Third Year Engineering (Semester V & VI) (Revised) Course for
Academic Year 2009-10,

Electronics and Telecommunication Engineering,

Scheme for TE, Semester V

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Duration of Theory papers (Hours)	Marks				
		Lecture	Practical	Tutorial		Theory	Term-work	Practical (3 Hrs.)	Oral	Total
1.	Random Signal Analysis	3	2		3	100	25	-	-	125
2.	Microprocessors & Microcontrollers - I	3	2	-	3	100	25	25	-	150
3.	RF Circuit Design	4	2	-	3	100	25	25	-	150
4.	Signals and System	4	2	-	3	100	25	-	25	150
5.	Principles of Control Systems	4	2	-	3	100	25	-	25	150
6.	Electronic hardware workshop	-	3	-	-	-	25	-	25	50
7.	Environment Studies	2	-	1	2	50	25	-	-	75
Total….		**20**	**13**	**1**		**550**	**175**	**50**	**75**	**850**

University of Mumbai			
CLASS: T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Random Signal Analysis			
Periods per week (Each of 60 min.)	Lecture	3	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	-
	Term Work	-	25
	Total		125

Module	Contents	Hours
Objective	The objective of this course is to analyze the behaviour of signals and random phenomena, with special emphasis on its applications to communication engineering, signals and linear systems.	-
1	**Introduction to Probability**: Classical and relative-frequency-based definitions of probability; sets, fields, sample space and events; axiomatic definition of probability; joint and conditional probabilities, independence, total probability; Bayes' Rule and applications. **Random variables**: Definition of random variable, Cumulative Distribution Function (CDF), Probability Mass Function (PMF), Probability Density Functions (PDF) and properties, some special distributions: Uniform, Gaussian and Rayleigh distributions; Binomial, and Poisson distributions; Mixed Random Variables.	**4 hrs** **6 hrs**
2	**Functions of one random variable:** Functions of one random variable and their distribution and density functions, mean, variance and moments of a random variable, Chebyshev, Markov inequality, characteristic functions, moment theorem. **Functions of two random variable:** Bivariate distributions, joint distribution and density, properties, marginal statistics, independence, one function of two random	**6** **7**

	variables two functions of two random variables; joint moments, covariance and correlation-independent, uncorrelated and orthogonal random variables; joint characteristic functions, conditional distributions, conditional expected values.	
3	**Stochastic Convergence and limit theorems:** Sequence of random variables, convergence everywhere, almost everywhere, MS, in probability, in distribution and comparison of convergence modes, strong law of large numbers (without proof); Central Limit Theorem (without proof) and its significance.	**5hrs**
4	**Random processes:** Discrete and continuous time random processes; probabilistic structure of a random process; mean, autocorrelation and autocovariance functions; stationarity- strict-sense stationary (SSS) and wide-sense stationary (WSS), ergodic processes: autocorrelation function of a WSS process and its properties, cross-correlation function.	**7hrs**
5	**LTI Systems with stochastic inputs** spectral representation of a real WSS process power spectral density and properties, cross-power spectral density and properties, auto-correlation function and power spectral density of a WSS random sequence; linear time-invariant system with a WSS process as an input: stationarity of the output, autocorrelation and power-spectral density of the output; examples of random processes: white noise process and white noise sequence; Gaussian process; Poisson process	**5hrs**
6	**Markov Chains:** Introduction, Homogeneous chain, stochastic matrix, Random walks, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states.	**5hrs**

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 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 the 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 experiments & 3 tutorials 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.

Practical list

1. Simulation of discrete random variable and estimation of its PMF & CDF
2. Study of uniform, exponential, Rayleigh and Gaussian density functions
3. To study relation between distribution and density functions.
4. To calculate $P(x_1 \leq X \leq x_2)$, $P(X \leq x)$, $P(X \geq x)$, $P(x_1 \leq X \leq x_2)$, from distribution and or density function
5. Study of mixed random variable
6. Study of joint density/distributions.
7. Study of power spectral density
8. Study of random process.
9. Study of ergodic process
10. Study of LTI system with stochastic input

Recommended Books:

1. A. Papoulis and S.U. Pillai, Probability, Random Variables and Stochastic Processes, 4th Edition, McGraw-Hill, 2002

2. P.Z. Peebles, Probability, Random Variables and Random Signal Principles, 4th edition, Mc-Graw Hill, 2000

3. H. Stark and J.W. Woods, Probability and Random Processes with Applications to Signal Processing, 3e, Pearson edu

4. Wim C Van Etten, Introduction to Random Signals and Noise, Wiley

5. Miller, Probability and Random Processes-with applications to signal processing and communication, first ed2007, Elsevier

University of Mumbai			
CLASS: T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Microprocessors & Microcontrollers - I			
Periods per week (each of 60 min.)	Lecture	3	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	3	25
	Oral Examination	-	-
	Term Work	-	25
	Total		150

Module	Contents	Hours
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**	-
1	Basics of 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	
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.	
3	Study and Interfacing of peripherals 8155/8255, 8253/8254, 8259 with 8085	
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 ports, • Counters and timers, • Serial data input and output • Interrupts. • Power saving modes	
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, timer and hardware interrupt service routines.	
6	Interfacing of LCD display, hex keyboard, ADC0808, DAC0808 and Stepper motor with 8051 Current trends in microprocessors and practical implementation • Comparative study of salient features of 8085, 8086, 80196, 80296, 80386, 80486 and Pentium. • Comparative study of salient features of	

	8051 and its derivatives like 89C51, 89C52, 89C2051 AND 89C2052 • Current processor and controller survey. (cost, availability, popularity)	

Theory Examination:

1. Question paper will be comprise of total 7 questions, each of 20 marks.
2. All questions must be analytical and design oriented.
3. Only 5 questions need to be solved.
4. Question number 1 will be compulsory and will cover all modules.
5. 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.)
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.

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.

Practical list

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.

Hardware Based:-

Any six experiments from the list given below.

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 keyboard-using 8279.

05) Interfacing display-using 8279.

06) Interfacing ADC 0808/0809.

07) Interfacing DAC 0808.

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

09) Interfacing a Centronics type printer.

10) Interfacing of Thumbwheel switches.

11) Interfacing of 8253 / 8254.

12) Interfacing of 8251

8051 experiments (any 3)

1. Arithmetic operations
2. Packing and unpacking
3. Ascending and descending
4. 8051 timer based experiment

8051 application based experiments (any 2)

1. Transmission of character using RS 232 to PC(preferably on bread board)
2. 16 * 2 LCD and Hex keyboard interface (preferably on bread board)
3. ADC or DAC interface (any application) (preferably on bread board)

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 Microprocessors & Microcontrollers, 2e, Elsevier, 2007
5. Calcut,8051 Microcontrollers:An Applications Based Introduction, Elsevier
6. DV Kodavade, S Narvadkar, 8085-86 Microprocessors Architecture Progg and Interfaces, Wiley
7. Udayashankara V, Mallikarjunaswamy, 8051 Microcontroller, TMH
8. Han-Way Huang, Using The MCS-51 Microcontroller, Oxford University Press.
9. Ayala, 8051 Microcontroller , Cengage (Thomson)
10. Rout, 8085 Mictoprocessor, Cengage (Thomson)
11. The 8085 Microcontroller-Architecture, programming and application, 2nd edi, Penram International.

University of Mumbai			
CLASS:T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: RF Circuit Design			
Periods per week (each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	3	25
	Oral Examination	-	-
	Term Work	-	25
	Total		150

Module	Contents	Hours
Objective	**The objective of this course is to introduce to the students the fundamentals of active & passive components and circuits used at RF.**	-
Pre-requisite	**Concept of Basic Electronics and Wave Theory.**	-
1	**Introduction** Importance of radiofrequency design, Dimensions and units, frequency spectrum. **1] RF behaviour of passive components:** High frequency resistors, capacitors & inductors. **2] Chip components and Circuit board considerations:** Chip resistors, chip capacitors, surface mounted inductors.	**05**
2	**Transmission Line Analysis:** Two-wire lines, Coaxial lines and Microstrip lines. Equivalent circuit representation, Basic laws, Circuit parameters for a parallel plate transmission line. **1] General Transmission Line Equation:** Kirchhoff voltage and current law representations, Traveling voltage and current waves, general impedance definition, Lossless transmission line model. **2] Microstrip Transmission Lines.** **3] Terminated lossless transmission line:**	**10**

	Voltage reflection coefficient, propagation constant and phase velocity, standing waves. **4] Special terminated conditions:** Input impedance of terminated lossless line, Short circuit transmission line, Open circuit transmission line, Quarter wave transmission line. **5] Sourced and Loaded Transmission Line:** Phasor representation of source, Power considerations for a transmission line, input impedance matching, return loss and insertion loss.	
3	**The Smith Chart:** Reflection coefficient in Phasor form, Normalized Impedance equation, Parametric reflection coefficient equation, graphical representation, Impedance transformation for general load, Standing wave ratio, Special transformation conditions. **Admittance Transformations**: Parametric admittance equation, Additional graphical displays. **Parallel and series Connections:** Parallel connections of R and L connections**,** Parallel connections of R and C connections, Series connections of R and L connections, Series connections of R and C connections, Example of a T Network.	**10**
4	**RF Filter Design:** Filter types and parameters, Low pass filter, High pass filter, Bandpass and Bandstop filter, Insertion Loss. **Special Filter Realizations:** Butterworth type filter, Chebyshev type filters, Denormalization of standard low pass design. **Filter Implementation:** Unit Elements, Kuroda's Identities and Examples of Microstrip Filter Design. **Coupled Filters:** Odd and Even Mode Excitation, Bandpass Filter Design, Cascading bandpass filter elements, Design examples.	**15**
5	**Active RF Components:** Semiconductor Basics: Physical properties of semiconductors, PN-Junction, Schottky contact. **Bipolar-Junction Transistors:** Construction, Functionality, Temperature behaviour, Limiting	**10**

	values. **RF Field Effect Transistors:** Construction, Functionality, Frequency response, Limiting values. **High Electron Mobility Transistors**: Construction, Functionality, Frequency response.	
6	**Active RF Component Modeling:** **Transistor Models:** Large-signal BJT Models, Small-signal BJT Models, Large-signal FET Models, Small-signal FET Models. **Measurement of Active Devices**: DC Characterization of Bipolar Transistors, Measurements of AC parameters of Bipolar Transistors, Measurement of Field Effect Bipolar Transistors Transistor Parameters. **Scattering Parameter Device Characterization.**	**10**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. All questions must be analytical and design oriented.
3. Only 5 questions need to be solved.
4. Question number 1 will be compulsory and cover all modules.
5. 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.)
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**.

Practical/ Oral Examination:

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

Practical list

1. Characterization of resistors.
2. Characterization of Inductors
3. Characterization of capacitors.
4. Study of Q in RLC Series resonance circuits.
5. Study of Q in RLC Parallel resonance circuits.
6. LP Filter Design
7. HP Filter Design
8. BP Filter Design
9. Tutorial on Smith Charts.
10. DC Characterization of BJT.
11. DC Characterization of FET.

Recommended Books:

1. Reinhold Ludwig, Pavel Bretchko, RF Circuit Design, Pearson Education Asia.
2. Joseph J. Carr, Secrets of RF Circuit Design, Tata McGraw-Hill.
3. W.Alan Davis , K K Agarwal, Radio Freuency circuit Design, Wiley
4. Pozar, Microwave Engineering, John Wiley.
5. Mathew M. Radmanesh, RF & Microwave Design Essential,
6. Ian Hickman, Practical RF Handbook, Elsevier

University of Mumbai			
CLASS: S.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Signals and System			
Periods per week (each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	3	25
	Term Work	-	25
	Total		150

Module	Contents	Hours
Objective	**objectives of this course is to** study and analyse characteristics of continuous, discrete signals and systems.	-
Pre-Requisite	**Concept of Fourier Series/Transform, Laplace Transform.**	-
1	**REPRESENTATION OF SIGNALS** Continuous and discrete time signals: Classification of Signals – Periodic aperiodic ,even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – properties of discrete time signal –impulse functions and its properties – Transformation in independent variable of signals: time scaling, time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals, properties of continuous time and discrete time Fourier series.	**10**
2	**ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS** Continuous time Fourier Transform and Laplace Transform analysis with examples – properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Parseval's relation, and convolution in time and frequency domains. Basic properties of continuous time systems:	**12**

	Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems -Analysis and characterization of LTI systems using Laplace transform & application in electrical networks, Computation of impulse response and transfer function using Laplace transform.	
3	**SAMPLING THEOREM AND z-TRANSFORMS** Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals. Basic principles of z-transform - z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform.	**12**
4	**DISCRETE TIME SYSTEMS** Computation of Impulse response & Transfer function using Z Transform., LTI-DT systems - Characterization using difference equation, Block diagram representation, Convolution, Properties of convolution and the interconnection of LTI Systems, Causality and stability of LTI Systems. DTFT, DTFT Properties and examples	**10**
5	**SYSTEMS WITH FINITE AND INFINITE DURATION IMPULSE RESPONSE** Systems with finite duration and infinite duration impulse response – recursive and non-recursive discrete time system – realization structures – direct form – I, direct form – II, Transpose, cascade and parallel forms.	**10**
6	**State Space Analysis** Representation and Solution for continuous and discrete time LTI System	**06**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. All questions must be analytical.
3. Only 5 questions need to be solved.
4. Question number 1 will be compulsory and covering the all modules.
5. 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.)
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**.

Oral Examination:

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

Term work:
Term work shall consist of minimum four experiments and five tutorials 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.

Practical list

Study of operations on signals.
Step and impulse response of system.
Impulse response using Laplace Transform.
Study of Sampling Theorem.
Study of Discrete Time Fourier Transform.
Pole-Zero plot of Z-transform
Realization structures of System

Recommended Books:

1. Simon Haykins, Signal and Systems 2nd edition. , Wiley
2. Oppenheim, Signals and System,2nd , Pearson edu
3. H P Hsu, 'Signals and Systems', TMH, 2006
4. Rao S.S., Signals and System, TMH
5. Zeimer RE, Signals & System: Continuous and Discrete, 4e, Dorling Kindersley(India) Pvt Ltd
6. Lathi B.P., Linear systems and signals, 2nd edi, Oxford Uni Press
7. S. Salivahanan, e.t. 'Digital Signal Processing,' TMH, 2005
8. Stuller, Signal & Systems , Cengage (Thomson)

University of Mumbai			
CLASS: T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Principles of Control Systems			
Periods per week (each of 60 min.)	Lecture	3	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	3	25
	Term Work	-	25
	Total		150

Module	Contents	Hours
Objective	Objective of this course is to understand fundamentals of control systems that has wide applications in industries. To understand optimal performance of the system, understanding and applying to conventional control strategies.	-
Pre-requisite	**Concept of electrical network**	-
1	**Introduction:** Open loop and closed loop systems, basic structure of a feedback control system. **Dynamic Models and Responses:** Dynamic model of an RLC network, state variable model, impulse response model, transfer function model, standard test/ disturbance signals and their models, transfer function model and dynamic response of a second order electrical system.	**07**
2	**Mathematical Modelling of Systems** Basic units of a feedback control system, reduction of system block diagrams, signal flow graphs, Mason's gain rule, block diagram reduction using Mason's gain rule, error detector, block diagram model of a typical control system using simplified sub- system, transfer function blocks.	**9**
3	**Feedback Control System Characteristics:** Stability, sensitivity, disturbance rejection, steady state accuracy, transient and steady state responses of a second order system. Effect of additional zeros and pole locations and dominant	**9**

	poles, steady state error constants, system type numbers and error compensation. .	
4	**System Stability analysis and compensation Design:** System stability bounds, Routh stability criterions, relative stability and range of stability, root locus concept, system characteristic equation, plotting root loci.	**11**
5	**Nyquist Criterion and Stability Margins**: Nyquist stability criterions, Nyquist plot, gain and phase margins, bode plot of magnitude and phase and determination of stability margins.	**9**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. All questions must be analytical.
3. Only 5 questions need to be solved.
4. Question number 1 will be compulsory and covering all modules.
5. 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.)
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**.

Oral Examination:

Oral Examination 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 six 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.

Practical list

Type '0' and Type '1' control system.
Closed Loop Control System.
Study of Bode Plot
Error Detector
Linear System Simulator
Series Control System
Time Response of first and second order systems (RLC).
Simulations:
- Time Response analysis
- Frequency response analysis
- Stability analysis

Recommended Books:

Control Systems- Principles and Design- M. Gopal
Tata Mc-Graw Hill Publication
Norman Nise, Control Sysmtem Engineering 4th edition, wiley
Srivastava Manjita et, Control System, TMH.
Control Systems Engineering-I.J Nagrath and M.Gopal
New Age International Publishers
Modern Control Engineering- Katsuhiko Ogata,4e, Pearson edu

University of Mumbai			
CLASS: T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Electronic Hardware Workshop			
Periods per week (Each of 60 min.)	Lecture	-	
	Practical	3	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	-	-
	Practical examination	-	-
	Oral Examination	3	25
	Term Work	-	25
	Total		50

Module	Contents	Hours
Objective	The objective of this course is to introduce to the students the basics of circuit assembly and debugging. To encouraging the students to design and implement innovative ideas.	-
Pre-Requisite	Concept of Basic Electronics, Digital Logic & Electrical Engg. Fundamentals	
1	**Study of soldering and PCB Design** Students are expected to select any experiment* that they have already performed in earlier semester. Soldering and testing are to be done for the selected experiment. Schematic as well as PCB design is to be carried out using any software tool. A report is to be prepared.	**09**
2	**Analogue Project** **(Design and implementation)** Students are expected to design any project*, of analogue circuit/system, discrete and/or IC based, of their choice (which can be used as experimental set-up in the laboratory). PCB design, fabrication, testing and implementation should be done. Students may use the software simulation for verification of hardware implementation. Documentation of the project is to be in standard IEEE format. Project report should include abstract in 100 words (max), key words, introduction, design, simulation, implementation, results/ results comparison, conclusion and references.	**15**

3	**Digital Project** **(Design and implementation)** Students are expected to design any project*, of digital circuit/ system of their choice, may involve microprocessor/ microcontroller (which can be used as experimental set-up in the laboratory). PCB design, fabrication, testing and implementation should be done. Students may use the software simulation for verification of hardware implementation. Documentation of the project is to be in standard IEEE format. Project report should include abstract in 100 words (max), key words, introduction, design, simulation, implementation, results/ results comparison, conclusion and references.	**21**

*** To be approved by the concerned faculty. Students will work in group, Minimum 2 students in each group but not more than 3.**

Oral Examination:

Oral Examination will be based on any experiment performed and on the entire syllabus.

Term work:

Students will work in group, Minimum 2 students in each group but not more than 3.
Term work shall consist of minimum TWO Projects.
The distribution of marks for term work shall be as follows,
Laboratory work (Project implementation, result and reports) : 20 marks.
Attendance : 05 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. Bossart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill

University of Mumbai			
CLASS: T.E. (Electronics & Telecommunication Engineering)		**Semester - V**	
SUBJECT: Environment Studies			
Periods 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

Module	Contents	Hours
Objective	**Objective of this course is to create environmental awareness, of variety of environmental concerns.**	-
1	**Nonliving Environment** **Soil** Origin, Classification, Soil types of India, Mineral Resources, Equitable Use of Mineral Resources **Water** Earth's reserves, Saltwater , Freshwater, Atmospheric water & Rainfall, Hydrology, Minimum Environmental Flows **Air** Composition, Oxygen, Carbon dioxide, Nitrogen, Wind **Solar System** The Sun, Solar energy	**5**
2	**Living Environment** Biodiversity, Genes, Populations, Species, Communities, Value of Biodiversity **Ecosystems** Classification, Ecosystem Resilience, Productivity, Food chain, Food web Nutrient cycling **Biomes** Rainforests, Seasonal broadleaved forests, Conifer forests Swamps, Grasslands, Arid and Semi-arid biome, Polar biome, Oceans	**5**

3	**Social Environment** **Population** Population explosion and migration, Women and Children, Pressures of population growth, Industrialization, Conflicts over land, Social conflicts Disasters, Human Rights and Value Education **Food** Agriculture, Irrigation, Livestock, Fisheries, Sustainable agriculture **Health** Communicable diseases, Vector borne diseases, Pandemics, Vulnerable groups, Role of information and awareness **Energy** Non-renewable Energy, Renewable Energy, Hydroelectric energy, Solar energy, Wind energy, Energy from biomass, Bio-diesel **Urbanization** Habitation, Communication, Recreation **Waste** Solid wastes, Sewage and Wastewater, Hazardous wastes, Management of solid wastes, Land disposal and Sanitary landfills, Recycling, Medical wastes Industrial wastes, Wastewater treatment, Bioremediation of wastewater Biodegradation and Composting , Management of toxic and hazardous wastes **Pollution** Air pollution, Noise pollution, Thermal pollution, Water pollution, Marine pollution, Bio-magnification, Land pollution, Control **Economy** Subsistence, Markets, Global trade regimes **Natural resource depletion** Deforestation, Mining, Soil erosion, Loss of wetlands, Loss of biodiversity, Desertification **Invasive species** Plants, Animals, Genetically Modified Organisms	**8**
4	**Environmental Conservation** Early warning systems, Bio-indicators, Tsunami & other natural disasters Disaster management **Impact assessment** Inventorying, Monitoring, GIS **Protected Areas** Wildlife Sanctuaries, National Parks, Biosphere	**6**

	Reserves **Endangered species** Ex-situ conservation, Conservation breeding **Economic valuation** Bio-resources, Nature's services **National Legislation** Constitutional provisions for safeguarding the environment, The Environmental (Protection) Act, The Air (Prevention and Control of Pollution) Act, The Water (Prevention and Control of Pollution) Act, The Wildlife (Protection) Act, Forest Act, Biodiversity Act **International Conventions and Treaties** Ramsar Convention, CITES, Convention on Biological Diversity, Convention to Combat Desertification, Convention on Climate Change	
5	**Global Efforts in protecting the living environment** Global Biodiversity Assessment, Ecosystem services and Millennium Ecosystem Assessment **Sustaining Biodiversity: The Species Approach** Species Extinction, importance of wild species, causes of premature extinction of wild species, protecting wild species, wild sanctuary, legislation, Reconciliation ecology **Environmental Economics, politics, and worldviews** Economic Systems and Sustainability Using Economics to improve Environmental Quality Reducing poverty to improve Environmental quality and human well-being Micro loans for the poor	**6**

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 BOOK BY Jagdish Krishnawamy , R J Ranjit Daniels, " Environmental Studies", Wiley India Private Ltd. New Delhi) 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