UNIVERSITY OF MUMBAI

Revised Syllabus for the

Third Year Electronics

Engineering

(Semester V & VI)
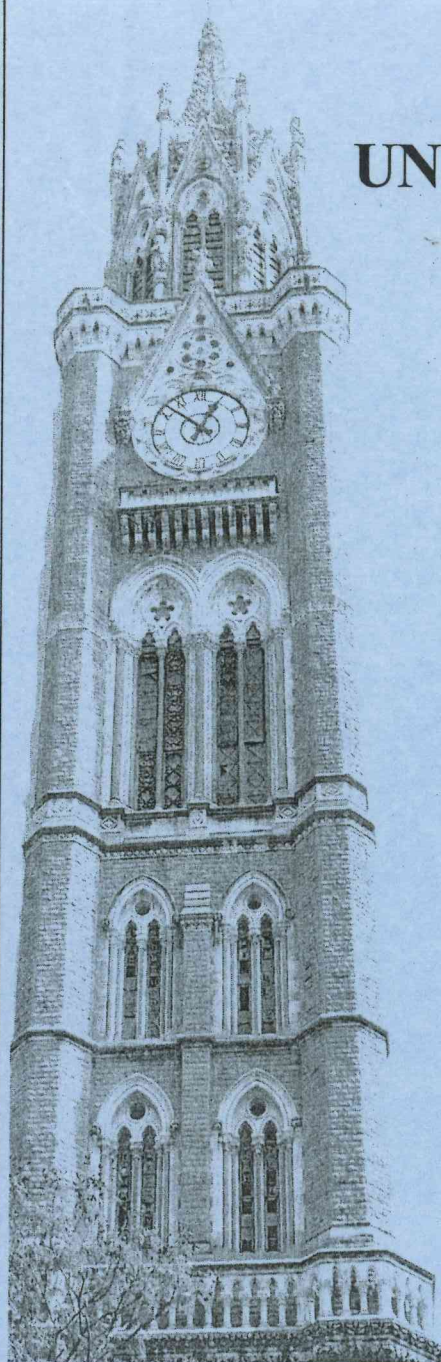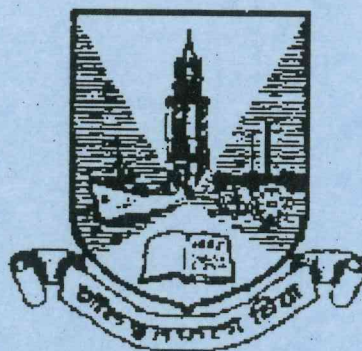
(With effect from the academic year 2009-2010)

UNIVERSITY OF MUMBAI

**Revised Syllabus Realting for the
Third Year Electronics Engineering
(Semester V & VI)**

(With effect from the academic year 2009-2010)

UNIVERSITY OFMUMBAI

SCHEME OF INSTRUCTION AND EVALUATION (R 2007)
COURSE ; B.E. (ELECTRONICS ENGINEERING)

SEMESTER: V

Sr No.	Subjects	No. of periods of 1 Hour			Duration of theory paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical /Oral	Oral	Total
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

Classwise tutorial

COURSE: B.E. (ELECTRONICS ENGINEERING)

SEMESTER : VI

Sr No	Subjects	No. of periods of 1 Hour			Duration of theory paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical /Oral	Oral	Total
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 System and Applications Medical Electronics Computer Organisation	4	2	--	3	100	25	--		125
Total		24	12	--	--	600	150	50	50	850

(**Note** : The Syllabus and scheme of papers for the Third year of Electronics Engineering (Sem V and VI) has been revised and that the same has been brought into force with effect from the academic year- 2009 – 2010 <u>vide</u> circular No. UG/253 of 2009 dated 7th July, 2009)

UNIVERSITY OFMUMBAI

SCHEME OF INSTRUCTION AND EVALUATION (R 2007)
COURSE ; B.E. (ELECTRONICS ENGINEERING)

SEMESTER: V

Sr No.	Subjects	No. of periods of 1 Hour			Duration of theory paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical /Oral	Oral	Total
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

Classwise tutorial

COURSE: B.E. (ELECTRONICS ENGINEERING)

SEMESTER : VI

Sr No	Subjects	No. of periods of 1 Hour			Duration of theory paper in Hours	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical /Oral	Oral	Total
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 System and Applications Medical Electronics Computer Organisation	4	2	--	3	100	25	--		125
Total		24	12	--	--	600	150	50	50	850

(**Note** : The Syllabus and scheme of papers for the Third year of Electronics Engineering (Sem V and VI) has been revised and that the same has been brought into force with effect from the academic year- 2009 – 2010 vide circular No. UG/253 of 2009 dated 7th July, 2009)

CLASS T.E. (Electronics Engineering)	Semester- V		
SUBJECT : Continuous Time signals and system			
Periods per week	Lecture	4	
	Practical	2	
(each of 60 min)	Tutorial	-	
		Hours	Marks
Evaluation system	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work		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

Module	Contents	Hours
1.	**Introduction to Signals & System** 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	10
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.	6
3.	**Fourier Series (FS) and Fourier Transform (FT) for CT System** Review of Trigonometric series, Exponential series properties and uses Amplitude and phase spectra Power Spectral Density Parseval's relation, Relation between Trigonometric and Exponential Fourier series. Gibbs Phenomenon The Fourier Transform (FT) FT of periodic signals Properties of FT and derivations FT of periodic signals Concepts introduction to C. T, short time Fourier Transform (STFT) Energy Spectral Density Analog to Digital conversion and its Reconstruction	12

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	6
5.	**Laplace transform analysis of signals and systems** Definition and properties of Two-sided and one-sided Laplace Transform Region of Convergence (ROC) Inverse Laplace transform Relationship with Fourier Transform and mapping BIBO stability and ROC Pole-zero diagram Impulse response of a system, and impulse response of cascade and parallel systems Time domain for first and second order systems Solution to differential equations and system behavior. Zero state & zero input responses System response to complex exponential inputs.	08
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	6

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 Singal Processing : Principles, Algorithms and applications, Prentice Hall of India, 1995

4.   Ashok Ambardar, Analog and Digital Singal 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 and 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. Nagrarh , S. N. Sharma, R. Ranjan, and S. Kumar, " Signals and Systems", 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 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 mark. A test shall be conducted and will carry a weightage of ten mark.

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

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CLASS T.E. (Electronics Engineering)		Semester- V	
SUBJECT : Microprocessors & Microcontrollers – 1			
Periods per week		Lecture	4	
		Practical	2	
(each of 60 min)		Tutorial	-	
			Hours	Marks
Evaluation system		Theory Examination	3	100
		Practical examination	-	-
		Oral Examination	-	25
		Term Work		25
		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 -

Module	Contents	Hours
1.	**Basic OF 8085 ;** • Basic 8085 microprocessor architecture 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	8
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 • Conditional call and return instructions operations related programs • Debugging programs	9
3.	Study and Interfacing of peripherals 8155 8255, 8253/ 8254, 8259 with 8085	06

4.	**Basics of 8051 :**	18
	• 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/ outputs ports, • Counters and timers • Serial data input and output • Interrupts, • Power saving modes	
5.	**Programming with 8051 :** i. Instruction set, addressing modes, ii. Immediate, registers, direct and indirect data movement and exchange. iii. push and pop op- codes iv. arithmetic and logic instructions , v. bit level operations, vi. jump and call instructions, vii. input / output port programming, viii. programming timers ix. asynchronous serial data communications and, x. hardware interrupt service routines Interfacing of LCD display, hex keyboard, ADC0808, DAC0808 and Stepper motor with 8051 Current trends in microprocessors and practical implementation.	9

| 6 | **Introduction to ARM Processor**

1. ARM family architecture,
2. Register Architecture,
3. Memory Access and addressing modes
4. Arithmetic and Logical Instructions,
5. 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) | 8 |

Recommended Books:

1. Mazidi & Mazidi, The 8085 Microcontroller & Embedded system, using Assembly and C, 2nd edi, Pearson edu.

2. Microprocessors 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 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. Udayashankara 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 Microprocessor, Cengage (Thomson)

12. The 8085 Microcontroller-Architecture, programming and application, 2nd edi, Penram International.

Suggested Practical List for TW

8085 Based (Max 020

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, RSP 7.5, RST 6.5 and 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 DAC interface (any application) (preferably on bread   board)

On latest :
Experiments are to be performed on Proteus VSM Plateform (Min 4)

To design and test circuits on

1. LED blinking
2. 7segments display,
3. 16 x 2 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.

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 tem 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)   : 10marks.
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 qustions, 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 mixec in nature. (e.g-Suppose Q. 2 has part (a) form, 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.

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CLASS T.E. (Electronics Engineering)	Semester- V	

SUBJECT : Electromagnetic Engineering	

Periods per week		Lecture	03	
		Practical		
(each of 60 min)		Tutorial	01	
			Hours	Marks
Evaluation system		Theory Examination	3	100
		Practical examination	-	-
		Oral Examination	-	
		Term Work		25
		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**

Module	Contents	Hours
1.	**Basic of Electomagnetics :** 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, Fraday's Law, Poisson & Laplace's Equations.	(06)

2.	**Maxwell Equations :** Formation of Maxwell's Equations Derivation of various basic electro magnetic laws using Maxwell's Equations, Conditions at Boundary Surfaces.	(06)
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.	(05)
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 oblique incidence angles, total reflection and total transmission of obliquely incident waves, wave propagation in dispersive media, pulse broadening in dispersive media.	(06)
5.	**Transmission Lines** Circuit representation of the parallel – plane transmission line, Transmission Line equations, Transmission Line Parameters, Terminated Transmission Line, Use of Smith Chart, Impedance matching techniques	(08)

6.	**Radiation & electromagnetic Interference (EMI)**	(05)
	Potential functions & the electromagnetic field, Potential functions for sinusoidal oscillations, The alternating current element (Or Oscillating Electric Dipole), Power radiated by a current element & radiation resistance, EMI Sources, Effects of EMI Need of EMC (Electromagnetic Compatibility) , Electrostatic Discharge (ESD)	

Text Books :

1. E. C. Jordan and K. G. Balmain – Electromagnetic Waves and 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. Questions number 1 will be compulsory an 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.

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CLASS T.E. (Electronics Engineering)	Semester- V

SUBJECT : Liner Integrated Circuit and Design

Periods per week		Lecture	4	
		Practical	2	
each of 60 min)		Tutorial	-	
			Hours	Marks
Evaluation system	Theory Examination		3	100
	Practical examination		3	25
	Oral Examination		-	-
	Term Work			25
	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

Module	Contents	Hours
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- Error Compensation, • Maximum Ratings. • Open –Loop Response, • Closed –Loop Response • Input and Output Impedances • Tansient Response • Effect of Finite GBP on Integrator Circuits • Current Feedback Amplifiers. • The Stability Problem • Stability in Constant- GBP Op Amps Circuits, • Internal Frequency Compensation. • Stability in CFA Circuits • Composite Amplifiers • Op Amp Powering • Slew rate and methods of improving slew rate.	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 Currents Converters, • Voltage- to – Currents Converters, • Grounded load V/I Converters, • V- F and F- V Converters • Sample and Hold Amplifiers	08

3.	**Active Filter**	08
	- The Transfer functions. - First Order Active Filters, - Audio Filter Applications, - Standard Second- Order Responses, KRC Filters, - Multiple – Feedback Filters, - State – variable and Biquad Filters, - Sensitivity, Filer approximations, - Cascade design, - Generalized impedance converters, - Direct design - Switched capacitor filters	
4.	**Non Linear Applications of OP- AMP**	08
	- Voltage Comparators - Comparator Application - Schmitt Triggers - Precision Rectifier - Peak Detectors - Mono Shot Multi- vibrator - Astable Multi-vibrator - Triangular saw tooth waveform Generator	
5.	**Data Converters and Regulators**	10
	- 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)	

| 6 | **Waveform Generators and Synthesizers**

• Oscillators using OP- Amp (RC –Phase shift and Wien Bridge oscillators)
• Monolithic Timer- NE 555
• Phase- Locked Loops, Monolithic PLLs | |

Text Books:

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

2.	Ramakant A. Gayakwad, OP- AMP and Linear ICs' Prentice Hall/ Pearson Education, 1994.

3.	Robert Coughlin and F Driscoll, Operational Amplifiers and Liner Integrated circuits, sixth edition, Pearson Education Asia, 2001.

4.	D. Roy Choudhry, Shail Jain, " Linear Integrated Circuits". New Age International Pvt. Ltd., 2000

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.

Suggested Practical list

Sr. No.	Topic	Experiments
1.	Operational Amplifier Fundamentals	Determination of Slew Rate, CMRR and Frequency and offset voltage for IC 741 Op amp
2.	Liner Applications of OP – AMP	Design and implementation of linear equation for op- amp ie. $V_o = V_1 + V_2 - V_3$ using IC 741

3.		Frequency response of Integrator/ differentiator Using simulation Program on SPICE
4.	Active Filter	Frequency Response of 2nd order HPF filter on SPICE
5.		Frequency Response of 2nd order LPF using SPICE
6.	Non Linear Applications of	Design of Schmitt Trigger using IC 741 for designed value of UTP and LTP
7.	OP- AMP	Design of mono-stable Multi- vibrator for required pulse width using IC 741
8.		Design of Astable multi- vibrator for required frequency and Duty cycle using IC 741
9.		Design of triangular /Saw- tooth wave form generator using IC 741
10.	Data Converters and Regulators	Design of R/2R ladder 4-bit D/A Converter using IC 741
11.		Design FLASH TYPE 2-bit A/D converter using LM 324
12.		Design of LOW/ HIGH Voltage Regulator using 723
13.	Waveform Generators and	Design RC oscillators for required frequency and verify it using SPICE code
14.	Synthesizers	Design of mono- stable Multi-vibrator for required pulse width using IC 555
15.		Design of Astable multi- vibrator for required frequency and Duty cycle using IC 555
16.		Verify IC 555 as Frequency Demodulator
17.		Verify working of waveform generator ICL 8038

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 consists 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 mark. A test shall be conducted and will carry a weightage of ten mark.

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

Laboratory work (Experiments 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

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 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 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

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CLASS T.E. (Electronics Engineering)	Semester- V		
SUBJECT : Digital Communication and Coding Techniques			

Periods per week	Lecture	4	
	Practical	2	
(each of 60 min)	Tutorial	-	
		Hours	Marks
Evaluation system	Theory Examination	3	100
	Practical examination		
	Oral Examination	-	25
	Term Work		25
	Total		**150**

Objective	The increase in demand for data transmission coupled with the available of wide band communication channels and sophisticated integrated circuits have led to the development of efficient and reliable digital communications systems. This course emphasizes impact of the channel limitations and characteristics on data transmission using digital data.
Pre-requisite	Concept of basic communication techniques- Modulation and Demodulation Sampling as per Transform.

Module	Contents	Hours
1.	**Concept of Probability Theory in communication systems:** Random variables, Mean and Variance of Random variables and sum of random variables Useful PDFs and CDFs Gaussian Rayleigh pdf & Rician Distribution Binomial and Poisson Distributions Central- Limit Theorem	03
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	05
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, liner block codes, Cyclic codes, Convolutional codes, Code tree, state and Trellis diagram, Decoding of convolutional codes using Viterbi algorithm.	13
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.	06

5.	**Digital Modulation Techniques** Digital Modulation formats, coherent and non modulation, Digital modulation techniques- BPSK,, Modifications of BPSK, QPSK,M-ary PSK, ASK and MSK- Transmitter- Receiver, Power spectra Bandwidth efficiency, Euclidian distance. Integrate and dump receiver, Matched filter, correlator. The optimum Receiver.	15
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.	06

Text Books:

1. Simon Haykin- Communication System, John Wiley and Sons

2. Taub Schilling & Saha- Principles of communication systems- Tata MCGraw Hill, Third edition.

3. Bernan 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, Second edition.

6. Simon Haykin Digital communication, John Wiley and sons.

Reference Book :

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. BEF calculation for a digital communication system

6. Huffman coding

7. Lempel Zic 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 sequence

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 consists 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)	15 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 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 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

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CLASS: T . E. Electronics Engineering		Semester – V	
SUBJECT : Environmental Studies			
Period per week (each of 60 min.)	Lecture	2	
	Practical	-	
	Tutorial	1*	
			Hours
Marks Evaluation System	Theory Examination	2	50
	Practical examination	-	-
	Oral Examination	-	-
	Term Work	-	25
	Total		75
* Class wise Tutorial			

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

Module	Contents	Hrs
1	The Multidisciplinary nature of environmental studies Definition, Scope and importance Need for public awareness	1
2	**Natural resources** Renewable and non – renewable resources Natural resources & associated problem. 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 surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c. Mineral resources: use and exploitation, environmental effect of extracting and using mineral resources, case studies. d. Food resources: world food problems overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies. f. Land resources: Land as a resources, land degradation, man induced landsides, soil erosion and desertification. • Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	4
3.	• Ecosystems • Concepts of an ecosystem. • Structural and function of an ecosystem • Producers, consumers and decomposers. • Energy flow in the ecosystem.	3

	• Ecological succession • Food chains, food webs and ecological pyramids. • Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)	
4	**Biodiversity and its conversation** • 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 • Bio- diversity at global, national, local levels • India as a mega diversity nation • Hot spots of bio- diversity • Threats to biodiversity: Habitat loss, poaching of wild life, man –wildlife conflicts • Endangered and endemic species of India • Conservation of biodiversity: In-situ and Ex-situ conversation of diversity	4

| 5 | **Environment 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 managements: 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 | 4 |
| 6 | **Social issues and environment**
• From unsustainable to sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management.
• Re-settlement and rehabilitation of people: Its problems and concerns. Case studies.
• Environmental ethics: issues and possible solution
• Climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies.
• Wasteland reclamation
• Consumerism and waste products
• Environment protection act.
• Air (Prevention and control of pollution) act
• Wildlife protection act | 4 |

	• Forest conservation act • Issues involved enforcement of environmental legislation • Public awareness.	

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
		4

8	**Understanding existence and Co-existence** International and Cyclicity between Materials 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** Dimension of Human Endeavor and Objectives, Interrelationship in Society Mutual Fulfillment and Cyclicity in Nature.	6

Theory Examination:

1.   Question paper will be comprising of total 7 question, each of 10 marks
2.   Only 5 question 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 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)   : 15 marks.

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

Recommended Books:

1. Erach Bharucha, text book of environmental studies, Universities Press/Orient Blackswan
2. Jagdish Krishnaswami, R. J. Ranjit Daniels, ' Environmental Studies', Wiley India Private Ltd. New Delhi.
3. Anindita Basak,'Environment Studies", Pearson
4. Deeksha Dave, "Text book of, 'Environmental Studies', Cengage learning, Thomason India edition..
5. Benny Joseph, 'Environmental Studies', Tata McGRAW HILL
6. D L Manjunath, Environmental Studies' Pearson
7. R. Rajgopalan, 'Environmental science and Engineering', University press
8. Alok Debi, 'Environmental Studies' Oxford
9. A. Nagaraj, Jeevan Vidya- A Prime.

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CLASS: T. E. (Electronics Engineering)	Semester – V

SUBJECT : Electronics Workshop -II

Period per week (each of 60 min.)	Lecture	
	Practical	04
	Tutorial	-

			Hours	Marks
Evaluation System		Theory Examination		
		Practical examination		
		Oral Examination	-	50
		Term Work	-	
	Total			**50**

Objective	This syllabus is designed to encourage students to design and implement innovate 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 to 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 of the to be done in standard IEEE format using Latex/ WinTex. Project report should include abstract in maximum 100 Words, keyword, introduction, design, simulation, Implementation, result, conclusion and reference..
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 , result, conclusionand 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.,m "Networking a Beginners Guide", Tata McGRAW Hill
5. Ingram, Peter, "Networking in easy Steps", Dreamtech Press.
6. Bigelow Stephen, "Troubleshooting, Maintenance and Repairing 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 Programming by Example" , Tata McGraw Hill.
10. VHDL Reference Manual
11. Reference Manuals for Selected Microcontrollers/ Microprocessors.

CLASS: T. E. (Electronics Engineering)		Semester – VI	
SUBJECT : Discrete time signals and systems			
Period per week (each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	

		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination		
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Objective	This second course in signals and system aim to introduce the student to the idea discrete time signal processing as a foundation course for subject like image processing, speech processing, filter design, adaptive signal processing. It also covers introduction to DSP processors.
Pre-requisite	Basic Continuous signals and systems

Module	Contents	Hours
1	**Discrete Time (DT) signals & Systems** Signal classification manipulations Signal Periodicity in DT domain Concept of systems 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 correction and cross BIBO stability condition	8

2	**Z Transform** Two-sides 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	6
3	**D. T. System analysis using Z Transform** System Transfer function & Impulse response, pole zero plot BIBO stability and ROC	10
	Solution of a difference equation zero input & zero state response 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.	
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	6

| 5. | **Discrete Fourier Transform (DFT)**
DFT and comparison with other transforms
DFT Properties
Circular convolution
Block convolution using DFT by Overlap – add &
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
Compression of complex and real, multiplication
and
additional of DFT and FFT.
DFT computation by Divide and conquer approach
Limitations of DFT
Applications of FFT | 10 |
| 6 | **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),
Application of DSP to speech, image, biomedical and
radar processing . | 08 |

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. Oppenheim, Ronaid W Schafer, Prentice Hall, 1983

- E. C. Ifeachor and B. W. Hervis, Digital Siganl Processing a Practical approach, Pearson Publication.
- B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and TMH, 2004

Additional Reading :

- S. K. Mitra, Digital Signal Processing, Tata McGraw- Hill Publications, 2001.
- B.. P. Lathi, Linear systems and signals Oxford University Press second Indian Impression, 2007
- B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and TMH, 2004
- R. H. Bishop Learning with Lab View 7 Express Pearson education
- Gupta, Virtual Instrumentation using Labview Tata McGraw- Hill Publication,
- Chi-Tsong Chen Digital signal processing, Oxford University Press

Suggested list of simulations

Matlab or C/C++ or Labview:

1. Generation and transformations of basic D., T. Signals (2Simulations)

2. Discrete periodicity

3. Convolution, correction, autocorrelation

4. Z transform of standard signals

5. System impulse response for various inputs

6. Magnitude and phase response suing DTF

7. Circular convolution using FFT

8. System realization

9. Application of signal processing operation to practical one dimensional signal e.g. speech signal, ECG signal, music signal etc. (different signal can be used by different students group as a practical assignment)

10. Real time experiments using DSP processor

T. W / Oral Examination:

Term Work :

The term work shall consist of at least two numerical assignments and eight MATLAB/ C or Labview 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)   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.

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 (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.

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CLASS: T. E. (Electronics Engineering)		Semester – VI	
SUBJECT : Microprocessor & Microcontrollers II			
Period per week (each of 60 min.)		Lecture	4
		Practical	2
		Tutorial	-

Evaluation System			Hours	Marks
		Theory Examination	3	100
		Practical examination	3	25
		Oral Examination	-	-
		Term Work	-	25
		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 & Microcontroller.

Module	contents	Hours
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, minimum and maximum modes of operation, 8086/8088 memory addressing, address decoding, memory system design of 8086 family, timing considerations for memory intenacing, introduction to 8087 floating point coprocessor and its connection to host 8086.	15

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 directive, initialization instructions, simple sequential and looping programs in assemble language, debugging assembly language programs.	10
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 features of	8
	8086, 80196, 80296, 80386, 80486 and Pentium.	
4	**PIC Controllers: PIC 18** • PIC 18 memory organization, • CPU registers, • Pipelining, • Instruction format, • Addressing modes, • Sample of PIC 18 Instructions, Overview of the 8- bit MCU Market	8
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.	8

6	**Parallel Ports** • I/O Addressing, • Synchronization. • Overview of the PIC 18 parallel ports, • Interfacing with simple output devices.	7

Recommended Books:

1. Microprocessors and Interfacing, Douglas V Hall, Tata Mc Gram Hill
2. Han Way Huabg, Plc Microcontroller, Cengage learing
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. ʹ Ajay Deshmukh, Microcontrollers, 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.

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 eight 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.

Suggested Practical list

8086 (any 4)

1. Write a program to arrange block of data in i) ascending and (ii) descending order.
2. Write a program to find out any power of a number such that $Z = X^N$, where N is programmable and X is unsigned number.
3. Write a programmable delay routine
4. Write a program to find out largest number in a block.
5. Experiment on string instructions.
6. Write a programme to multiply 32 bit number.

PIC 18 :
The experiments are to be performed by using Proteus VSM Platform (any 4)
To design and test circuits
1. Addition, Subtraction
2. BCD Adder
3. Multiplication, Division
4. 4 bit LCD driver
5. Working of ADC/ DAC
6. Demonstration of Traffic light
7. Implement door bell
8. Data Logger
9. Working of calculator

On latest: Students can perform
To design and test circuits on Graphical based LCD, Interface external memory, Temperature display, Key pad interface using AVR controller.

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.

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CLASS: T. E. (Electronics Engineering)	Semester – VI

SUBJECT : MICROWAVE DEVICES AND CIRCUIRS

Period per week	Lecture	4	
	Practical	2	
	Tutorial	-	
(each of 60 min.)			

Marks			Hours
Evaluation System	Theory Examination	3	100
	Practical examination	-	
	Oral Examination	-	
	Term Work	-	25
	Total		**125**

Module	Contents	Hours
Objective	With ever – increasing need for radio – frequency Spectrum space, microwave communication and optical communication have grown 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 is this course.	

Pre-requisite	Knowledge of basic engineering electro magnetics.	
1	**Introduction to microwave communications** Microwave Spectrum and Bands, Limitations of Conventional circuit theory concepts at microwave frequencies. Applications of Microwaves.	2
2	**Generation & amplification of microwaves** Imitations of conventional vacuum tubes at microwave frequencies. Two cavity klystron amplifiers and Reflex Klystron oscillators: Construction , process of velocity modulation and bunching, Applegate diagram, o/p Power and Efficiency , applications. Cylindrical magnetron: Construction and working principle, Hull cut off magnetic equation and Hull cur off voltage equation, Cyclotron angular frequency, applications. Traveling wave tube: Construction and working principle, applications Numerical examples based on the above topics	8 4
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 Models, Group and phase velocities, Cut off Frequency. Numerical examples based on the above topics	8 4

4	**Wave guide components and analysis**	8
	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 Multipart Junctions, E Plane and H plane Tees, Magic Tees, Hybrid Ring, Directional Couplers.	
	Microwave Ferrite components Faraday Rotation Isolator, Gyrator, Circulator.	
	Numerical examples based on the above topics	3
5	**Microwave solid state devices**	5
	Principle of Operation and characteristics of Gunn diode, TRAPATT and IMPATT diodes, Microwave transistors, Introduction to strip lines	
6	**Microwave Measurement**	6
	Measurement of Power, Attenuation, Frequency, VSWR, Cavity Q and Impedance	

Text Books:

1) Microwave Devices and Circuits, Samuel U. 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 Hills.

Additional Reading:

1) Electronic Communication Systems, Kennedy, Davis 4e TMH
2) Microwave Engineering : Passive Circuit , Peter A. Rizzi. PHI
3) Foundation for Microwave engineering, 2e Robert E. Colin John Wiley.
4) Basic Microwave Techniques & Laboratory manual Sisodia M. L. Raghuvanshi G. S. 2001 New Age International (p) Ltd

Proposed Practical list

To plot the modes of Reflex Klystron Oscillator

To plot the Power _ Frequency Characteristics of Reflex Klystron oscillator

To plot the Radiation Pattern of Horn antenna.

Study of Waveguide Attenuators.

Measurement of Standing Wave Ratio & Reflection Coefficient

Measurement of Guide Wavelength

Study of Directional Coupler.

V I characteristics of Gunn diode

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 (Experiment 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.

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 then 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

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CLASS: T. E. (Electronics Engineering)	Semester – VI

SUBJECT : Electronics Instrumentation Systems

Period per week	Lecture	4
	Practical	2
(each of 60 min.)	Tutorial	-

Evaluation System		Hours	Marks
	Theory Examination	3	100
	Practical examination	-	
	Oral Examination	-	25
	Term Work	-	25
	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 electronics signal processing techniques included so that a strong link with courses is maintained.
Pre- requisite	System of units, Measuring Instruments, Measurement Of Inductance and Capacitance AC bridges

Module	Contents	Hours
1	**Instrumentation Systems** • 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	08
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, speed. accelerator, vibration, weight, level, sound, force and torque. • Sensors used in analytical measurement of Ph, viscosity. Humidity and dew point.	10
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 current Converters. • Current to voltage an voltage to current converters Data converters.	09

4	**Data Acquisition System and Advances In Instrumentation systems** • Signal channel data acquisition. • Multi – channel data acquisition systems. • Monitoring Instruments : Indicators, Alarm, Recorders • Data logger. • PC – based Instrumentation: concept and applications • Distributed Control System (DCS)	10
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	06
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.	05

Text Books:

1 Instrumentation Devices and systems

> By C S Rangan, G R Sharma, V S V Mani
> 2nd Edition Tata McGraw hill Publication

2 Process Control System and Instrumentation
> By Terry Barlett DELIMAR CENGAGE learning Reprint-2008

Additional Reading:

1. Principles of Industrial Instrumentation and control Systems
   By Chennakesava R. Alavala DELIMAR CENGAGE learning Reprint-2008
2. Instrumentation, Measurement and Analysis
   By B C Nakra K K Chaudhary 2nd Edition Tata McGrawhill Publication
3. Measurement of systems Applications and Design
   By E O Doebelin 4th Edition Tata Mc-graw Hill, 1990
4. Learning with Lab VIEW TM7
   By Robert H. Bishop Express Pearson Education Publication
5. Instrumentation for Engineer and Scientist
   By John D Turner Martyn Hill Oxford University Press

Suggested List of Experiments:

1 To Study the Response of different instruments for different test inputs (Unit, Ramp and Sinusoidal Signals) USE EITHER MATLAB/LabVIEW
2 Study the charact3 Study the characteristics of different transducers (Two to Four Experiments can be performed to include transducers in Chaper-2)
3 Design of filter (2nd order Butterworth) with discrete components Response can be also observed using VI in LabVIEW
4 Design of Instrumentation Amplifier
5 Study of controller modes or PID controller (Either on Trainer kit or Constructing VI on LabVIEW)
6 Experiment to show Calibration of Instrument and tuning of Controller

Termwork:

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

The distribution of marks for term work shall be as follow,
Laboratory work (Experiments 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

Oral Examination:

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

Theory Examination:
1.   Question paper will comprise of total 7 questions, each of 20 marks.
2.   Only 5 questions need to be solved.
4.   Question number 1 will be compulsory and will cover all modules.
5.   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 module3.)
6.   In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
7   No question should be asked from pre-requisite module.

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CLASS T.E. (Electronics Engineering)		Semester- VI	
SUBJECT : Power Electronics			
Periods per week		Lecture	4
each of 60 min)		Practical	2
		Tutorial	-
Evaluation system			Hours	Marks
	Theory Examination	3	100
	Practical examination	3	25
	Oral Examination	-	-
	Term Work		25
	Total		**150**

Objective	To teach the basic concepts of power electronics. Also to study important power devices in detail alongwith basic application of SCR as controlled rectifier. To get skill of developing and design related to power electronics circuits.
Pre-requisite	Concept of semi conductor, rectification behavior of inductor capacitor harmonics Fourier analysis.

Module	Contents	Hours
1.	**Semiconductor Power Devices:-** Characteristics of power diodes, power transistors, power MOSFET, IGBT, SCRs, TRIACs, DIAC and GTO Rating of power devices, series and parallel connections of SCRs.	10

2.	**SCR protections-** dv/dt, di/ dt, over voltage and over current protection, cooling of semiconductor devices, Isolation circuits using optocoupler and transformer	04
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)	10
4.	**Applications of Thyristors :-** Static circuit breakers, over voltage protectors, zero voltage switch, integral cycle triggering, time delay method, soft start method.	06
5.	**Controlled Rectifier Circuits:-** Single Phase: - Half wave, full wave, half controlled and full controlled converters with R & RL Load, effect of Free wheeling diode. Calculations of performance parameters expected.	12
6	**Controlled Rectifier Circuits :** Three Phase:- Half wave, full wave, fully controlled converters with Resistive Load only.	06

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.

Additional Reading

1. Chute and Chute: Electronics in Industry: MGH

2. B. W. Willams: Power Electronics, Jhon Willey, 1975.

Suggested Laboratory Experiments

1. To study SCR Characteristics. Also calculate Values of holding and latching.

2. To study Diac/ Triac Characteristics. Also calculate Break over voltage of diac and Traic.

3. Application of diac and triac as light dimmer and fan regulator

4. To study different turn on Methods of SCR.
   1) R   2) R-C   3) UJT

5. To study different turn off Methods of SCR (Class A to Class F)

6. To Study A- C power control using double R- C Network.

7. To study single phase full controlled Rechfier with R and R-L Load (with and without Free wheeling diode.)

8. To study single phase half controller Rechfier with R Load.

9. To study single phase full controlled Rechfier (Semi converter) with R and R-L Load (with and without Free wheeling diode)

10. Triggering circuits
    i) Ramp and Pedestal
    ii)Cosine inverse.

Note: Students are expected to perform minimum 8 experiments.

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 :

The term work shall consists 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)	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

Theory Examination:

1. Question paper will be comprised 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 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

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CLASS T.E. (Electronics Engineering)	Semester- VI

SUBJECT : Communications Systems and Applications (Elective-1)

Periods per week	Lecture	4	
each of 60 min)	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation system	Theory Examination	3	100
	Practical examination		
	Oral Examination	-	-
	Term Work		25
	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	Concept of basic communication techniques, characteristics of guided and unguided media.

Module	Contents	Hours
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.	08

2.	**Television principles** : Television system and standards, The composite video signal, Blanking and synchronizing pluses, video modulation and VSB signal.	06
3.	**Color TV** : Color TV transmission, color reception, PAL –B Standard color TV Transmitter and Receiver (block diagram only), features of Cable TV, Digital TV, HDTV, LCD and Plasma T.V.	08
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 Gec- stationary satellites.	10
5.	**Radar systems** : Basic principles, Radar performance factors, Antenna scanning and tracking, MTI and Pulsed Doppler radar, Continuous wave Doppler radar, FM-CW Radar.	8
6.	**Optical communication systems** : Key elements of Optical fiber communication link, Fiber configurations and classifications, Losses in fiber, cables, Optical sources, Optical Detectors.	8

Text Books ;

1. Kennedy, Davis – Electronic Communication Sytems, Tata Mcgraw Hill Fourth ed, 1999.

2. Wayne Tomasi – Advanced Electronic communication Systems, PHI, Sixth ed, 2004.

3. Gulati – Monochrome and Color Television, New Age International (P) Ltd.

4.   Roy Blake- Electronic communication systems, Thomson Learning, 2nd ed,
        2002

5.   A. M. Dhake- Television & Video engineering, Tata Mcgraw Hill, 2nd Ed, 2002.

Reference Books:

1.   Jordan, Balmian – Electromagnetic waves and Radiating systems PHI 2nd Ed,
        1988.

2.   Merrill Skolnik- Introduction to Radar System., Tata Mcgraw Hill, Third edition,
        2001

3.   Michoel O Kolawole- Radar system peak detection & Tracking, Elsevier.

4.   Dennis Roddy- Satellite Communication, Mcgraw Hill, third ed, 2001

5.   Pratt Bostian- Satellite Communication, John Wiley and sons, 1986

6.   Gerd Keiser- Optical Fiber Communications, Tata Graw Hill, fourth ed. 2008.

PRACTICAL SETUP;

The experimental list should consist of minimum 8 experiments:

i.   2 experiments on Antennas.
ii.   2 experiments on color TV
iii.   2 experiments on satellite communication
iv.   2 experiments on Optical fiber communication

Term work :

The term work shall consists of minimum eight experiments and student
presentation (not more than two students per group) on communication Application
and a written test.

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

Laboratory work (Experiments 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

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 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 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

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CLASS T.E. (Electronics Engineering)		Semester- VI	
SUBJECT : Medical Electronics (Elective-1)			
Periods per week		Lecture	4	
		Practical	2	
each of 60 min)		Tutorial	-	
			Hours	Marks
Evaluation system		Theory Examination	4	100
		Practical examination		
		Oral Examination	-	-
		Term Work		25
		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 now safety measures in biomedical equipments, Recording electrodes and recording systems used. Introduce concept of Telemetry and Hospital management system.
Pre-requisite	Knowledge of basis requirements of a good Instrument and Human body and different life processes.

Module	Contents	Hours
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	8

2.	**Bio- Potential Amplifiers and signal conditioner and Recording Systems** Electrocardiogram Electroencephalogram Electro-myogram Electronic Spirometer Electrooculogram Electroretinogram	8
3.	**Diagnostic Equipments** Electrocardiograph (ECG) Electroencephalograph (EFG) Electromygraph Pluse oximeter Measurement of blood pressure, blood flow And cardiac output Impedance plethysmography Measurements in the respiratory system	8
4	**Therapeutic and Prosthetic equipment** Defibrillators Pacemakers Ventilators, Bedside Monitor, Audiometer Hemodialysis Infant Incubators Muscle and Nerve stimulators Electrocautery machine Short wave Diathermy Ultrasound therapy Unit	8
5	**Imaging equipments** Computed Tomography Magnetic Resonance Imaging Ultrasonic Imaging System Positron Emission Tomography	8

6	**Safety and Telemetry in Biomedical Instrumentation** Causes of Electrical shock micro & macro shock Electrical safety codes and standards Methods of accident preventions Test of grounding system in patient care area, chassis leakage current Biomedical Telemetry Hospital management system	8

Text Book:

1. Webster J. G. Medical Instrumentation- Application and Design, Wiley and Sons Inc, third edition, 1999.
2. Khandpur R.S. Handbook of Biomedical Instrumentation, Tata McGraw Hill, second edition. 2003

Additional Reading:

1. Carr and Brown, Introduction to biomedical equipment technology, fourth edition, Pearson press, 2003
2. Cromwell L. Weibell & Pfeiffer, Biomedical Instrumentation and measurements, Prentice Hall of India, 1993
3. John G. Webster, Bioinstrumentation John Wiley and sons,2004

Practical list

Sr.no	Topic	Title of Experiment
1	Sources of Bio-Electric Potential	Recording system can be implemented using Lab VIEW VI
2.	Bio-potential Amplifiers and	Implement ECG preamplifier using Instrumentation Amplifier
3.	Signal conditioner and Recording system	Design Band pass Filters for EEG (different types of EEG waveform) Lab VIEW

4.	Therapeutic and	Working ECG machine
5.	Prosthetic	Blood Pressure monitor Unit
6.	Equipment	Pulse Oximeter
7.		Electro-spirometer
8.	Therapeutic and	DC Defibrillator Demo
9.	Prosthetic Equipment Muscle stimulator	

Term work :

The term work shall consists 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 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 + Journal + Presentation)   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

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 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 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

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CLASS T.E. (Electronics Engineering)		Semester- VI	
SUBJECT : Computer Organization (Elective-1)			
Periods per week	Lecture	4	
	Practical	2	
each of 60 min)	Tutorial	-	
		Hours	Marks
Evaluation system	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination		
	Term Work	-	25
	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 related to instruction execution, storage allocation etc.

Prerequisite :

Fundamental of Microprocessor Architecture, Memory interfacing

Module	Contents	Hours
1.	**Basic Processing Unit –** CPU Organization Some fundamentals like register transfer, fetching and storing a ward from memory Execution of an instruction including branch The data path design Fixed Point Arithmetic- Addition, Fast Addition, Multiplication, Division Algorithms	8

2.	**Control Unit –** Hardware control : Design Example of Multiplier/ Divisor Micro programmed control : Design Examples Performance Enhancement using Pipelining : Introduction, Data Hazards, Instruction Hazards, Super scalar Architecture	8
3	**Memory Organization –** Memory system : Multiple, Concept of cache and Virtual Memory, Address translation, segmentation paging, TLB, Memory Allocation Replacement policies Cache system: -cache architecture: look though and look Aside -cache organization : direct and associative mapping -Replacement Algorithms, Hit Ratio, performance of cache memory	8
4.	**Input/Output Organization-** - I/O devices types and access methods, - 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
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

| 6 | **Introduction to ARM**
- the Arm Family architecture (RISC)
- Register Structure
- Memory access ad addressing modes
- Arithmetic and Logical Instruction
- branching Instructions | 8 |

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 Kauffman

Practical list

1. Writing program and Simulation of Arithmetic algorithms (2)
   (Like Booth Multiplier / Division Algorithm etc)

2. Writing program and Simulation for Control Unit (1)
   (Like ALU design)

3. Writing program to evaluate various replacement policies (1)

4. Simple programs using Arithmetic and Logical instructions of IA32 Processor (2)
   (Like ASCII to BCD Conversion, multiplication etc.)

5. Assignment on I/O organisation (1)

6. Program/ Assignment on ARM processor (2)

7. Assignment on Cache Memory Design (1)

Term work :

The term work shall consists of minimum eight experiments and two assignments and term work test.

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

Laboratory work (Experiments 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

Theory Examination:

1.   Question paper will be comprise of total 7 questions, each of 20 marks.

2.   Only 5 questions need to be solved.

4.   Question number 1 will be compulsory and will cover all modules.

5.   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)

6.   In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

7.   No question should be asked from pre-requisite module

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