KAMLA NEHRU INSTITUTE OF TECHNOLOGY, SULTANPUR (U. P.)

BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2014-15)

SEMESTER- III

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KEC-301	Fundamental of Electronics Devices	3	1	0	30	20	50	100	150
2.	KEC-302	Digital Electronics	3	1	0	30	20	50	100	150
3.	KEC-303	Electromagnetic Field Theory	3	1	0	30	20	50	100	150
4.	KEC-304	Network Analysis & Synthesis	3	1	0	30	20	50	100	150
5.	KEC-305	Discrete Analog Circuits	3	1	0	30	20	50	100	150
6.	KAS-302	*Human Values & Professional Ethics	2	-	0	15	10	25	50	75
PRACTICAL/TRAINING/PROJECT										
7.	KEC-351	Electronics Engg. Lab-I	0	0	2	--	20	20	30	50
8.	KEC-352	Digital Electronics Lab-I	0	0	2	--	20	20	30	50
9.	KEC-353	PCB & Electronics Workshop	0	0	2	--	20	20	30	50
10	KEC-354	Networks Lab	0	0	2	--	20	20	30	50
11	KGP-301	General Proficiency	-	-	-	-	-	50	-	50
Total										**1000**

***Compulsory audit course. Candidate has to secure Minimum 40% marks.**

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BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2014-15)

SEMESTER- IV

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KAS-401	Mathematics-III	3	1	0	30	20	50	100	150
2.	KEC-401	Electronic Circuits	3	1	0	30	20	50	100	150
3.	KEC-402	Computer Architecture & Organization	3	1	0	30	20	50	100	150
4.	KEC-403	Electronics Instrumentation & Measurement	3	1	0	30	20	50	100	150
5.	KEC-404	Signal & Systems	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	KEC-451	Electronics Engg. Lab-II	0	0	2	--	20	20	30	50
7.	KEC-452	Digital Electronics Lab-II	0	0	2	--	20	20	30	50
8.	KEC-453	Measurement Lab	0	0	2	--	20	20	30	50
9	KEC-454	Computer Architecture & Organization Lab	0	0	2	--	20	20	30	50
10	KGP-401	General Proficiency	-	-	-	-	-	50	-	50
Total										**1000**

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BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2015-16)

SEMESTER- V

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KAS-501	Engineering & Managerial Economics	3	1	0	30	20	50	100	150
2.	KEC-501	Integrated Circuit	3	1	0	30	20	50	100	150
3.	KEC-502	Principles of Communications	3	1	0	30	20	50	100	150
4.	KEC-503	Microprocessors	3	1	0	30	20	50	100	150
5.	KEC-504	Antenna and Wave Propagation	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	KEC-551	Integrated Circuit Lab	0	0	2	--	20	20	30	50
7.	KEC-552	Communication Lab-I	0	0	2	--	20	20	30	50
8.	KEC-553	Microprocessor Lab	0	0	2	--	20	20	30	50
9	KEC-554	CAD of Electronic Circuit Lab	0	0	2	--	20	20	30	50
10	KGP-501	General Proficiency	-	-	-	-	-	50	-	50
Total										**1000**

KAMLA NEHRU INSTITUTE OF TECHNOLOGY, SULTANPUR (U. P.)

BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2015-16)

SEMESTER- VI

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KAS-601	Industrial Management	3	1	0	30	20	50	100	150
2.	KEC601	Digital communication	3	1	0	30	20	50	100	150
3.	KEC-602	Digital Signal Processing	3	1	0	30	20	50	100	150
4.	KEC-603	Microwave Engineering	3	1	0	30	20	50	100	150
5.	KEC-604	Linear System Theory	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	KEC-651	Communication Lab-II	0	0	2	--	20	20	30	50
7.	KEC-652	Digital Signal Processing Lab	0	0	2	--	20	20	30	50
8.	KEC-653	Microwave Lab	0	0	2	--	20	20	30	50
9	KEC-654	Seminar	0	0	2	--	50	50	--	50
10	KGP601	General Proficiency	-	-	-	-	50	50	-	50
Total										**1000**

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BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2016-17)

SEMESTER- VII

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KEC-701	Embedded Systems	3	1	0	30	20	50	100	150
2.	KEC-702	Optical Communication	3	1	0	30	20	50	100	150
3.	KEC-703	Data Communication Networks	3	1	0	30	20	50	100	150
4.	KEC-01	Departmental Elective-I	3	1	0	30	20	50	100	150
5.	KEC-02	Departmental Elective-II	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
6.	KEC-751	Data Communication & Fiber Optic Lab	0	0	2	--	20	20	30	50
7.	KEC-752	Embedded System Design Lab	0	0	2	--	20	20	30	50
8.	KEC-753	Industrial Training Viva-Voce	0	0	2	--	50	50	--	50
9	KEC-754	Project	0	0	2	--	50	50	--	50
10	KGP-701	General Proficiency	-	-	-	-	-	50	-	50
Total										**1000**

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BACHELOR OF TECHNOLOGY

Electronics Engineering

STUDY & EVALUATION SCHEME

(Effective from the Session 2016-17)

SEMESTER- VIII

S. N.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total
						SESSIONAL EXAM.			ESE	
			L	T	P	CT	TA	Total		
THEORY SUBJECTS										
1.	KEC-801	Mobile & Wireless Communication	3	1	0	30	20	50	100	150
2.	KEC-802	VLSI Design	3	1	0	30	20	50	100	150
3.	KEC-803	Radar & Satellite Communication	3	1	0	30	20	50	100	150
4.	KEC-03	Departmental Elective-III	3	1	0	30	20	50	100	150
PRACTICAL/TRAINING/PROJECT										
5.	KEC-851	Project	0	0	12	--	100	100	250	350
6.	KGP-801	General Proficiency	-	-	-	-	50	50	-	50
Total										**1000**

List of Electives

Elective –I

1. KEC-011 Analog Signal Processing
2. KEC-012 Data Structure
3. KEC-013 Advance Semiconductor Devices
4. KEC-014 Integrated Circuit Technology

Elective-II

1. KEC-021 Filter Design
2. KEC-022 Optical Network
3. KEC-023 Artificial Neural Network
4. KEC-024 Introduction to Electric Drive

Elective-III

1. KEC-031 Digital Image Processing
2. KEC-032 Speech Processing
3. KEC-033 Electronic Switching
4. KEC-034 Digital System Design using VHDL

KEC 401 ELECTRONIC CIRCUITS

L T P 3 1 0

Unit 1:

Operational Amplifier: Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.

Unit 2:

MOSFET: Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

Unit 3:

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

Unit 4:

Differential Amplifier: MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.

Unit 5:

Feedback: The general feed back structure, properties of negative feed back, the four basic feed back topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book: A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Ed.

Reference Books:

1. Neamen D A, “Electronics Circuits”, 3rd Ed TMH
2. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Ed TMH

KEC 402 COMPUTER ARCHITECTURE AND ORGANIZATION

Unit 1: L T P 3 1 0

Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design

Unit 2:

The Processor Level: Processor level components, Processor level design. Processor basics: CPU organization- Fundamentals , Additional features Data Representation – Basic formats, Fixed point numbers, Floating point numbers. Instruction sets – Formats, Types, Programming considerations.

Unit 3:

Datapath Design: Fixed point arithmetic – Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.

Unit 4:

Control Design: basic concepts – introduction, hardwired control, Micro programmed control – introduction, multiplier control unit, cpu control unit, Pipeline control- instruction pipelines, ipeline performance.

Unit 5:

Memory organization: Multi level memories, Address translation, Memory allocation, Caches – Main features, Address mapping, structure vs performance, System Organisation: Communication methods- basic concepts, bus control.
Introduction to 8085

Text Book: John P Hayes “Computer Architecture and Organisation” McGraw Hilll 3rd Edition
Reference Books: M Morris Mano, “Computer System Architecture” PHI 3rd Edition

KEC 403 ELECTRONIC INSTRUMENTATION AND MEASUREMENTS

L T P 310

Unit I:

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter,

Unit II:
Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter system

Unit III:
Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter

Unit IV:
CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance.
Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications

Unit V:
Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters

Text Book:

David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI , New Delhi 2008.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.

2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann),

KEC 404 SIGNALS AND SYSTEMS

L T P 3 1 0

Unit 1:

Signals: Definition, types of signals and their representations:continuous-time/discrete-time,periodic/non-periodic, even/odd, energy/power, deterministic / random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).

Unit II:

Laplace-Transform (LT) and Z-transform (ZT):
(i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC)
(ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping

Unit III:

Fourier Transforms (FT):
(i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT
(ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT

Unit IV:

Systems: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response
of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,

Unit V:

Time and frequency domain analysis of systems: Analysis of first order and second order systems, continuous-time (CT)system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions,block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter

Text Book:

P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

1. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004

KEC-501 Integrated Circuit

Unit I:

Analog Integrated circuit Design: an overview: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated currentMirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror

The 741 IC Op-Amp: Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage;Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR

Unit II:

Linear Applications of IC op-amps: An Overview of Op-Amp (ideal and non ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors Filters: First and second order LP, HP, BP BR and All pass active filters and State Variable Biquad filters; Sinusoidal oscillators

Unit III:

Non-Linear applications of IC Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Sample and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astablemultivibrator, Monostablemultivibrator, Generation of Triangular Waveforms, D/A & A/D converter.

Unit IV:

Integrated Circuit Timer: The 555 Circuit, Implementing a MonostableMultivibrator, AstableMultivibrator, VCO, Schmitt Trigger circuit using the 555 IC.

Phase locked loops (PLL): Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL,D/A and A/D converters.

Unit-V

Digital Integrated Circuit Design-An Overview: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates Latches and Flip flops**:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop,D Flip-flop Circuits.

Text Book:

[1] Sedra and Smith, “Microelectronic Circuits”, 4th Edition, Oxford University Press.
[2] D. Roy Choudhary, “ linear Integrated Circuit” PHI

Reference Books:

[1] Michael Jacob, `Applications and Design with Analog Integrated Circuits’, PHI, 2nd Edn, 2006

[2] Jacob Milliman and Arvin Grabel, “Microelectronics”, 2nd Edition, TMH, 2008

KEC-502 Principles of Communications

Unit-I

Introduction: Overview of Communication system, Communication channels, need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator.

Unit-II

Angle Modulation, Modulation index, Pre-emphasis & De-emphasis, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators: Direct method & Indirect method and Demodulators: PLL, Phase discriminator & Ratio detector, PM Modulator and Demodulator, Stereophonic FM Broadcasting,

Unit-III

Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing ,Line Coding and their Power Spectral density.

Unit-IV

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, T1 Digital System, TDM Hierarchy, Noise in Amplitude Modulation: Analysis, signal to noise ratio, figure of merit, noise in frequency modulation

Unit-V

Noise: Types of Noise and their sources , Noise calculation, noise due to several amplifiers in cascade, noise in reactive circuits, noise figure & noise temperature calculation.

Text Book:

1. H. Taub, D L Schilling, GoutomSaha, “Principles of Communication Systems”, 4th Edition, Tata McGraw-Hill Publishing Company Ltd.
2. G. Kennedy, B. Devis, S. R. M. Prasanna, “Electronic Communication Systems” 5th Edition, Tata McGraw-Hill Publishing Company Ltd.

Reference Books:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 3rd Edition, Oxford University Press, 2009.
2. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
3. H. P. HSU & D. Mitra , "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

KEC- 503 Microprocessors

Unit-I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

Unit-II

Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

Unit-III

Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

Unit-IV

Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to- Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

Unit-V

8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller. Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, TMH, 2006. Reference Book: Kenneth L. Short, "Microprocessors and programmed Logic", 2nd Ed, Pearson Education

KEC 504 Antenna and Wave Propagation

Unit-I

Antennas Basics

Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle)ΩA, Radiation Intensity, Beam \Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance, Retarded Potential, Far Field due to an alternating current element.

Unit-II

Point Sources and Their Arrays

Introduction, Point Source ,Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, No isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with No uniform Amplitude Distributions.

Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures

The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.

Unit-III

The Loop Antenna. Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas

Unit-IV

Reflector Antennas

Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types(summarized), Feed Methods for Parabolic Reflectors,

Antenna Measurements

Introduction, Antenna Measurement ranges, Radiation pattern Measurements, Gain and Directivity Measurements, Spectrum Analyzer

Unit-V

Ground Wave Propagation

Plane Earth Reflection, Space Wave and Surface Wave, **Space Wave Propagation** Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, **Sky wave Propagation** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation,

Text Book:

1- John D Krauss, Ronald J Marhefka and Ahmad S. Khan,"Antennas and Wave Propagation", Fourth Edition, Tata McGraw Hill, 2010 Special Indian Edition.

Reference Books:

1. A .R. Harish, M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2009.

2. Jordan Edwards C. and Balmain, Keith G.“Electromagnetic Waves and Radiating Systems”, PHI.
3. A. Das, Sisir K. Das, “Microwave Engineering”, Tata McGraw Hill.

LABOROTARY

KEC-551 Integrated Circuits Lab

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–

a. Low pass filter of cutoff frequency 1 KHz.
b. High pass filter of frequency 12 KHz.
c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.

4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostablemultivibrator using IC 555.

KEC-552 Communication Lab-I

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation

a. using switching method
b. by sample and hold circuit

8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

KEC-553 Microprocessor Lab

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port.

Note :-In addition, Institutes may include two more experiments based on the expertise.

KEC-554 CAD of Electronic Circuits

PSPICE Experiments

1. (a) Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a) Transient Analysis of NMOS inverter using step input.
   (b) Transient Analysis of NMOS inverter using pulse input.
   (c) DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b) Transient Analysis of CMOS inverter using step input with parameters.
   (c) Transient Analysis of CMOS inverter using pulse input.
   (d) Transient Analysis of CMOS inverter using pulse input with parameters.
   (e) DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient& DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.

VHDL Experiments

1. Synthesis and simulation of Full Adder.
2. Synthesis and Simulation of Full Subtractor.
3. Synthesis and Simulation of 3 X 8 Decoder.
4. Synthesis and Simulation of 8 X 1 Multiplexer.
5. Synthesis and Simulation of 9 bit odd parity generator.
6. Synthesis and Simulation of Flip Flop (D, and T).

KEC-601 Digital Communications

Unit-I

Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK),M-ary Digital carrier Modulation.

Unit-II

Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes,

Unit-III

Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,

Unit-IV

Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications

Unit-V

Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memory less channel Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability , Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.

Text Book:

1. B.P. Lathi, “Modern Digital and Analog communication Systems”, 4th Edition, Oxford University Press, 2010.
2. Simon Haykin, “ Digital Communication” John Wiley & Sons.

Reference Book:

1. R. N. Mutagi, “ Digital Communication” Oxford University Press.
2. P. Chakrabarti, “ A Text Book of Analog and Digital Communication” DhanpatRai& Co.
3. Dennis Roddy and John Coolen, “ Electronics Communication” PHI
4. Bernard Sklar and Pabitra Kumar Ray, “ Digital Communication” Pearson.

KEC-602 Digital Signal Processing

Unit-I

Digital Signal & System: Introduction to DSP, Representation of Digital Signal, Basic Sequences, Representation of Arbitrary Sequences, Linear Shift Invariant System, stability &causulty, Sampling, Frequency Domain Concept of Digital Signal.

Unit-II

Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.

Unit-III

Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters

Unit-IV

Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window

Unit-V

Discrete Fourier Transforms: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution
Fast Fourier Transform Algorithms: Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm

Text Books: Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009.

Reference Books:
1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, " Digital Signal Processing" PHI

KEC-603 Microwave Engineering

Unit-I

Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Micro strip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities.

Unit-II

Scattering Matrix , Passive microwave devices: Microwave Hybrid Circuits. , Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.

Unit-III

Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.

Unit-IV

Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit –time devices: IMPATT Diode, TRAPPAT Diode,

Unit-V

Microwave Measurements: General set up of a microwave test bench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.

Text Books:

1. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd Ed, Pearson Education.
2. A. Das and S. K. Das, “Microwave Engineering”, TMH.3rd Edition.

Reference Books:

1. R.E Collin, “Foundation for Microwave Engineering “, 2nd Ed., John Wiley India.

KEC-604 Linear System Theory

Unit- I

Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.

Unit-II

State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions.

Unit-III

Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady State error, time response of a first order system, transient response of a prototype second order system

Unit-IV

Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion.

Unit-V

Frequency Domain Analysis: *Mr (resonant peak) and ωr (resonant frequency)* and bandwidth of the prototype Second order system, effects of adding a zero tothe forward path, effects of adding a pole to the forward path, Nyquist stabilitycriterion, relative stability: gain margin and phase margin, stability analysis withthe Bode plot

Text Book: B.C. Kuo&FaridGolnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rd Edition, Tata McGraw Hill, Special Indian Edition 2010.
3. I. J. Nagrath& M. Gopal, "Control System Engineering", New Age International Publishers

LABOROTARY

KEC-651 Communication Lab – II

1.To construct a triangular wave with the help of Fundamental Frequency and its Harmoniccomponent.

2.To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.

3.Study of Pulse code modulation (PCM) and its demodulation using Bread Board.

4.Study of delta modulation and demodulation and observe effect of slope overload.

5.Study of pulse data coding techniques for NRZ formats.

6.Study of Data decoding techniques for NRZ formats.

7.Study of Manchester coding and Decoding.

8.Study of Amplitude shift keying modulator and demodulator.

9.Study of Frequency shift keying modulator and demodulator.

10.Study of Phase shift keying modulator and demodulator

11Study of single bit error detection and correction using Hamming code.

12Measuring the input impedance and Attenuation of a given Transmission Line

KEC-652 Digital Signal Processing Lab

1.With the help of Fourier series, make a square wave from sine wave and cosine waves. Find outcoefficient values.

2.Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.

3.Implement the FIR Filters for 2 KHz cutoff frequency and 2 KHz bandwidth for band pass filter.

4.Design FIR filter using Fourier series expansion method.

5.Implement IIR low pass filter for a 4 KHz cutoff frequency and compare it the FIR filter with the same type use chirp as input signal.

6.Verify Blackman and Hamming windowing techniques for square wave as an input which window will give good results.

7.Implement the filter functions.

8.Generate DTMF sequence 1234567890*# and observe its spectrogram.

9.Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones.

10.Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones.

11.Generate an FSK wave form for transmitting the digital data of the given bit sequence. Predict and verify the FFT for the same one.

12.To study the circular convolution.

KEC-653 Microwave Engg. Lab

1. Study of Reflex Klystron Characteristics.

2 Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.

3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench

4. Determine the S-parameter of any Three port Tee.

5 Determine the S-parameter of a Magic Tee.

6. Study various parameters of Isolator .

7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.

8 Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.

9 To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.

10. Study of waveguide horn and its radiation pattern and determination of the beam width.

11. Study radiation pattern of any two types of linear antenna.

KEC 701: Embedded Systems

Unit 1:

Introduction to Embedded system, Embedded System Project Management, ESD and Codesign issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

Unit II

8051 Microcontroller: Microprocessor V/s Micro-controller, 8051 Microcontroller: General architecture; Memory organization; I/O pins, ports & circuits; Counters and Timers; Serial data input/output; Interrupts. 8051 Instructions: Addressing Modes, Instruction set: Data Move Operations, Logical Operations, Arithmetic Operations, Jump and Call Subroutine, Advanced Instructions. 8051 Interfacing and Applications: Interfacing External Memory, Keyboard and Display Devices: LED, 7-segment LED display, LCD.

Unit III

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, and VHDL data types, concurrent and sequential statements. Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

Unit IV

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Unit V

Brief general architecture of AVR, PIC and ARM microcontrollers, JTAG: Concept and Boundary Scan Architecture. Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated
Specialized Components of FPGAs, Applications of FPGAs.

TEXT BOOKS:

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill.
2. The 8051 Microcontroller And Embedded Systems Using Assembly And C, 2/E, Mazadi, Pearson Education India, 2007

REFERENCE BOOKS:

1. Embedded Systems by Raj Kamal, TMH, 2006.
2. The 8051 Microcontroller by K Ayala, 3rd Ed., Thomson Delmar Learning, 2007.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

4. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
5. PIC Microcontroller by H.W Huang, Delmar CENGAGE Learning g, 2007.

KEC- 702 Optical Communication

Unit-I

Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques.

Unit-II

Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening.Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.

Unit-III

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power,Modulation, Power bandwidth product. Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD

Unit-IV

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers

Unit-V

Link Design: Point to Point Links, Power Penalities, Error control,Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter

TEXT BOOKS:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.

REFERENCE BOOKS

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004.

KEC-703 Data Communication Networks

Unit-I

Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.

Unit-II

Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch ,Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol

Unit-III

Multiple Access : RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16

Unit-IV

Network Layer :Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6Addresses, Internet Protocol, Hardware Addressing versus IP Addressing,IP Data Gram

Unit-V

Transport Layer Protocol : UDP and TCP, ATM ATM, Cryptography, Network Security

Text Books:

1. B. A. Forouzan, “Data Communications and Networking”, MGH, 4th ed. 2007

Reference Books:

1. A. S. Tanenbaum, “Computer Networks”, PHI.
2. W. Stallings, “Data and Computer Communication”, PHI.

Elective-I

KEC-011 Analog Signal Processing

Unit-I

Liner Analog Functions: Addition , Subtraction, Differentiation, Integration, Impedance Transformation and Conversion

Unit-II

AC/DC Signal Conversion: Signal Rectification, Peak and Valley Detection, rms to dc Conversion, Amplitude Demodulation

Unit-III

Other Nonlinear Analog Functions: Voltage Comparison, Voltage Limiting(Clipping), Logarithmic Amplifiers, Analog Multipliers, Analog Dividers

Unit-IV

Continuous time op-amp RC filters: Second order LP, HP, BP, Notch and AP transfer functions, Kirwin-Huelsman-Newcomb biquad, Ackerberg- Mosberg Circuits, Tow-Thomas biquad, compensated integrators, Sallenkey Circuits, Generalized convertor, GIC biquads.

Unit-V

Transconductance-C filters: Transconductance cells, realization of resistors, integrators, amplifiers, summers and gyrators, first order and second order sections, Ladder design.

Text Books:

1. Ramon Pallas-Areny, John G. Webster, “Analog Signal Processing”, John Wiley& Sons
2. R. Schaumann and M. E. Valkenberg, “Design of Analog Circuits”, Oxford University Press, 2001.

KEC-012 Data Structure

Unit-I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, time-Space trade-off, Abstract Data Types (ADT)
Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List, Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

Unit-II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of Postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion**.**
Queues: Operations of Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue

Unit-III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

Unit-IV
Graphs: Terminology, Sequential and linked Representations, of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth first Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kurskal algorithm, Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

Unit-V
Searching: Sequential search, Binary search, Comparison and Analysis, Internal Sorting: Insertion Sort, selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees Storage Management: Garbage Collection and Compaction.
Text Book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, " Data Structures using C and C++" , PHI
2. Lipschutz, " Data Structures" Schaum's Outline series, TMH

Reference Book:

1. Horowitz and Sahani, " Fundamentals of Data Structures" , Galgotia Publication

KEC-013 Advance Semiconductor Devices

Unit-I

Review of Fundamentals of Semiconductors: Semiconductor Materials and their properties Carrier Transport in Semiconductors Excess Carriers in Semiconductor

Unit-II

Junctions and Interfaces: Description of p-n junction, Action, The Abrupt Junction, Example of an Abrupt Junction, The linearly graded Junction. The Ideal Diode Model, Real Diodes, Temperature Dependence of I-V Characteristics, High Level Injection Effects, Example of Diodes. Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction

Unit-III

Majority Carrier Diodes: The Tunnel Diode, The Backward Diode, The Schottkey Barrier Diode, Ohmic Contacts Heterojunctions.

Unit-IV

Microwave Diodes: The Varactor Diode, The p-i-n Diode, The IMPATT Diode, TRAPATT Diode, The BARITT Diode, Transferred Electron Devices Optoelectronic Devices: The Solar Cell, Photo detectors, Light Emitting Diodes, Semiconductor Lasers.

Unit-V

Metal Semiconductor Field Effect Transistors: Basic Types of MESFETs, Models for I-V Characteristics of Short –Channel MESFETs, High Frequency Performance, MESFETs Structures. MOS Transistors and Charge Coupled Devices: Basic Structures and the Operating Principle, I-V Characteristics, Short-Channel Effects, MOSFET Structures, Charge Coupled Devices.

Text Book: M.S. Tyagi, "Introduction To Semiconductor Materials And Devices", John Willy-India Pvt. Ltd.

Reference Books:

1. S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, John Willy-India Pvt. Ltd.
2. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5th Edition, PHI.

KEC-014 Integrated Circuit Technology

Unit-I

Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.

Unit-II

Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon , Silicon Dioxide, Silicon Nitride.

Unit-III

Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources , Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.

Unit-IV

Metallization: :Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.

Unit-V

VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication

Text Book:

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication.

Reference Books:

1. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition,. Willy-India Pvt. Ltd.
2. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
3. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford Univ Press.

Elective-II

KEC-021 Filter Design

Unit-I

Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.

Unit-II

Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.

Unit-III

Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.

Unit-IV

Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.

Unit-V

Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.

Text Book:

[1] GobindDaryanani, “Principles of active network synthesis and design”,John Wiley & Sons.
[2] R. Schaumann, M. E. Van Valkenburg, “Design of analog filters”, Oxford University Press.

KEC-022 Optical Networks

Unit-I

Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in non linear region ,OpticalPacket Switching, Transmission Basics, Multiplexers & Filters,

Unit-II

Optical Amplifiers ,Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing,Spectralefficiency,Crosstalk,Introduction of Soliton systems.

Unit-III

SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH
Infrastructure, Ethernet.Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS.WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.

Unit-IV

WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution

Unit-V

Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, “Optical Networks a Practical perspective”, Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee “Optical WDM Networks” Springer Pub 2006.

KEC-023 Artificial Neural Networks

Unit-I

Introduction:
Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.

Unit-II

Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks

Unit-III

Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.Perceptrons and LMS
Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α-LMS learning, MSE error surface, steepest descent search,
μ-LMS and application.

Unit-IV

Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning

Unit-V

RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. Stochastic Machines Statistical mechanics, simulated annealing, Boltzmann machine. Adaptive Resonance Theory, Self organizing feature map.

Text Books:

1. Kumar Satish, “Neural Networks”, TMH
2. Simon Haykin, ”Neural Networks”, PHI
3. J. M. Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishers, 3rd Ed.

KEC-024 Introduction to Electric Drives

Unit-I

Electric Drives and its Parts, Classification of Electric Drives.
Thyristor: Principles and Characteristics Gate Triggering Circuits
Phase Controlled Rectifiers
Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters

Unit-II

Inverters: Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.
Choppers: Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper
Cycloconverters: Introduction, The Basic Principle of Operation, Single-phase to Single-phase Cycloconverter, Three-phase half-wave Cycloconverters, Cycloconverter Circuits for Three-phase Output

Unit-III

Control of D.C. Drives: Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives

Unit-IV

Control of A.C. Drives: Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives.

Unit-V

Applications of Electric Drives, Introduction to Solar and Battery Power Drives, Switched Reluctance Motor Drives. Industrial Applications of Electric Drives, Drive control considerations for cement mills, Steel Rolling Mills, Paper Mills, Machine Tools, Cranes and Hoist Drives.

Text Book: M.D. Singh & K. Khan chandani, “Power Electronics”, Tata McGraw Hill 1998 Edition

Reference Books: M H Rashid, “Power Electronics”, 3rd Ed., Pearson Education, 2009

KEC-751 Data Communication and Fibre Optics Lab

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.
9. Study of Network Topologies.
10. Study of Network Protocols.

KEC-752 Embedded System Design Lab

EMBEDDED SYSTEM LAB

The following Programs are to be implemented on ARM Processor

1. Simple Assembly Program for
    a. Addition | Subtraction | Multiplication | Division
    b. Operating Modes, System Calls and Interrupts
    c. Loops, Branches

2. Write an Assembly programs to configure and control General Purpose Input/Output (GPIO) port pins.
3. Write an Assembly programs to read digital values from external peripherals and execute them with the target board.
4. Program to demonstrate Time delay program using built in Timer / Counter feature on IDE environment
5. Program to demonstrates a simple interrupt handler and setting up a timer
6. Program demonstrates setting up interrupt handlers. Press button to generate an interrupt and trace the program flow with debug terminal.
7. Program to Interface 8 Bit LED and Switch Interface
8. Program to implement Buzzer Interface on IDE environment
9. Program to Displaying a message in a 2 line x 16 Characters LCD display and verify the result in debug terminal.
10. Write an application that creates a two task to Blinking two different LEDs at different timings
11. Write an application that creates a two task displaying two different messages in LCD display in two lines.
12. Sending message to PC through serial port by three different tasks on priority Basis.

KEC-801 Mobile and Wireless Communication

Unit-I

Mobile Radio Propagation, Large scale path loss: free Space propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath: Small Scale multipath Propagation, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Types of small scale feeding.

Unit-II

Equalization and Diversity: Fundamentals of equalization, Equalizers in communication receiver, Survey of equalization techniques, linear equalizer, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantization techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications: FDMA, TDMA, SSMA, SDMA.

Unit-III

Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and grade of service improving coverage and capacity in cellular systems.

Unit-IV

GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel

Unit-V

Introduction to Mobile Adhoc Networks, Mobile data networks, Introduction to Wireless Networks, Traffic Routing in wireless network, wireless data services, common channel signaling.

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson, Second Edition.
2. T L Singal ,“Wireless Communications ”,McGraw Hill Publications.
3. R. Pandya, “ Mobile and personal communication system”, PHI.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University press.
2. Andreas F. Molisch, “Wireless Communications”, Wiley Student Edition.
3. S. Haykin& M. Moher, “Modern wireless communication”, Pearson, 2005.
4. John W. Mark and WeihuaZhuang, “ Wireless Communication and Networking” PHI, 2009.

KEC-802 VLSI Design

Unit-I

Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances

Unit-II

MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

Unit-III

Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviourbistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Unit-IV

Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.

Unit-V

Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability andObservability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques

Text Book:

1. Sung-Mo Kang &YosufLeblebici, “CMOS Digital Integrated Circuits: Analysis & Design”, TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design: Systems and Circuits”, PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

KEC-803 Radar and Satellite Communications

Unit-I

Elements of Satellite Communication.look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

Unit-II

Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna
Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

Unit-III

Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and nongeostationary,

Unit-IV

Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross- Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency.

Unit-V

MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.
Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low- Angle Tracking, Tracking in Range,

Text/ Reference Books:

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4th Ed.
3. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
4. R. Pandya, “Mobile and Personal Communication Systems and Services ”, PHI.
5. Merrill I. Skolnik“ Introduction to Radar Systems” Third Edition._
6. J.C. Toomay , Paul J. Hannen “ Principles of Radar” Third Edition._

Elective- III

KEC-031 Digital Image Processing

Unit-I

Introduction and Digital Image Fundamentals: Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image processing Systems, Sampling and Quantization, some basic relationship like neighbors , Connectivity, distance measure between pixels. Imaging Geometry, Image Transforms: One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms.

Unit-II

. Image Enhancement: Introduction, point operations, spatial Domain Methods, Frequency Domain Methods, Spatial Filtering, Low Pass Filtering, High Pass Filtering, Homomorphic Filtering, histogram modeling and Equalization , Colour Image Processing.

Unit-III

Image Restoration: Introduction, image observation models, Degradation Models, Diagnolization of circulant and Block Circulants matrices. Algebraic Approach to Restoration.Inverse & Wiener filtering, difference between enhancement & restoration.Restoration-spatial filtering, Noise reduction in frequency domain.

Unit-IV

Image Compression: Introduction, Interpixel and Psycho visual redundancy. Pixel coding, Predictive coding, Transform coding, Inter-frame coding. Image Compression Models, Error free Compression, Lossy Compression, Image Compression Standards.

Unit-V

Image Segmentation: Introduction, Detection of discontinuities , Edge Linking and Boundary Detection, Thresholding, region oriented segmentation, Motion Based Segmentation. Spatial feature extraction, Transforms features, Segmentation techniques.

Text Books:

1. Rafael C. Gonzalez Richard E Woods, “Digital Image Processing”, Pearson, 3rd Ed. 2009.
2. Anil K Jain, “Fundamentals of Digital Image Processing”, PHI.
3. Chanda&Majumdar, “ Digital Image Processing” PHI.

KEC-032 Speech Processing

Unit-I

Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.

Unit-II

Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.

Unit-III

Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.

Unit-IV

Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphicvocoder.

Unit-V

predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.

Text / Reference Books:

1. R. L. Rabiner& R.W. Schafer, “Digital Processing of speech signals”, PearsonEducation.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley IndiaEdition, 2006.

KEC-033 Electronic Switching

Unit-I

Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.

Unit-II

Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.

Unit-III

Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.

Unit-IV

Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signaling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.

Unit-V

Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.

Text Books:

1. ThiagarajanViswanathan, “Telecommunication switching System and networks”, PHI.
2. J.E. Flood, “Telecommunication switching, Traffic and Networks”, Pearson education.
3. J.C. Bellamy, “Digital Telephony”, John Wiley, 3rdEd.

KEC-034 Digital System Design using VHDL

Unit-I

Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case array loops and assert statements, subprograms.

Unit-II

Digital System Design Automation– Abstraction Levels, System leveldesign flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration

Unit-III

Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE– related issues, Predefined Attributes

Unit-IV

VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution

Unit-V

Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts.
Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.

TEXT BOOKS:

1. Z. Navabi, “VHDL-Modular Design and Synthesis of cores and Systems”, TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, “Introduction to VHDL” Spriger Publication, 2010.

REFERENCE BOOKS:

1. C. H. Roth, “Digital System Design using VHDL”, PWS Publishing
2. Douglas Perry, “VHDL- Programming by examples”, MGH