Course Structure of B.Tech

Department of Electronics and Communication Engineering.
Triguna Sen School of Technology,
Assam University, Silchar

Academic Session: 2015-16

FIRST YEAR

Year	Semester	Min. Credits						Min. credits to be earned for the promotion to second year with arrear courses
		Semester	Offered for CF	Earned from CF	Offered for EF	Earned from EF	To be earned to complete first year programme	
I	Sem I	26	24	40	5	10	**60**	40% of 60 = **24**
	Sem II	34	28		9			

First Semester

Sl. No.	Course Code	Course Title	Contact hours/week			Credits
			L	T	P	
1	SOT CF 01	Engineering Mathematics	**4**	**-**	**-**	**4**
2	SOT CF 02	Engineering Physics	**4**	**-**	**-**	**4**
3	SOTCF 03	Environmental Science	**3**	**-**	**-**	**3**
4	SOTCF 04	Communication Skill in English	**3**	**-**	**-**	**3**
5	SOTCF 05	Engineering Chemistry	**4**	**-**	**-**	**4**
6	SOTCF 11	Engineering Physics Lab	**-**	**-**	**4**	**2**
7	SOTCF 12	Engineering Chemistry Lab	**-**	**-**	**4**	**2**
8	SOTCF 13	Engineering Drawing	**-**	**-**	**4**	**2**
	Total Credits (Compulsory Foundation)					**24**
9	SOTEF 01	Economics and Human Development	**3**	**-**	**-**	**3**
10	SOTEF 06	NCC	**-**	**-**	**4**	**2**
	Total Credits (Elective Foundation)					**5**

Second Semester

Sl. No.	Course Code	Course Title	Contact hours/week			Credits
			L	T	P	
1	SOTCF 06	Advanced Engineering Mathematics	**4**	**2**	**-**	**5**
2	SOTCF 07	Engineering Mechanics	**4**	**-**	**-**	**4**
3	SOTCF 08	Computer Systems and Programming	**4**	**2**	**-**	**5**
4	SOTCF 09	Electrical Technology	**4**	**-**	**-**	**4**
5	SOTCF 10	Basic Electronics	**4**	**-**	**-**	**4**
6	SOTCF 15	Computer Systems and Programming Lab	**-**	**-**	**4**	**2**
7	SOTCF 16	Electrical & Electronics Lab	**-**	**-**	**4**	**2**
8	SOTCF 17	Workshop Technology	**-**	**-**	**4**	**2**
	Total Credits (Compulsory Foundation)					**28**
9	SOTEF 02	Values and Ethics	**3**	**-**	**-**	**3**
10	SOTEF 03	Communication skill in French	**4**	**-**	**-**	**4**
11	SOTEF 07	NSS	**-**	**-**	**4**	**2**
	Total (Elective Foundation)					**9**

CC – Compulsory Core, CF – Compulsory Foundation, EF – Elective Foundation,
DE – Discipline Elective, OE – Open Elective, PT – Project/Training/Seminar/GD/Grand-Viva

Second Year

Year	Semester	CC	CF	EF	DE	OE	PT	Total
II	III	7	22	-	-	4	-	29
	IV	23	8	-	-	4	-	31

CC – Compulsory Core, CF – Compulsory Foundation, EF – Elective Foundation,
DE – Discipline Elective, OE – Open Elective, PT – Project/Training/Seminar/GD/Grand-Viva

Third Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CF-01	Signals & Systems	**4**	**-**	**-**	**4**
2	EC-CF-02	Solid State Devices	**3**	**2**	**-**	**4**
3	EC-CF-03	Solid State Device Lab	**-**	**-**	**6**	**3**
4	EC-CF-04	Electromagnetic Theory	**4**	**-**	**-**	**4**
5	EC-CF-05	Circuit Theory and Network Analysis	**3**	**2**	**-**	**4**
6	EC-CF-06	Networks Analysis Lab	**-**	**-**	**6**	**3**
7	EC-CC-01/ EC-OE-01	Digital Electronic Circuits	**4**	**-**	**-**	**4**
8	EC-CC-02	Digital Electronics Lab	**-**	**-**	**6**	**3**
Total			**18**	**4**	**18**	**29**

Fourth Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CC-03	Analog Communication	**3**	**-**	**-**	**3**
2	EC-CC-04	Analog Communication Lab	**-**	**-**	**6**	**3**
3	EC-CC-05	Analog Electronic Circuits	**4**	**-**	**-**	**4**
4	EC-CC-06	Analog Electronics Lab	**-**	**-**	**6**	**3**
5	EC-CC-07/ EC-OE-02	Instrumentation & Measurements	**4**	**-**	**-**	**4**
6	EC-CC-08	Instrumentation & Measurements Lab	**-**	**-**	**6**	**3**
7	EC-CC-09	Antenna & Radar Engineering	**3**	**-**	**-**	**3**
8	EC-CF-07	Computer Architecture and Organization	**4**	**-**	**-**	**4**
9	EC-CF-08	Random Processes, Probability Theory & Statistics	**4**	**-**	**-**	**4**
Total			**22**	**-**	**18**	**31**

Third Year

Year	Semester	CC	CF	EF	DE	OE	PT	Total
III	V	27	-	-	4	4	-	31
	VI	19	-	-	6	4	-	29

Fifth Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CC-10	Digital Communication	**3**	**-**	**-**	**3**
2	EC-CC-11	Digital Communication Lab	**-**	**-**	**4**	**2**
3	EC-CC-12/ EC-OE-03	Microprocessor	**4**	**-**	**-**	**4**
4	EC-CC-13	Microprocessor Lab	**-**	**-**	**4**	**2**
5	EC-CC-14	Digital VLSI Design	**4**	**-**	**-**	**4**
6	EC-CC-15	Digital VLSI Design Lab	**-**	**-**	**4**	**2**
7	EC-CC-16	Microwave Engineering	**4**	**-**	**-**	**4**
8	EC-CC-17	Microwave Engineering Lab	**-**	**-**	**6**	**3**
9	EC-CC-18	Microelectronics Technology	**3**	**-**	**-**	**3**
10	EC-DE-01	Discipline Elective I	**4**	**-**	**-**	**4**
Total			**22**	**-**	**18**	**31**

List of Electives

A. Control Systems (Credit: 4)
B. Telecommunication Systems (Credit: 4)
C. Electronic Sensors and MEMS (Credit: 4)

Sixth Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CC-19	Computer Communication & Networking	**3**	**-**	**-**	**3**
2	EC-CC-20	Computer Networking Lab	**-**	**-**	**4**	**2**
3	EC-CC-21/ EC-OE-04	Digital Signal Processing	**4**	**-**	**-**	**4**
4	EC-CC-22	Digital Signal Processing Lab	**-**	**-**	**6**	**3**
5	EC-CC-23	Microcontroller	**4**	**-**	**-**	**4**
6	EC-CC-24	Microcontroller Lab	**-**	**-**	**6**	**3**
7	EC-DE-02	Discipline Elective II	**4**	**-**	**-**	**4**
8	EC-DE-03	Discipline Elective II Lab	**-**	**-**	**4**	**2**
9	-	Open Elective I	**4**	**-**	**-**	**4**
Total			**19**	**-**	**20**	**29**

List of Electives

A. Advanced Digital System Design (Theory & Lab) (Credit: 4+2)
B. Power Electronics (Theory & Lab) (Credit: 4+2)
C. Image Processing (Theory & Lab) (Credit: 4+2)

Fourth Year

Year	Semester	CC	CF	EF	DE	OE	PT	Total
IV	VII	6	-	-	6	4	13	29
	VIII	-	3	-	3	4	21	31

Seventh Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CC-25	Analog VLSI Design	**4**	**-**	**-**	**4**
2	EC-CC-26	Analog VLSI Design Lab	**-**	**-**	**4**	**2**
3	EC-DE-04	Discipline Elective III	**3**	**-**	**-**	**3**
4	EC-DE-05	Discipline Elective IV	**3**	**-**	**-**	**3**
5	-	Open Elective II	**4**	**-**	**-**	**4**
6	EC-PT-01	Seminar	-	-	**2**	**1**
7	EC-PT-02	Project I	**-**	**-**	**20**	**10**
8	EC-PT-03	Industrial Training	**-**	**-**	**-**	**2**
Total			**14**	**-**	**26**	**29**

List of Electives

A. Optical Electronics & Optical Communication (Credit: 3)
B. Advanced Communication (Credit: 3)
C. Embedded Systems (Credit: 3)

A. Microwave Integrated Circuits (Credit: 3)
B. Principles of Electromagnetic and Electrostatic Compatibility (Credit: 3)
C. Operating System (Credit: 3)

Eighth Semester

Sl. No.	Course Code	Course Title	Contact Hrs/Week			Credit
			L	T	P	
1	EC-CF-09	Industrial Management	**3**	**-**	**-**	**3**
2	EC-DE-06	Discipline Elective V	**3**	**-**	**-**	**3**
3	-	Open Elective III	**4**	**-**	**-**	**4**
4	EC-PT-04	Grand VIVA	**-**	**-**	**-**	**6**
5	EC-PT-05	Project II	**-**	**-**	**30**	**15**
Total			**10**	**-**	**30**	**31**

List of Electives

A. Nanotechnology & Nanoelectronics (Credit: 3)
B. Biomedical Instrumentation(Credit: 3)
C. EDA for VLSI Design (Credit: 3)

Third Semester

EC-CF-01: SIGNAL AND SYSTEMS

Contact Hrs. /Week

L	T	P	Credit
4	-	-	4

Unit 1: Signal and System classification

Definition of signals and systems. Classifications of Continuous and Discrete Time signals- Periodic & Aperiodic; Energy & Power; Even & Odd; Basic test (singularity) Signals and its physical significance; Basic properties of systems; Idea of Linear time invariant [LTI] system.

Unit 2: Signal Representation and frequency analysis

Concepts of linear vector space and orthogonal signal representation; Fourier series representation of continuous-time signals. Fourier transform and its properties; Parseval's relation; Applications of Laplace transform in signal analysis; Relationship of Laplace and Fourier transforms.

Unit: Sampling and Fourier analysis of Discrete Time signals

Sampling of continuous Time signals and its Spectrum; ideal reconstruction; aliasing and its effects.Definition of DTFT and its properties, IDFT; DFT-definition & properties; Discrete convolution and duality; IDFT. Computation of DTFT and DFT; Basic idea of FFT computation; Discrete power spectral density.

Unit 4: Analysis of CT and DT LTI system

Block diagram representations; Impulse response; Representation of signals in terms of impulses; convolution sum and transfer function representation of discrete time linear time invariant systems; properties of LTI systems; Unit impulse response of an LTI system; Frequency domain analysis of LTI system; State variable representation of LTI systems.

Unit 5:Ztransforms

Definition, Region of convergence; properties; Evaluation of inverse z-transform; Relation with other transforms; Convolution, correlation- cross correlation and autocorrelation; LTI systems analysis using Z-transforms.

Text books

1. Ramakrishna Rao, P., “Signals and Systems”, 2nd Edition, TMH, [2008].
2. Allan V. Oppenheim, Wilsky, S, and Nawab, S. H., “Signals and Systems”, 8th Edition, Pearson Education, [2007].

References

1. Simon Haykins and Barry Van Veen., “Signals and Systems”, 16th Edition, JohnWiley and Sons, [2004].
2. Robert A. Gabel and Richard A. Roberts., “Signals and Linear Systems”, 3rdEdition, John Wiley, [1987].
3. Rodger E. Ziemer, William H. Tranter and Ronald Fannin, D., “Signals & Systems”, 4th Edition, Pearson Education, [2002].

EC-CF-02: SOLID STATE DEVICES

Contact Hrs/Credit

L	T	P	Credit
3	2	-	4

Unit 1:

Energy Bands and Charge Carriers in Semiconductors- Energy bands, E-k diagram; carrier charge and concentration; carrier drift, diffusion and recombination, quasi-Fermi energy level, surface effects.

Unit 2:

Transport phenomena in semiconductor junctions: Basic p-n junction and its fabrication; junction current flow, generation and recombination junctions with non-uniform doping, switching time, metal semiconductor junctions and hetero-junctions.

Unit 3:

Rectifier,Reversed-biased p-n junction, photovoltaic effect-solar cells, zener and tunnel diodes; Varactor, Semiconductor sensors and detectors. Elements of device fabrications technology.Opto-electronic Devices: Optical absorption, photo-detectors, LEDs and LCDs, Laser diode.

Unit 4:

Bipolar Transistor: Physical mechanism, current gain, minority current distribution; Punch-through and avalanche effect, small signal model CE, CB and CC configurations, Input and output characteristics (CE only).

Unit 5:

Field Effect Transistors: JFETS, IJFETS and MOSFETs; V-I characteristics; MOS-capacitors, flat band and threshold voltages; P and N-channel MOSFETS.

Text Books

1. Neamen- Semiconductor Physics and Devices- TMH
2. Bhattacharya & Sharma- Solid State Electronic Devices- Oxford
3. Maini&Agrawal- Electronics Devices and Circuits- Wiley
4. Streetman and Banerjee – Solid State Electronic Devices – PHI Learning.

Reference Books

1. Milman, Halkias&Jit- Electronics Devices and Circuits- TMH
2. Bell-Electronics Devices and Circuits-Oxford
3. Dimitrijev- Semiconductor Devices- Oxford
4. Singh & Singh- Electronics Devices and Integrated Circuits –PHI
5. Bogart, Bisley& Rice- Electronics Devices and Circuits- Pearson
6. Kasap-Principles of Electronic Materials and Devices- TMH
7. Boylestad&Nashelsky- Electronics Devices and Circuit Theory- Pearson

8. Salivahanan, Kumar &Vallavaraj- Electronics Devices and Circuits- TMH

EC-CF-03: SOLID STATE DEVICE LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	6	3

1. Characteristics of PN junction diode.
2. Characteristics of zener diode.
3. Characteristics of LED
4. Rectifier circuits .
5. Study of filter circuits.
6. CE Characteristics of transistor
7. CB Characteristics of transistor
8. Characteristics of JFET
9. Characteristics of MOSFET
10. Characteristics of UJT
11. Characteristics of SCR
12. Characteristics of TRIAC
13. Characteristics of DIAC .

EC-CF-04: ELECTROMAGNETIC THEORY

Contact Hrs/Week

L	T	P	Credit
4	-	-	4

Unit 1:

Fundamentals of Vector Algebra, Vector Calculus, Physical Interpretation of Differential Vector operations, Green's Theorem, Divergence &Stoke's Theorem, concept of scalar & vector Fields.

Unit 2:

Electrostatics, Gauss Law, Electric Potential, Laplaces'&Poissons' Equation, Boundary value problems, Method of Images, Energy storage in Electric Field.

Unit 3:

Magnetostatics, Faradays Law ,Amperes Law Dielectric & Magnetic Media, BiotSavart's Law, Magnetic Vector Potential, Relationship Between ES & MS Fields.

Unit 4:

Equation Of Continuity For Steady & Time Varying Currents, Maxwell's Law, Displacement Current & Displacement Current Density, Wave Equation, Phasor Concept for Time Harmonic Fields, Plane Waves in Simple Media &Lossy Media, Imhomogeneity&Ansotropy.

Unit 5:

Polarization, Poincare sphere, reflection & refraction at different Interfaces, Brewsters' Angle, Total Internal Reflection. Poynting Theorem,- General & Complex, Power & Power Density, Case studies for Power Flow Calculations. Magnetic current concept, Herz Potentials, Equivalence of Electric & Magnetic sources.

Text Books

1. Principles of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press.
2. Electromagnetic Waves Shevgaonkar, Tata-McGaw-Hillr –R K.

Reference Books

1. Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
2. Fields & Waves in Communication Electronics, S. Ramo, J. R. Whinnery& T. Van Duzer, John Wiley
3. Electromagnetic Theory & Applications, A. K. Saxena, Narosa Publishing House Pvt. Ltd. Electromagnetics, 2ed Edition – J AEdminister, Tata-McGraw-Hill.

4. Engineering Electromagnetics, 7thEdition-W.H.Hayt &J.A.Buck, Tata-McGraw-Hill

EC-CF-05: CIRCUIT THEORY AND NETWORK ANALYSIS

Contact Hrs/Week

L	T	P	Credit
3	2	-	4

Unit 1

Introduction to circuit elements, Kirchhoff's Voltage and Current laws, Network Theorems, Formulations of network equations, Loop analysis and Node analysis.

Unit-2

First –order systems, Introduction, Natural response of First order system, Initial conditions, complete response of First- order systems, zero state and zero input responses of First order system.
Second order system, Natural response, Over-damped, Under-damped and critically damped case. Geometry of plane, unit-step and unit impulse response, linear system with sinusoidal inputs, impedance and admittance, power.

Unit-3

Concept of Complex frequency, Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots.

Unit-4

Introduction to filter, Butterworth, Chebyshev, and Bessel type LP, HP, BP and BR filters. Characterization of LTI two port networks ZY, ABCD and h-parameters, reciprocity and symmetry. Inter relationships between the parameters, inter-connections of two port networks.

Unit-5

Attenuators, L-type network, T-type network, distributed and lumped network, graph of a network and its parts, oriented graph, tree, co-tree, loops, tri-set and cut-set matrices.

Text books

1. M.E. Van Valkenburg," Network Analysis", Prentice Hall of India
2. Donald E. Scott : "An Introduction to Circuit analysis: A System Approach" McGraw Hill Book Company.
3. A.Chakrabarti,'Circuit Theory" DhanpatRai and Co.
4. D.RoyChoudhary,"Networks and Systems" Wiley Eastern Ltd. W.H. Hayt and Jack E-Kemmerly, Engineering Circuit analysis" Tata McGraw Hill.

5. Ram Kalyan, Linear Circuits Oxford University Press.

EC-CF-06: NETWORK ANALYSIS LAB

Contact Hrs/Week

L	T	P	Credit
-	-	6	3

1. Familiarization of resistance color codes.
2. Study of unit step response of an RC circuit.
3. Study of unit step response of an RL circuit.
4. Study the unit step response of an RLC circuit.
5. Design a LPF for a given cut-off frequency.
6. Design a HPF for a given cut-off frequency.
7. Design a BPF for a given cut-off frequencies.
8. Design a series resonant RLC circuit.

EC-CC-01/EC-OE-01: DIGITAL ELECTRONICS CIRCUITS

Contact Hrs.'/Week

L	T	P	Credit
4	-	-	4

Unit 1: Boolean algebra And Minimization

Basic theorems – Boolean functions – Canonical and Standard forms – Minimization techniques – K-map up to five variables – NAND and NOR implementation – Exclusive- OR function - Hardware Description Language (HDL).

Unit 2: Digital Logic Families

Switching operation of PN junction diode – bipolar and MOS devices – Bipolar logic families – RTL – DTL – DCTL – HTL – TTL – ECL – MOS and CMOS – Tristate logic Interfacing of CMOS and TTL families, fan-out, fan-in.

UNIT 3: Combinational Logic Design

Design using gates – BCD arithmetic circuits – Binary adder – Subtractor – Multiplier –Divider – Design using MSI devices – Multiplexer and Demultiplexer as logic elements – Encoder and decoder – Parity checker – Parity generator – Code converter – Magnitude comparator.

Unit 4: Sequential Logic Design

Flip Flops and their conversions – Analysis and synthesis of synchronous sequential circuits – Excitation table – State table and state diagram – Design of synchronous counters – Analysis of asynchronous sequential circuits – Reduction of state and flow table – Race free state assignment – Design of Asynchronous counters – Timing diagram – Shift registers and their applications.

Unit 5: Memory Devices

Classification of memories – ROM organization – PROM – EPROM – EEPROM –EAPROM – RAM organization – Write operation – Read operation – Memory cycle –Timing wave forms – Memory decoding – Memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable LogicDevices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) –FieldProgrammable Gate Arrays (FPGA).

Text books

1. Morris Mano M., "Digital Design", 3rd Edition, Pearson Education, [2007].
2. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning,[2002].

References

1. John F.Wakerly, "Digital Design", 4th Edition, Pearson/PHI, 2006
2. Charles H.Roth, " Fundamentals of Logic Design", Thomson Learning, 2003.

3. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2003.

EC-CC-02: DIGITAL ELECTRONICS LAB

Contact Hrs/Week

L	T	P	Credit
-	-	6	3

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 & vice-versa.
3. 4-bit parity generator & comparator circuits.
4. Construction of simple Decoder & Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK & D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops & logic gates.
9. Realization of Universal Register using multiplexer & flip-flops.
10. Construction of Adder circuit using Shift Register & full Adder.
11. Realization of Asynchronous Up/Down counter.
12. Realization of Synchronous Up/Down counter.
13. Design of Sequential Counter with irregular sequences.
14. Realization of Ring counter & Johnson's counter.
15. Construction of adder circuit using Shift Register & full Adder.

Fourth Semester

EC-CC-03: ANALOG COMMUNICATION

Contact hrs. /Week

L	T	P	Credit
3	-	-	3

Unit 1: Signals and Spectra

An Overview of Electronic Communication Systems, Signal and its Properties, Fourier series Expansion and its Use, The Fourier Transform, Orthogonal Representation of Signal.

Random variables and processes:
Probability, Random variables, Useful Probability Density functions, Useful Properties and Certain Application Issues

Unit 2: Amplitude Modulation Systems

Review of spectral characteristics of periodic and non-periodic signals – Generation and demodulation of AM, DSBSC, SSB and VSB signals – Comparison of amplitude modulation systems – Frequency translation – FDM – Non-linear distortion.

Unit 3: Angle Modulation Systems

Phase and frequency modulation – Single tone – Narrow band and wideband FM – Transmission bandwidth – Generation and demodulation of FM signal.Pulse Modulation and Digital Transmission of Analog Signal**:** pulse Amplitude Modulation and Concept of Time division multiplexing, Pulse Width Modulation and Pulse Position Modulation, Signal conditioning-RZ, NRZ, Manchestor coding and there BW, Signal rate.

Unit 4: Noise Theory

Review of probability – Random variables and random process – Gaussian process – Noise – Shot noise – Thermal noise and white noise – Narrow band noise – Noise temperature – Noise figure.

Unit 5: Performance of CW Modulation systems

Super heterodyne radio receiver and its characteristic – SNR – Noise in DSBSC systems using coherent detection – Noise in AM system using envelope detection FM system – FM threshold effect – Pre-emphasis and de-emphasis in FM – Comparison of performances.

Text books

1. Dennis Roddy and John Coolen., “Electronic Communication”, 4th Edition, PHI,1995.
2. Herbert Taub and Donald L Schilling., “Principles of Communication Systems”, 3rd Edition, TMH, 2008.

References

1. Simon Haykin., “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
2. Bruce Carlson., “Communication Systems”, 3rd Edition, TMH, 1996.
3. Lathi, B. P., “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford Press, 2007.
4. John G. Proakis, MasoudSalehi., “Fundamentals of Communication Systems”, 5th Edition, Pearson Education, 2006.

EC-CC-04: ANALOG COMMUNICATION LAB

Contact Hrs/Week

L	T	P	Credit
-	-	6	3

1. Study of Amplitude Modulation & Demodulation techniques.
2. Study of Double Side Band Suppressed Carrier (DSB-SC) &Demodulationtechnique.
3. Study of Single Side Band Suppressed Carrier (SSB-SC) &Demodulationtechnique.
4. Study of Frequency Modulation & Demodulation.
5. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).
6. Study of Time Division Multiplexing (TDM) &Demultiplexing.
7. Study of Noise Effect in Audio circuits & in communication system.Determination of Signal to Noise Ratio (SNR).
8. Study Frequency Division Multiplexing (FDM) &Demultiplexing.
9. Study of a Superheterodyne Receiver.

EC-CC-05: ANALOG ELECTRONIC CIRCUITS

Contact Hrs. /Week

L	T	P	Credit
4	-	-	4

Unit 1: Biasing of BJTs and FETs, MOSFETS

Load lines (AC and DC), Operating Points, Fixed Bias and Self Bias, Voltage Divider Bias, DC Bias with Voltage Feedback, Bias Stabilization, Design Operation.

Unit 2: Multistage Amplifier

Need of multistage amplifier, voltage gain (V/V and dB), different coupling scheme, their merits and demerits, analysis of RC and direct coupled amplifiers using h- parameter model and frequency response.

Unit 3High Frequency Response of Transistor Amplifier

High frequency model for CE configuration, approximate CE high frequency model with resistive load, Tuned Amplifier: General behaviour of tuned amplifiers, resonance-series and parallel resonant circuit, calculations of circuit impedance at resonance. Feedback Amplifier: Feedback concept, characteristics of negative and positive feedback.

Unit 4: Oscillators

Oscillations ,frequency stability of oscillatory circuits, Tuned based Oscillators, Hartley Oscillator, Colpitts Oscillators, Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator. Oscillator circuit design using BJT, FET .

Unit 5:

Concept of multi-vibratorastable, monostable, and bistable and their applications Block diagram of IC555 and its working, IC555 as monostable and astable multi-vibrator.Linear voltage regulator: series and shunt. Switched mode power supply.

Text Book

1. Millman&Halkias – Integrated El;ectronics, Tata McGraw Hill.
2. Franco—Design with Operational Amplifiers & Analog Integrated Circuits, 3/e, TMH
3. Schilling &Belone—Electronic Circuit:Discrete& Integrated , 3/e ,TMH
4. Gayakwad R.A -- OpAmps and Linear IC's, PHI
5. Coughlin and Drisscol – Operational Amplifier and Linear Integrated Circuits –Pearson Education Asia.

Reference

1. Malvino—Electronic Principles , 6/e ,TMH
2. Millman&Taub- Pulse, Digital & switching waveforms- TMH
3. Horowitz & Hill- The Art of Electronics; Cambridge University Press.
4. Hayes & Horowitz- Student Manual for The Analog Electronics; Cambridge University Press.
5. Boyle'stead&Nashelsky: Electronic Devices & Circuit theory, PHI.
6. Millman&Halkias: Basic Electronic Principles; TMH.

7. Tobey &Grame – Operational Amplifier: Design and Applications, McGraw Hill.

EC-CC-06: ANALOGELECTRONICSLAB

Contact Hrs/Week

L	T	P	Credit
-	-	6	3

1. Obtain the Input and Output Characteristics of BJT in CE configuration.
2. Study of JFET drain and transfer characteristics.
3. Build and Test JFET CS amplifier and find performance parameters for JFET amplifier – Av, Ri, Ro.
4. Designand Test a single and multistage BJT (CE) amplifier and find performance parameters - Av, Ri, Ro, Ai
5. Study of MOSFET drain and transfer characteristics.
6. Design a Clipper circuit and obtain the characteristics.
7. Design a Clamper circuit and obtain the characteristics.
8. Design a RC phase shift oscillator and obtain the characteristics.
9. Design Wein bridge oscillator and obtain its characteristics.
10. Design a mono-stable and astable multi-vibrator circuit using IC 555 timer.

EC-CC-07: INSTRUMENTATION & MEASUREMENTS

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Unit 1: Instrumentation

Electronic instruments & their characteristics, a generalized instrumentation scheme, classification of instrumentation error & their statistical analysis; Basic instrumentation circuits- Operational amplifier application, Instrumentation amplifier.

Unit 2: Measurements

Measurement of current, voltage & power at audio & radio frequencies; Instrument transformers. Electronic voltmeters, vacuum tube voltmeters; True RMS-Responding voltmeter, digital voltmeter, Q meter, power factor meter; DC ammeters; ohmmeter, - Analog& digital Multimeter.

Unit 3: Transducers

Terminology and definitions, classification of Transducers, Strain gauges, Thermistors, LVDT, Capacitive transducer, Potentiometer, Thermocouple,Digital transducers.

Unit 4: Signal generators and CROs

Basic circuits for generation of square wave & triangular wave. Block diagram of laboratory square-wave & pulse generator. Basic block diagram of Function and sweep generator. Block diagram of CRO, CRT: construction principles of focusing & deflection of electron beam, Application of CRO, Different types of CRO. Introduction to spectrum analyser;

Unit 5: Displays Devices and recorders

Recorders; x-y recorders, strip- chart recorders, magnetic and potentiometric recorders.Digital displays; LED& LCD, Introduction to Data acquisition systems.

BOOKS RECOMMENDED

1. A.K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”,DhanpatRai and Sons.
2. B. Stout, “Basic Electrical Measurements”, Prentice-Hall.Inc.
3. WD. Cooper, “Electronic Instrumentation and Measurement Techniques”, Prentice-Hall.
4. BE. Jones, “Instrumentation, Measurement and Feedback”, McGraw-Hill.
5. B.E. Oliver and J.M. Cage, “Electronics Measurements and Instrumentation”, McGraw Hill

EC-CC-08: INSTRUMENTATION & MEASUREMENTS LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**6**	**3**

1. Study of DC Bridges. (Wheatstone bridge)
2. Calibration of single phase energy meter.
3. Calibration of current transformer.
4. Measurement of three phase power and power factor.
5. Digital to analog converter.
6. Analog to digital converter.
7. Calibration of three phase energy meter.
8. Study of pressure transducer.
9. Study of displacement transducer.
10. Instrumentation amplifier.

EC-CC-09 ANTENNA AND RADAR ENGINEERING

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
3	**-**	**-**	**3**

Unit 1: **Fundamental Concepts**

Physical concept of radiation, retardedpotentials, Hertzian dipole; Antenna parameters: Radiation pattern,gain, directivity, effective aperture, and reciprocity; Radiation fromdipoles of arbitrary length.Loop Antenna and Horn Antenna.

Unit 2: **Antenna Arrays**

Uniform linear arrays of isotropic elements, array factor and directivity. Broadside &Endfire array, principle of pattern multiplication. Synthesis of binomial and DolphChebyshevarrays.**Micro strip Antenna** – Basic Characteristics, Rectangular Patch, Circular Patch, Quality factor bandwidth and efficiency,

Unit3: **Broadband Antennas**

Log-periodic and Yagi antennas, frequencyindependentantennas,broadcastantennas.

Unit 4: **Introduction to Radar Systems**

Basic Principle; Block diagram and operation of Radar, Radar range Equation, PRFs and Range Ambiguities, Applications of Radar. Doppler Radars: Doppler determination of velocity, CW radar and its limitations, FMCW radar,

Unit 5: **Scanning and Tracking Techniques**

Various scanning techniques (Horizontal, vertical, spiral, palmer, raster, nodding), Angle tracking systems, Range tracking systems, Doppler (velocity) tracking systems.

BOOKS RECOMMENDED

1. Collin R.E, “Antennas and Radio Wave Propagation”, McGraw Hill.
2. K.D. Prasad, “Antenna and wave Propagation”, SatyaPrakashan.
3. Balanis C.A, “Antenna Theory”, John Wiley & sons
4. Krauss J.D, “Antenna Theory”, McGraw Hill.
5. Microwave devices and radar engineering by M.Kulkarni;Umesh Publications
6. Introduction to radar systems by Merill I. Skolnik

EC-CF-07:COMPUTER ARCHITECTURE AND ORGANIZATION

Contact Hrs. /Week

L	T	P	Credit
4	-	-	4

Unit 1: Basic Structure of Computers

Functional units – Basic operational concepts, bus structures, software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

Unit 2: Arithmetic

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers – Signed operand multiplication and fast multiplication – Integer division – Floating point numbers and operations.

Unit 3: Basic Processing Unit

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and controlConsideration – Superscalar operation.

Unit 4: Memory System

Basic concepts – Semiconductor RAM, ROM – Speed, size and cost – Cache memories – Performance consideration – Virtual memory – Memory management requirements – Secondary storage.

Unit 5: I/O Organization

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O interfaces (PCI, SCSI, and USB).

Text book

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky., "Computer Organization"5th Edition, TMH, 2002.

References

1. William Stallings, "Computer Organization & Architecture –Designing for Performance", 6th Edition, Pearson Education, 2003 reprint.
2. David A. Patterson and John L. Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002 reprint.
3. John P. Hayes, "Computer Architecture & Organization", 3rd Edition, TMH, 1998.

EC-CF-08: RANDOM PROCESSES, PROBABILITY THEORY & STATISTICS

Contact Hrs. /Week

L	T	P	Credit
4	-	-	4

UNIT1: Probability Theory

Definitions of Probability, Axioms of Probability, Probability Spaces, Properties of Probabilities, Joint and Conditional Probabilities, Independent Events.

UNIT2: Random Variables

Probability Distribution Functions, Probability Density Functions, Joint Distribution of Two Variables, Conditional Probability Distribution and Density, Independent Random Variables.

Unit 3: Statistics

Mean, Median, Mode and Standard Deviation; Samples Space; Correlation, Covariance; Sampling theory: Random sampling. Parameter, Statistic and its Sampling distribution.Standard error of statistics.

UNIT4: Statistical Averages

Functions of Random Variables and Random Vectors, Statistical Averages, Characteristic Function of Random Variables, Inequalities of Chebyshev and Schwartz, Convergence Concepts, Central Limit Theorem.

UNIT5: Random Processes

Stationarity, Ergoridicity, Covariance Function and their Properties, Spectral Representation, Weiner-Kinchine Theorem, Linear operations, Gaussian Function, Poisson Processes, Low-pass and Band-pass Noise Representation.

Textbook

1. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand andCo. New Delhi, 1998 (2nd Edition).
2. Probability Theory and Random Signal Principles, Peebles, Tata McGrew HillPublishers.

References

1. Signal Analysis, Papoulis, McGraw Hill N. Y., 1977.
2. Introduction to Random Signals and Noise, Davenport W. B. Jrs. and W. I.Root, McGraw Hill N.Y., 1954.

Fifth Semester

EC-CC-10: DIGITAL COMMUNICATION

Contact Hrs. /Week

L	T	P	Credit
3	-	-	3

UNIT I: Introduction

Digital Communication System Model, Modulation Process, AnalogVs. Digital Communication; Fundamental Limitations of Communication Systems.Random Variables Review.

UNIT II: Baseband Transmission

Introduction To PCM, Sampling, Reconstruction, Aliasing, Quantization, Quantization Error, Companding, Line Coding And Its Properties, Dynamic Range, Coding Efficiency, DM, ADM, DPCM, ISI, Matched Filter.

UNIT III:Pass band Transmission

Coherent And Non-Coherent Detection Of Signals In Noise, Generation And Detection Of ASK, FSK, PSK, DPSK, QPSK, OOK, QAM And MSK, Probability Of Error Analysis Of Digital Modulation Techniques, M-arySignalling, Eye Pattern.

UNIT IV: Spread Spectrum Communication

Spread Spectrum Technologies, Spreading Techniques, PN Sequences, Direct Sequence Spread Spectrum Systems, Frequency Hopping Spread Spectrum Systems, Hybrid Systems, Demodulation Schemes, RAKE Receivers, Use Of Spread Spectrum With Code Division Multiple Access

UNIT V: Information Theory

Measure of Information, Entropy, Channel Capacity and Shannon'sTheorems, Mutual Information, Introduction To Source Coding And Channel Coding Techniques.

RECOMMENDED BOOKS

1. Simon Haykin, Communication Systems, Fourth Edition, Wiley Publication.
2. Tomasi, Electronic Communication Systems, Fourth Edition, Pearson Publications.
3. Gary M. Miller, Modern Electronic Communication, Sixth Edition, Prentice-Hall.
4. F. G. Stremler and Addison-Wesley, Introduction to Communication Systems, Third Edition.
5. E.A. Lee and D.G. Messerschmitt, Digital Communication, Kluwer AcademicPublishers.
6. H. Meyr, M. Moeneclaey and S.A. Fechtel, Digital Communication Receivers, Wiley Publication.
7. J.Proakis, Digital Communications, Second Edition, McGraw Hill.

EC-CC-11: DIGITAL COMMUNICATION LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	4	2

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
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. Error Detection & Correction using Hamming Code.

EC-CC-12/EC-OE-03: MICROPROCESSOR

Contact Hrs/Week

L	T	P	Credit
4	-	-	4

UNIT I: Microprocessor Architecture

Evolution Of Microprocessors, Technological Trends In Microprocessor Development. The Intel Family Tree. CISC Versus RISC. Applications Of Microprocessors. Intel 8085 Microprocessor Architecture. Memory, Input And Output Devices, The 8085 MPU, The SDK-85 Memory System.

UNIT II:Programming the 8085

Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction Format. Data Transfer Operations, Arithmetic Operations, Logic Operations, Branch Operations. Stack, Subroutine.Writing Assembly Language Programs.

UNIT III:Interfacing Of Memory & I/O Devices

Basic Interfacing Concepts, Memory Interfacing, Interfacing Input Devices, Interfacing Output Devices. Memory- Mapped I/O, I/O- Mapped I/O. The 8085 Interrupt, 8085 Vectored Interrupts

UNIT IV: General –Purpose Programmable Peripheral Devices

The 8255A Programmable Peripheral Interface, Interfacing Keyboard And Seven-Segment Display, The 8254 Programmable Interval Timer, The 8259 A Programmable Interrupt Controller, Direct Memory Access (DMA) And The 8257 DMA Controller, Serial Communication And Programmable Communications Interface 8251.

UNIT V: Introduction to Microcontrollers

Introduction To Microcontrollers Embedded Versus External Memory Devices. Introduction to MCS-51 Architecture, 8051 Pin Description, Memory Organization.8051 Addressing Modes, Instruction Set Of 8051.

Text books

1. Ramesh S.Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, Penram International, Edition 3rd

References

1. Badri Ram., “Advanced Microprocessors & Interfacing” , Tata MC Graw Hill, Edition 1st
2. Charles M.Gilmore, “Microprocessor Principles and Applications”, TMH Edition 1997. Edition 2nd
3. Douglas V. Hall , “Microprocessors and Interfacing programming and Hardware”
4. Ali Mazidi, “The 8051 Microocntroller and embedded Systems”
5. D. KenethJ.Ayla, “Microcontroller 8051” , Penram International Publishing (India)
6. Rajiv Kapadia, “8051 Microcontroller & Embedded Systems”.,JaicoPublising House.
7. Ajay V. Deshmukh, Microcontrollers [Theory and Applications**]**, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.

EC-CC-13: MICROPROCESSOR LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	4	2

1. Familiarization of 8085 kits.
2. Verification of arithmetic and logic operations using above kits. (At least 5 programs).
3. Application of assembly language using 8085 instructions set to develop various programs
4. Study of interfacing of 8225 and 8155 with 8085 kit.
5. Study of dc motor control card using 8085 kit.
6. Study of 8051/8031 Micro controller kits.

EC-CC-14 DIGITAL VLSI DESIGN

Contact Hrs. /Week

L	T	P	Credit
4	-	-	4

Unit 1

Evolution of VLSI Technology and present stage and its limitation, Review microelectronics, design requirement, combinational logic, MOS transistor Enhancement & depletion mode transistors, CMOS processes, BiCMOS technology, transit voltage of CMOS inverter, NM.

Unit 2

MOS Transistors:Parameters pass transistor, NMOS inverters, CMOS Inverters, MOS Transistor circuit model, Latch up in CMOS circuits, Basic gates, Depletion & enhance mode pull ups, pull down transistor.

Unit 3

MOS Circuit Design Processes: MOS layers stick diagrams, design rules and layout, delay calculation of inverter, NAND gate, NOR gate etc. under different technology.

Unit 4

Basic circuit concepts-Sheet resistance concept applied to MOS transistors and Inverters Area Capacitance of layers, Inverter delays, Super buffers, propagation delays, miniaturization of CMOS Technology and its consequences.

Unit 5

Subsystem Design and Layout-Switch logic, gate logic, inverter, two input NMOS,CMOS and BICMOS NAND and NOR gates, Design of Combinational Circuits, PLA Design of Sequential Circuits – two phase clock dynamic, shift registers, register to register transfer, Finite State Machines.

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BOOKS RECOMMENDED

1. S.M.SZE—VLSI Technology Mc-Graw Hill.
2. Debaprasad Das, VLSI Design, Oxford University Press.
3. Murarka&Peckerar-- Electronic Materials, Science & Technology.
4. VLSI Design by Pucknell
5. CMOS Digital Integrated Circuits – S M Kang and Y Leblebici, TMH.

EC-CC-15: DIGITAL VLSI DESIGN LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	4	2

1. Design of CMOS inverter: Study VTC curve, propagation delay and power.
2. Design CMOS NAND and NOR gate.
3. Design of Layout of CMOS inverter, NAND and NOR gate.
4. Design of Half and Full adder using CMOS.
5. Design of Supper buffers using CMOS.
6. Design of RS, JK, and D flip-flops.

EC-CC-16: MICROWAVE ENGINEERING

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Unit 1

Introduction: microwave frequencies, Electron motion in EM field, impedance matching, Limitations of conventional tubes: Limitations of conventional vacuum tubes at VHF and UHF; Bandwidth limitation effects, Tube reactance effects and transit time effects;

Unit 2

Microwave Tubes- construction, operation and properties of Klystron Amplifier; reflex Klystron, Magnetron, TWT, BWO, Crossed field amplifiers.

Unit 3

Microwave Solid State Devices-Limitation of conventional solid state devices at MW, Transistors, Diodes, Transferred Electron Devices (Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD)

Unit 4

Microwave Components-Analysis of MW components using s-parameters, Junctions (E plane, H plane, Hybrid), Directional coupler,Bends and Corners, MW posts, S.S. tuners, Attenuators, Phase shifter, Ferrite devices (Isolator, Circulator, Gyrator), Cavity resonator.

Unit 5

Microwave Measurements: Measurement of VSWR, Power measurements using calorimeters and bolometers, impedance, insertion loss, scattering parameters and dielectric constantmeasurement.

BOOKS RECOMMENDED

1. Microwave devices and circuits: Samuel Liao;PHI
2. Microwave devices and radar engg: M.Kulkarni;Umesh Publications
3. Foundation of Microwave Engg :R.E.Collin;McGraw Hill
4. Microwave Engg: K.C Gupta , PEARSONS EDU
5. Microwave Engg. Passive circuits: Peter A. Rizzi

EC-CC-17 MICROWAVE ENGINEERING LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**6**	**3**

1. Determination of phase and group velocities in a waveguide carrying TE10 Wave from Dispersion diagram [ω−β Plot].
2. Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of thesusceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench.
3. Study of the characteristics of a Reflex Klystron oscillator
4. Study of Gunn-oscillator Characteristics using X-band waveguide test bench.
5. Measurement of coupling factor, Directivity, Insertion loss and Isolation of a Directional coupler using X-band waveguide test bench set up.
6. Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.
7. Experimental/Simulation Study of filter (LPF, HPF,BPF) response.
8. Measuring of dielectric constant of a material using waveguide test bench at X-band.

EC-CC-18: MICROELECTRONICS TECHNOLOGY

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
3	**-**	**-**	**3**

Unit 1

Introduction: Integrated circuits, advantages of IC are over Discrete Components, Evolution of IC technology.

Crystal Growth & Wafer Preparation: MGS, EGS, Czochralski crystal growth, Float zone technique, Bridgman technique, wafer shaping, wafer characterization, die, and crystal defects.

Unit 2

Lithography: Clean room, photolithography, E-beam lithography, X-ray Lithography, photoresist, mask, printing technique, reactive Plasma Etching, Plasma Properties, Feature Size control and anisotropic etching, Plasma etching techniques and equipment. Photolithography Thick Film and Thin Film Hybrid ICs - Features of Hybrid IC technology, Thick film technology, Thick film processing. Thick film substrates, Thick film design, guidelines and applications of thick film hybrids. Thin film technology, thin film processing, thin film design, guidelines, advantages and applications of thin film hybrids.

Unit 3

Epitaxial Growth, Oxidation, and Etching Oxidation: Thermal Oxidation Kinetics, Oxidation Techniques, Oxide Properties, Oxidation induced defects. Thin film deposition techniques: Epitaxy, VDE, CVD, PECVD, MOCVD, PVD, Sputtering ,MBE and epitaxial layer evaluations.

Monolithic IC Processes - Refining and growth of silicon crystals, Silicon-Wafer preparation, Diffusion of dopant Impurities, Defication system. Ion implantation Thermal oxidation.Photolithography.Fine Line Lithography, Relative Plasma etching, Chemical Vapour deposition (CVD) Silicon on insulators, Metallization.

Unit 4

Diffusion & Ion Implantation Monolithic Components - Epitaxial devices and their characteristics, Bipolar IC process.P-N junction Isolation, Monolithic Bipolar transistor constructions.Dielectricisolation.Isopolar and other IC structures, Monolithic Diodes, Monolithic Junction FETS, MOSFET technology, short channel MOS structures, Typical NMOS IC technologies for VLSI chips. Complementary Symmetry MOSFET technologies, Monolithic resistors.Monolithic capacitors, IC crossover, Process Monitoring.

Unit 5

Metallization & IC Packaging Basic Building Blocks for ICs - Bipolar Transistor current sources independent of supply voltage variations.

Books Recommended

1. Gary May & S M Sze, “Semiconductor Fabrication Principles”, Wiely.
2. S K Gandhi, “VLSI Fabrication Principles”,
3. J. Millman, “Microelectronics”, McGraw-Hill.
4. S. M. Sze, “*VLSI Technology”*, McGraw Hill International Edition.
5. D. Nagchoudhuri, “Principles of Microelectronics Technology”, A. H. Wheele

(Discipline Elective I)

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

EC-DE-01(A): CONTOL SYSTEMS

UNIT I

System Modelling: Introduction To Control System, Basic Elements In Control System, Open And Closed Loop Control Systems, Differential Equation Representation Of Physical Systems, Transfer Function, Mathematical Modeling Of Electrical And Mechanical Systems (Translational And Rotational), Analogous System, Block Diagram Representation Of Systems, Block Diagram Reduction Techniques, Signal Flow Graph.

UNIT II

Time Domain Analysis: Standard Test Signals, Time Domain Analysis Of First And Second Order Systems To Step, Ramp And Other Inputs, Steady State Error, Generalized Error Co-Efficient, Types Of Systems, Stability Analysis, Routh Hurwitz Criterion, Absolute And Relative Stability.

UNIT-III

Frequency Domain Analysis: Frequency Domain Analysis Of First And Second Order Systems To Step, Ramp And Other Inputs, Frequency Domain Specifications, Bode Plot, Phase Margin And Gain Margin, Polar Plot, Nyquist Stability Criterion.

UNIT-IV

Root Locus Technique: Root Locus Concept, Root Loci, Properties And Construction of RootLoci,Development Of Root Loci For Various Systems.

State Variable Analysis: Importance Of State Variable Analysis; Definition Of State, State Space, State Vector, SV Representation Of Physical Systems And Electrical Networks, Eigen Value And Eigen Vector, Determination Of Transfer Function Using SVA.

UNIT-V

Compensation: Necessity Of Compensation, Compensation Networks, Application Of Lag And Lead Compensation, Principle Of PI, PD And PID Compensation. Basic Modes Of Feedback Control.

BOOKS RECOMMENDED

1. Modern Control Engg. by K. Ogata, Prentice Hall, New Delhi
2. Control System Components by J.F. Gibsen, Mcgraw Hill, .
3. Automatic Control System by B.C. Kuo, Prentice Hall, 3 Ed.
4. Control System Engineering by I.J. Nagrath&Gopal, Wiley Eastern Ltd.

EC-DE-01(B): TELECOMMUNICATION SYSTEMS

UNIT I

Introduction: Network management standards, network management model, organization model, information model abstract syntax notation 1 (ASN.1), encoding structure, macros, functional model**,**Network management application functional requirements:Configuration management, fault management, performance management, Error correlation technology, security management.

UNIT II

Telecommunication management network (TMN) architecture: Terminology, functional architecture, information architecture, physical architecture, TNN cube, TMN and OSI.

UNIT III

Common management information service element (CMISE): CMISE model, service definitions, errors, scooping and filtering features,synchronization, functional units, association services, common management information protocol (CMIP) specification .

UNIT IV

Information Modeling for TMN: Rationale for information modeling, management information model, object oriented modeling paradigm, structure of management information, managed object class definition, management information base (MIB) .

UNIT V

Simple network management protocol: SNMPv1: managed networks, SNMP models, organization model, information model, SNMPv2 communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB, SNMPv2 protocol, compatibility with SNMPv1, SNMPv3, architecture, applications, MIB security, remote monitoring (RMON) SMI and MIB, RMQN1 and RMON2.

Recommended Books:

1. Network Management: Principles and Practice - Mani Subramanian, Addison Wesley, Pearson Education Asia publication.
2. Fundamentals of Telecommunication Network Management - Lakshmi Raman IEEE Communication Society, Prentice Hall of India Edition 1999
3. Telecommunication Network Management: Technologies and Implementations - Airdarous Salah, Plevyak Thomas. Prentice Hall of India
4. Telecommunication Network Management - Haojin Wang Mc- Graw Hill Professional Publication

EC-DE-01(C): Electronic Sensors and MEMS

Unit 1. Electronic Sensor: Pressure sensors, Piezo-resistance Effect, Piezoelectricity, Piezo-resistive Sensor, capacitive sensors, Inductive sensors, MEMS inertial sensors, micro-machined micro-accelerometer for MEMS, Parallel-plate Actuator, piezo-actuators.

Unit 2. Thermal Sensors: Temperature coefficient of resistance, Thermo-electricity, Thermocouples, Thermal and temperature sensors, heat pump, micromachined thermocouple probe, thermal flow sensors, shape memory allloy.

Unit 3. Introduction to MEMS: Introduction to MEMS and Microsystems, Materials and Substrates for MEMS, Sensors/Transducers, Sensors characterization and classifications, microactuators, Application of MEMS.

Unit 4. Material Properties: MEMS materials, structural and sacrificial materials, properties of silicon, mechanical, electrical and thermal properties of materials, Basic modeling of elements in electrical and mechanical systems.

Unit 5. MEMS Fabrication: MEMS Fabrication Technologies, single crystal growth, micromaching, photolithography, microsterolithography, thin film deposition, impurity doping, diffusion, etching, bulk and surface micromaching, etch stop technique and microstructure, LIGA.

Recommended Books:

Text Books

1. Analysis and Design Principles of MEMS Devices by MinhangBao, ELSEVIER.
2. M. J. Usher, “Sensors and Transducers”, McMillian Hampshire.
3. N. P. Mahalik, “MEMS” Tata McGraq Hill

References

1. R.S. Muller, Howe, Senturia and Smith, “Microsensors”, IEEE Press.
2. S. M. Sze, Semiconductor Sensors, Willy –Interscience Publications

Sixth Semester

EC-CC-19: COMPUTER COMMUNICATION AND NETWORKING

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
3	**-**	**-**	**3**

UNIT I: Introduction

Use Of Computer Networks, Network Hardware And Software; Layering, Reference Models And Their Comparison.

Physical Layer: Theoretical Basis For Data Communication, Transmission Media And Impairments, Switching Systems.

UNIT II: Data Link Layer

Design Issues, Framing, Error Detection and Correction, Elementary and Sliding Window Protocols, Examples Of Data Link Layer Protocols.

UNIT III: Medium Access Control Sub Layer

Channel Allocation Problem, Multiple Access Protocols, Ethernet, Data Link Layer Switching.

UNIT IV: Network Layer

Design Issues, Routing Algorithms, Congestion Control, QOS,Internetworking, IP and IP Addressing.

UNIT V: Transport Layer

Transport Service, Elements of Transport Protocols, TCP and UDP.
Application Layer: Network Security, DNS, SNMP, Electronic Mail, World Wide Web, Multimedia.

BOOKS RECOMMENDED

1. Computer Networks by Andrew S. Tanenbaum (3rd Edition), PHI.
2. Data and computer communications, 5th Ed,W.Stallings,PHI

EC-CC-20: COMPUTER NETWORKING LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**4**	**2**

1. Network components such as Modem, Gateways, Routers, Switches, Cables etc.
2. Various network softwares, services and applications.
3. Network trouble shooting Techniques: Trouble shooting basic TCP/IP problems.
4. Commands like ipconfig, getmac, tracert, pathping, arp, ping, netstat, finger etc.
5. Straight cabling, Cross cabling, Signal testing, T568A and B wiring standards (including hands on practice)
6. Program that prints the address of www.aus.ac.in
7. Program that prints all the addresses of www.indianrail.gov.in
8. Program that scans lower ports and prints them.
9. Program to list host names from command line, attempt to open socket to each one and print the remote host, the remote port, the local address and the local port.
10. Program for splitting the URLs entered into command line into component parts.
11. Program to list all the interfaces available on a workstation.
12. Program for “echo” client. The Client enters data to the server, and the server echoes the data back to the clients.
13. Program for “echo” Server. The Server listens at the port specified and reads from client and echoes back the result.
14. Program to write out “Hello World” to a serial port or to a USB to Serial Converter.

EC-CC-21/EC-OE-04: DIGITAL SIGNAL PROCESSING

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Unit 1

Advantages and typical applications of DSP; Review of discrete-time signal and system analysis.Samplingand discrete-time processing of continuous time signals; Decimation and interpolation. Review of Z-Transform & its properties, Review of Discrete Fourier transform and its properties;

Unit 2

Properties and applications of DFT, implementing linear time invariant systems using DFT; Implementation of DFT using convolution. FFT algorithms: Decimation in time (DIT), decimation in frequency (DIF); Use of the FFT Algorithm in Linear Filtering and Correlation; DCT and its applications

Unit 3

Design of digital IIR filters: Impulse invariant, and bilinear transformation techniques for Butterworth, Chebyshev and elliptic filters.

Unit 4

Design of FIR filters: Window technique, frequency sampling technique, optimum approximations of FIR filters; Multistage approach to sampling rate conversion**.** Comparison of FIR and IIR filters. Block diagrams and signal flow graphs for FIR and IIR systems. Direct form, cascade and parallel form for IIR

Unit 5

Adaptive Filters: Application of Adaptive Filters: System Identification or System Modeling, Adaptive Direct-Form FIR Filters-The LMS Algorithm: Minimum Mean Square Error Criterion; Adaptive Channel Equalization, Adaptive Noise Cancelling.

BOOKS RECOMMENDED

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, Pearson.
2. Digital signal Processing by Salivahanan, TMH
3. Johnny R. Johnson, Introduction to Digital Signal Processing..A. V. Oppenheim and R.W. Schafer, Digital Signal Processing, PHI Latest Edition.
4. A.V. Oppenheim and R.W. Schafer, Digital Signal Processing.
5. Sanjit and Mitra, Digital Signal Processing, Tata McGraw Hill.
6. A.V. Oppenheim and R.W. Schafer, Discrete Time Signal Processing,Pearson Education Ltd.

EC-CC-22: DIGITAL SIGNAL PROCESSING LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**6**	**3**

(Perform the following exercises using MATLAB)

1. To develop program for discrete convolution and correlation.
2. To develop program for finding response of the LTI system described by the difference Equation.
3. To develop program for computing inverse Z-transform.
4. To develop program for finding magnitude and phase response of LTI system described by system function H(z).
5. To develop program for computing DFT and IDFT.
6. To develop program for computing circular convolution.
7. To develop program for conversion of direct form realisation to cascade form realisation.
8. To develop program for cascade realisation of IIR and FIR filters.
9. To develop program for designing FIR filter.
10. To develop program for designing IIR filter.
11. Display filtered signals in time domain.
12. Determine the spectral characteristics of speech.

EC-CC-23: MICROCONTROLLER

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

UNIT1:
Microcontroller: Introduction, Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von- Neumann CPU architecture, The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, Stacks.

UNIT2:
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes, Bit inherent addressing, bit direct addressing. Instruction set: Instruction timings, 8051 instructions, Subroutine, Bit manipulation instruction.

UNIT3:
8051 programming, 8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming, External Memory interfacing,

UNIT4:

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, programming 8051 timers in assembly and C .

UNIT 5:

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232, Serial communication Programming in assembly and C. 8255A Programmable Peripheral Interface:, Architecture of 8255A, I/O addressing,, I/O devices interfacing with 8051 using 8255A.

EC-CC-24 MICROCONTROLLER LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	6	3

1. Study the architecture of 8051
2. Study the pin diagram of 8051
3. Addition/Substraction of two 16-bit nos.
4. Multiplication of 16 bit no by 8 bit no.
5. Division of 16 bit no by 8 bit no.
6. Exchange contents of block 1 with block 2.
7. Find largest no from given data of N –bytes.
8. Find smallest no from given data of N –bytes.
9. Average of an array of data.
10. Stepper motor interfacing with 8051 using 8255.
11. Interfacing of ADC, DAC, 7-segment display with 8051.
12. Study of interrupt in 8051.

(Discipline Elective – II)

EC-DE-02(A): ADVANCED DIGITAL SYSTEM DESIGN

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Unit 1:Combinational Logic Design:

Concept of hierarchical design, technology mapping, decoder & decoder based combinational circuit design, encoder & priority encoder, multiplexer & multiplexer based combinational circuit design, binary adders, binary subtractor, adder-subtractor, other arithmetic functions: contraction, increment/decrement, constant multiplication/division, zero filling, extension.

Unit 2:Sequential Circuits:

Basics of sequential circuits, latches, flip-flops, sequential circuit analysis, state equation, state diagram, state table, sequential circuit design, state assignment, state encoding, state machine diagram, design applications. Flip-flop timing, sequential circuit timing analysis.Concept of asynchronous & synchronous circuits.

Unit 3:Programmable Logic Design, Register, Counter:

Read only memory, programmable logic array, programmable array logic, field programmable array logic, registers: serial-in-parallel out, serial-in-serial-out, parallel-in-serial-out, parallel-in-parallel-out, register transfer operations. Micro-operations, arithmetic, logic, shift, arithmetic & logic shift, barrel shifter, counters.

Unit 4:Memory:

Basic definitions, random-access memory, SRAM integrated circuit, SRAM array, DRAM integrated circuit, DRAM types, DRAM array, CAM.

Unit 5:Computer design basics:

Datapath logic, arithmetic-logic unit, datapath representation, control logic, control word, simple computer architecture, instruction formats, instruction decoder, basic operation cycle, operand addressing, addressing modes, instruction set architectures,.

RECOMMENDEDBOOKS:

1. Morris Mano, Charles R. Kime, Tom Martin, “Logic and Computer Design Fundamentals”, Pearson.
2. Stephen Brown &ZvonkVranesic, “Fundamentals of digital logic with VHDL design”, TMH.
3. Charles H. Roth Jr, “Fundamentals of logic design”, Thomson Learning.
4. Donald G. Givone, “Digital principles and design”, TMH.
5. Thomas L. Floyd, Digital fundamentals”, Prentice Hall.

EC-DE-03(A): ADVANCED DIGITAL SYSTEM DESIGN LAB

Contact Hrs. /Week

L	T	P	Credit
-	-	4	2

LIST OF EXPERIMENTS:

All the experiments are to be carried out either using VHDL or Verilog.

1. Design of8-bit adder serial adder.
2. Design of 8-bit parallel-adder/subtractor.
3. Design of 8-bit signed & unsigned multiplier.
4. Design of 8-bit shift register.
5. Design of 8-bit counter.
6. Design of 8-bit ALU.
7. Design of finite state machines.

FPGA based experiments.

1. Design of full-adder.
2. Design of 4:1 multiplexer.
3. Design of 4-bit counter.
4. Design of 4-bit multiplier.

EC-DE-02(B): POWER ELECTRONICS

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Unit 1

Introduction to power electronics: Basic terminologies, definitions, comparison of conventional and power electronics; Characteristics of Selected Devices - Fast recovery diodes, Schottky diode, SCR, gate trigger and commutation circuits, protection circuits, series and parallel connection of SCRs, Diac, Triac, UJT, Power MOSFETs.

Unit 2

Controlled Rectifier - Half wave and full wave with resistive & R-L-E and resistive-inductive loads. Free-wheeling diode, three Phase rectifiers, and Bridge rectifiers -half controlled and fully controlled.

Unit 3

Inverters: Principle of operation, voltage driven inverters, current driven inverters; Single phase inverters – PWM techniques, Sinusoidal PWM, Choppers: Basic principles, Type A, B and C choppers Series and parallel turn-off choppers, Morgan choppers and Jones choppers. Cycloconverter: single phase bridge cycloconverter and its advantages and disadvantages

Unit 4 DC and AC Drives

DC Motor Speed control; Induction Motor Speed Control; Synchronous Motor Speed Control

Unit 5

A.C. Voltage Controllers - Types of AC Voltage Controllers, Integral cycle control, single phase voltage controller, Sequence control of AC voltage (Transformer tap changers)

BOOKS RECOMMENDED

1. P.C. Sen, “Power Electronics”,Tata McGraw Hill Publishing Co., Ltd
2. S.K. Dutta, “Power Electronics and Control” Prentice Hall of India Pvt. Ltd
3. P.S .Bimbra, “ Power Electronics” , Khanna publishers
4. Mohammed h Rashid, “ Power Electronics Circuits Devices and Applications” ,PHI , New Delhi
5. M D Singh and K .B.khanchandani, “Power Electronics”, Tata McGraw Hill Publishing Co., Ltd

EC-DE-03(B): POWER ELECTRONICS LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**4**	**2**

List of experiments with objectives and exercises

1.Characteristics of SCR

2.Characteristics of TRIAC

3.Characteristics of MOSFET and IGBT

4.Transient characteristics of SCR and MOSFET

5.AC to DC fully controlled converter

6.AC to DC half-controlled converter

7.Step down and step up MOSFET based choppers

8.IGBT based single-phase PWM inverter

9.IGBT based three-phase PWM inverter

10.Resonant dc-to-dc converter

EC-DE-02(C): IMAGE PROCESSING

L	T	P	Credit
4	-	-	4

Unit-1

Introduction
Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling andquantization.

Spatial Domain Filtering
Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Unit-2

Filtering in the Frequency domain
Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Image Restoration
Basic Framework, Interactive Restoration, Image deformation and geometric transformations, imagemorphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Unit-3

Image Compression
Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an informationsource, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG,
Lossless predictive coding, Lossy predictive coding, Motion Compensation

Unit-4

Wavelet based Image Compression
Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

Morphological Image Processing:
Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Unit-5

Image Segmentation
Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Recommended Books:

1. Digital Image Processing – Rafeal C. Gonzalez, Richard E. Woods – Pearson Education.
2. Image processing, analysis, and machine vision – Milan Sonka, Vaclav Hlavac, RogerBoyle – Thomson Learning.
3. Introduction to Digital Image Processing with MATLAB – Alas DairMcAndrew, Thomson Course Technology.

EC-DE-03(C): IMAGE PROCESSING LAB

L	T	P	Credit
-	-	4	2

1. Point processing in spatial domain

a. Negation of an image

b. Thresholding of an image

c. Contrast Stretching of an image

2. Bit Plane Slicing

3. Histogram Equalization

4. Histogram Specification

5. Zooming by interpolation and replication

6. Filtering in spatial domain

a. Low Pass Filtering

b. High Pass Filtering

c. Median filtering

7 . Edge Detection using derivative filter mask

a. Prewitt

b. Sobel

c. Laplacian

8. Data compression using Huffman coding

9. Filtering in frequency domain

a. Low pass filter

b. High pass filter

10. Hadamard transform

OPEN ELECTIVE I

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

Seventh Semester

EC-CC-25 ANALOG VLSI DESIGN

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

UNIT I: MOS TRANSISTOR THEORY

NMOS and PMOS transistors, CMOS logic, MOS transistor theory – Introduction, Enhancement mode transistor action, Ideal I-V characteristics, DC transfer characteristics, Threshold voltageBody effect- Design equations- Second order effects. MOS models and small signal AC characteristics, Simple MOS capacitance Models, Detailed MOS gate capacitance model, Detailed MOS Diffusion capacitance model

UNIT II: CMOS TECHNOLOGY AND DESIGN RULE

CMOS fabrication and Layout, CMOS technologies, P -Well process, N -Well process, twin -tub process, MOS layers stick diagrams and Layout diagram, Layout design rules, Latch up in CMOS circuits, CMOS process enhancements, Technology – related CAD issues, Fabrication and packaging.

UNIT III:CMOS current source/sink, current mirror, amplifier, common-source, common drain, common-gate configurations, voltage reference cascade amplifier.

UNIT IV:CMOS Differential Amplifier, current amplifier, output amplifier, compensation techniques.

UNIT V: VLSI Comparator, Switch capacitor circuits, Voltage Level Shifter, Digital-to-Analog Converter, Analog-to-Digital Converter.

Multiplexers, Decoders, comparators, priority encoders, Shift registers. Arithmetic circuits – Ripple carry adders, Carry look ahead adders, High-speed adders, Multipliers. Physical design – Delay modelling ,cross talk, floor planning, power distribution, Clock distribution, Basics of CMOS testing.

REFERENCES

1. Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2nd edition, 2000.
2. John P.Uyemura “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, Inc., 2002.
3. Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions, 1990.
4. Pucknell, “Basic VLSI Design”, Prentice Hall of India Publication, 1995.
5. Wayne Wolf “Modern VLSI Design System on chip. Pearson Education, 2002.

EC-CC-26 ANALOG VLSI DESIGN LAB

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**4**	**2**

4. Design of CMOS amplifier, obtain AC response.
5. Design of CMOS amplifier layout, DRC, LVS.
6. Design of CMOS current mirror.
7. Design of CMOS differential amplifier.
8. Design of CMOS OPMAP.
9. Design of voltage level shifter.
10. Layout design, DRC, LVS, extraction.

Discipline Elective – III

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
3	**-**	**-**	**3**

EC-DE-04(A): Optical Electronics and Optical Communication

Unit-1

The evolution of Fiber Optics Systems.Quantum Nature of Light, Optical Laws.Optical Fiber modes and configuration.SI, GI Fibers.Dispersion in Fibers.Fiber Loss. Signal Distortion in Optical Fibers.

Unit-2 :

LED structures.Spectral Distribution. Semi-Conductor Laser Diodes, types of laser diodes. Source to Fiber Launching. Lensing Schemes for Coupling improvement. Fiber to Fiber joints.Fiber Splicing.Optical Fiber connectors.Photodectectors. PIN Photodectector, Avalanche Photodectector. Optical Receiver operation.

Unit 3:

Technology: Propagation of signals in optical fiber: Light propagation in optical fiber, loss and bandwidth, chromatic dispersion, nonlinear effects, solitons and problems.

Unit 4:

Components: Couplers, isolators and circulators, multiplexers and filters, optical amplifiers, transmitters, detectors, switches, wavelength converters and splicer.

Unit 5:

Modulation and Demodulation: Modulation, Subcarrier modulation and multiplexing, spectral efficiency, demodulation, error detection and corrections and problems. Optical Networks.SONET/SDH Networks.Wavelength-Routed Networks Performance of WDM & EDFA Systems.Solitoin Optical Transmission.Optical CDMA.

Text Books: 1.

1. Optical Networks,R.Ramaswami, K.N.Sivarajan Elsevier

References Books:

1. Optical Communication System,J.Gower Prentice Hall of India

2. Optical Fiber Communication, John M. Senior Pearson Education

3. Optical Fiber Communication,Gerd Keiser McGraw Hill

4. Optical Networks, Rajiv Ramaswami Elsevier

5. Fiber-optic communication systems,Govind P. Agrawal John Wiley & sons

6. Fiber Optics and Optoelectronics, R.P. Khare Oxford University Press

EC-DE-04(B): ADVANCED COMMUNICATION

Unit 1 : Review of Digital Modulation Techniques: Review of digital modulation schemes and comparing in terms of BW, SNR, BER, bit/words rates in context to wireless Communication.

Unit 2 : Receiver Design: Receivers in additive white Gaussian noise channels, CPM, MSK, CPFSK; Intersymbol interference; Adaptive receivers and channel equalization.

Unit 3 : Carrier Synchronization: MMSE, ZFE, FSE; Carrier and clock synchronisation; Effects of phase and timing jitter.

Unit 4 : Channel Coding Scheme: Block codes, Convolutional codes and their performance evaluation; Coded modulation schemes: TCM; Turbocodes.

Unit 5 : Channel Modeling Techniques: Digital transmission over fading channels.

References books:

1. Principles of Digital Transmission with Wireless Applications S Benedetto and E Biglieri Kluwer Academic.
2. Principles of Digital Communication R G Gallager Cambridge University Press.
3. Digital Communications J G Proakis McGraw Hill.
4. Fundamentals of Digital Communication U Madhow Cambridge University Press.

EC-DE-04(C): EMBEDDED SYSTEMS

Unit 1

Introduction to Embedded System: Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of Embedded Systems, 'Smart' running shoes from Adidas – The Innovative bonding of Life Style with Embedded Technology.

Unit 2

The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System Components, PCB and Passive Components. Characteristics of Embedded System, Quality Attributes of Embedded System. Washing Machine – Application Specific Embedded System, Automotive – Domain Specific Example for Embedded System.

Unit 3

Hardware Software Co-Design and Program Modeling: Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language (UML), Hardware Software Trade-offs. Embedded Hardware Design and Development: Analog Electronic Components, Digital Electronic Components, VLSI and Integrated Circuit Design, Electronic Design Automation (EDA) Tools.

Unit 4

Embedded Firmware Design and Development: Embedded firmware Design Approaches, Embedded firmware Development Languages, Programming in Embedded 'C'.Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling: Putting them altogether, Task Communication, Task Synchronization, Device Drivers, How to choose an RTOS.

Unit 5

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware & Firmware, Board Power up. Integrated Development Environment (IDE), Types of files generated on cross-compilation, Disassembler/Decompiler, Simulators, Emulators & Debugging, Target Hardware Debugging, Boundary Scan.

Text Book:

1. Shibu K.V., Introduction to Embedded Systems, TMH Private Limited, New Delhi, 2009.

Reference Book

1. Peter Marwedel, Embedded System Design, Springer, 2006 http://ls12-www.cs.uni-dortmund.de/~marwedel/kluwer-es-book/
2. Wayne Wolf, Computers as Components, Morgan Kaufmann, 2001 http://www.ee.princeton.edu/~wolf/embedded-book
3. G. De Micheli, Rolf Ernst and Wayne Wolf, eds, Readings in Hardware/Software Co-Design, Morgan Kaufmann, Systems-on-Silicon Series Embedded
4. Frank Vahid and Tony D. Givargis, System Design: A Unified Hardware/Software Introduction, Addison Wesley, 2002.
5. Michael Barr, Programming Embedded Systems in C and C++, O'Reilly, 1999.
6. David E. Simon, An Embedded Software Primer, Addison Wesley, 1999.
7. Jack Ganssle, The Art of Designing Embedded Systems, Newnes, 2000.
8. K. Short,Embedded Microprocessor System Design, Prentice Hall, 1998.
9. C. Baron, J. Geffroy and G. Motet, Embedded System Applications, Kluwer, 1997.
10. Raj Kamal, Embedded Systems – Architecture, Programming and Design, Tata McGraw Hill Publishing Company Limited, New Delhi,

Discipline Elective - IV

Contact Hrs. /Week

L	T	P	Credit
3	-	-	3

EC-DE-05(A): MICROWAVE INTEGRATED CIRCUITS

Unit 1: Introduction: Lower Frequency Analog Design and Microwave Design Versus Radio Frequency Integrated Circuit Design, RFIC used in a Communication Transceiver, Review of Transmission Line Theory, Distributed Transmission Lines, Smith Chart, Impedance Matching, Microstrip and Coplanar Waveguide Implementations, S Parameters, Components and Interconnects at High frequencies.

Unit 2 : Issues in RFIC Design: Noise – Thermal Noise, Noise Power, Noise Figure, Phase Noise; Linearity and Distortion in RF Circuits – Third Order Intercept Point, Second Order Intercept Point, 1-dB Compression Point, Relationships between 1-dB compression point and IP3 Points, Broadband Measures of Linearity; Modulated Signals – PM, FM, MSK, QAM, OFDM.

Unit 3 : LNA Design: Basic Amplifiers, Feedback Techniques, Noise in Amplifiers, Linearity in Amplifiers, Stability Analysis, Differential Amplifiers, Low Voltage Topologies and Use of on-chip Transformers, DC Bias, Broadband LNA Design, CMOS LNA Example.

Mixers: Basic Mixer Operation, Transconductance Controlled Mixer, Double Balanced Mixer, Mixer Noise, Linearity, Isolation, Genera Design Comments, Image Reject and Single-Sideband Mixer, Alternative Mixer Designs, CMOS Mixer Example.

Unit 4 : Voltage Controlled Oscillators: LC Resonator, Analysis of Oscillator as Feedback System, Negative Resistance Oscillator, Differential Topologies, Colpitts Oscillator, Phase Noise Reduction Techniques, Quadrature Oscillators and Injection Locking. CMOS Example. Frequency Synthesis: PLL Components, Continuous Time Analysis of PLL Synthesizers, Discrete Time Analysis for PLL Synthesizers, Transient Behaviors, Fractional – N PLL Frequency Synthesizers, CMOS Example.

Unit 5 : Power Amplifiers: Introduction, Power Capability, Efficiency, Matching Considerations, Class A,B,C,D,E,F,G amplifiers, AC Load line, Transistor Saturation, Power Combining Techniques, Effects and Implications of Nonlinearity – Cross Modulation, AM – PM Conversion, Spectral Regrowth, Linearization Techniques, Feedforward, Feedback, Predistortion, CMOS Power Amplifier Example.

Reference books:

1. The Design of CMOS Radio-Frequency Integrated Circuits Thomas H. Lee Cambridge University Press.
2. Radio Frequency Integrated Circuit Design Rogers and PlettArtech House Publishers.
3. RF Power Amplifiers for Wireless Communications Steve C. Cripps Artech House Publishers.
4. Analysis and Design of Analog Integrated Circuits Gray, Hurst, Lewis & Meyer Wiley India Pvt Ltd.
5. Design of Analog CMOS Integrated Circuits B. Razavi TMH.

EC-DE-05(B):Principles of Electromagnetic and Electrostatic Compatibility

Unit 1 :
Sources of EMI, Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation- typical noise path- use of network theory- methods of eliminating interferences.

Unit 2
Cabling –capacitive coupling- inductive coupling- shielding to prevent magneticradiationshield transfer impedance, Grounding – safety grounds – signal groundssingle point and multipoint ground systems- hybrid grounds- functional ground layout – grounding of cable shields- ground loops-guard shields.

Unit 3:
power supply decoupling- decoupling filters-amplifier filtering –high frequency filtering shielding near and far fields-shielding effectiveness- absorption and reflection loss, Shielding with magnetic material- conductive gaskets,

Unit 4 Frequency versus time domain- analog versus digital circuits- digital logic noise- internal noise sources- digital circuit ground noise –power distribution-noise voltage objectives measuring noise voltages-unused inputs-logic families.
Unit 5

Static Generation- human body model- static discharges-ED protection in equipment design- ESD versus EMC, Industrial and Government standards – FCC requirements – CISPR recommendations-Laboratory techniques-Measurement methods for field strength-EMI.

REFERENCES

1. Henry W.Ott, " Noise reduction tech Henry W.Ott, " Noise reduction techniques in electronic systems", John Wiley & Sons, 1989.
2. Bernhard Keiser, "Principles of Electro-magnetic Compatibility", Artech House, Inc. (685 canton street, Norwood, MA 020062 USA) 1987.
3. Bridges, J.E Milleta J. and Ricketts.L.W., "EMP Radiation and Protective techniques", John Wiley and sons, USA 1976.
4. IEEE National Symposium on "Electromagnetic Compatibility", IEEE, 445, hoes Lane, Piscataiway, NJ 08855

EC-DE-05(C):Operating System

Unit I:

Introduction: Introduction to OS. Operating system functions, evaluation of O.S., Different types ofO.S.: batch, multi-programmed, time-sharing, real-time, distributed, parallel.
System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy,different types of protections, operating system structure (simple, layered, virtual machine), O/Sservices, system calls.Process Management: Processes: Concept of processes,processscheduling,operations on processes, co-operating processes, inter-process communication.Threads: overview, benefits of threads, user and kernel threads.

Unit II:

CPU scheduling: scheduling criteria, preemptive& non-preemptive scheduling, scheduling algorithms(FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.
Process Synchronization: background, critical section problem, critical region, synchronizationhardware, classical problems of synchronization, semaphores.
Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlockprevention, deadlock avoidance, deadlock detection, recovery from deadlock. Storage Management:

Unit III:

Memory Management: background, logical vs. physical address space, swapping, contiguous memoryallocation, paging, segmentation, segmentation with paging.
Virtual Memory: background, demand paging, performance, page replacement, page replacementalgorithms (FCFS, LRU), allocation of frames, thrashing.

Unit IV:

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block andcharacter devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/Osubsystem (scheduling, buffering, caching, spooling and device reservation, error handling),performance.Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), diskreliability, disk formatting, boot block, bad blocks.

Unit V:

File Systems: file concept, access methods, directory structure, file system structure, allocationmethods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping),directory implementation (linear list, hash table), efficiency & performance.Protection & Security: Goals of protection, domain of protection, security problem, authentication,one time password, program threats, system threats, threat monitoring, encryption.

Textbooks:

1. Tanenbaum A.S., Operating System Design & Implementation, Practice Hall NJ.
2. Milenkovie M., Operating System: Concept & Design, McGraw Hill.
3. Silbersehatz A. and Peterson J. L., Operating System Concepts, Wiley.

References:

1. Dhamdhere, Operating System, TMH
2. Stalling, William, Operating Systems, Maxwell McMillan International Editions, 1992.

Open Elective II

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

EC-PT-01: Seminar

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**2**	**1**

EC-PT-02: Project I

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**20**	**10**

EC-PT-03: Industrial Training

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**-**	**2**

Eighth Semester

EC-CF-09: INDUSTRIAL MANAGEMENT

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
3	**-**	**-**	**3**

Unit 1

Basic concepts of management, objectives, classification and hierarchy, different schools ofmanagement thought, principal functions of management, Management as an organizing and directing force.

Unit 2

Structure of the management decision making process, Organization structure, authority and responsibility, Organization dynamics, Managerial leadership, communication systems.

Unit 3

Managing human factors in business and industry, Industrial relation, Union activities, trade union acts, collective bargaining, procedure.

Unit 4

Organizational objectives and long range forecasting, planning, organizing, programming and controlling process, managerial control strategies; quantity and quality control, cost benefit analysis, present work and breakeven analysis, budgetary control, use of

Unit 5

Management science for the efficient administration of economic units, production, financial and marketing management.Adoption of statistical and computer methods and techniques to managerial research and managerial decision making and general management.

Books

1. Industrial Management - S C Jain, W S Bawa, DhanpatRai& Co. (P) Ltd.
2. Industrial Management, Vol.1 L.C. Jhamb, EPH,
3. Industrial Engineering & Production Management - MartandTelsang, S. Chand
4. Industrial & Business Management - Martand T. Telsang, S. Chand
5. Introduction to Materials Management - J Tony Arnold & Stephen N. Chapman, Pearson Education Asia
6. Production & Operations Management – Adam, Pearson Education /PHI
7. Industrial Relations, Trade Unions &Labour Legislation - Sinha, Pearson Education Asia

DISCIPLINE ELECTIVE – V

Contact Hrs. /Week

L	T	P	Credit
3	-	-	3

EC-DE-06(A): NANOTECHNOLOGY & NANO-ELECTRONICS

Unit 1

Unit-I: Introduction to Quantum Mechanics; Schrodinger equation and expectation values, Solutions of the Schrodinger equation for free particle, particle in a box, particle in a finite well, Reflection and transmission by a potential step and by a rectangular barrier.Introduction to Nanotechnology, review of various techniques and tools, future prospects ofnanotechnology, applications.

Unit 2

Synthesis techniques of nanoparticles: classical nucleation theory for cluster formation,sputtering and thermal evaporation and laser methods for nanoparticles' synthesis, particle synthesis by chemical routes. Synthesis of semiconductor nanoclusters.

Unit 3

Electronic Properties: Free electron theory of metals, Band theory of solids, Bloch theorem, Kroning-Penne model, Metals and Insulators, Semiconductors: Classification, Transport properties, Size and Dimensionality effects, Band structures, Brillouin zones, Mobility, Resistivity, Relaxation time, Recombination centers, Hall effects.

Unit 4

Properties of nanostructured materials: Magnetic properties, electrical transport properties, non-linear optical properties. Special nanomaterials, Porous silicon nanostructures - formation, optical properties; Fullerones - synthesis, properties and application.

Unit 5

Nanoelectronics - Nanodevices, nanotransistors, nanoelectrooptics, Nano structures in electronics, carbon nanotube, graphenenanoribbon, CNTFET, GNRFET, nanointerconnects.

Suggested Books

1. A.S Edelstein,Camarata, R.C, Nanomaterials synthesis, properties and application. Institute of Physics Publication.
2. Mark J. Madou. Fundamentals of Microfabrication: The Science of Miniaturization,CRC Press, 3rd edition.
3. Sibelia, J.P , A Guide to material characterization, Prentice Hall.
4. AjoyGhatak, S. Lokanathan, Quantum Mechanics: Theory and Applications, Volume 1,Springer Science and Business Media, 31-Mar-2004.
5. Paul Harrison, Quantum wells, Wires & Dots: Theoretical & Computational Physics of Semiconductors Nanostuructures, Wiley, 3rd edition.

EC-DE-06(B): BIOMEDICAL INSTRUMENTATION

Unit 1

What is bioengineering: Engineering versus Science, Bioengineering, Biochemical Engineering, Biomedical Engineering, and Career Opportunities? Medical Instrumentation: Sources of Biomedical Signals, Basic medical Instrumentation system, Performance requirements of medical Instrumentation system, use of microprocessors in medical instruments, PC based medical Instruments, general constraints in design of medical Instrumentation system & Regulation of Medical devices.

Unit 2

Bioelectrical Signals & Electrodes: Origin of Bioelectric Signals, Electrocardiogram, Electroencephalogram, Electromyogram, Electrode-Tissue Interface, Polarization, Skin Contact Impedance, Motion Artifacts. Electrodes for ECG: Limb Electrode, Floating Electrodes, Prejelled disposable Electrodes, Electrodes for EEG, Electrodes for EMG.

Unit 3

Physiological Transducers: Introduction to Transducers, Classification of Transducers, Performance characteristics of Transducers, Displacement, Position and Motion Transducers.

Unit 4

Strain gauge pressure transducers, Thermocouples, Electrical Resistance Thermometer, Thermister, Photovoltaic transducers, Photo emissive Cells & Biosensors or Biochemical sensor

Unit 5

Recording Systems: Basic Recording systems, General considerations for Signal conditioners, Preamplifiers, Differential Amplifier, Isolation Amplifier, Electrostatic and Electromagnetic Coupling to AC Signals, Proper Grounding (Common Impedance Coupling) .

Text Books

1. Introduction to Biomedical Engineering by Michael M. Domach, Pearson Education Inc,-2004
2. II-Hand Book of Biomedical Instrumentation-2nd Ed by R.S.Khandpur, Tata McGraw Hill, 2003.

Reference Books

1. Introduction to Biomedical equipment technology, 4e. By JOSEPH.J.CAAR & JOHN M.BROWN (Pearson education publication)
2. Medical Instrumentation-application & design. 3e – By JOHN.G.WEBSTER John Wiley & sons publications
3. Leslie. Cromwell – Biomedical instrumentation & measurements, 2e PHI (4) Dr. M. Arumugam – Biomedical instrumentations, Anuradha Publishers.

EC-DE-06(C): EDA for VLSI design

Unit 1

Introduction to Application specific Integrated circuits(ASICs) &design automation. VLSI Design Styles, VLSI design flow, Moore's law, VLSI CAD tools.

Unit 2

Standard Cell Library: Design, Characterization, Wire Load Model, Layout Design, Design rule check, Layout vs. Schematic, Parasitic extraction.

Unit 3

Physical Design: Floorplanning, Partitioning, Placement, Routing, Slicing and non-slicing floor planning, algorithms, compaction, Lee's routing, High-tower algorithm.

Unit 4

Logic Level Synthesis and Optimization of Combinatorial and Sequential circuits.Timing Analysis in VLSI Circuits.

Unit 5

VLSI Testing: Faultmodeling, Simulation, Test generation, and Design for Testability. Physical verification.

Text books

1. M.J.S Smith, "Application-Specific Integrated Circuits ", Addison-Wesley Professional 2008 .
2. Neil H.E. Weste, Kim Haase, David Harris, A. Banerjee , "CMOS VLSI Design: A circuits andSystems Perspective", Pearson Education, 3rd edition.
1. WayneWolf,FPGA-Based System design, Prentice Hall Modern Semiconductor Design Series,Kindle Edition.
2. G.Hatchel and F.Somenzi , Logic Synthesis and verification Algorithms,Kluwer,1998.
3. Debaprasad Das, "VLSI Design", OUP, Second Edition.
4. Sherwani, Naveed A,"Algorithms for VLSI Physical Design Automation", Springer, 3rd edition.
5. P.J Anderson , "The designer's guide to VHDL" , Morgan Kaufman , 2nd edition ,2002.
6.

Open Elective III

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
4	**-**	**-**	**4**

EC-PT-04: Grand Viva

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**-**	**6**

EC-PT-05: Project II

Contact Hrs. /Week			
L	**T**	**P**	**Credit**
-	**-**	**30**	**15**