

UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN
STUDY AND EVALUATION SCHEME (B.TECH. III Year)

**B. Tech. (1) Electronics and Communication Engineering (2) Electronics and
(3) Electronics & Telecommunication Engineering**

YEAR III

SEMESTER-VI

| Sl. No. | Course Code | SUBJECT | PERIODS | | | | Evaluation | | | ESE | Subject Total |
|-----------------------------------|-------------|-------------------------------|---------|---|---|----|----------------|-----|-------|-------------|---------------|
| | | | L | T | P | CT | SESSIONAL EXAM | TA | Total | | |
| | | | | | | | | | | | |
| THEORY | | | | | | | | | | | |
| 1. | TAS-601 | Industrial Management | 3 | 1 | 0 | 30 | 20 | 50 | 100 | 150 | |
| 2. | TEC-601 | Digital Communication | 3 | 1 | 0 | 30 | 20 | 50 | 100 | 150 | |
| 3. | TEC-602 | Digital Signal Processing | 3 | 1 | 0 | 30 | 20 | 50 | 100 | 150 | |
| 4. | TEC-603 | VLSI Technology and Design | 3 | 1 | 0 | 30 | 20 | 50 | 100 | 150 | |
| 5. | TEC-604 | Microwave and Radar Engg. | 3 | 1 | 0 | 30 | 20 | 50 | 100 | 150 | |
| PRACTICAL/TRAINING/PROJECT | | | | | | | | | | | |
| 6. | PEC-651 | Digital communication Lab | 0 | 0 | 2 | - | 20 | 20 | 30 | 50 | |
| 7. | PEC-652 | Digital Signal Processing LAB | 0 | 0 | 2 | - | 20 | 20 | 30 | 50 | |
| 8. | PEC-653 | Microwave Lab | 0 | 0 | 2 | - | 20 | 20 | 30 | 50 | |
| 9. | GP-601 | General Proficiency | - | - | - | - | - | 100 | - | 100 | |
| 10. | DIS-601 | Discipline | | | | | | 100 | | 100 | |
| | | Total | | | | - | - | - | - | 1100 | |

Note- 4 to 6 Weeks Industrial Interaction after VI semester exam to be evaluated in VII semester

Industrial Management (TAS-601)

YEAR III

SEMESTER-VI

| Unit | Topic | Text Book/ | Lectures |
|------|--|---------------------------------|----------|
| 1 | What is Operations Research? OR-research model, solving the OR model, Queuing and simulation models, Art of modeling, Phases of OR study. | 1/1 Except 1.5, 1.7 | 2 |
| 2. | Introduction to Linear Programming: Two variable L-P model, Graphical LP solution, Analysis of selected LP models. | 1/2.1, 2.2, 2.5 | 3 |
| | The Simplex Method: LP solution space, Graphical to algebraic solution, The simplex method, Artificial starting solution, Special cases in simplex method applications. | 1/3 | 4 |
| | Transportation Model and its Variants: Definition of transportation model, Non-traditional transportation models, Transportation algorithms, Assignment model | 1/5 Except 5.5 | 4 |
| 3. | Network Models: Network definitions, Minimal spanning tree algorithm, CPM and PERT. | 1/6.1, 6.2, 6.6 | 4 |
| | Game Theory: Optimal solution of two persons zero sum games, Solution of mixed strategy games. | 1/ 14.4 | 2 |
| 4. | Introduction to Patents and Intellectual Propriety Right | | 3 |
| | Introduction to Engineering Management: Engineering and Management Historical Development of Engineering Management | 1/1 1/2 | 3 |
| 5. | Functions of Technology Management Planning and Forecasting Decision Making Organizing Motivating and Leading Technical People Controlling | 2/3 2/4 2/5 2/7 2/8 | 6 |
| | Project Management Project Planning and Acquisition Project Organization, Leadership, and Control | 2/14 2/15 | 4 |

Text Books:

1. Hamdy H Taha, Operations Research – An Introduction; 7e, Pearson Education/ PHI – 2002.
2. Babcock & Morse, Managing Engineering and Technology; Pearson Education, 2004

Reference Books:

1. Hillier & Hillier, Introduction to Management Science; TMH Ed 05 .

Digital Communication (TEC-601)

| Unit | Topic | Text Book/ Chapter | Lectures |
|-------------|---|-----------------------|----------|
| 1. | Elements of Digital Communication and Information Theory Model of a Digital Communication, System, Probability Theory | 1/9 | 5 |
| | Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix Coding and Kraft Inequality, Shannon-Fano and Huffman Coding. | 1/9 | 4 |
| 2 | Digital Base band Transmission PCM Coding, DM, DPCM, ADPCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding and Their Power Spectra (No Derivation) Matched Filter Receiver, | 1/4 | 4 |
| | Derivation of Its Impulse Response and Peak Pulse Signal to Noise | 1/5 | 4 |
| | Correlation Detector, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum. | 1/4 | |
| 3 & 4 | Digital Modulation Techniques Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of | 1/6 | 11 |
| | Error and Comparison of Various Digital Modulation Techniques. Digital Multiplexing Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 to T4 PCM TDM System (DS1 to DS4 Signals) | 1/3 | 3 |
| 5 | Error Control Coding Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Encoder and Decoder For Cyclic Codes, Convolution Codes, Encoder, Viterbi and Sequential Decoding, Comparison of performance. | 1/10 | 9 |

Text Book:

- Haykin, Simon / "Communication Systems" / John Wiley / 4th Ed.

References Books:

- Singh, R.P. & Sapre, S.D. / "Communication Systems: Analog & Digital" / Tata McGraw-Hill.
- Lathi, B.P / "Modern Digital & Analog Communication Systems" / Oxford University Press /.
- Simon Haykin / "Digital Communication" / John Wiley.
- Taub & Schilling / "Principles of Communication Systems" / Tata McGraw-Hill /
- A.B. Carlson / "Communication Systems" / Tata McGraw-Hill. Proakis J.J / "Digital Communications" / McGraw Hill.

6. Charkrabarti, P. / "Analog Communication Systems" / Dhanpat Rai & Co.
7. Schaum's Outlines / "Analog & Digital Communication" / Tata McGraw-Hill.
8. Kennedy, George & Davis, Bernard / "Electronic communication systems" / Tata McGraw-Hill.

Digital Signal Processing (TEC-602)

| Unit | Topic | Text Book/ Chapter | Lectures |
|------|--|-----------------------|----------|
| 1. | Discrete Fourier Transform: Frequency Domain Sampling: The Discrete Fourier Transform Frequency- Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT. | 1/5 | 10 |
| 2. | Efficient Computation of DFT Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, Efficient computation of the DFT of a 2N- | 1/6 | 10 |
| 3. | Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter Structures-. Direct form structure, frequency sampling structure, Lattice | 1/7 | 08 |
| 4. | Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency Sampling Method, Design of FIR, Equiripple filter design Differentiators. Design of Hilbert Transformers. | 1/8 | 08 |
| 5. | Design of IIR Filters From Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev | 1/8 | 08 |

Text Books:

1. Proakis, J.G. & Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall (India).

Reference Books:

1. Sanjit K. Mitra, "Digital Signal Processing", Third Edition, TMH, 2005
2. Oppenheim A.V. & Schaffer, Ronald W., "Digital Signal Processing", Pearson Education.
3. Rabiner, L.R. and Gold B., "Theory and applications of DSP", PHI.
4. DeFatta, D.J., Lucas, J.G. & Hodgkiss, W.S., "Digital Signal Processing", John Wiley & Sons

VLSI Technology and Design (TEC-603)

| | | | |
|----|---|---|------------|
| 1 | <p>1. Era of Integrated Circuit: Introduction to Monolithic Circuit Technology, Bipolar & MOS IC, Film IC</p> <p>2. Crystal Growth: Silicon wafer Preparation & characterization, Oxidation system.</p> | 1 | 2 6 |
| 2. | <p>Diffusion of dopants: Diffusion Eqns. Dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, Ion Implantation: Ion implantation techniques, dopant profiles, apparatus used, Epitaxy: Epitaxial growth of Si, apparatus for epitaxy, Photolithography techniques for pattern transfer, Mask making, photo resist & Etching techniques. Film Deposition: Vacuum deposition & Sputtering apparatus, CVD Processes and its applications in IC Lab, Metallization</p> | 1 | 8 |
| 3. | <p>1. MOS Transistor: MOS Structure, MOS/IGFET Devices, MOS System under external bias, Structure & operation of MOSFET, Enhancement mode & Depletion mode devices, I-V Characteristics, MOSFET Scaling & Small-Geometry Effects.</p> <p>2. CMOS Basic Circuits: MOS Inverters, static & dynamic characteristics, NAND, NOR, AOI Circuits, Design Considerations, Layout Design, Micron & Submicron technologies, parasitic effects, Physical limitations, Concepts of SPICE for Circuit simulation.</p> | 2 | 6 4 |
| 4. | <p>Standard Digital ICs: Combinational and Sequential MOS Logic Circuits, Design of standard Cells for LSI, VLSI Circuits, Computer-Aided Design Technology, Semiconductor Memories: DRAM, SRAM, Flash</p> | 3 | 7 |
| 5. | <p>Programmable Logic Devices: PLA, PAL, PLD/CPLD, PGA/FPGA, ASIC, VLSI Testing.</p> | 3 | 7 |

Text Books:

1. S.M. Sze (Ed.) / VLSI Technology / M Hill. 1988.
2. Basic VLSI Design by D.A. Pucknell & Eshraghian (PHI)
3. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)

References

1. S. Gandhi / VLSI Fabrication Principles / 2nd ED. John Willey 1994.
2. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)
3. S.A. Campbell / The Science and Engineering of Microelectronic Fabrication / Oxford
4. Univ. Press 1996 Introduction to Digital Microelectronics Circuits by K. Gopalan (TMH)
5. Microelectronic Circuits *International Student Edition* by Sedra / Smith (Oxford)
6. Microelectronics by Milman & Grabel (Mc Graw-Hill).
7. Dr. R.K. Singh, VLSI Design with VHDL, Kataria & Sons, New Delhi

Microwave & Radar Engineering (TEC- 604)

| Unit | Topic | Text Book/Chapter | Lectures |
|------|--|-------------------|----------|
| 1. | Propagation through waveguides: Rectangular waveguide, solution of wave equation in rectangular co-ordinates, Derivation of field equations for TE & TM modes degenerate and dominant mode, power Transmission and Power loss, Excitation of waveguides, non existence of TEM mode in waveguides, Introduction to circular Waveguides, Stripline and microstripline. | ¼, 1/11 | 9 |
| 2. | Microwave cavity resonators: Rectangular and cylindrical cavities, Quality factor, Excitation of cavities. Microwave components: Waveguide couplings, bends and twists, Transitions, Directional couplers, hybrid couplers, Matched load, Attenuators and phase shifters, E0-plane, H-plane and Hybrid Tees, Hybrid ring, Waveguide discontinuities, Windows, Irises and Tuning screws, Detectors, wave meters, Isolators and Circulators, tunable detector, slotted line carriage, VSWR meter, Scattering Matrix. | ½ 2/6 | 2 8 |
| 3. | Microwave Measurements: Measurement of frequency, Wave length, VSWR, Impedance, Attenuation, Low and high power. Radiation pattern. | 3/10 | 6 |
| 4. | Limitation Tubes: conventional active devices at Microwave frequency. | 1/9 | 1 |
| 5. | Klystron, Reflex Klystron, Magnetron, TWT, BWO Their schematic, Principal of operation, performance characteristics and application. | 1/10 | 6 |
| 6. | Microwave Semiconductor Devices: PIN diode, Tunnel diode, Gunn Device IMPATT and TRAPATT, their Principal of operation, characteristics and applications. | 1/5, 1/7, 1/8 | 8 |

Text Books:

1. Liao, S.Y./ Microwave Devices & Circuits, PHI 3rd Ed.
2. M.I. Skolnik, Introduction to Radar Engineering, THM
3. KulKarni, Microwaves Devices- THM

Reference:

1. Collin, R.E. Foundations for Microwave Engineering, TMH 2nd Ed.
2. Rizzi, Microwave Engineering: Passive Circuits, PHI
3. A Das and S.K. Das, Microwave, TMH.

Digital Communication Lab (TEC-651)

1. Study of Sampling and reconstruction techniques.
2. Study of Pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload DCL-07
4. Study of Adaptive Delta modulation and demodulation
5. Study of data coding techniques.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Study of TDM PCM Transmitter and receiver.

Digital Signal Processing Lab (TEC-652)

1. Sampling & Waveform Generation.
2. Quantization.
3. PCM Encoding
4. Delta Modulation
5. Digital Modulation Schemes (ASK, PSK, FSK)
6. Error Correcting Codes.
7. DFT Computation.
8. Fast Fourier Transform.
9. FIR Filter implementation.
10. IIR Filter implementation.
11. Computational Experiments with Digital Filters

Microwave Engineering Lab (TEC-653)

1. Measurement of guide wavelength and frequency of the signal in a rectangular waveguide.
2. Measurement of VSWR using slotted line.
3. Study of mode characteristics of reflex Klystron and determination of mode number, transit time & electronic tuning sensitivity.
4. Study of characteristics of Gunn oscillator.
5. Study of Gunn diode as modulated source (PIN modulation) and determination of modulation depth.
6. measurement of coupling coefficient and directivity of a directional coupler.
7. Study of insulation & coupling coefficient of a magic T.
8. Measurement of attenuation using substitution method and plot of attenuation versus frequency characteristics.
9. Study of waveguide horn and its radiation pattern and determination of the beam width.
10. Measurement of microwave power using power meter.