# N.C.College of Engineering

## Israna-132107 (Panipat)


Scheme and Syllabus

# w.e.f 2015-16 Session

## ELECTRONICS & COMMUNICATION ENGINEERING

## Third Year (5th and 6th Semester)

# SCHEME OF STUDIES & EXAMINATION
# B.TECH (Semester V)
# Electronics & Communication Engineering

| S. No. | Subject Code | Subject | BOS | L | T | P | Contact Hours | Credit |
|---|---|---|---|---|---|---|---|---|
| 1 | | * Elective | ECE | 3 | 1 | - | 4 | 4 |
| 2 | EC-351 | Control Systems Engineering | ECE | 3 | 2 | - | 5 | 4 |
| 3 | EC-352 | HDL | ECE | 3 | 1 | - | 4 | 4 |
| 4 | EC-353 | Antenna & Wave Propagation | ECE | 3 | 1 | - | 4 | 4 |
| 5 | EC-354 | Microprocessors & Interfacing | ECE | 3 | 1 | - | 4 | 4 |
| 6 | EC-355 | Digital Communications | ECE | 3 | 1 | - | 4 | 4 |
| 7 | EC-35P1 | Microprocessors & Interfacing Lab | ECE | - | - | 2 | 2 | 1 |
| 8 | EC-35P2 | Digital Communications Lab | ECE | - | - | 2 | 2 | 1 |
| 9 | EC-35P3 | Electronic Workshop (Based on HDL) | ECE | - | - | 4 | 4 | 2 |
| | | TOTAL | | 18 | 7 | 8 | 33 | 28 |

*** List of Electives**

**(i) Information Theory and Coding (EC-35E1)**

**(ii) Bio- Medical Engineering (EC-35E2)**

**B.TECH V SEMESTER**
**CONTROL SYSTEM ENGINEERING**
**(EC-351)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 2 | 4 | End Semester Evaluation: 100 Marks |

Time: 3 hrs Marks:100

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT-I

**Introduction:** The control systems: Open loop & Closed loop with examples & their comparison, Servomechanism, Stepper motor.

**Mathematical Models of Physical Systems:** Differential equations of physical systems (Electrical and Mechanical), Transfer function, Block diagram algebra, Signal flow-graphs, Mason's formula & its applications.

**Feedback Characteristics of control Systems**: Feedback and non-feedback systems, Effects of feedback on sensitivity (to parameter variations), Stability, Overall gain etc.

## UNIT-II

**Time Response Analysis:** Standard test signals, Time response of first order and second order systems, Steady-state errors and error constants, Design specification of second-order-systems. Basic control actions: Proportional, Integral, Derivative, PI, PD and PID control actions, their advantages and limitations.

**Stability**: The concept of stability ,Necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion, Relative stability analysis.

**The Root Locus Technique**: The Root locus concept, Construction/Development of root loci for various systems, Stability considerations.

## UNIT-III

**Frequency Response & Stability Analysis:** Correlation between time and frequency response, Polar Plots, Nyquist plots, Bode Plots, Nyquist stability criterion, Gain margin & Phase margin, Relative stability using Nyquist Criterion, Frequency response specifications.

## UNIT-IV

**Compensation of Control Systems**: Necessity of compensation, Phase lag compensation, Phase lead compensation, Phase lag lead compensation, Feedback compensation .

**State Variable Analysis:** Concept of state, State variable, State model, Advantage of state space techniques, State space representation of electrical network, nth order differential equation and transfer function, State models for linear continuous time systems, Diagonalization solution of state equations, Transfer matrix, Computation of state transition matrix, Concept of controllability and observability.

**Text Book:**

1. Control System Engg - I.J.Nagrath & M.Gopal, New Age India.

**Reference Books:**

1. Automatic Control Systems - B.C.Kuo, PHI.
2. Modern Control Engg - K.Ogata; PHI.

3. Linear Control System - B.S. Manke, Dhanpat Rai.

**B.TECH V SEMESTER**

# HARDWARE DESCRIPTION LANGUAGES

**(EC-352)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs**

**Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

**UNIT- I**

**Introduction to VHDL:** Introduction, Hardware abstraction, Basic language elements- Identifiers, Data objects, Data types, Operators.

**Behavioral Modeling-**Variable and signal assignment statements, Wait, If, Case, Null, Loop, Exit, Next, Assertion & Report statements.

**UNIT – II**

**Dataflow & Structural Modeling**:-Concurrent vs. sequential statements, Conditional and selected signal assignment statements, Block statements, Component declaration and instantiation using structural modeling

**Supporting Constructs:** Generics, Configurations, Functions & Procedures, Subprogram and Operator overloading.

**Advanced Features**: Generation of statements.

**UNIT-III**

**Introduction To VERILOG**: Basic concepts, Lexical conventions, Data types, System tasks and compiler directives, Modules and ports, Gate level modeling- Gate types, Various types of gate delay specifications.

**Data flow modeling**- Assignments, Delays, Expressions, Operators.

**Behavioral modeling**- Structured procedures, Procedural assignments, Timing controls, Conditional statements, Loops, Sequential and parallel blocks, Generation of Blocks, Tasks and Functions.

**UNIT-IV**

**Design:** Introduction of finite state machines, Melay v/s Moore machines.

**VHDL Programs**:- 4 bit up counter,4 bit down counter, Shift registers.

**Verilog programs**:- 4 bit ripple carry adder, multiplexer and demultiplexer.

**Text Books:**


1. S. Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis*"*, Pearson Edu., 1996.
2. J. Bhaskar, "A VHDL Primer",3rd edition, Pearson Education


**Reference Books:**


1. P. J. Ashenden, "The Designer's Guide to VHDL*"*, 2nd Ed, Morgan Kaufmann, 2001
2. C. H. Roth, "Digital System Design with VHDL", PWS/Brookscole, 1998.

**B.TECH V SEMESTER**
**ANTENNA AND WAVE PROPAGATION**
**(EC-353)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT – I

**Basic Principles and Definitions:** Retarded vector and scalar potentials, Radiation from a small current element, Induction and Radiation fields, Radiation from a half wave dipole, Linear and Sinusoidal current distribution, Antenna parameters: Radiation pattern, Radiation resistance, Beam width, Gain, Directive gain, Power gain, Antenna efficiency, Directivity, Effective aperture, Effective length, Bandwidth and Antenna Temperature.

## UNIT – II

**Radiating Wire Structures and Antenna Types:** Folded dipole, Yagi-Uda antenna, Biconical Antenna, Helical Antenna, Horn antenna, Slot antenna, Notch antenna, Patch antenna, Turnstile antenna, Discone antenna.

**Aperture Type Antennas :** Radiations from rectangular aperture, Lens Antenna, Parabolic reflector antennas

## UNIT – III

**Antenna Array:** Principle of pattern multiplication, Broadside arrays, Endfire arrays, Array pattern synthesis, Uniform Array, Binomial Array, Chebyshev Array

**Broadband and Frequency Independent Antenna:** Broadband antennas, The frequency independent concept: Rumsey's principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral antenna and Log periodic antenna.

## UNIT – IV

**Propagation of Radio Waves:** Fundamental equation for free space propagation, Different modes of propagation: Ground waves, Sky waves, Space waves, Structure of atmosphere, Wave propagation in the ionosphere, critical frequency, Maximum Usable Frequency (MUF), Lowest Usable Frequency (LUF), Optimum Working Frequency (OWF), Skip distance, Virtual height, Space waves: Range, Effective Earth's radius, Field Strength, Ionospheric Abnormalities, Duct Propagation

**Text Books:**


1. K.D. Prasad: Antenna and Wave Propagation - Satya Parakashan.
2. John D. Kraus: Antennas - McGraw Hill.


**Reference Books:**


1. Robert E.Collin: Antenna & Wave Propagation, McGraw Hill

2. E.C.Jordan and K.G.Balmain: Electromagnetic Waves and Radiating Systems, PHI

## B.TECH V SEMESTER

## MICROPROCESSORS & INTERFACING
## (EC-354)

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |
| Time: 3 hrs | | | Marks:100 |

**NOTE**: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks**.** Question paper should have 25 % numerical part.

### UNIT-I

**Introduction:** Evolution of microprocessors, CISC Versus RISC, Applications of microprocessors.
**8085 CPU Architecture:** 8085 programming model, 8085 hardware model, Microprocessor operation, 8085 architecture, 8086 pin diagram description, Bus timings: Opcode fetch, Memory read, Memory write.
**8085 Instruction Set:** Instruction formats, Addressing modes, Data Transfer instructions: 8 bit,16 bit; Arithmetic instructions: 8bit, 16 bit; Logic & bit manipulation instructions, Branch instructions, Machine control instructions, Stack, Subroutine, Programming examples.
**8086 CPU Architecture:** 8085 versus 8086, 8086 block diagram: BIU and EU, Physical address computations, PSW with examples.

### UNIT-II

**8086 Pin Diagram :** Description of pin diagram, Generating 8086 CLK and Reset signals using 8284, 8086 minimum mode and maximum mode CPU module.
**8086 Instruction Set:** Addressing modes, Data transfer instructions, String instructions, Logical instructions, Arithmetic instructions, Transfer of control instructions, Process control instructions, Assembler directives.
**8086 Programming Techniques:** Writing assembly language programs, Timing delays, Loops, Data conversions, Procedures, Modular programming, Macros.

### UNIT-III

**Interfacing Device:** 8255 PPI Chip: Architecture, Pin diagram, Control words, Modes.
**DMA:** DMA operation, Intel 8237: Architecture, Working.
**Interrupt:** Interrupt driven I/O, Interrupt mechanism, Interrupt vector table of 8086, Interrupt structure of 8085.
**Interrupt Controller:** 8259: Architecture, Pin diagram, Working, ICWs, OCWs.

### UNIT-IV

**Main Memory System Design of 8085 & 8086:** Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode, Address decoding techniques, Interfacing SRAMS, ROMS/PROMS, Interfacing and refreshing DRAMs.

**Basic I/O Interface:** Memory mapped I/O vs Isolated I/O, Interfacing 8259, ADCs, DACs, Keyboards, Multiplexed displays with 8085 & 8086 microprocessors.

**Reference Books :**


1. D.V.Hall: Microprocessors and Interfacing , McGraw Hill ($2^{nd}$ Ed.)
2. J. Uffenbeck: The 8086/8088 family, PHI.

3. A.K Ray and B.M Burchandi, Advanced Microprocessors and Peripheral McGraw Hill (2nd Ed.).
4. Ramesh S. Gaonkar, Microprocessor Architecture, Programming & Applications with 8085, Penram International Publications India Pvt. Ltd. (5th Ed.)

**B. TECH. V SEMESTER**

**DIGITAL COMMUNICATION**

**(EC-355)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE**: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks**.** Question paper should have 25 % numerical part.

**UNIT – I**

**Sampling Theory & Pulse Modulation**: Sampling process, PAM and TDM, Aperture effect. PPM noise in PPM, Channel bandwidth, Recovery of PAM and PPM signals, Quantization process, Quantization noise, PCM, μ-Law and A-law compressors, Encoding, Noise in PCM, DM, and Delta Sigma modulator, DPCM, ADM.

## UNIT – II

**Digital Baseband Pulse Transmission:** Matched filter and its properties, Error rate due to noise in PCM receivers, Demodulators & detectors for optimum receiver with AWGN channel, Intersymbol interference, Nyquist criterion for distortionless base band binary transmission, Ideal Nyquist channel raised cosine spectrum, Adaptive equalization, LMS algorithm.

## UNIT – III

**Digital Passband Transmission**: Pass band transmission model, Gram-Schmidt orthogonalization procedure, Hierarchy of digital modulation techniques, BPSK, DPSK, DEPSK, QPSK, systems, ASK, FSK, M-ary FSK, MSK, M-ary QAM/QASK, Signal space diagram and spectra of the above systems, Effect of intersymbol interference, Bit symbol error probabilities.

**UNIT – IV**

**Spread Spectrum Modulation**: Pseudonoise sequence, A notion of spread spectrum, Direct sequence spread spectrum with coherent BPSK, Signal space dimensionality & processing gain, Probability of error, Jamming margin, Frequency hopping spread spectrum, CDMA.

**Text Book:**

1. Simon Haykin: Communication systems, John Wiley & Sons

**Reference Books :**

1. Taub & Schilling, Principles of Communication Systems, TMH
2. John G. Proakis, Digital Communication, PHI
3. B.P.Lathi, Modern Digital and Analog Communication Systems, Oxford University Press.

B.TECH V SEMESTER

# INFORMATION THEORY AND CODING

**(EC-35E1 )**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT-I

**Basic Concepts of Information Theory:** A measure of Uncertainty, Binary Sources, Measure of Information for two-dimensional discrete finite probability Scheme, Noise characteristics of channel, Basic relationship among different entropies, Measure of mutual information, channel capacity. Capacity of channel with symmetric noise structure BSC and BEC

## UNIT-II

**Elements of Encoding:** Purpose of encoding separable binary codes, Shannon Fano encoding, Noiseless Coding Theorem, Average length of encoding message, Shannon's 'Binary encoding, Fundamental Theorem of discrete Noiseless coding, Huffman's Minimum Redundancy codes.

## UNIT-III

**Introduction to Algebra:** Groups, Fields Binary field Arithmetic, Construction of Galois field GF (2m **)**

**Linear Block Codes:** Introduction to Linear Block codes, Syndrome and Error detection, Minimum distance of block code, error detecting and Error correcting capabilities a block code.

**Cyclic Codes**: Description of Cyclic codes, Generator and parity check matrices of cyclic codes, encoding of cyclic codes syndrome computation & error detection decoding of cyclic codes.

## UNIT-IV

**Convolutional Codes**: Encoding of convolution codes, structural properties of Convolution codes, Distance Properties of convolutional codes, Maximum likelihood decoding of convolutional codes, Viterbi decoding.

Majority logic decodable codes, Burst error correction Techniques.

**Automatic Repeat Request Strategies**: Stop and wait, Go back and selective repeat ARQ strategies, Hybrid ARQ Schemes

**Text Book:**

1. F. M. Reza, Information Theory, McGraw Hill.

**Reference Books:**


1. Das, Mullick and Chatterjee, Digital Communication, Wiley Eastern Ltd.
2. Shu Lin and J. Costello, Error Control Coding, Prentice Hall.


## B.TECH V SEMESTER
## BIO- MEDICAL ENGINEERING
## (EC-35E2)

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**Note: There will be nine questions in total. Question no. 1 is compulsory and will have four parts a, b, c, d covering the entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.**

### UNIT I

**Introduction to medical instrumentation system – Evolution of medical instrument, components of a medical instrumentation system, Problems encountered in a measuring system, Biofeedback instrumentation, static & dynamic characteristics of medical instruments. Biosignal, characteristics, classification of errors, statistical analysis. Reliability, accuracy, fidelity, speed of response, linearization of technique, data acquisition system; Detection of physiological parameters using impedance techniques:**

### UNIT II

**Transducers - Classification, selecting of transducers, circuit based on transduction. Temperature transducers – Displacement transducer - Pressure transducer - catheter tip transducers. Photoelectric transducers - Flow transducers - Piezoelectric transducers and their applications.**

### UNIT III

**Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG), Electrooculogram (EOG), Electroretinogram (ERG), Recording Electrodes – Electrode-tissue interface, polarization, skin contact impedance, motion artifacts, Silver-Silver Chloride electrodes, Electrodes for ECG, Electrodes for EEG, Electrodes of EMG, Electrical**

**Conductivity of electrode jellies and creams, microelectrodes, Needle electrodes.**

### UNIT IV

**Biosensors Chemo receptors, hot and cold receptors, baron receptors, sensors for smell, sound, vision, osmolality and taste. Transducers for the measurement of ions and dissolved gases Ion exchange membrane electrodes - Measurement of pH - Glass pH electrodes. Measurement of pO2, Measurement of pCO2. ISFET for glucose, urea.**

**Textbooks:**


**1. A.K.Sawhney, "A Course in Electrical and Electronic measurements and Instruments", Dhanpat Rai and Sons, 2000. (UNIT I, II)**

**2. Leshie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, "Biomedical Instrumentation and Measurements", 2nd Edition, PHI, 2003. (UNIT III, IV)**
**3. John G. Webster, Medical Instrumentation: Application and Design, 3rd edition, John Wiley & Sons, New York, 1998. (UNIT V)**
**References:**
**1. R.Anandanatarajan, "Biomedical Instrumentation", PHI Learning, 2009.**
**2. M. Arumugam, "Biomedical Instrumentation", Anuradha Agencies Publishers, Vidayal Karuppar, 612 606, Kumbakonam, R.M.S: 1992**

**B.TECH V SEMESTER**

**MICROPROCESSORS LAB**
**(EC-35P1)**

| P | Cr | |
|---|---|---|
| **2** | **1** | **On Semester Examination : 120 Marks**<br>**End Semester Examination: 80 Marks** |

# LIST OF EXPERIMENTS:

1. Familiarization with 8085 Trainer Kit.
2. Write a program using 8085 & verify for:
   a) Addition of two 8-bit numbers.
   b) Addition of two 8-bit numbers (with carry).
3. Write a program using 8085 & verify for:
   c) Subtraction of two 8-bit numbers (display borrow).
   d) Subtraction of two 16-bit numbers (display borrow).
4. Write a program using 8085 for multiplication of two 8-bit numbers.
5. Write a program using 8085 to arrange block of data in descending order.
6. Write a program using 8085 to generate fibonaccii series.
7. Write a program using 8085 to find out the smallest number in a string.
8. a) Familiarization with 8086 Trainer Kit.
   b) Familiarization with Digital I/O, ADC and DAC Cards.
   c) Familiarization with Turbo Assembler and Debugger S/Ws.
9. Write a program using 8086 to arrange block of data in ascending order.
10. Write a program using 8086 to find out any power of a number such that $Z=X^N$, where N is programmable and X is an unsigned number.
11. Write a program using 8086 to move a block of data from 0300H-031FH to 0310H-032FH
12. Write a program using 8086 to generate fibonaccii series.
13. Write a program using 8086 to find out the largest number in a string.
14. Write a programmable delay routine to cause a minimum delay = 2ms and a maximum

delay = 20 minutes in the increments of 2 MS

15. Write a program using 8086 to fill 50 decimal byte block of memory in extra Segment beginning at address 2000H with data byte 20H.

Note**: At least 12 experiments are to be performed from above list.**

**B.TECH V SEMESTER**
**DIGITAL COMMUNICATION LAB**
**(EC-35P2)**

| **P** | **Cr** | **On Semester Examination : 120 Marks** |
|---|---|---|
| **2** | **1** | **End Semester Examination: 80 Marks** |

**LIST OF EXPERIMENTS:**

1. To perform Amplitude Shift Keying
2. To perform Frequency Shift Keying
3. To perform Phase Shift Keying
4. To perform Sampling Theorem
5. To perform Pulse Code Modulation
6. To perform Delta Modulation
7. To perform Adaptive Delta Modulation.
8. To perform Time Division Multiplexing of signals.
9. To set up a Fiber Optic Analog Link
10. To set up a Fiber Optic Digital Link
11. To calculate the Losses in Optical Fiber
12. To measure the Numerical Aperture in Optical Fiber

**NOTE**: At least 10 experiments are to be performed from above list.

**B.TECH V SEMESTER**
**HARDWARE DESCRIPTION LANGUAGES LAB**
**(EC-35P3)**

| **P** | **Cr** | **On Semester Examination: 120 Marks** |
|---|---|---|
| **2** | **1** | **End Semester Examination: 80 Marks** |

**LIST OF EXPERIMENTS:**

1. Design all logic gates using VHDL.
2. Write the code for half adder and full adder using VHDL.
3. Write a program for half subtractor and full subtractor using VHDL .
4. Design an 8:1 multiplexer and 1:8 demultiplexer using VHDL.
5. Design an odd parity generator using VHDL .
6. Write a program for detecting a Fibonacci series using VHDL.
7. Design all logic gates using VERILOG.
8. Write the code for half adder and full adder using VERILOG.
9. Write a program for half subtractor and full subtractor using VERILOG.
10. Design an m:1 multiplexer and 1:m demultiplexer using VERILOG.
11. Design an odd parity generator using VERILOG.
12. Design T and D flip/flop using VERILOG and VHDL both.

**NOTE**: At least 10 experiments are to be performed from the above list.

# SCHEME OF STUDIES & EXAMINATION
# B.TECH (Semester VI)

***Electronics & Communication Engineering***

| S. No. | Subject Code | Subject | BOS | L | T | P | Contact Hours | Credit |
|---|---|---|---|---|---|---|---|---|
| 1 | | Elective* | ECE/CSE | 3 | 1 | - | 4 | 4 |
| 2 | EC-361 | Optical Communication | ECE | 3 | 1 | - | 4 | 4 |
| 3 | EC-362 | Digital Signal Processing | ECE | 3 | 2 | - | 5 | 5 |
| 4 | EC-363 | Microcontroller | ECE | 3 | 1 | - | 4 | 4 |
| 5 | EC-364 | Microwave & Radar Engineering | ECE | 3 | 1 | - | 4 | 4 |
| 6 | EC-36P1 | DSP using MATLAB | ECE | - | - | 2 | 2 | 1 |
| 7 | EC-36P2 | Microwave Lab | ECE | - | - | 2 | 2 | 1 |
| 8 | EC-36P3 | Electronic Workshop (Based on Microcontroller) | ECE | - | - | 4 | 4 | 2 |
| 9 | SSAA-360 | Soft Skill Analytical Ability (SSAA) | ECE | 1 | 2 | - | 3 | 3 |
| 10 | EC-365 | General Proficiency & Fitness | ECE | - | - | - | - | 1 |
| | | TOTAL | | 16 | 8 | 8 | 32 | 29 |

**List of Electives***

**(i) Satellite Communication (EC-36E1)**

**(ii) Multimedia Communication (EC-36E2)**

**(iii) Audio Video Engineering (EC-36E3)**

**(iv) IT Foundation Program – I (CSE-340)**

**B.TECH VI SEMESTER**

# OPTICAL COMMUNICATIONS

**(EC-361)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT- I

**Introduction:** Advantages of optical fibers, Ray theory transmission: 'Total internal reflection, Critical angles, Numerical aperture', EM mode theory for optical propagation, Diffraction, Multi-mode and single-mode fibers, Step index and graded index fibers, Modes of propagation in the fiber, Splicing fibers.

## UNIT – II

**Losses in Optical Fibers:** Rayleigh Scattering Losses, Absorption Losses, Leaky modes, Mode coupling losses, Bending Losses, Combined Losses in the fiber.

**Dispersion Effect**: Dispersion, Effect of dispersion on the pulse transmission, Intermodal dispersion, Material dispersion, Wave guide dispersion, Total dispersion, Transmission rate, Dispersion shifted and dispersion flattened fibers.

## UNIT-III

**Light Sources**: LEDs : 'Principle of action, Structures, Quantum efficiency', LASERs: 'Laser Action in semiconductor Lasers, FP laser diodes, Laser modes, Spectral characteristics, Efficiency, Temperature effects'.

**Photodetectors**: Optical detection: 'Principle, Efficiency, Responsivity', P-I-N Photodiode, Avalanche photodiode, APD Noise Analysis, Speed of response, The fiber-optic Communication System, Infrared sensors (eg: TSOP 1738).

## UNIT-IV

**Passive Components**: Optical couplers / splitters, Wavelength division multiplexers and demultiplexers, Optical switches, Optical filters, Isolators, Circulators, Attenuators,

Wavelength converters, Optical amplifiers: ' SOA & EDFA', Optical add-drop multiplexers, Single-hop and multi-hop optical link networks.

**Reference Books:**


1) John M. Senior, "Optical Fiber Communications", Pearson Education
2) Gerd Keiser, "Optical Fiber Communications", Tata McGraw Hill
3) D.K.Mynbaev & L.L.Scheiner, "Fiber Optic Comm. Technology", Pearson Education


**B.TECH VI SEMESTER**

# DIGITAL SIGNAL PROCESSING

**(EC-362)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 2 | 5 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

**UNIT- I**

**Discrete Transforms**: Z - transform & its properties, Inversion of Z transform, One-sided Z-transform & solution of difference equations, Causality & stability of LTI systems in Z-domain, Schur-Cohn stability test, Relationship between Z & Fourier transform, Frequency domain sampling & DFT, Properties of DFT, Linear Filtering using DFT, Radix-2 DIT & DIF FFT Algorithms, Goertzel Algorithm, Chirp Z Algorithm, Applications of FFT algorithms.

**UNIT – II**

**LTI system as Frequency Selective Filters:** Introduction, Minimum phase, Maximum phase & Mixed phase systems, Introduction to IIR & FIR Filters.

**Implementation of Discrete Time Systems:** Direct form, Linear phase structures, Cascade form, Frequency sampling & Lattice structures for FIR systems, Direct forms, Transposed form, Cascade & Parallel structure, Lattice & Lattice Ladder structure, State space structures for IIR systems.

**UNIT-III**

**Design of IIR Filters:** Characteristics of practical frequency selective filters, Filter design specifications, Design of IIR filters from analog filters: Design by approximation of derivatives, Impulse invariant method & Bilinear transformation method, Characteristics of Butterworth, Chebyshev & Elliptical analog filters and Design of IIR filters, Frequency transformation.

**UNIT-IV**

**Design of FIR Filters**: Four types of FIR Filters, Design of FIR Filters using windows, Gibbs phenomenon, Kaiser window design method, Design of FIR Filter by frequency sampling method, Design of optimum equiripple linear phase FIR Filters, Comparison of design methods for FIR Filters.

**Text Books:**


1) John G. Proakis, "Digital Signal Processing", PHI.
2) Salivahan, "Digital Signal Processing", TMH.

**Reference Books:**


1) Alon V. Oppenhelm, "Digital Signal Processing", PHI.
2) S.K. Mitra, "Digital Signal Processing", TMH.
3) Rabiner and Gold, "Digital Signal Processing", PHI.


**B.TECH VI SEMESTER**

# MICROCONTROLLER

**(EC-363)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT-I

**The 8051 Microcontrollers:** Microcontrollers and embedded processors; Comparing microcontrollers and microprocessors; Four-bit to thirty-two-bit microcontrollers; Overview of the 8051 family; Pin description of 8051.

## UNIT-II

**8051 Architecture:** Inside the 8051; Program Counter & ROM space in 8051; Data types and Directives; Flag bits & the PSW register; Register banks & stacks; I/O port programming; 8051 Timer programming; 8051 serial port programming; Interrupts programming; Oscillator & clock circuit.

## UNIT-III

**8051 Instruction Set and Programming:** Addressing modes; Arithmetic instructions & logical instructions; Jump, loop & call subroutines; Timing subroutines; Lookup tables.

## UNIT-IV

**8051 Applications:** LCD & keyboard interfacing; ADC, DAC & sensor interfacing; Interfacing to external memory; Interfacing with the 8255; DS12887 RTC interfacing; Motor control: relay, PWM, DC & stepper motor.

**Reference Books:**

1. Muhammed Ali Mazidi, "The 8051 Microcontroller & Embedded System", 2nd Ed., Pearson Publications.
2. K.J.Ayala, "The 8051 Microcontroller", 2nd ed., Penram International.
3. Jack Ganssle, "Embedded System", Newnes Publications.
4. Intel's manual on "Embedded Microcontrollers".

**B.TECH VI SEMESTER**
**MICROWAVE & RADAR ENGINEERING**
**(EC-364)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |
| Time: 3 hrs | | | Marks:100 |

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

**UNIT- I**

**Introduction to Microwaves & Waveguides:** History, Microwave region and band designation, Microwave Systems, Advantages and applications of Microwaves, Comparison of waveguides with transmission lines, Types of waveguides, Propagation of waves in rectangular waveguides, Modes in rectangular waveguides.

**Microwave Components**: Microwave junctions, S-matrix representation of two-port & multiport network, Losses in terms of S-parameters, Properties of S-matrix, Waveguide Tees: H-plane tee, E-plane tee, E-H plane tee or Magic tee, Rat Race circuits, Directional Couplers: Structure, Properties, Parameters of a two hole directional coupler, S-matrix of a directional coupler, Circulators & Isolators, Attenuators, Phase shifters.

**UNIT – II**

**Microwave Tubes:** Introduction, High frequency limitations of conventional vaccume tubes, Principle, Construction, Operation, Performance characteristics, Mathematical analysis and applications of: Klystron, Reflex Klystron, Helix Travelling wave tubes, Cylindrical Magnetron.

**Cavity Resonators:** Introduction, Expression for cut-off frequency in rectangular and circular resonators and Applications of cavity resonators.

**UNIT-III**

**Solid State Microwave Devices**: Gunn effect diodes: Ridley-Watking-Hilsum(RWH) theory, Modes of operation, Avalanche transit time devices: Construction and Characteristics of IMPATT, TRAPATT, BARITT diodes.

**Microwave Measurements**: Frequency Measurement, Power measurement, Attenuation measurement, VSWR measurement, and Impedance measurement.

**UNIT-IV**

**Radar Basics**: Basic RADAR, Simple form of RADAR equation, RADAR block diagram, RADAR frequencies, Applications of radar, Detection of signal in noise, Pulse repetition frequency & range ambiguities, Introduction to Doppler & MTI Radar.
**Tracking Radar**: Tracking with radar, Monopulse tracking radar, Conical and Sequential Lobing.
**Reference Books:**


1. Samuel Y. Liao, "Microwave Devices and Circuits", Prentice Hall of India.
2. David M. Pozar, "Microwave Engineering", John Wiley and sons Inc.
3. Das, Annapurna & Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.
4. M.Kulkarni, "Microwave Engineering & Radar Engineering", Umesh Publishing
5. Merrill I. Skolnik, "Introduction to Radar Systems", MGH


**B.TECH VI SEMESTER**

***IT FOUNDATION PROGRAM-I***

# CSE-340

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.**

**2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.**

**UNIT-I**

## Introduction to Computer Systems

- To explain various terminologies like hardware, software (application vs. system), firmware, program and data.CPU: functions such as fetch, decode and execute of an instruction.
- Classification of Memory: Internal, Primary and Secondary. Volatile/Non-Volatile
- Comparison of different types of memories them with respect to speed and volume.
- Different types of information kept in each of the above mentioned memories.
- To explain the usage of I/0 devices and examples. Requirement of Bus : functionality and Types,. Computer Configuration To explain various components of computer(like processing units, memory). Execution of Instructions
- To explain various phases involved in execution of an instruction
- Language translators To make the trainees to understand the need of a Compiler, Assembler and Interpreter

**UNIT-II**

## Problem Solving Techniques

- Introduce essential skills for a software engineer; focusing on problem solving and analytical skills, Logic To formulate analytical and logical thinking for solving computational problems
- Introduction to problem solving Analyze and classify different problems based on control flow

- Introduction to algorithms: Define algorithm and it's properties, Implementation of algorithms using flowchart, Introduce flow charting using RAPTOR tool for different computational problems which involves sequence, selection and iteration concepts
- Searching and sorting algorithms, Introduce standard searching and sorting algorithms with flow chart e.g. linear search, binary search, bubble sort and selection sort
- Introduction and classification to Data Structures, Introduce the concept of different data structures and their usage in different applications
- Basic Data Structures: Introduce array, record, link list, stack and queue Advanced Data Structures, Introduce tree, graph and hashing

**UNIT-III**

# Programming and Testing

- To introduce Programming Paradigms and Pseudo code, To introduce the participants to algorithmic thinking, Introduction to pseudo code, trace table and dry run ,Programming Style
- Basic Programming concepts, Character data type Explain the basic data types, concept of variables, constants, ASCII character set and operators
- Recap of Control structures: Bring in concept of selection/condition by the usage of if and switch statements, Bring in concept of iteration by the usage of while, do while and for loops
- To introduce coding standards and best practices that are used in real life projects, To introduce industry coding standards
- Introduction and Demonstration of basic Data Structure, 1-D and 2-D array, Introduce the concept and demonstrate the storage of data items in a 1-D Array and 2-D Array
- Demonstration of stack using Arrays To enable participants to understand and String handling functions and use of pointers Explain string manipulation functions with demo programs Revision and Practice Session
- To introduce Code Optimization techniques Ability to write optimized code
- Recap of functions Introduce the concept of modularity, reusability of code using functions, problem solving using top down approach by division into sub-problems
- To introduce SDLC Unit testing Experience Project life cycle, To introduce Unit Testing and different

**Books:**


1. Andrew S. Tanenbaum, Structured Computer Organization, PHI, 3rd ed., 1991
2. Silberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley, 1995
3. Dromey R.G., How to solve it by Computers, PHI, 1994
4. Kernighan, Ritchie, ANSI C language PHI,1992
5. Wilbert O. Galitz, Essential Guide to User Interface Design, John Wiley, 1997
6. Alex Berson, Client server Architecture, Mc Grew Hill International, 1994
7. Rojer Pressman, Software Engineering-A Practitioners approach, McGraw Hill, 5th ed., 2001
8. Alfred V Aho, John E Hopcroft, Jeffrey D Ullman, Design and Analysis of Computer Algorithms, Addison Wesley Publishing Co., 1998
9. Henry F Korth, Abraham Silberschatz, Database System Concept, 2nd

ed. McGraw-Hill International editions, 1991
10. Brad J Cox, Andrew J.Novobilski, Object – Oriented Programming – An evolutionary approach, Addison – Wesley, 1991

**B.TECH VI SEMESTER**

# SATELLITE COMMUNICATION

**(EC-36E1)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT- I

**Introduction**: Satellite communication, Brief history, Kepler's laws, Orbits of satellite: Low, Medium and Geo-synchronous main characteristics, Orbital elements, Look angles, Propagation delay, Earth coverage and slant range, Limits of visibility, Eclipse effects and Orbital perturbations.

## UNIT – II

**Space Link Design:** Free space loss, General link design equation, System noise temperature, G/T Ratio & Complete link design.

**Satellite Subsystems:** Transponder, Earth stations, Attitude and Orbit Control System (AOCS), Propulsion sub-system & Telemetry, Tracking and Command (TTC) sub-system.

## UNIT-III

**Radio Wave Propagation:** Frequency window, Atmospheric absorption, Rainfall attenuation, Ionosphere scintillation and Faraday rotation

**Digital Carrier Systems**: ASK, FSK, PSK, and QPSK, Coherent and non-coherent detection, Error rate performance.

## UNIT-IV

**Satellite Access**: Multiple Access Techniques, Random Access Techniques, FDMA, SPADE system, TDMA system concept and configuration, System-timing frames format, CDMA basic principles, VSAT satellite systems and Global Positioning Satellite Systems

**Reference Books:**

1) Dennis Roddy, "Satellite Communication", Fourth Ed., TMH New Delhi, 2009.
2) D.C. Aggarwal, "Satellite Communications", Sixth Ed., Khanna Pub., 2006.
3) Tri T. Ha, "Digital Satellite Communications", McGraw-Hill Pub., 1998.
4) Timothy Pratt, "Satellite Communications", Second Edition, Wiley India, 2004.

**B.TECH VI SEMESTER**

# MULTIMEDIA COMMUNICATIONS

**(EC-36E2)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |

**Time: 3 hrs** **Marks:100**

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

## UNIT- I

**Multimedia Communications:** Introduction, Multimedia networks, Multimedia applications. Multimedia information representation: Introduction, Digitization principles, Representation of text, images, audio & video, Distributed multimedia systems.

## UNIT – II

**Text Compression:** Static Huffman coding, Dynamic Huffman coding, Arithmetic coding, Lempel-ziv coding.

**Image Compression:** Graphics Interchange Format (GIF), Tagged Image File Format (TIFF), Digitized document, Digitized pictures, JPEG (Introduction).

## UNIT-III

**Audio Compression:** Differential PCM, Adaptive differential PCM, Code excited LPC, MPEG audio coders, Dolby audio coders.

**Video Compression:** Basic principles, Video compression standards H.261, H.263, MPEG (Basic introduction), MPEG 4.

## UNIT-IV

**Multimedia & Internet:** Internet, DNS, HTTP, WWW, E-mail, Web Browsers, HTML , Web page development, Design considerations for Web pages, Bandwidth and application considerations, Accessing contents on Internet.

**Text Book:**

1. Fred Halsall, "Multimedia Communications", Pearson Education, Asia.

**Reference Books:**

1. K. Thakkar, " Multimedia Systems Design", PHI.
2. Ralf Stein Metz & Klara Nahrstedt, "Multimedia: Computing, Communications & Applications", Pearson Education. Tay Vaughan , "Multimedia: Making it Work", TMH.

**B.TECH VI SEMESTER**
**AUDIO & VIDEO ENGINEERING**
**(EC-36E3)**

| L | T | Cr | On Semester Evaluation:100 Marks |
|---|---|---|---|
| 3 | 1 | 4 | End Semester Evaluation: 100 Marks |
| Time: 3 hrs | | | Marks:100 |

**NOTE:** There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

**UNIT- I**

**Audio Engineering:** Sound waves, Complex sounds, Audio frequency range, Loudness, Pitch, Decibels, Sound pick up devices (microphones): 'Condenser, Carbon, Piezoelectric'- Direction pattern, Parameters of microphones: Frequency range, Sensitivity, Impedance, Noise, Sound reproduction devices: 'Horn, Cone': Typical specifications, Acoustics of speech production and hearing, Recording of Sound: Magnetic recording systems, Optical storage systems-Coding and decoding applied to CD – CD-R.

**UNIT – II**

**Video Engineering:** Elements of Television System: Basic block diagram of monochrome TV transmitter and receiver, Gross structure, Flicker& Interlaced scanning, Number of scanning lines, Horizontal and Vertical resolution, Resolution and Bandwidth, Composite video signal: Vertical and Horizontal synchronization, Vestigial sideband transmission, Transmission of sound signal, Modulation: Positive and Negative Modulation and their comparison, Picture tubes, Television cameras, Working principle and operation of CCD cameras.

**UNIT-III**

**Colour Television:** Compatibility considerations, Colour response of human eye, Three colour theory, Additive mixing of colours, Chromaticity diagram, Luminance and Chrominance, Block diagram of Colour TV Cameras, Colour difference signal and its generation, Colour signal transmission, Modulation of colour difference signals and colour burst signal, Basic colour Television Systems: 'PAL, NTSC and SECAM': Block diagram, Explanation and Comparison, Colour TV picture tubes: CRTs, LCDs and Plasma displays.

**UNIT-IV**

**Audio and Video coding:** Introduction to audio coding, Audio compression, MPEG: Block diagram of audio encoder and decoder, Digital audio broadcasting & its block diagram, Video coding and compression, Need for compression, Video image representation, Quantization of image data, Intra frame

compression techniques: DPCM, DCT based transform coding, Motion Compensation, Video conference coding, Standard MPEG video compression, HDTV, DVB-T

**Reference Books:**


1. RR Gulati, "Monochrome and Colour Television", New Asian Age Publications.
2. Fred Halsal , "Multimedia Communications", Pearson Education.
3. Thomas Quatieri, "Discrete Time Speech Signal Processing: Principles and Practice", Pearson Education.
4. Kinsler, Frey, Coppens, "Fundamentals of Acoustics" , Wiley Eastern, 4th edition.
5. Bernad Grob, "Basic Television Engineering", McGraw Hill.
6. S P Bali, "Colour Television", New Age International Publishers
7. Whitaker & Jerry, "Mastering Digital Television: The Complete Guide to DTV Conversion", McGraw Hill.


## B.TECH VI SEMESTER
## DIGITAL SIGNAL PROCESSING LAB
## (EC-36P1)

| P | Cr | |
|---|---|---|
| **2** | **1** | **on Semester Examination: 120 Marks**<br>**End Semester Examination: 80 Marks** |

**LIST OF EXPERIMENTS:**

1. Write a program to plot the following functions:
   a) impulse function b) unit step c) unit ramp d) exponential e) sinusoidal
2. Write a program to plot real, imaginary, phase and magnitude of exponential function.
3. Write a program to find the linear convolution of two sequences using in-built convolution function.
4. Define a function to compute DTFT of a finite length signal. Plot the magnitude and phase plots using subplots. Use this function to obtain DTFT of a 21 point triangular pulse over the domain $-10<n<10$. Plot the results over $-\pi<w<\pi$.
5. Design an FIR filter using different window functions available in signal processing toolbox and their controlling parameters.
6. Design an analog Butterworth Low Pass Filter and plot its Magnitude & frequency response.
7. Design an analog Chebyshev Low Pass Filter and plot its Magnitude & frequency response.
8. Design a Butterworth Low Pass Filter in digital domain and plot its Magnitude & Frequency response.
9. Design a Chebyshev Low Pass Filter in digital domain and plot its Magnitude & Frequency response.
10. To study the Digital Signal Processing toolbox.

**NOTE**: At least 9 experiments are to be performed from above list.

## B.TECH VI SEMESTER
## MICROWAVE LAB
## (EC-36P2)

| P | Cr | |
|---|---|---|
| **2** | **1** | **On Semester Examination : 120 Marks**<br>**End Semester Examination: 80 Marks** |

### LIST OF EXPERIMENTS

1. To study the microwave components.
2. To determine the frequency and wavelength in a rectangular waveguide working in TE 10 mode.
3. To determine the standing wave ratio and reflection coefficient.
4. To study E-Tee and H-Tee.
5. To study the Magic tee.
6. To study the isolator and circulator.
7. To measure the coupling coefficient and directivity of a wave guide directional coupler.
8. To study fixed and variable attenuator.
9. To study the characteristics of the Reflex Klystron tube.
10. To determine electronic tuning range of Reflex Klystron tube.
11. To study the I-V characteristics of Gunn diode.

**NOTE**: At least 10 experiments are to be performed from above list.