHI - Communication system engineering, Pearson Education

Proposed Practical list

1.BPSK
2.QPSK
3.BFSK
4.QASK
5.BER calculation for a digital communication system
6.Huffman coding
7.Lempel Ziv coding
8.Linear Block code - Code generation, d_{min}, syndrome.
9.Cyclic Code - Systematic and non-systematic code generation, syndrome.
10.Convolution Code – code generation from generator sequences
11.Direct sequence spread spectrum

T.W. / Oral Examination:

Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term Work:

Term work shall consist of minimum eight experiments, Two Assignments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks.

Test (at least one) : 10 marks.

Attendance (Practical and Theory) : 05 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. **In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.**
6. No question should be asked from pre-requisite module.

T.E. (ELECTRONICS) SEMESTER V
Environmental Studies

Lectures: 2per week	Theory Paper: 2 hours and 50 marks
Tutorial: 1 (each of 60min)	Term work: 25 marks Total:75

Objective :Objective of this course is to create environmental awareness, of variety of environmental concerns.

Hours01

1. The multidisciplinary nature of environmental studies:
Definition, Scope and importance need for public awareness.

Hours04

2. Natural Resources
Renewable and non- renewable resources
Natural resources and associated problems

a.Forest resources: use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.

b.Water resources: use and over utilization of surfaces and ground water, floods drought, conflicts over water, dams-benefits and problems.

c.Mineral resources: use and exploitation, environmental effects of extracting and using mineral sources, case studies.

d.Food resources: World food problems overgrazing, effects of modern agriculture, fertilizers-pesticides problems, Water logging, salinity, case studies.

e.Energy resources: Growing energy needs, Renewable and non- renewable sources,use of alternate energy sources, case studies

f. Land resources: Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conservation of natural resources. Equitable use resources for sustainable lifestyles

Hours03

3. Ecosystems
Concepts of ecosystems
Structure and function of an ecosystem
Producers, consumers and decomposers
Energy flow in ecosystems
Ecological succession
Food chains, food web and ecological pyramids
Introduction, types, characteristics features, structure and function of following ecosystems
a. Forest ecosystems
b. Grassland ecosystems
c. Desert ecosystems
d. Aquatic ecosystems(ponds, streams, lakes, rivers, oceans, estuaries)

Hours04

4. Biodiversity and its conservation
Introduction- definition: genetic species and ecosystem diversity

Bio-geographical classification of India
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
Biodiversity at global, national, local level
India as a mega diversity nation
Hot spots of bio diversity
Threats to biodiversity: habitat loss, poaching of wild life, man wild life conflicts
Endangered and endemic species of India
Conservation of bio-diversity: In-situ and Ex-situ conservation of biodiversity

Hours04

5. Environmental Pollution Definition-
Causes, effects and control measures of:-
a.Air pollution
b.Water pollution
c.Soil pollution
d.marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards
Solid waste management: Causes, effect and control measures of urban and industrial wastes
Role of an individual in prevention of pollution
Pollution case studies
Disaster management: floods, earthquake, cyclone and land slides.

Hours04

6. Social Issues and environment
From unsustainable to sustainable development.
Urban problems related to energy
Water conservation rain water, harvesting, water-shed management.
Resettlement and rehabilitation of people, its problem and concerns case studies.
Environmental ethics, issues and possible solution
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust case studies.
Waste-land reclamation
Consumerism and waste product
Environmental protection act
Air(prevention and control of pollution) act
Water (prevention and control of pollution) act
Wide-life protection act.
Forest conservation act.
Issues involved in enforcement of environmental legislation.
Public awareness

Hours04

7. Human population and the environment
Population growth variation among nations
Population explosion-family welfare program
Environment and human health

Human rights
Value education
HIV/AIDS
Women and child welfare
Role of information technology in environment and human health
Case studies

Hours06

8. **Understanding existence and co-existence:**
Interrelation and cyclicity between material order, bio-order, animal-order and human-order.

Understanding the human conduct:
Relationship in family, justice in relationship, relationship of human with nature(environment), human behavior, human values, nature and morality

Understanding the human society:
Dimensions of humans Endeavor and objectives, inter-relationship in society, mutual fulfillment and cyclicity in nature.

Theory Examination:
1. Question paper will be comprising of total 7 questions, each of 10 marks.
2.Only 5 questions need to be solved.
3.Question number 1 will be compulsory and covering the all modules.
4.Remaining questions will be mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5.In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term work:
Term work shall consist of minimum five projects (PROJECTS SHALL BE DESIGNED ON THE SAME GUIDE- LINE OF GIVEN TEXT BOOK) and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Tutorial/Project and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:
1.Jagdish Krishnawamy , R J Ranjit Daniels, " Environmental Studies", Wiley India Private Ltd. New Delhi
2.Anindita Basak, Environmental Studies, Pearson
3.Deeksha Dave , "Textbook of Environmental Studies", Cengage learning, THOMSON INDIA EDITION
4.Benny Joseph" Environmental Studies"Tata McGRAW HILL
5.D. L. Manjunath, Environmental Studies, Pearson
6.R.Rajgopalan, Environmental Studies, Oxford
7.Erach Bharucha, Textbook of Environmental Studies , Universities Press/Orient BlackSwan
8.Alok Debi, Environmental science and engineering, university press
9.A. Nagraj, Jeevan Vidya- A Primer.

T.E. (ELECTRONICS) SEMESTER V

Electronic Workshop-II

Practical: 04 per week	**Oral : 50**
Tutorial: -	**Term work: 25 marks Total:50**

Objective: This syllabus is designed to encourage students to design and implement innovative ideas. The syllabus will give them in depth practical knowledge from design to the final verification stage. Documentation of any project is an important part of the project and students are expected to document their work properly in standard IEEE format.

Every group of students should select different projects. Number of students should not be less than TWO and not more than THREE in one group.

1. **Computer Architecture**

Demonstration of various parts of PC, Installation, Network Configuration and Troubleshooting of PC.

2. **Microcontroller/Microprocessor Based Project**

Students are expected to design any* microcontroller/microprocessor based system/application. PCB design, simulation and physical verification of the project should be carried out. Documentation of the project is to be done in standard IEEE format using Latex/WinTex. Project report should include abstract in maximum 100 words, keywords, introduction, design, simulation, implementation, results, conclusion and references.

3. **VHDL Based Project**

Students are expected to design any* VHDL based application. Simulation, synthesis and implementation on FPGA/CPLD should to be carried out. Documentation of the project is to be done in standard IEEE format using Latex/WinTex. Project report should include abstract in maximum 100 words, keywords, introduction, design, simulation, implementation, results, conclusion and references.

**** To be approved by the subject in-charge**

Oral Exam include —Project report +Presentation (PPT)

References:-

1.Govindarajalu B., “IBM Pc and clones: Hardware, Troubleshooting and Maintenance”, Tata McGraw Hill.

2.Gilster Ron, ‘PC Hardware: A Beginner’s Guide”, Tata McGraw Hill

3.Minasi Mark, “PC Upgrade and Maintenance Guide”, BPB Pub.

4.Hallberg Bruce A., “Networking a Beginners Guide”, Tata McGraw Hill

5.Ingram, Peter, “Networking in easy Steps”, Dreamtech Press

6.Bigelow Stephen, “Troubleshooting, Maintenance and Reparing PC’s”, Tata McGraw Hill

7.Brown Stephen and Vranesic Zvonko, “Fundamentals of digital logic with VHDL design”, Tata McGraw Hill

8.Perry Douglas, “VHDL Programming by Example”, Tata McGraw Hill

9.Bhasker J. “VHDL Primer”, Pearson Edu.

10.VHDL Reference Manual

11.Reference Manuals for Selected Microcontrollers/Microprocessors

UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTION AND EVALUATION (R2007)
COURSE B.E. (ELECTRONICS ENGINEERING)

SEMESTER:VI

Sr. No.	Subjects	No.of periods of 1 Hour			Duration Of Theory Paper in Hours	Marks				Total
						Theory Paper	Term work	Practical /Oral	Oral	
1	Discrete Time Signal & System	4	2	--	3	100	25	--	25	150
2	Microprocessor and Microcontroller-2	4	2	-	3	100	25	25	--	150
3	Microwave Devices and Circuits	4	2	--	3	100	25	--	--	125
4	Electronics Instrumentation System	4	2	--	3	100	25	--	25	150
5	Power Electronics	4	2	--	3	100	25	25	--	150
6	Elective-1 •Communication Systems and Applications •Medical Electronics • Computer Organization	4	2	--	3	100	25	--	--	125
	Total	24	12	--	--	600	150	50	50	850

T.E. (ELECTRONICS) SEMESTER VI

Discrete Time Signal and System

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Oral: 25 , Term work: 25, Total:150**

Objective : This second course in signals and systems aims to introduce the student to the idea of discrete time signal processing as a foundation course for subjects like image processing, speech processing, filter design, adaptive signal processing. It also covers introduction to DSP processors.

Prerequisite: Basic continuous signals and systems.

8 Hours

1.Discrete time (DT) signals & systems: Signal classification manipulations, signal periodicity in DT domain. Concept of system and system classification. System representation as a difference equation. Impulse response. Finite impulse response (FIR) & infinite impulse. Response (IIR) systems. Convolution and its properties, auto correlation and cross correlation and its properties. BIBO stability condition.

6 Hours

2.Z Transform: Two-sided Z transform and region of convergence (ROC). Properties of Z Transform and derivations. Relationship with laplace transform & mapping . One-sided Z transform. Inverse Z transform.

10 Hours

3.D.T.System analysis using Z Transform: System transfer function & impulse response, pole zero plot, BIBO stability and ROC. Solution of a difference equation: Zero input & zero state responses. Frequency response using analytical & graphical techniques. Pole zero plot and filter type for first and second order systems. System classification based on phase response as minimum phase, maximum phase, mixed phase or linear phase systems.

6 Hours

4.DT Signal Analysis & Computation of Spectra: DTFS definitions from orthogonal complex exponentials. CTFS & DTFS and properties of DTFS. Power density spectrum DTFT and properties of DTFT. Energy density spectrum. Relationship between DTFT & Z transform.

10 Hours

5.Discrete Fourier Transform (DFT): DFT and comparison with other transforms. DFT properties. Circular convolution. Block convolution using DFT by Overlap-add and overlap save methods. Fast fourier transform (FFT) by radix 2 and radix 3 and radix 4 techniques. Decimation in time. Decimation in frequency with development of flow graphs. DFT analysis of sinusoidal signals. Goertzel algorithm. Comparison of complex and real, multiplication and additions of DFT and FFT. DFT computation by divide and conquer approach limitation of DFT. Applications of FFT.

DSP processors and application of DSP: Need for special architecture of DSP processor. Difference between DSP processor & microprocessor. Fixed point and floating point processors. A general DSP processor (TMS320C54XX series). TMS6713, and Da - vinci. Application of DSP to speech, image, biomedical and radar processing.

Text books: Ashok Ambardar, Digital Signal Processing, Cengeg Learning Publication. J.G.Proakis, D.G.Manolakis, digital signal processing: Principles, Algorithms and applications, Prentice Hall of India, 1995. A.V.Oppentheim, Ronald W.Schater, Prentice Hall, 1983. E.C.Ifeachor and B.W.Jervis, digital signal processing a practical approach, Pearson publication. B Venkata Ramani and M.Bhaskar, Digital signal processors, architecture programming and TMH 2004.

Term work:
The term work shall consist of at least two numerical assignments and eight MATLAB/C or lab view simulations covering the whole of syllabus, duly recorded and graded. This will carry a weightage of fifteen marks. A test shall be conducted and will carry a weightage ten marks. Laboratory work-15 marks. Test – 10 marks.

T.E. (ELECTRONICS) SEMESTER VI

Microprocessors & Microcontrollers-II

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Practical Exam 3 hours and 25 marks** **Term work: 25 marks Total:150**

Objective : The objective of this course is to introduce to the students 16 bit Microprocessors & Microcontrollers.

Pre-requisite: Concept of 8 bit Microprocessor and Microcontroller.

Hours 15

1.8086 and 8088 Microprocessors: Architecture and organization of 8086/8088 microprocessors family, bus interface unit, 8086/8088 hardware pin signals, timing diagram of 8086 family microprocessors, simplified read/ write bus cycles, 3086 minimum and maximum modes of operation, 8086/8088 memory addressing, address decoding, memory system design of 8086 family, timing considerations for memory interfacing, input/output port addressing and decoding, introduction to 8087 floating point coprocessor and its connection to host 8086.

Hours 10

2.8086 assembly language programming: Addressing modes, 8086 instruction formats and instruction set, data transfer, arithmetic, bit manipulation, string, program execution transfer and program control instructions, machine codes of 8086 instructions, assemble language syntax. Assembler directives, initialization instructions, simple sequential and looping programs in assemble language, debugging assembly language programs.

Hours 8

3.Programmable Interface and peripheral devices: Interfacing of 8155, 8255 and 8259 with 8086 and study and interfacing of 8257 DMA controller with 8086. Comparative study of salient feature of 8086, 80196, 80296, 80386, 80486 and Pentium.

Hours8

4.PIC Controllers: PIC 18 memory organization. CPU registers. Pipelining. Instruction format. Addressing modes. Sample of PIC 18 instructions. Overview of the 8-bit MCU market.

Hours8

5.PIC 18 assembly language programming: Assembly language programme structure. Assembler directives. Writing programmes to perform arithmetic computations. Programme loops. Reading and writing data in programme memory. Logic instructions. Using programme loop to create time delays. Rotate instructions. Using rotate instructions to perform multiplications & divisions.

Hours7

6.Parallel Ports: I/O addressing. Synchronization. Overview of the PIC 18 parallel ports. Interfacing with simple outpur devices.

Suggested Practical list

8085 Based (Max 02)

01) Addition and subtraction of two 8-bit numbers with programs based on different addressing modes of 8085A.

02) Addition and subtraction of two 16-bit numbers. (Using 2's complement method, also programs which access numbers from specified memory locations.)

03) Addition and subtraction of two 16-bit BCD numbers. (Using DAA instruction.)

04) Multiplication of two 8-bit numbers using the method of successive addition and Shift & add.

05) Division of two 8-bit numbers using the method of successive subtraction and shift & subtract.

06) Block transfer and block exchange of data bytes.

07) Finding the smallest and largest element in a block of data.

08) Arranging the elements of a block of data in ascending and descending order.

09) Converting 2 digit numbers to their equivalents.

a) BCD to HEX and b) HEX to BCD

10) Generating delays of different time intervals using delay subroutines and measurement of delay period on CRO using SOD pin of 8085A.

11) Generation of Fibonacci Series.

Application Based (Max 2)

01) Program controlled data transfer using 8255 PPI.

A) To INPUT data bytes from peripheral port and to store them in memory.

B) To OUTPUT data bytes from memory to peripheral port.

02) Study of interrupts by enabling them in main line program and then executing different subroutines when TRAP, RST 7.5, RST 6.5 & RST 5.5 are activated.

03) Interfacing 7 segment LED display using 8255A – in static and dynamic mode.

04) Interfacing ADC 0808/0809.

05) Interfacing DAC 0808.

06) Interfacing stepper motor with microprocessor using 8255A – in Half and Full excitation.

07) Interfacing a Centronics type printer.

08) Interfacing of Thumbwheel switches.

09) Interfacing of 8253 / 8254.

8051 experiments (Max 2)

1.Arithmetic operations

2.Packing and unpacking

3.Ascending and descending

4.8051 timer based experiment

5.Transmission of character using RS 232 to PC(preferably on bread board)

6.16 * 2 LCD and Hex keyboard interface (preferably on bread board)

7.ADC or DA C interface (any application) (preferably on bread board)

On latest: Students can be perform on Proteus VSM Plateform (Min 4)

To design and test circuits on

1.LED blinking,
2.7segments display,
3.16x2 multiple character LCD,
4.Run stepper motor/ DC motor,
5.Implement square wave,
6.Temperature display using
7.Demonstration of traffic lights,
8.Speed control of motor,
Using ARM Processor.

Note: The above list of experiment can be done by using Proteus Vsm software

Practical/ Oral Examination:

Practical Examination will be based on experiments performed from the list of experiment given in the syllabus and the evaluation based on the same experiment.

Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Term work:

Term work shall consist of minimum ten experiments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 10 marks.
Test (at least one) : 10 marks.
Attendance (Practical and Theory) : 05 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Theory Examination:

1.Question paper will be comprise of total 7 questions, each of 20 marks.
2.Only 5 questions need to be solved.
3.Question number 1 will be compulsory and will cover all modules.
4.Remaining questions will be from same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5.In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6.No question should be asked from pre-requisite module.

Recommeded Books:

1.Microprocessors and interfacing, Douglas v shall, Tata Mc Gram Hill.
2.Han Way Huang, PIC Microcontroller, Cengage Learning.
3.Design with PIC microcontrollers by John B. Peatman, pearson education Asia LPE.
4.The 8086/8088 family, john uffenbuck, pearson media, LPE
5.DV Kodavade, S Narvadkar, 8085-86 microprocessors architecture progg and interfaces, wiley.
6.Ajay deshmukh, microcontroller, TMH.
7.Smith, programming. The pic microcontroller with mbasic(CD), Elsevier.
8.Gaonkar ramesh, fundamentals of microcontrollers and applications in embedded systems, penram international publishing.
9.Martin Bates, PIC microcontrollers, 2e, Elsevier.

T.E. (ELECTRONICS) SEMESTER VI

Microwave Devices and Circuits

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks Total:125**

Objective : With ever-increasing need for radio-frequency spectrum space microwave communication and optical communication have growth rapidly. At shorter wavelengths the conventional low frequency circuit analysis no longer holds good and hence knowledge of electromagnetic field theory is required for an adequate description of the electrical phenomenon. An understanding of the microwave principles and working of microwave devices is presented in this course.

Knowledge of basic engineering electric magnetics.

1. Introduction to microwave communications: Microwave spectrum and bands, limitations of conventional circuit theory concepts at microwave frequencies. Applications of Microwaves.

2.Generation and amplification of microwaves: Limitations of conventional vacuum tubes at microwave frequencies. Two cavity klystron amplifiers and reflex klystron oscillators: constructions, process of velocity modulation and bunching, applegate diagram, o/p power and efficiency, applications. Cyclindrical magnetron: construction and working principle. Hull cut off magnetic equation and hull cut off voltage equation, cyclotron angular frequency, applications. Traveling wave tube: Construction and working principle, applications. Numerical examples based on the above topics.

3.Wave guides: Rectangular and circular wave guides, solution of maxwell's equation for distribution of fields in the waveguides, characteristic equation, dominant and degenerate modes, group and phase velocities cut off frequency. Numerical examples based on the above topics.

4.Wave guide components and analysis: Definition and significance of s-parameters, properties of s-parameters. Construction working principle and s-matrix representation of the following microwave components. Cavity resonators waveguide attenuators, waveguide phase shifters, waveguide multiport junctions, E plane and H plane tee, magic tee, hybrid ring, directional couplers. Microwave ferrite components faraday rotation isolator, gyrator, circulator. Numerical examples based on the above topics.

5.Microwave solid state devices: Principle of operation and characteristics of gunn diode, TRAPATT and IMPATT diodes, microwave transistors, introduction to strip lines.

6.Microwave measurement: Measurement of power attenuation, frequency, VSWR, cavity Q and impedance.

Text books:

1. Microwave devices and circuits, Samuel y.liao. phi
2. Microwave circuits and passive devices, M.L.sisodia, G.S.Raghuvanshi. New Age international (p) ltd.
3. Microwave Engineering Annapurna Sas. Tata Mcgraw Hil.

Term work:

Term work shall consist of minimum eight experiments. Two assignments and a written test. Laboratory work-15 marks. Test-10 marks.

T.E. (ELECTRONICS) SEMESTER VI
Electronics Instrumentation Systems

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Term work: 25 marks, Oral: 25marks Total:150**

Objective: An undergraduate course on instrumentation systems in some form is regarded as an essential element of study for all electronic engineering students. A balance must be drawn between the diversity of sensors that are presented and the diversity of electronic signal processing techniques included so that a strong link with other courses is maintained.

Pre-requisite: System of units, measuring instruments, measurement of inductance and capacitance AC bridges.

1.Instrumentation System: Basic characteristics of instruments static and dynamic. Classification of instruments. Response for standard inputs: Unit step Ramp and sinusoidal signals. Performance characteristics and error analysis of measuring system.

2.Transducers: Requirement of Transducers: Classification of transducers. Advantages of electrical transducer. Transducer used for measurement of different physical parameters such as: displacement. Strain, temperature, pressure, flow speeds accelerators, vibration weight, level, sound force and torque. Sensors used in analytical measurement of PH. Viscosity, humidity and dew point.

3.Signal Generation and Conditioning system: Various signal generators and its implementation. Active and passive filters. Filter design for different applications. Switch capacitor filter. Logarithmic amplifier. Instrumentation amplifier with programmable gain. Window comparator. Input-output protection circuit. Frequency to voltage and voltage to frequency converters. Current to voltage and voltage to current converters. Data converters.

4.Data Acquisition System and Advances in Instrumentation Systems: Single channel data acquisition. Multi-channel data acquisition systems. Monitoring instruments: Indicators, alarm, recorders. Data logger, PC-based instrumentation system. HMI, SCADA. Virtual instrumentation: concept and applications. Distributed control system(DCS).

5.Controllers: Manipulations devices. The control valves, valve characteristics. Solenoid. Servomechanism and DC and AC Motor. Continuous and discontinuous controller. Proportional controller. Proportional band. RESET controller. Rate controller. Composite controller. Cascade controller. Feed-forward controller.

6.Calibration of instruments and controller tuning: Need of instrument calibration. Preparation for calibration. Standard calibration procedure. Five point calibration procedure. Controller tuning: need and different method of controller tuning.

Text Books:

1. Instrumentation Devices and Systems. By C.S.Rangan. G.R.Sarma. V.S.Mani
2. 2.Process Control System and Instrumentation. By Terry Barlett DELIMAR CEMGAGE learning Reprint – 2008.

Term work:

The term work shall consist of at least eight laboratory experiments covering the whole of syllabus, duly recorded and graded. The guidelines for carrying out the experiments is as given below. Distribution of marks 15 marks. Laboratory work 10 marks.

T.E. (ELECTRONICS) SEMESTER VI

Power Electronics

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Term work: 25 marks, Oral/Practical: 3hrs. 25marks Total:150**

Objective: To teach the basic concepts of power electronics. Also to study the important power devices in detail along with basic application of SCR as controlled rectifier. To get skill of developing and design related to power electronics circuits.

Pre-requisite: Concept of semiconductor, rectification, behavior of inductor, capacitor harmonics. Fourier analysis.

1.Semiconductor power devices: Characteristics of power diodes, power transistors, power MOSFET, IGBT, SCRs, DIAC and GTO. Rating of power devices, series and parallel connections of SCRs.

2.SCR protections : dv/dt, di/dt, over voltage and over current protection, cooling of semiconductor devices. Isolation circuits using optocoupler and transformer.

3.Turn on and turn off circuits: Turn on methods-study of single phase firing circuits using UJT, ramp and pedestal, cosine inverse, microprocessor/ microcontroller based turn OFF methods- forced commutation circuits parallel capacitance, resonant turn off, external pulse commutation, auxiliary thyristors and load commutation.(class A to F)

4.Applications of Thyristors: Static circuit breakers, over voltage protectors, zero voltage switch, integral cycle triggering, time delay method, soft start method.

5.Controlled Rectifier Circuits: Single phase- Half wave full wave, half controlled and full controlled converters with R & RL load, effect of freewheeling diode. Calculations of performance parameters expected.

6.Controlled Rectifier Circuits: Three phase- Half wave, full wave, fully controlled converters with resistive load only.

Text books:

1. General Electric: SCR manual, USA
2. Ned Mohan: Power electronics, John Willey Pub
3. M.H.Rashid, power electronics, PHI India.
4. M.D.Singh and K.B.Khanchandani, power electronics, Tata McGraw Hill
5. P.C.Sen, Power Electronics, TMH.
6. Dr.P.S.Bimbhra, power electronics, khanna publications.

Term work:

Term work shall consist of minimum eight experiments. Two assignments and a written test. Laboratory work – 15 marks, Test (at least one) 10 marks.

T.E. (ELECTRONICS) SEMESTER VI

Communication Systems and Application (Elective-1)

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Total:125**

Objective: This course acquaints the students with antenna fundamentals and continues with a consideration of overview of different communication systems. This study emphasizes the requirements and standards of a quality television systems, both monochrome and color TV. Wide usage of satellite communication and optical fiber communication around us focus is also on RADAR. Its fundamentals and performance factors, that gave birth to microwave technology in later years.

Pre-requisite: Concepts of basic communication techniques, characteristics of guided and unguided media.

1. Antennas: The half wave dipole, antenna characteristics, effects of ground on antennas, effects of antenna height, antenna coupling, antenna arrays: directional HF Antennas, UHF and microwave antennas.

2.Television principles: Television system and standards. The composite video signal, blanking and synchronizing pulses, video modulation and VSB signal.

3.Color TV: Color TV transmission, color reception, PAL-B standard color TV transmitter and receover (block diagram only), features of cable TV, digital TV, HDTV, LCD and plasma TV.

4.Satellite Communication : Kepler's Laws, satellite orbits, spacing and frequency allocation, look angles, satellite system link models, multiple access: FDMA, TDMA, Direct broadcast satellite services. Applications of LEO, MEO and Geo-stationary satellites.

5.Radar systems: Basic principles, radar performance factors, antenna scanning and tracking. MTI and pulsed Doppler radar, continuous wave Doppler radar, FM-CW radar.

6.Optical communication system : Key elements of optical fiber communication link, fiber configurations and classifications losses in fiber cables, optical sources, optical detectors.

Text books:

1.Kennedy Davis-Electronic Communication Systems, Tata Mcgraw Hill, Fourthed 1999.
2.Wayne Tomasi-Advanced Electronic Communication Systems, PHI, Sixthed 2004.
3.Gulati-Monochrome and color television, New Age International (P) Ltd.
4.Roy Blake-Electronic Communication Systems, Thomson Learning, 2nd 2002.
5.AM Dhake-Television & Video Engineering, Tata Mcgraw Hill, 2nd Ed2002.

Reference Books:

1.Jordan Balmian- Electromagnetic waves and Radiating systems, PHL, 2nd Ed., 1988.
2.Merrill skolnik-introduction to rader system., Tata Mcgraw Hill, Third edition, 2001.
3.Micchoel o kolawole- Radar system peak detection & tracking Elsevier.
4.Dennis Roddy-Satellite Communication, Mcgraw Hill, third ed, 2001.
5.Prall Bostian-Satellite Communication, John Wiley and Sons, 1986.
6.Gerd Keiser-Optical Fiber Communications, Tata Mcgraw Hill, Fourthed 2008.

Term work:

Term work shall consist of minimum eight experiments and student presentation (not more than two student per group)on communication application and a written test. Laboratory work – 15 marks, Test (at least one) 10 marks.

T.E. (ELECTRONICS) SEMESTER VI

Medical Electronics(Elective-1)

Lectures: 4 hours / week	**Theory Paper: 4 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Total:125**

Objective : To Understand generation of electrical signal after studying anatomy and physiology of human body and different systems. Picking of signal and use of different instruments under different category such as diagnostic, intensive care. Therapeutic equipment and imaging units. To know safely measures in biomedical equipments, recording electrodes and recording systems used introduce concept of telemetry and hospital management system.

Pre-requisite: Knowledge of basic requirements of a good instrument and human body and different life processes.

1.Sources of Bio-Electric Potential: Man-instrument system requirements difficulties and types. Basics of generation of action potential. Recording electrodes. Electrode-electrolyte interface. Physiological Transducers.

2.Bio-potential Amplifiers and Signal Conditioner and Recording Systems: Electrocardiogram, Electroencephalogram, Electro-myogram, Electronic spirometer, Electrooculogram, Electroetinogram.

3. Diagnestic Equipments: Electrocardiograph(ECG), Electroencephalograph(EEG), Electromyograph, Pulse oximeter, Measurement of blood pressure, blood flow and cardiac output. Impedance plethysmography, Measurements in the respiratory system.

4.Therapeutic and prosthetic equipment: Defibrillators, Pacemakers, ventilators, bedside monitor, audiometer, Hemodialysis, infant incubators, muscle and nerve stimulators, Electrocautery machine, short wave diathermy, ultrascund therapy unit.

5. Imaging equipment: Computed tomoyraphy, Magnetic resonance imaging, Ultrasonic imaging system, Positron emission tomography.

6. Safely and Telemetry in Biomedical Instrumentation: Causes of electrical shock micro & macro shock. Electrical safely codes and standards. Methods of accident preventions. Test of grounding system in patient care area, chassis leakage current. Biomedical telemetry. Hospital management system.

Text books:

1.Webster J. G. medical instrumentation- application and design, wiley and sonsinc., third edition, 1999.
2.Khandpur R.S.Handbook of biomedical instrumentation, Tata Mcgraw Hill second edition, 2003.

Term work:
The term-work shall consist of at least six laboratory experiments covering the whole of syllabus, duly recorded and graded. The experiments can performed with the help of lab VIEW S/W as mentioned in the list. This will carry a weightage of ten marks. A test shall be conducted and will carry a weightage of ten marks.
Laboratory work – 15 marks
Test-10 marks.

T.E. (ELECTRONICS) SEMESTER VI

Communication Organization

Lectures: 4 hours / week	**Theory Paper: 3 hours and 100 marks**
Practicals: 2 hours / week	**Termwork: 25 marks, Total:125**

Objective: The subject of Computer Organization shall lay a strong fundamental base in understanding the functional and design aspects of various units of digital computer. The emphasis shall be on understanding of Hardware issues in computer design while addressing a number of software issues to instruction execution, storage allocation etc.

Prerequisite: Fundamentals of microprocessor architecture, memory interfacing.

8 Hours

1.Basic Processing Unit- CPU Organization. Some fundamentals like register transfer, fetching and storing a word from memory. Execution of an instruction including branch. The data path design. Fixed Point Arithmetic- Addition, fast addition, multiplication, division algorithms.

8 Hour

2. Control Unit-Hardwired control design example of multiplier/ divisor. Micro programmed control: design examples. Performance enhancement using pipelining: Introduction, data hazards, instruction hazards, super scalar architecture.

8 Hours

3.Memory Organization- Memory system: multiple level memories, concept of cache and virtual memory, address translation, segmentation, paging, TLB, memory allocation, replacement policies. Cache system: Cache architectures- look though and look aside. Cache organizations: direct and associative mapping. Replacement algorithms, hit ratio, performance of cache memory.

8 Hours

4.Input/output organization- I/o devices types and access methods. Interrupts and DMA. Types of busses and bus arbitration, synchronous and asynchronous bus. I/o interface – serial and parallel ports. Storage devices- organization, access techniques of magnetic hard disks and optical disks.

8 Hours

5.Introduction to intel IA32 architecture- Intel IA32 architecture: pipelined. Register structure, addressing modes. Advancements in arithmetic and logical instructions. Exception handling in IA32 architecture.

8 Hours

6.Introduction to ARM- Te ARM family architecture (RISC). Register structure. Memory access and addressing modes. Arithmetic and logical instructions. Branching instructions.

Suggested Books:

1.Hamacher, vranesic, zaky: Computer organization, Tata Mcgraw hill, fifth edition.
2.John P. Hayes: Computer Architecture and Organization, Tata Mcgraw Hill.
3.Hennessy and Patterson: Computer Organization and design, Morgan.

Term work:

Term work shall consist of minimum eight experiments and student presentation (not more than two student per group)on communication application and a written test. Laboratory work – 15 marks, Test (at least one) 10 marks.