

**UTTRAKHAND TECHNICAL UNIVERSITY,  
DEHRADUN**

**STUDY & EVALUATION SCHEME**

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

**YEAR III, SEMESTER-VI**

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme			ESE	Subject Total
			L	T	P	CT	SESSIONAL	Total		
							EXA			
<b>THEORY</b>										
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 Engineering.	3	1	0	30	20	50	100	150
<b>PRACTICAL/TRAINING/PROJECT</b>										
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				-	-	-	-	<b>1100</b>

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

**YEAR III, SEMESTER-VI Industrial Management (TAS-601**

Unit	Topic	Text Book/ Chapter	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.	<b>Introduction to Linear Programming:</b> Two variable L-P model, Graphical LP solution, Analysis of selected LP models.	1/2.1, 2.2, 2.5	3
	<b>The Simplex Method:</b> LP solution space, Graphical to algebraic solution, The simplex method, Artificial starting solution, Special cases in simplex method applications.	1/3	4
	<b>Transportation Model and its Variants:</b> Definition of transportation model, Non-traditional transportation models, Transportation algorithms, Assignment model	1/5 Except 5.5	4
3.	<b>Network Models:</b> Network definitions, Minimal spanning tree algorithm, CPM and PERT.	1/6.1, 6.2, 6.6	4
	<b>Game Theory:</b> 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
	<b>Introduction to Engineering Management:</b> Engineering and Management Historical Development of Engineering Management	1/1 1/2	3
5.	<b>Functions of Technology Management</b> Planning and Forecasting Decision Making Organizing Motivating and Leading Technical People Controlling	2/3 2/4 2/5 2/7 2/8	6
	<b>Project Management</b> 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.	<b>Elements of Digital Communication and Information Theory</b> Model of a Digital Communication, System, Probability Theory and Random Variables, Logarithmic Measure of Information, 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	5
		1/9	4
2	<b>Digital Base band Transmission</b> PCM Coding, DM, DPCM, ADCM, 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, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio.  Correlation Detector, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum.	1/4	4
		1/5	4
		1/4	
3 & 4	<b>Digital Modulation Techniques</b> 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 Error and Comparison of Various Digital Modulation Techniques. <b>Digital Multiplexing</b> 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)	1/6  1/3	11  3
5	<b>Error Control Coding</b> 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 / 4<sup>th</sup> 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.
- Prokis J.J / "Digital Communications" / McGraw Hill /
- Charkrabarti, P. / "Analog Communication Systems" / Dhanpat Rai & Co.
- Schaum's Outlines / "Analog & Digital Communication" / Tata McGraw-Hill.
- Kennedy, George & Davis, Bernard / "Electronic communication systems" / Tata McGraw-Hill /

## Digital Signal Processing (TEC-602)

Unit	Topic	Text Book/ Chapter	Lectures
1.	<b>Discrete Fourier Transform:</b> 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.	<b>Efficient Computation of DFT</b> 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-Point real sequences, Gortzel Algorithm, Chirp Z-transform algorithm.	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 structure, Linear phase FIR structure . FIR structures.	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.	<b>Design of IIR Filters From Analog Filters:</b> 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 filters.	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. & Schafer, 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

1	<b>1.Era of Integrated Circuit:</b> Introduction to Monolithic Integrated Circuit Technology, Bipolar & MOS IC, Film IC <b>2. Crystal Growth:</b> Silicon wafer Preparation & characterization, <b>Oxidation:</b> Thermal oxidation, Oxide thickness measurement, Oxidation system.	1	2 6
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### VLSI Technology and Design (TEC-603)

2.	<b>Diffusion</b> of dopants: Diffusion Eqns. Dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, <b>Ion Implantation:</b> Ion implantation techniques, dopant profiles, apparatus used, <b>Epitaxy:</b> Epitaxial growth of Si, apparatus for epitaxy, Photolithography techniques for pattern transfer, Mask making, photo resist & <b>Etching</b> techniques. <b>Film Deposition:</b> Vacuum deposition & Sputtering apparatus, CVD Processes and its applications in IC Lab, <b>Metallization</b>	1	8
3.	<b>1.MOS Transistor:</b> 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. <b>2.CMOS Basic Circuits:</b> 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.	2	6 4
4.	<b>Standard Digital ICs:</b> Combinational and Sequential MOS Logic Circuits, Design of standard Cells for LSI, VLSI Circuits, Computer-Aided Design Technology, Semiconductor Memories: DRAM, SRAM, Flash	3	7
5.	<b>Programmable Logic Devices:</b> PLA, PAL, PLD/CPLD, PGA/FPGA, ASIC, VLSI Testing.	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 / 2<sup>nd</sup> 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 Univ. Press 1996
4. 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)