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

**SEMESTER: V**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subjects</th>
<th>No.of periods of 1 Hour</th>
<th>Duration Of Theory Paper in Hours</th>
<th>Marks</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Theory Paper</td>
<td>Term work</td>
<td>Practical /Oral</td>
</tr>
<tr>
<td>1</td>
<td>Continuous Time Signal &amp; System</td>
<td>4</td>
<td>2</td>
<td>3</td>
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<tr>
<td>2</td>
<td>Microprocessor and Microcontroller-1</td>
<td>4</td>
<td>2</td>
<td>3</td>
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<tr>
<td>3</td>
<td>Electromagnetic Engineering</td>
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<td>1</td>
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<td>4</td>
<td>Linear Integrated Circuits and Design</td>
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<tr>
<td>5</td>
<td>Digital Communication and Coding Techniques</td>
<td>4</td>
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<td>6</td>
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<td>7</td>
<td>Electronics Workshop II</td>
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<td>4</td>
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<td>21</td>
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# Class wise tutorial
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

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

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.

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

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

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

**Text- Books:**

1. S. Haykin, Signals and Systems, Wiley Eastern Publication
5. B.P.Lathi, linear systems and signals Oxford University Press second Indian Impression, 2007

**Additional Reading:**

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

T.W. / Oral Examination:

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

The distribution of marks for term work shall be as follows:
Laboratory work (Experiments and Journal) : 10 marks.
Test (at least one) : 10 marks.
Attendance (Practical and Theory) : 05 marks.

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

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

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

Hours 08

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

Hours 09

2. **Programming with 8085:**

Hours 06

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

Hours 08

4. **Basics of 8051:**

Hours 09

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

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

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

**Recommended Books:**
2. Microprocessor and interfacing 8085, Douglas V Hall, Tata Mc Gram Hill.
3. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
5. ARM system-on-chip architecture, 2e pearson education.
7. DV koddavade, S.Narvadkar, 8085-86 microprocessors Architecture progg and interfaces, wiley.
8. Udyashankara V., Mallikarjunaswamy, 8051 microcontroller, TMH.
10. Ayala, 8051 microcontroller, cengage(Thomson).
11. Rout, 8051 microcontroller-architecture, programming and application, 2nd edi, penram international.

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

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

<table>
<thead>
<tr>
<th>Lectures: 3 per week</th>
<th>Theory Paper: 3 hours and 100 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial: 1 (each of 60min)</td>
<td>Term work: 25 marks Total: 125</td>
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</table>

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

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

2. **Maxwell Equations:**
   Formation of Maxwell’s Equations
   Derivation of various basic electromagnetic laws using Maxwell’s Equations, Conditions at Boundary Surfaces

3. **Electromagnetic Waves**
   The wave equation for free space & conducting medium, Uniform Plane wave, Intrinsic Impedance, Helmholtz Equations, Propagation characteristics of Electromagnetic Wave, Polarization, Poynting’s Theorem, Instantaneous, Average & Complex Poynting vector

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

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

Text Books:

Additional Reading:
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 be based on transmission line problems using Smith Chart only.
- Student shall write some simple Electromagnetic Fields Related simulation programs using MATLAB/SCILAB to demonstrate the applications of field theory.

Term-work:
A journal shall be consisting of solved problems in tutorials based on teachings in the lectures, in addition to assignments along-with some simple Electromagnetic Fields Related Simulation programs using MATLAB/SCILAB which will demonstrate the applications of field theory. A test based on the above contents shall be conducted and the test paper shall be attached to the journal as a part of term-work.
The distribution of marks for term work shall be as follows,
Tutorials : 10 marks.
Test (at least one) : 10 marks.
Attendance (Tutorials and Theory) : 05 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of Tutorials work and minimum passing in the term-work.
Theory Examination:
1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.-
suppose Q.2 has part (a) from, module 3 then part (b) will be from any
module other than module 3.)
5. In the question paper, weightage of each module will be proportional to
number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module
T.E. (ELECTRONICS) SEMESTER V
Linear Integrated Circuit and Design

<table>
<thead>
<tr>
<th>Lectures: 4 per week</th>
<th>Theory Paper: 3 hours and 100 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical: 2 (each of 60min)</td>
<td>Practical exam: 3 hours Marks 25</td>
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<tr>
<td></td>
<td>Term work: 25 marks Total:150</td>
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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

Hours 08

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

   Hours 08

2. **Linear Applications of OP-AMP**
   - Current shunt feedback (Inverting Amplifier)
   - Current Series feedback (Non-Inverting Amplifier)
   - Summing Amplifier, Averaging Amplifier
   - Difference Amplifier,
   - Instrumentation Applications,
   - Integrator/Differentiator using OP-AMP
Current-to-Voltage Converters,
Voltage-to-Currents Converters,
Grounded load V/I Converter
V-F and F-V Converters.
Sample-and-Hold Amplifiers

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

4. Non Linear Applications of OP-AMP
Voltage Comparators
Comparator Application
Schmitt Triggers,
Precision Rectifier
Peak Detectors
Mono-shot Multi-vibrator
Astable Multi-vibrator
Triangular/saw-tooth waveform Generator

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

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

Text Books:

**Additional Reading:**

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

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

**Theory Examination:**
1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module.
Objective: The increase in demand for data transmission coupled with the availability of wideband communication channels and sophisticated integrated circuits have led to the development of efficient and reliable digital communication systems. This course emphasizes impact of the channel limitations and characteristics on data transmission using digital data.

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

**Hours03**

1. **Concept of Probability Theory in communication systems**
   Random variables, Mean and Variance of Random variables and sum of random variables,
   Useful PDFs & CDFs : Gaussian , Rayleigh pdf & Rician Distribution , Binomial and Poisson Distributions, Central-Limit Theorem.

**Hours05**

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

**Hours13**

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

**Hours06**

4. **Pulse Shaping for optimum transmission**
   Concept of Inter channel and Inter symbol Interference, Eye Pattern, Nyquist’s Criterion for distortion less Baseband Binary Transmission, Correlative Coding.

**Hours15**

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

Hours 06


Text Books:
1. Simon Haykin- Communication System, , John Wiley and sons
4. Amitabha Bhattacharya,-Digital communication , Tata McGraw Hill
6. Simon Haykin Digital communication, John Wiley and sons

Reference Books:
9. Lathi B.P.,- Modern Digital and Analog communications systems - PRISM Indian edition
10. PROAKIS & SALEHI - Communication system engineering, Pearson Education

Proposed Practical list
1. BPSK
2. QPSK
3. BFSK
4. QASK
5. BER calculation for a digital communication system
6. Huffman coding
7. Lempel Ziv coding
8. Linear Block code - Code generation, dmin, syndrome.
10. Convolution Code – code generation from generator sequences
11. Direct sequence spread spectrum

T.W. / Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.
**Term Work:**
Term work shall consist of minimum eight experiments, Two Assignments and a written test.
The distribution of marks for term work shall be as follows:
Laboratory work (Experiments and Journal) : 10 marks.
Test (at least one) : 10 marks.
Attendance (Practical and Theory) : 05 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

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

<table>
<thead>
<tr>
<th>Lectures: 2 per week</th>
<th>Theory Paper: 2 hours and 50 marks</th>
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<tbody>
<tr>
<td>Tutorial: 1 (each of 60min)</td>
<td>Term work: 25 marks Total: 75</td>
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Objective: Objective of this course is to create environmental awareness, of variety of environmental concerns.

Hours 01
1. The multidisciplinary nature of environmental studies:
   Definition, Scope and importance need for public awareness.

Hours 04
2. Natural Resources
   - Renewable and non-renewable resources
   - Natural resources and associated problems
     a. Forest resources: use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
     b. Water resources: use and over utilization of surfaces and ground water, floods, drought, conflicts over water, dams-benefits and problems.
     c. Mineral resources: use and exploitation, environmental effects of extracting and using mineral sources, case studies.
     d. Food resources: World food problems overgrazing, effects of modern agriculture, fertilizers-pesticides problems, Water logging, salinity, case studies.
     e. Energy resources: Growing energy needs, Renewable and non-renewable sources, use of alternate energy sources, case studies.
     f. Land resources: Land as a resource, Land degradation, man induced landslides, soil erosion and desertification

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

Hours 03
3. Ecosystems
   - Concepts of ecosystems
   - Structure and function of an ecosystem
   - Producers, consumers and decomposers
   - Energy flow in ecosystems
   - Ecological succession
   - Food chains, food web and ecological pyramids
   - Introduction, types, characteristics features, structure and function of following ecosystems
     a. Forest ecosystems
     b. Grassland ecosystems
     c. Desert ecosystems
     d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Hours 04
4. Biodiversity and its conservation
   - Introduction- definition: genetic species and ecosystem diversity
Bio-geographical classification of India
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
Biodiversity at global, national, local level
India as a mega diversity nation
Hot spots of bio diversity
Threats to biodiversity: habitat loss, poaching of wild life, man wild life conflicts
Endangered and endemic species of India
Conservation of bio-diversity: In-situ and Ex-situ conservation of biodiversity

Hours 04

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

Hours 04

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

Hours 04

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

Hours

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

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

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

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

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

**Recommended Books:**
1. Jagdish Krishnawamy , R J Ranjit Daniels, “ Environmental Studies”, Wiley India Private Ltd. New Delhi
2. Anindita Basak, Environmental Studies, Pearson
3. Deeksha Dave , “Textbook of Environmental Studies”, Cengage learning, THOMSON INDIA EDITION
4. Benny Joseph” Environmental Studies”Tata McGRAW HILL
5. D. L. Manjunath, Environmental Studies, Pearson
6. R.Rajgopalan, Environmental Studies, Oxford
7. Erach Bharucha, Textbook of Environmental Studies , Universities Press/Orient BlackSwan
8. Alok Debi, Environmental science and engineering, university press
Objective: This syllabus is designed to encourage students to design and implement innovative ideas. The syllabus will give them in depth practical knowledge from design to the final verification stage. Documentation of any project is an important part of the project and students are expected to document their work properly in standard IEEE format.

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

1. **Computer Architecture**
   Demonstration of various parts of PC, Installation, Network Configuration and Troubleshooting of PC.

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

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

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

   Oral Exam include — Project report + Presentation (PPT)

References:

5. Ingram, Peter, “Networking in easy Steps”, Dreamtech Press
10. VHDL Reference Manual
11. Reference Manuals for Selected Microcontrollers/Microprocessors