Syllabus Approved by BOS
on

19.07.2013

of

B.Tech

Electronics Engineering Stream

Electronics Engineering Department

HBTI, Kanpur

Index

Name of Course: B. Tech.
Year I, Semester-I

Study & Evaluation Scheme
[Effective from 2013-14]

Branch: Electronics Engineering

S. No.	Course Code	Subject	Periods			Evaluation Scheme				**Subject Total**	**Credit**
						Sessional			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IMA101	Mathematics I	3	1	0	30	20	50	100	150	4
2.	IPH101	Physics	3	1	0	30	20	50	100	150	4
3.	IEE101	Electrical Engineering	3	1	0	30	20	50	100	150	4
4.	IME101	Engineering Mechanics	3	1	0	30	20	50	100	150	4
5.	IHU101	Professional Communication	3	1	0	30	20	50	100	150	4
6.	IHU102	Remedial English	2	0	0				50	50	Audit
		Practical /Design/Drawing									
7.	IPH151	Physics	0	0	3	15	10	25	25	50	1
8.	IHU151	Language Lab	0	0	3	15	10	25	25	50	1
9.	IEE151	Electrical Engineering	0	1	3	30	20	50	50	100	2
10.	IGP101	General Proficiency	-	-	-	-	-	50	-	50	
										1000	

TA- Teachers assessment ESE- End semester examination CT- cumulative test

Note- Duration of ESE shall be 3 (Three) hours for subjects carrying 100 marks and 2 (Two) hours for those carrying 50 marks

Name of Course: B. Tech
Year I, Semester-II

Study & Evaluation Scheme
[Effective from 2013-14]

Branch: Electronics Engineering

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				**Subject Total**	**Credit**
						SESSIONAL			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IMA 201	Mathematics II	3	1	0	30	20	50	100	150	4
2.	ICY 201	Chemistry	3	1	0	30	20	50	100	150	4
3.	IET 201	Electronics and Instrumentation Engineering	3	1	0	30	20	50	100	150	4
4.	ICS 201	Concepts of Computer and C programming	3	1	0	30	20	50	100	150	4
5.	ICE 201	Engineering Graphics	3	1	0	30	20	50	100	150	4
6.	ICE 201	Environment and Ecology	2	0	0				50	50	Audit
		Practical /Design/Drawing									
7.	ICY 251	Chemistry	0	0	3	15	10	25	25	50	1
8.	ICS 251	Computer Lab	0	0	3	15	10	25	25	50	1
9.	IWS 251	Workshop Practice	0	1	3	30	20	50	50	100	2
10.	IGP 201	General Proficiency	-	-	-	-	-	50	-	50	
11.						-	-	-	-	1000	

TA- Teachers assessment ESE- End semester examination CT- cumulative test
Note- Duration of ESE shall be 3 (Three) hours for subjects carrying 100 marks and 2 (Two) hours for those carrying 50 marks

Name of Course: B. Tech.
Year II, Semester-III

Study & Evaluation Scheme
[Effective from 2014-15]

Branch: Electronics Engineering

S. No.	Course Code	Subject	Periods			Evaluation Scheme				**Subject Total**	**Credit**
						Sessional Exam			ESE		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IMA 302	Computer Oriented Numerical and Statistical Techniques	3	1	0	30	20	50	100	150	4
2.	IEE 303	Networks Analysis and Synthesis	3	1	0	30	20	50	100	150	4
3.	IEE 302	Electrical Measurements and Measuring Instruments	3	1	0	30	20	50	100	150	4
4.	IET 301	Solid State Devices And Circuits	3	1	0	30	20	50	100	150	4
5.	IET 302	Digital Electronics	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
6.	IEE 353	Network Lab	0	0	2	15	10	25	25	50	1
7.	IMA 352	Numerical Techniques Lab	0	0	2	15	10	25	25	50	1
8.	IET 351	Solid State Devices and Circuits Lab	0	0	2X2	30	20	50	50	100	2
9.	IGP 301	General Proficiency	-	-	-	-	-	50	-	50	
		Total	15	5	8	-	-	-	-	1000	

Name of Course: B. Tech.
Year II, Semester-IV

Study & Evaluation Scheme
[Effective from 2014-15]

Branch: Electronics Engineering

S. No.	Course Code	SUBJECT	Periods			Evaluation Scheme				**Subject Total**	**Credit**
						Sessional			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	ICS 407	Data Structures	3	1	0	30	20	50	100	150	4
2.	IEE 405	Electrical Machines	3	1	0	30	20	50	100	150	4
3.	IET 401	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
4.	IET 402	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	IPH 401	Solid State Physics	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
7.	ICS 455	Data Structures Lab	0	0	3	15	10	25	25	50	1
8.	IEE 455	Electrical Machines Lab	0	0	3	15	10	25	25	50	1
9.	IET 451	Electronic Workshop and PCB Lab	0	0	3	15	10	25	25	50	1
10.	IET 452	Digital Electronics Lab	0	0	3	15	10	25	25	50	1
	IGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		Total	15	5	12	-	-	-	-	1000	

Name of Course: B. Tech.
Year III, Semester-V

Study & Evaluation Scheme
[Effective from 2015-16]

Branch: Electronics Engineering

S. No.	Course Code	Subject	Periods			Evaluation Scheme				**Subject Total**	**Credit**
						Sessional			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IHU 501	Industrial Economics and Principle of Management	3	1	0	30	20	50	100	150	4
2.	IEE	Automatic Control System	3	1	0	30	20	50	100	150	4
3.	IET 501	Analog Communication	3	1	0	30	20	50	100	150	4
4.	IET 502	Antenna and Microwaves	3	1	0	30	20	50	100	150	4
5.	IET 503	Microprocessors	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
6.	IET 551	Analog Communication Lab	0	0	2X2	30	20	50	50	100	2
7.	IET 552	Microprocessor Lab	0	0	2X2	30	20	50	50	100	2
8.	IGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		Total	15	5	8	-	-	-	-	1000	

Name of Course: B. Tech.
Year III, Semester-VI

Study & Evaluation Scheme
[Effective from 2015-16]

Branch: Electronics Engineering

S. No.	Course Code	Subject	Periods			Evaluation Scheme				**Subject Total**	**Credit**
						Sessional			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IEE 603	Power Electronics	3	1	0	30	20	50	100	150	4
2.	IET 601	Analog Integrated Circuits	3	1	0	30	20	50	100	150	4
3.	IET 602	Digital Communication	3	1	0	30	20	50	100	150	4
4.	IET 603	Advanced Instrumentation	3	1	0	30	20	50	100	150	4
5.	IET 604	VLSI Design	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
6.	IEE 653	Power Electronics Lab	0	0	2	10	10	20	30	50	1
7.	IET 651	Analog Integrated Circuits Lab	0	0	2X2	30	20	50	50	100	2
8.	IET 652	VLSI Design Lab	0	0	3	15	10	25	25	50	1
9.	IGP 601	General Proficiency	-	-	-	-	-	50	-	50	
		Total	15	5	10	-	-	-	-	1000	

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

Name of Course: B. Tech.
Year IV, Semester-VII

Study & Evaluation Scheme
[Effective from 2016-17]

Branch: Electronics Engineering

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				**Subject Total**	**Credit**
						SESSIONAL			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.		Open Elective	3	1	0	30	20	50	100	150	4
2.	ICS	Computer Network	3	1	0	30	20	50	100	150	4
3.	IET 701	Digital Signal Processing	3	1	0	30	20	50	100	150	4
4.	IET 702	Wireless Communications	3	1	0	30	20	50	100	150	4
5.	IET	Elective-I	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
6.	IET 751	Digital Signal Processing Lab	0	0	3	15	10	25	25	50	1
7.	IET 752	Project	0	0	6	-	-			100	2
8.	IET 753	Industrial / Practical Training and Report Presentation	0	0	3	-	50	50	-	50	1
9.	IGP 701	General Proficiency	-	-	-	-	-	50	-	50	
		Total	15	5	12	-	-	-	-	1000	

Name of Course: B. Tech.
Year IV, Semester-VIII

Study & Evaluation Scheme
[Effective from 2016-17]

Branch: Electronics Engineering

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional			Examination		
		Theory	L	T	P	CT	TA	Total	ESE		
1.	IHU 801	Engineering Economics and Management	3	1	0	30	20	50	100	150	4
2.	IET	Elective-II	3	1	0	30	20	50	100	150	4
3.	IET	Elective-III	3	1	0	30	20	50	100	150	4
4.	IET 801	Optical Communication	3	1	0	30	20	50	100	150	4
		Practical/Training/Project									
5.	IET 851	Seminar	0	0	3	15	10	25	25	50	1
6.	IET 852	Communication Lab	0	0	3	15	10	25	25	50	1
	IET 853	Project			10				250	250	4
7.	IGP 801	General Proficiency	-	-	-	-	-	50	-	50	
		Total	12	4	16	-	-	-	-	1000	

	Elective I		**Elective II**		**Elective III**
IET 711	Satellite Communications	IET 821	Telecommunication Switching	IET 831	Information Theory and Coding
IET 712	VLSI Technology	IET 822	Digital System Design Using VHDL	IET 832	Embedded Systems
IET 713	Optoelectronics	IET 823	VLSI system Design	IET 833	Architecture and Application of Digital Signal Processors
IET 714	Radar Engineering	IET 824	Image Processing	IET 834	Optical Networks
IET 715	Fuzzy Logic with Electronics Engineering Applications	IET 825	Advanced Semiconductor Devices	IET 835	Bio Medical Signal Processing

List of Open Electives

1. **Fuzzy Logic with Electronics Engineering Applications**
2. **Biomedical Electronics**
3. **Digital Signal Processing**
4. **Mobile Communication**
5. **VLSI System Design**
6. **Satellite Communications**
7. **Image Processing**

Electronics and Instrumentation Engineering (IET 101/ IET 201)

P-N Junction Diode, V-I Characteristics, Diode Application as Rectifier (Half Wave & Full Wave), Zener Diode and its Applications.

Introduction of Bipolar Junction Transistor, FET: Applications, demo, explanation,
OPAMP and its Applications

Boolean Algebra, Logic Gates, Concept of Universal Gate.
Basic Combinational Circuits: Adder, Subtractor.
Sequential Circuits: Flip-Flops, Registers.

Functional Elements of Instruments, Classification & Characteristics, Types of Errors,
Active and Passive Transducers and their Characteristics, LVDT

Display Devices: Seven Segment Display, Alphanumeric Display, LCD, Dot Matrix Displays.
Electronic Ammeter and Voltmeter, Digital Multi-meter, Cathode Ray Oscilloscope.

Text Books:

1. Malvino, A.P. / "Electronics Principles" / Tata McGraw-Hill / 6th Ed.
2. Boylestad, Robert & Nashelsky, Louis / "Electronic Devices & Circuit Theory" / Prentice Hall of India / 8th Ed.
3. H.S. Kalsi / "Electronic Instrumentation" / Tata McGraw-Hill
4. Malvino & Leach / "Digital Principles & Applications" / Tata McGraw-Hill / 5th Edition

Reference Books:

1. Sedra, Adel S., Smith, Kenneth C. / "Microelectronic Circuits"/ Oxford University Press / 5th Edition
2. Sawhney AK/ "Electrical and electronic Measurement and Instrumentation"/ Dhanpat Rai & sons.
3. Lectures of NPTEL

Solid State Devices and Circuits (IET 301)

Diodes: Energy Band Theory of Crystals, Semiconductors, Mechanism of Conduction, Mass Action Law, Drift and Diffusion Currents, Semiconductor Equations, P-N Junction Diode, Depletion Region, Transition Capacitance, Junction Breakdown Diodes. Diffusion Capacitance, I-V Characteristics and Equation, Models: Piece wise & Small Signal, Effect of Temperature, Switching Characteristics, Special Diodes: Zener, LEDs, Varactors, Photodiodes, Schottky Barrier Diodes.

Transistors: Introduction to Bipolar Junction Transistors, Basic Transistor Operation, Transistor current components.

Field Effect Transistors: Theory and Operation of MOSFET, I-V Characteristics, Biasing, MOSFET circuits at DC, MOSFET as an amplifier and as as a switch, Biasing in MOSFETs

Analysis of Single Stage MOS Amplifier: Small signal Operation and Model, Analysis of Single Stage CS, CG & CD (MOSFET Amplifiers) in Mid-band & High Frequency Region, Analysis of Single Stage CS, CG & CD (MOSFET Amplifiers) in Mid-band and High Frequency region, Frequency Response of the CS Amplifier

Classification of Amplifiers: Multistage Amplifiers, Power Amplifiers, Feedback Amplifiers, Basic Concept of Feedback, Effect of Negative Feedback, Simple Analysis, and Stability of Feedback Amplifier.

Oscillators and Power Supplies: Condition for Oscillations, Generalized form of Hartley & Colpitts Oscillators, Op-Amp Based RC Phase Shift, Wein Bridge, Crystal Oscillators, Frequency Stability. Power Supply: Unregulated Power Supply, Ripple Factor, Filters, Rectifier Efficiency. Regulated Power Supply, Regulation, Shunt Regulators, Series Regulators.

Text Book:

1. Millman, J. & Halkias, C. / "Integrated Electronics" / McGraw-Hill International.
2. Sedra, Adel S., Smith, Kenneth C. / "Microelectronic Circuits"/ Oxford University Press / 5th Edition
3. Shilling, D. H. & Belove, Ch. / "Electronic Circuit"/ McGraw-Hill International.

Reference Books:

1. Streetman, B.G. & Banerjee, Sanjay / "Solid State Electronic Devices" / Prentice Hall (India) / 5th Ed / Pearson Education
2. Bell, David A. / "Electronic Devices & Circuits"/ Prentice-Hall (India), 4th Ed.
3. Millman, J. and Grabel, A. / "Microelectronics"/ McGraw –Hill.
4. Nair, B. Somanathan /"Electronic Devices & Applications"/ Prentice-Hall (India)
5. Nagrath , I.J. / "Electronics, Analog & Digital"/ Prentice-Hall (India).
6. Neamen, Donald A. / "Electronic circuit Analysis & design" / Tata McGraw Hill
7. Neamen, Donald A. / "Semiconductor physics & Devices" / Tata McGraw Hill
8. Salivahanan, S. & Kumar, Suresh N. & Vallavraj / "Electronic Devices & Circuits" / Tata McGraw-Hill.
9. Schaum's Outlines / "Electronic Devices & Circuits"/ Tata McGraw Hill, 2nd Ed.
10. Lectures of NPTEL

Digital Electronics (IET 302)

Logic Families: CMOS Logic, CMOS Dynamic Electrical Behaviour, Bipolar Logic: Diode Logic, Transistor Logic Inverter, TTL Logic, NMOS, CMOS / TTL Interface, ECL
Number System: Representation of Negative Numbers & 1's Complement, 10's Complement, Arithmetic Using 2's Complement.
Minimization of Boolean Function, "Don't-Care" Input Combinations, K-Map Minimization Using Tabular Method
Combinational Logic Design: Decoders, Encoders, Tri State Devices, Multiplexers, Comparator, Adder, Subtractor, ALU
Sequential Logic Design: Latches & Flip-Flops, Clock Synchronous State Machine Analysis & Design, Designing State Machine using State Diagram, Timing analysis of digital circuits, Counter, Counter Design, Shift Registers, Introduction to HDL
Memory, CPLDs & FPGAs:
ROM, R/W Memory, SRAM, DRAM, CPLD, FPGA

Text Books:

1. Wakerly, John F. / "Digital Design Principles & Practices" / Pearson Education / 3rd Ed.

References Books:

1. Bartee , Thomas C. / "Fundamentals of Digital Computers"/ Tata McGraw-Hill
2. Gopalan, K. "Gopal" / "Introduction To Digital Microelectronic Circuits" / Tata McGraw-Hill
3. Taub, Herbert & Schilling, Donald / "Digital Integrated Electronics"/ Tata McGraw-Hill
4. Millman, Jocob & Taub, Herbert / "Pulse, Digital & Switching Waveforms" / Tata McGraw-Hill
5. Mano, M. Morris / "Digital Design"/ Prentice Hall /
6. Malvino, A.P. & Leach, Donald P. / "Digital Principles & Applications" / Tata McGraw-Hill
7. Mano, M. Morris / "Digital Logic and Computer Design"/ Prentice Hall (India)
8. Tokheim, H. Roger L. /"Digital Electronics Principles & Application"/ Tata McGraw-Hill / 6th Ed.
9. Lectures of NPTEL

Solid State Devices and Circuits Lab (IET 351)

For ET Students

1. Study of CRO and measurement of Phase Difference & Frequency.
2. Measurement of Low Resistance using Kelvin's Double Bridge.
3. Study of LCR bridge.
4. Characteristics of Diode: Semiconductor PN Junction Diode, Zener Diode.
5. Diode as a Circuit Element:
6. Rectifiers - Half-wave, Full-wave & Bridge Rectifiers
7. Performance of RC Filters, Half-wave & Full-wave Rectifiers.
8. I/P and O/P Characteristics of BJT: CE Configuration.
9. Drain and Transfer Characteristics of FET.
10. Switching Characteristics of FET.
11. Biasing of FET in CS configuration.
12. Measurement of h-parameters of FET Amplifier.
13. Op Amp as Adder, Subtractor & Integrator, Instrumentation Amplifier.
14. Realization of fixed frequency Wein Bridge Oscillator.
15. Design, Implementation and Testing of Amplifier/ Filter

ELECTRONICS LAB (IET 352)

Only for EE Students

1. Study of CRO and multimeter applications.
2. Plot V-I characteristics of junction diode under forward and reverse-biased.
3. Draw the waveshape of the electrical signal at the input and output points of the half-wave, full wave and bridge rectifiers.
4. Plot the V-I characteristics of Zener diode.
5. Plot the input / output characteristics for the common base transistor.
6. Plot output characteristics of FET & measure pinch –off voltage. Calculate FET parameters at a given operating point.
7. Realize a voltage regulator using zener diode and study the load characteristics.
8. Design of P.S: 220/230V(AC), 5VDC, 200ma.

Electromagnetic Field Theory (IET 401)

Review of
Vector Analysis, Static Electric Fields, Solution of Electrostatic Problems,
Review of
Steady Electric Currents, Static Magnetic Fields
Time Varying Fields
Faraday's Law of Electromagnetic Induction, Maxwell's Equations., Potential Functions, Electromagnetic Boundary Conditions, Wave Equations & Their Solutions , Time Harmonic Fields
Plane Electromagnetic Waves: Plane Waves in Lossless & Lossy Media, Group Velocity, Poynting Vector & Poynting Theorem, Refractions and Reflections at Normal and Oblique Incidence at Plane Conducting and Plane Dielectric Boundary
Transmission Lines
Transverse Electromagnetic Wave Along a Parallel Plate Transmission Line, Transmission-Line Equation, Wave Characteristics on Finite Transmission Lines, Transient on Transmission Lines Transmission Line as circuit element, Transmission Line Impedance Matching, Smith Chart, Introduction to Wave Guides

Text Books:

1. Cheng, David K. / "Field & Wave Electromagnetics" / Pearson Education / 2nd Ed.

Reference books:

1. Hayt, Jr. & William, H./ "Engineering Electromagnetics"/ Tata McGraw-Hill
2. Jordan, Edwards C. and Balmain, Keith G./ "Electromagnetic Waves and Radiating Systems" /Prentice Hall (India) / 2nd Ed.
3. Harington, R. F. / "Time Harmonic EM Fields" / McGraw Hills
4. Krauss, J.D./ "Antennas"/ Tata McGraw-Hill
5. Prasad, K.D./ "Antennas and Wave Propagation"/ Khanna Publications
6. Collin, R. E. / "Antennas and Radio Wave Propagation"/ Tata McGraw-Hill
7. Pramanik, Ashutosh / "Electromagnetism, Theory & Applications" / Prentice Hall (India).
8. Schaum's Outlines / "Electromagnetics" / Tata McGraw-Hill / 2nd Ed..
9. Kraus, Fleisch / "Electromagnetics with Applications" / Tata McGraw-Hill, 5th Ed.
10. Sadiku , Matthew N.O. / "Elements of Electromagnetics" / Oxford University Press, 3rd Ed.
11. Lectures of NPTEL

Signal and Systems (IET 402)

Introduction to Signals and Systems: Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equations.

Fourier Series and Fourier Transforms: The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equations.

Time and Frequency Characterization of Signals and Systems: Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.

Sampling and Laplace Transform: Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transforms, Region of Convergence, Inverse Laplace Transforms, Analysis and Characterization of LTI system, Block diagram representation, unilateral Laplace Transform.

Z-Transform: z- Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.

Text Books:

1. Oppenheim, Alan V. & Willsky, Alan S. / "Signals and Systems" / Prentice Hall (India) / 2nd Ed.
2. Haykin, Simon / "Signals and Systems" / John Wiley /

Reference Books:

1. Proakis, J.G. and Manolakis, D.G. / "Digital Signal Processing: Principles Algorithms and Applications" / Pearson Education / Prentice Hall (India)
2. Roberts, M.J. / "Signals and Systems" / Tata McGraw-Hill
3. Ambardar, Ashok /"Analog and Digital Signal Processing"/ Thomson/ 2nd Ed.
4. Mitra, S.K. / "Digital Signal Processing" / Tata McGraw-Hill
5. Chen 'Signals & Systems, Oxford University, Press.
6. Lectures of NPTEL.

Electronic Workshop and PCB Lab (IET 451)

Fabrication of CE Amplifier

1. Art work and Printing of a Simple PCB.
2. Etching & Drilling of PCB.
3. Mounting & Soldering of Components on PCB.
4. Testing of Amplifier.

Digital Electronics / Pulse and Digital Electronics Lab (IET 452) For EE, ET, CS, and IT Students

1. Linear & Non Linear wave shaping wave shaping (Diode clipping & Clamping Circuits).
2. Input , Output & Transfer Characteristics of TTL Inverter
3. Minimization and Realization of a Given Function Using Basic Gates (AND, OR, NOR, NAND, EXOR).
4. Function Generation Using Decoders and Multiplexers.
5. Experiments on Priority Encoder Using 74LS148.
6. Applications of Multiplexers.
7. Seven Segment Display Experiments.
8. Four Bit and Eight Bit Adder and Subtractor.
9. Experiments on SR Latch and Master-Slave JK Flip-Flop Using SSI Gates.
10. Design and Testing of Ripple Counters Using ICs
11. Design and Testing of Mod-K Synchronous Counters.
12. Design and Testing of Shift Registers.
13. Simple experiments with HDL (writing simple combination & sequential logic such as adder, flop, counters)

Analog Communication (IET 501)

Communication (Transmission) System: Elements of Communication System and its Limitations, Mismatch between Signal & Channel- Modification of Channel or Modification of Signal, Modulation Benefits and Application, An Overview of Different types of Modulations- Analog & Digital, In Analog- Amplitude & Angle (Frequency & Phase) Modulation

Amplitude (Linear) Modulation: Generation and Detection of DSB, SSB and VSB, Carrier Acquisition, AM Transmitter and Receiver

Angle (Exponential) Modulation: Types of Angle Modulation, Concepts of Instantaneous Frequency, Wide band & Narrow band FM, Generation and Detection of FM, Generation and Detection of PM, FDM

Noise: Random Variable & Random Processes, Stationary Processes, Ergodic Processes, Transmission Through LTI, Power Spectral Density, Gaussian Processes, External and Internal Source of Noise, Thermal Noise, Voltage and Current models of a noisy resistor, Calculation of thermal noise in RC circuits, Shot Noise, Noise Figure, Noise Temperature, Equivalent Noise Band width, Noise Figure for cascaded networks

Noise Performance of C. W. Modulation Systems: Noise In DSB-SC, SSB-SC, & AM System Noise in FM and PM, FM Threshold and its extension, Pre Emphasis and De Emphasis in FM

Text Books:

1. Haykin, S. / "Communication Systems" / John Wiley & Sons / 4th Ed.
2. Kennedy, G. & Davis, B. / "Electronic Communication Systems" / Tata McGraw-Hill.

References Books:

1. Taub, Herbert & Schilling, Donald L. / "Communication Systems" / Tata McGraw-Hill
2. Carlson, A. Bruce, Crilly, Paul B. & Rutledge, Janet C. / "Communication Systems an Introduction to Signals & Noise in Electrical Communication"/ Tata McGraw-Hill.
3. Lathi, B. P. / "Modern Analog & Digital Communication Systems" / Oxford University Press
4. Kennedy, George & Davis, Bernard / "Electronic Communication Systems" / Tata McGraw-Hill / 4th Ed.
5. Singh, R.P. & Sapre, S.D. / "Communication Systems: Analog & Digital" / Tata McGraw- Hill.
6. Lectures of NPTEL

Antennas and Microwaves (IET 502)

Antenna Principles: Potential Functions & Electromagnetic Field, Current Elements, Radiation from Monopole & Half Wave Dipole, Directional Properties of Dipole Antenna.
Antenna Gain, Effective Area, Antenna Terminal Impedance, Antenna as an Opened Out Transmission Line, Practical Antennas and Methods of Excitation, Transmission Loss between Antennas, Antenna Temperature and Signal to Noise Ratio.
Antennas Arrays: Two Element Array, Horizontal Patterns in Broadcast Arrays, Linear Arrays, Binomial Array, Tchebyscheyff Distribution, LF anteena,MF antenna, VHF and UHF antenna.
Wave Propagation: Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Elevated Dipole Antennas above a Plane Earth, Wave Tilt of the Surface Wave, Spherical Earth Propagation, Tropospheric Wave, Ionosphere Propagation, Sky Wave Transmission Calculations, Effects of the Earth's Magnetic Field, Wave Propagation in the Ionosphere, Virtual Height, MUF/LUF, Skip Distance, Duct Propagation, Space wave
Wave Guides: Rectangular, Circular, Transmission Line Analogy for Waveguides, Dielectric Slab Waveguide
Microwave Generation: Conventional Vacuum Tubes, Klystrons; Reflex & Multicavity, TWT, Magnetrons, FWCFA, BWCFA & BWO, IMPATT, Parametric Devices, Gunn, InP, CdTe Diodes

Text Books:

1. Jordan Edwards C. and Balmain Keith G./ "Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)
2. Liao, S.Y. / "Microwave Devices & Circuits" / Prentice Hall (India) / 3rd Ed.
3. Collin, R. / "Antennas and Radiowave Propagation" / Tata McGraw-Hill.

Reference Books:

1. Kraus, John D. & Mashefka, Ronald J. / "Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.
2. Prasad, K.D./ "Antennas and Wave Propagation"/ Khanna Publications
3. Hayt Jr. William H./ "Engineering Electromagnetics "/ Tata McGraw-Hill
4. Das, Annaparna & Das, Sisir K. / "Microwave Engineering"/ Tata McGraw Hill.
5. Roy, Sitesh Kumar & Mitra, Monojit / "Microwave Semiconductor Devices" / Prentice Hall (India).
6. Lectures of NPTEL

Microprocessors (IET 503)

Introduction to Microprocessors: Introduction to 8085: Architecture, Programming.
Evolution of microprocessors, Register structure, ALU, Bus Organization, Timing and Control.
Architecture of 16-bit and 32-bit Microprocessors: Internal Organization of 8086, Bus Interface Unit, Execution unit, Register Organization,Memory Organization, Bus Cycle.
Assembly Language Programming: Addressing Modes, Data Transfer Instructions, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instructions, Assembler Directives.
CPU Module Design: Signal Description of pins of 8086 and 8088, Clock generation, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode CPU Module, Maximum Mode operation.
Basic I/O Interfacing: Programmed I/O, Interrupt Driven I/O, DMA , Parallel I/O (8255- PPI, Centronics Parallel port), Serial I/O(8251/8250,RS-232 Standard)
8259 Programmable Interrupt Controller, 8237-DMA Controller, 8253/8254, Programmable Timer/Counter, ADC and DAC interfacing, Memory Interfacing.
ARM (Advanced RISC Microprocessor): CPU Design

Text Books:

1. Brey, Barry B. / "INTEL microprocessors" / Prentice Hall (India) /4th Ed.
2. Gaonkar, Ramesh S. / "Microprocessor Architecture, Programming, and Applications with the 8085" / Pen ram International Publishing / 5th Ed.
3. Liu and Gibson G.A. / "Microcomputer Systems: The 8086/8088 Family" / Prentice Hall (India) / 2nd Ed.
4. Hall D.V. / "Microprocessors Interfacing" /Tata McGraw Hill / 2nd Ed.

Reference Books:

1. Singh, B.P. / "Advanced Microprocessors and Microcontrollers" / New Age International
2. Ray, A.K. & Burchandi, K.M./ "Advanced Microprocessors and Peripherals: Architecture, Programming and Interfacing"/ Tata McGraw Hill.
3. Ayala, Kenneth J. / "The 8086 Microprocessor Programming & Interfacing The PC"/ Pen ram International Publishing (India) Limited.
4. Lectures of NPTEL

Analog Communication Lab (IET 551)

1. Generation of AM Signal and measurement of Modulation Index.
2. Envelop Detector for AM Signals
3. Generation & Detection of DSB-SC Signal.
4. SSB Generation.
5. Detection of SSB signal
6. Generation of NBFM Signal.
7. Generation of FM Signal.
8. FM Detector using PLL.
9. Generation & Detection of VSB signal.
10. Measurement of VSWR
11. Study of Characteristics of Reflex Klystron and Gunn Oscillator.
12. Measurement of coupling Coefficient and directivity of a directional coupler.
13. Study of insertion and coupling Coefficient of Magic Tee
14. Directional pattern of different antennas.

Microprocessor Lab (IET552)

8085/8086 Based Experiments:

1. Signed and unsigned binary addition.
2. Signed Multiplication.
3. Signed and unsigned binary division.
4. BCD Addition and subtraction
5. Look up table method for finding the ASCII of an alpha-numeric code.
6. Interfacing with 8255 in I/O mode/BSR mode.
7. Interfacing with seven segment display.
8. Interfacing with 8253.
9. Verification of Interrupts.
10. Interfacing with ADC/DAC.
11. Mini Project on some interfacing applications (preferably ARM based)

Communication Engineering Lab (IET 553)

Only for EE students

1. To study Amplitude Modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal.
4. To study Envelope detector for demodulation of AM Signal and abserve diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity.
6. To study frequency modulation using Voltage Controlled Oscillator.
7. To detect FM Signal using Phase Locked Loop.
8. To measure naise figure using a noise generation.
9. To study PAM, PWM and PPM.
10. To Realize PCM signal using ADC and reconstruction using DAC and 4bit/8bit system. Observe quantization noise in each case.
11. To study Delta modulation and Adaptive delta modulation.
12. To study PSK- modulation system.
13. To study FSK modulation system.
14. To study sampling through a sample and hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate and width of the sampling pulses.
15. To study functioning of colour television.

Communication Engineering (IET 504)

Only for EE students

Amplitude modulation: Amplitude modulation, DSBSC,SSB and VSB modulation and demodulation schemes, AM Transmitters and receivers, super-hetrodyne receiver, IF amplifiers, AGC circuits Frequency devision multiplexing.
Angle Modulation: Frequency Modulation, Phase Modulation FM receivers and demodulators. Pulse Communication Sample Process, PAM, PWM, PPMand PCM, Delta modulation and adaptive delta modulation Digital Modulation: Introduction, Brief description of phase shift keying(PSK), deffential phase shift keying (DPSK), Frequency shift Keying(FSK), Quadrature amplitude modulation(QAM) and time division multiplexing (TDM).
Radio Propagation: Ground waves, sky wave propogation, space waves, tropospheric scatter propagation, Satellite Communication- transponders, Geo-stationary satellite system, low earth and medium earth – orbit satellite system. Introduction to Cellular system personal communication system(PCS), datacommunication with PCS.
Television: TV systems and standards, scanning and synchronizing, common video and sound circuits, vertical and horizontal deflection, colour transmission and reception. Fibre Optical Communication: Optical fibre and fibre cable, fibre characteristics and classification, fibre optic components and systems.

Text Books:

1. G. Kennedy and B.Davis, "Electronic CommunicationSystems" Tata McGraw Hill.
2. Simon Haykin, "Communication Systems" Jojn Wiley & Sons.

Reference Books:

1. Roy Blake, " Wireless Communication Technology" Thomson Asia Pvt. Ltd. Singapore.
2. B.P. Lathi, "Modern Analog and Digital Communication Systems" Oxford University Press.

Taub & Schilling, "Principles of Communication Systems" McGraw 'Hill.

Analog Integrated Circuits (IET 601)

Single Stage Integrated Circuit Amplifiers: Comparison of the MOSFET, BJT & Bi-CMOS Circuits, IC Biasing & Modified Current Sources, Amplifiers With Active Load, Cascode Amplifier,
Differential Amplifiers: MOS Differential Pair, Non Ideal Characteristics of the Differential Amplifier, Differential Amplifier with Active Load, Freq. Response of Differential Amplifier, Two Stage CMOS Op-Amp, Introduction to OTA
Data Converters: DAC/ADC
Filters: Active Filters: Transmission, Types & Specifications, Transfer Function, Butterworth & Chebyshev Filters, First Order & Second Order Filter Functions, Second Order Filter Realization Based on Two Integrator Loop Topology, Noise in Devices, Switched capacitor filters
Signal Generators & Wave Shaping Circuits: Bi-Stable Circuits**:** Comparator, Schmitt Trigger, Generation of Square & Triangular Waveforms, IC Timer 555 and its Applications, PLL And Its Applications, Precision Rectifier Circuits, Voltage Regulators ICs, SMPS

Text Books:

1. Sedra, Adel S., Smith, Kenneth C. / "Microelectronic Circuits"/ Oxford University Press / 5th Edition.
2. Millman, J. & Grabel, A. / "Microelectronics"/ McGraw-Hill.
3. Gray, P.R., Hurst, P.J., Lewis, S.H. & Meyer, R.G. / "Analysis and Design of Analog Integrated Circuits" / John Wiley & Sons / 4th Ed.
4. Gayakwad, R.A. / "Op-Amps and Linear Integrated Circuits" / Prentice-Hall (India).

Reference Books:

1. Laker, Kenneth / "Design of Analog Integrated Circuits and Systems" / Tata McGraw-Hill.
2. Franco, Sergio / Design with Operational Amplifiers and Analog Integrated Circuits / Tata McGraw-Hill / 3rd Ed.
3. Singh, B.P. / "Semiconductor Devices and Circuits" / Dhanpat Rai & Co.
4. Allen, Phillip E. & Holberg, Douglas R. / "CMOS Analog Circuit Design" / Oxford University Press / 2nd Ed.
5. Bell, David A. / "Operational Amplifiers & Linear ICs"/ Prentice Hall (India) / 2nd Ed
6. Soclof, S./"Application of Analog Integrator Circuits"/Prentice Hall (India).

Digital Communication (IET 602)

Elements of Digital Communication and Information Theory: Model of a Digital Communication System, Introduction to Information Theory, Source Coding,
Digital Base band Transmission: PCM Coding / DM / DPCM / ADCM, Data Transfer Rate, PAM, PWM, PPM, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding and their Power Spectra (No Derivation)
Matched Filter Reciver, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio, Correlation Detector, Decision Threshold and Error Probability for Binary Unipolar (On-Off) Signalling, ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum.
Digital Modulation Techniques: Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, Waveforms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection Of Coherent & Non-Coherent Binary ASK, FSK & PSK, Differential Phase Shift Keying, Quadrature Modulation Techniques, QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques
Digital Multiplexing: Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of E1, TDM, PCM Hierarchy, Introduction to spread spectrum communication, CDMA
Error Control Coding: Error Free Communication over a Noise Channel, Linear Block Codes, Cyclic Codes, Convolution Codes

Text Book:

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

References Books:

1. Simon Haykin / "Digital Communication" / John Wiley.
2. Taub & Schilling / "Principles of Communication Systems" / Tata McGraw-Hill /
3. Singh, R.P. & Sapre, S.D. / "Communication Systems: Analog & Digital" / Tata McGraw-Hill.
4. Lathi, B.P / "Modern Digital & Analog Communication Systems" / Oxford University Press /
5. A.B. Carlson / "Communication Systems" / Tata McGraw-Hill.
6. Prokis J.J / "Digital Communications" / McGraw Hill /
7. Charkrabarti, P. / "Analog Communication Systems" / Dhanpat Rai & Co.
8. Schaum's Outlines / "Analog & Digital Communication" / Tata McGraw-Hill.
9. Kennedy, George & Davis, Bernard / "Electronic communication systems" / Tata McGraw-Hill.
10. Lectures of NPTEL

Advanced Instrumentation (IET 603)

Measurement of Non Electrical Quantities: Measurement of Temperature: Absolute, Thermodynamic Scale, Bimetallic Element, Fluid Expansion Systems, Pressure: Manometers, Ring Balance Manometer & Bell Type Manometer, Bellows Element, Bourdon Tube Elements, Force: Helical Spiral Springs, Cantilever Beams, Loads Cells, Liquid Level: Float Element, Level to Pressure Converters, Level to force Converters Flow

Passive Electrical Transducers: Resistive: Resistance Thermometers, Resistive Displacement Transducer, Resistive Strain Transducer, Resistive Pressure Transducer, Inductive: Inductive Thickness Transducers, Inductive Displacement Transducers, Eddy Current Type Inductive Transducers, Capacitive: Capacitive Thickness Transducers, Capacitive Displacement Transducer

Active Electrical Transducers: Thermo Electric Transducers, Piezo Electric Transducers: Force Transducers, Strain Transducers, Torque Transducers, Pressure Transducers, Photo Electric Transducers, Digital Transducers: Digital Displacement Transducers, Digital Tachometers

Telemetry and Data Acquisition System: Telemetry: Introduction & Characteristics, Land Line Telemetry, Radio Telemetry, Components of an Analog Data Acquisition System, Components of an Digital Data Acquisition System, Types of Multiplexing Systems, Uses of Data Acquisition Systems, Use of Recorders in Digital Systems, Modern Digital Data Acquisition System

Advance Measuring Instruments: Data Loggers, Digital Read Out Systems, Digital Input Output devices, Digital Storage CRO, Spectrum Analyzer, Logic Analyzer, Microwave Instruments: Vector Network analyzer, power meter, Instrument Interfacing

Text Books:

1. Shawhney, A.K. / "Electrical & Electronic Measurement & Measuring Instruments" / Dhanpat Rai & Co. / 2001
2. Doebilin, E.O. / "Measurement Systems" / McGraw Hill
3. Murty, D.B.S. / "Transducers & Instrumentation" / Prentice Hall (India) / 1999
4. Anand, M.M.S. / "Electronic Instruments & Instrumentation Technology" / Prentice Hall (India) / 2004

Reference books:

1. Cooper, W.D. & Helfrick, A.D. / "Modern Electronic Instrument & Measurement Techniques" / Prentice Hall (India) / 2000.
2. Oliver & Cage / "Electronic Measurement & Instrumentation" / McGraw Hill.

VLSI Design (IET 604)

Introduction: Issues in Digital Integrated Circuit Design, Quality Metrics of a Digital Design
The Manufacturing Process: Manufacturing CMOS Integrated Circuits, Design Rules, IC Layout, Packaging Integrated Circuits
The Devices: Spice Diode Model, The MOSFET Transistors: The MOS Transistor Under Static Condition, Secondary Effects, Spice Models For the MOS Transistors, Scaling, Circuit Simulation
The CMOS Inverter: The Static CMOS Inverter, Performance of CMOS Inverter, Power, Energy and Energy Delay
Designing Combinational Logic Gates in CMOS: Static CMOS Design, Dynamic CMOS Design, Simulation and Layout Techniques for Logic Gates
Designing Sequential Logic Circuits: Static Latches and Register, Dynamic Latches and Register
Designing Arithmetic Building Blocks: Data Paths in Digital Processors, Adders, Designing Memory and Implementation Strategies For Digital ICs, From Custom to Semi Custom and Structured – Array Design Approaches
Custom Circuit Design, Cell Based Design Methodology, Array Based Implementation Approaches

Text Books:

1. Rebaey, John M. & Chandrakasan, Anantha & Nikolic, Borivoje / "Digital Integrated Circuits: A Design Prospective" / Pearson Education / 2nd Ed.

References Books:

1. Kang, Sun-mo & Leblebici, Yusuf / "CMOS Digital integrated Circuits, Analysis & Design"/ Tata McGraw-Hill / 3rd Ed.
2. Pucknell, Douglas A. & Eshraghian, Kamran / "Basic VLSI Design"/ Prentice – Hall (India).
3. Razavi, Behzad / "Design of Analog CMOS integrated circuits" / Tata McGraw-Hill.
4. Wayne Wolf, "Modern VLSI Design- Systems on Silicon" / Addison-Wesley / 2nd Ed.
5. Geiger, R.L., Allen, P.E. & Strader, N.R. / "VLSI: Design Techniques for Analog & Digital Circuits" / McGraw-Hill.
6. Weste, N.H.E. & Eshraghian, K. / "Principles of CMOS VLSI Design" / Pearson Education Asia
7. Gopalan, K. / "Introduction to Digital Microelectronics Circuits" / Tata McGraw- Hill.
8. Millman and Grabel / "Microelectronics"/ McGraw –Hill.
9. Tsividis, Yannis / "Operation & Modeling of the MOS Transistor" / Oxford University Press.

Analog Integrated Circuits Lab (IET 651)

1. Measurement of Op-amp Parameters. (Open Loop Gain, Input offset Voltage, CMRR, Slew rate).
2. Determination of Frequency response of Op-Amp.
3. Precision Rectifier.
4. Instrumentation Amplifier.
5. Open Loop operation of Op-amp -Comparators - Schmitt Trigger.
6. Astable & Monostable Operation Using 555.
7. IC Voltage Regulator.
8. Voltage Controlled Oscillator.
9. Phase Locked Loop.
10. Frequency Multiplier.
11. A/D Converters & D/A Converters.
12. Second Order Active Filter- High Pass & Low Pass Realization.

VLSI Design Lab (IET 652)

1. Design, Simulation and Analysis of following circuits using Circuit simulator:
   (a) Differantial Amplifier
   (b) NMOS and CMOS inverter
   (c) Two input NAND Gate
   (d) Two input NOR Gate
2. Layout Design of NMOS and CMOS Inverter using Layout Generator
3. Layout Design of Two Input NAND Gate
4. Simulation of Full Adder using HDL
5. Simulation of MUX using VHDL
6. Simulation of RS Flip Flop.

Digital Signal Processing (IET 701)

Review of Discrete Time Signals And Systems, Z-Transform, Sampling of Continuous Time Signal, Transform Analysis of LTI Systems.

Structures For Discrete-Time Systems: Block Diagram Representation, Signal Flow Graph Representation, Basic Structures For IIR Systems: Direct Form, Cascade Form, Parallel Form, and Feedback In IIR Systems. Transposed Forms, Basic Network Structures For FIR Systems: Direct Form, Cascade Form, Structures For Linear-Phase FIR Systems.

Overview of finite precision Numerical Effects, Effects of Coefficient quantization, Effects of Round-off Noise in Digital Filters, Zero-input Limit cycles in Fixed-point Realizations of IIR Digital filters.

Filter Design Techniques: Design of D-T IIR Filters from continuous-time filters, Design of FIR filters by windowing, Kaiser Window method, Optimum Approximations of FIR Filters, FIR Equiripple approximation.

Discrete Fourier Transform: Discrete Fourier transform, Properties, Linear convolution using DFT, DCT, Efficient computation of the DFT, Goertzel algorithm, Decimation in time and decimation in frequency FFT algorithm, Practical considerations, Implementation of the DFT using Convolution, Effects of Finite Register Length.

Fourier Analysis Of Signals Using DFT: DFT analysis of sinusoidal signals, Time-dependent Fourier transform; Block convolution, Fourier analysis of Non-stationary and stationary random signals, Spectrum analysis of Random signals using estimates of the autocorrelation sequence.

Implementation of DSP algorithm: Floating point Implementation of FIR and IIR filtering using TMS320C67X, Fixed point Implementation of FIR and IIR filtering using TMS320C67X, Implementation of FFT algorithm usingTMS32067X.

Text Books:

1. Oppenheim A.V. ,Schafer, Ronald W. & Buck, John R. / "Discrete Time Signal Processing" / Pearson Education / 2nd Ed. / Prentice-Hall (India)
2. Sen M. Kuo & Woon-Seng S. Gan, "Digital Signal Processors-architectures, implementation and applications" / Pearson Education / Ist Ed. /

Reference Books:

1. Proakis, J.G. & Manolakis, D.G. / "Digital Signal Processing: Principles Algorithms and Applications" / Prentice Hall (India) / Pearson Education
2. Oppenheim A.V. & Schafer, Ronald W. / "Digital Signal Processing" / Pearson Education / 2nd Ed.
3. Rabiner, L.R. and Gold B./ "Theory and applications of DSP" / Prentice Hall (India)
4. Oppenheim, Alan V. & Willsky, Alan S. / "Signals and Systems" / Prentice Hall (India) / 2nd Ed.
5. Johnson, J.R. / "Introduction to Digital Signal Processing" / Prentice Hall (India)
6. DeFatta, D.J., Lucas, J.G. & Hodgkiss, W.S / "Digital Signal Processing"/ John Wiley & Sons.

Wireless Communication (IET 702)

Evolution of mobile radio communication fundamentals: 1G, 2G, 3G and 4G fundamentals; Concept of Cell Architecture, Frequency reuse, Channel assignment strategies and Power Allocation Strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems .

Large scale path loss: Propagation models, Reflection, Diffraction, Scattering, Practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multi path channels, types of fading, theory of multi-path shape factor for fading wireless channels.

Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FHSS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multipath channels.

Fundamentals of equalization: Equalizer in communication receiver, Survey of equalization techniques, linear equalizer, non-linear equalization,
Diversity Techniques: Introduction to Diversity Schemes, Types of Diversity Techniques, RAKE receiver.
Characteristics of speech signals: Quantization techniques, Vocoders, linear predictive coders.

Multiple Access Schemes: Frequency division multiple access, Time division multiple access, Code division multiple access, and other advanced multiple access schemes.
Introduction to other wireless systems: OFDM and related technologies, UWB Technology, WIMAX Technology, Various Wireless standards.

Text Book:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Edition

Reference Books:

1. Willium C. Y. Lee, "Mobile Communication Design and Fundamentals"
2. D. R. Kamilo Fehar, "Wireless Digital Communication"
3. Haykin S & Moher M., "Modern Wireless Communication", Pearson, 2005.
4. R. Pandya, “Mobile and Personnel Communication system", PHI

DSP Lab (IET 751)

1. Sampling & Waveform Generation.
2. Quantization
3. PCM Encoding
4. Delta Modulation
5. DFT Computation.
6. Fast Fourier Transform Implementation.
7. FIR Filter implementation.
8. IIR Filter implementation.
9. DSP Processor Implementation
10. Computational Experiments with Digital Filters.
11. Floating point Implementation of FIR and IIR filtering using TMS320C67X,
12. Fixed point Implementation of FIR and IIR filtering using TMS320C67X,
13. Implementation of FFT algorithm usingTMS32067X.

Text Books:

1. Oppenheim A.V. ,Schafer, Ronald W. & Buck, John R. / "Discrete Time Signal Processing" / Pearson Education / 2nd Ed. / Prentice-Hall (India)
2. Sen M. Kuo & Woon-Seng S. Gan, "Digital Signal Processors-architectures, implementation and applications" / Pearson Education / Ist Ed. /

Optical Communication (IET 801)

Wave Propagation through Optical Fibers: Introduction to optical fiber communication system and its advantages, Structure of optical wave-guide, light propagation in optical fiber. Modes in optical fiber step & graded index fiber, fiber fabrication,
Signal degradation in optical fibers: Attenuation, dispersion and pulse broadening in different types of fibers. Modal birefringence and polarization maintaining fibers.
Optical Sources: Review of semiconductor physics, LED structure, materials. Quantum efficiency and power, modulation of LED, Laser diodes
Optical Detectors: Principles of photodiodes, PIN photodiodes, avalanche photodiodes, Photo detector noise, Response time characteristic, Avalanche multiplication noise, structures of photodiodes.
Optical Receivers: Fundamental receiver operation, Digital receiver noise, shot noise. Pre-amplifier types, Analog receivers
Optical Fiber Communication Systems: Digital system design, Modulation formats for analog optical communication systems, Introduction to WDM concepts, Advanced multiplexing strategies

Text Books:

1. Keiser, Gerd / "Optical Fiber Communications" / McGraw-Hill / 3rd Ed.
2. Senior, John M. / "Optical Fiber Communications Principles & Practices" / Prentice-Hall (India) / 2nd Ed.

Reference Books:

1. Agrawal, G.P. / "Fiber-optic Communication Systems" / Wiley / 3rd Ed.
2. William, B. Jones Jr. / "Introduction to Optical Fiber Communication Systems" / Holt, Rinehart and Winston, Inc. International Edition
3. Wilson, J. & Hawkes, J.F.B. / "Optoelectronics An Introduction"/ Prentice-Hall (India)
4. Gupta, S.C. / "Text Book of Optical Fiber Communication & Its Applications"/ Prentice–Hall (India).
5. Slavarajan, A., Kar.S. & Srinivasan T. / "Optical Fiber Communication, Principles & Systems" / Tata McGraw Hill
6. Khare, R.P. / "Fiber Optics & Optoelectronics" / Oxford University Press
7. Agarwal, D.C. / "Fiber Optic Communication" / S. Chand

Communication Lab (IET 852)

1. Sample and hold circuit.
2. PAM, PWM, PPM generation and detection
3. Delta modulation and detection.
4. Pulse data coding and decoding techniques for NRZ formats
5. ASK, FSK, PSK modulation and detection
6. Single bit error detection and correction.
7. PCM Modulation and detection
8. Voice transmission through optical link
9. Losses in optical fiber
10. Fiber optic digital link
11. PC to PC communication Link using optical fiber

Elective I

Satellite Communication (IET 711)

Introduction: Origin & Brief History of Satellite Communication,

Orbital Mechanism & Launching of Satellite:

Equation of Orbit, Locating the Satellite in the Orbit, Look Angles Calculation, ORBITAL Perturbations, Mechanics of Launching a Satellite.

Spacecraft

Introduction to Satellite Subsystems:

Telemetry, Tracking & Command, Communication Subsystem, Spacecraft Antenna Systems

Satellite Link Design

G/T Ratio of Earth Station, Design of Downlinks, Design of Uplinks, Design for Specified C/N, System Design, Propagation Effects, FM Detection Theory, S/N Improvement, Analog FM Links, Digital Transmission, Baseband and Band-pass Transmission of Digital Data, Digital Links.

Multiple Access Techniques

FDMA, Calculation of C/N with Intermodulation, TDMA, Bits, Symbols and Channels, TDMA Frame Structure, Synchronization in TDMA Networks, Satellite Switched TDMA, DAMA, FDMA-SCPC-DA, Random Access, CDMA, Spread Spectrum Transmission and Reception.

Direct Broadcast Satellite Television and Radio, Satellite Navigation and GPS

Introduction to Digital DBS TV, System Design, Satellite Radio Broadcasting

Introduction to Satellite Navigation and Global Positioning System

Text Books:

1. Pratt, T, Bostian, C.W. and Allnutt, J. E. / Satellite Communications / John Wiley and Sons / 2nd Ed.

Reference Books:

1. Pratt, T. and Bostian, C.W. / Satellite Communications / John Wiley & Sons, 1986.
2. Ha, Tri T. / "Digital Satellite Communications" / Macmillan Publishing Company
3. Richharia, M. / "Mobile Satellite Communications" / Pearson Education
4. Roddy, D./ "Satellite Communication"/ Prentice Hall (India)
5. D.C. Agarwal / "Satellite Communication" / Khanna Publishing.
6. Raja Rao, K. N. / "Fundamentals of Satellite Communication" / Prentice Hall (India)
7. Lectures of NPTEL

VLSI Technology (IET 712)

Crystal Growth & Wafer Characterization: Electronic Grade Silicon, CZ Crystal Growing, Silicon Shaping, Processing Consideration.
Epitaxy: Vapor Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators
Oxidation: Growth Mechanism, Thin Oxides, Oxide Properties, Oxidation Induced Defects
Lithography: Optical Lithography, Electron Lithography, X-Ray Lithography, Ion Lithography
Reactive Plasma Etching: Feature Size Control and Anisotropic, Etch Mechanisms, Reactive Plasma Etching Techniques and Equipment
Dielectric and Polysilicon Film Deposition: Deposition Processes, Poly Silicon, Silicon Dioxide, Silicon Nitride
Diffusion: Models of Diffusion in Solids, Fick's One Dimensional Diffusion Equations, Atomic Diffusion Mechanisms
Ion Implantation: Range Theory, Implantation Equipment, Annealing
Metallization: Metallization Applications, Metallization Choice, Physical Vapour Deposition, Patterning, Bipolar IC Technology
Introduction to MOS: MOS, CMOS IC Technology, Metal Gate, Poly Silicon Gate, P-Channel, N- Channel Devices, Enhancement Mode and Depletion Mode Devices and their Characteristics

Text Books:

1. Sze, S.M./ "VLSI Technology" / Tata McGraw-Hill / 2nd Ed.
2. Streetman, B.G. & Banerjee, Sanjay / "Solid State Electronic Devices" / Prentice Hall (India) / 5th Ed.

Reference Books:

1. Campbell, Stephen A. / "The Science & Engineering of Microelectronic Fabrication" / Oxford University Press.
2. Gandhi, S. / "VLSI Fabrication Principle" / John Wiley

Optoelectronics (IET 713)

Wave guide and Optical fibers
Total internal reflection, Dielectric Slab waveguides, Optical fiber waveguides, Step & graded index optical fibers, modes of propagation. Losses in fibers, Fiber jointing, Fiber materials & manufacture & fiber cables
Photo Sources
p-n junction, Injection Luminescence & the light emitting diode, materials, construction & drive Circuitry, LED power &efficiency, LED characteristics & modulation bandwidth.
Lasers: Emission & absorption of radiation, Einstein relations, Population inversion, Optical feed back, Threshold conditions, Laser modes. Semiconductor Lasers
Photo Detectors
Optical detection principles, Absorption, Quantum efficiency, Responsivity, Long wavelength cut-off, P-N photodiode, Speed of response, Noise, Avalanche photodiode, Multiplication factor
Electro- optic Effects
Integrated optical devices, Optical bistability & Digital optics, Optical computation, Magneto-optic Effect, Acousto-optic Effect, Nonlinear optics, Holography
Sensors & Display Devices
Optical Fiber sensors, Display Devices, Plasma display, LCD Display, Numeric Display

Text Books:

1. Wilson, J. & Haweks, J.F.B. / "Opto-Electronics An Introduction"/ Prentice Hall (India)
2. Senior, John M. / "Optical Fiber communication"/ Prentice Hall (India)

Reference Books:

1. Bhattacharya, Pallab / "Semiconductor Optoelectronics Devices" / Pearson Education.
2. Singh, Jasprit / "Optoelectronics An Introduction to Materials and Devices"/ McGraw-Hill
3. Khare, R.P. / "Fiber Optics & Optoelectronics" / Oxford University Press
4. Gupta, S.C. / "Text Book of Optical Fiber Communication & Its Applications"/ Prentice–Hall (India).

Radar Engineering (IET 714)

Nature of Radar
Radar block diagram & operation, Radar range performance & its equations, Minimum detectable signal, Cross-section of a target, PRF & Range ambiguity, Antenna parameters
MTI & Doppler radar
Doppler effect, CW radar, FM CW, Delay line cancellers, Multiple or staggered, PRF, Non coherent MTI, Pulse Doppler Radar
Scanning, Duplexers and Radar receivers
Sequential lobing, Conical Scanning, Monopulse Tracking RADAR, Tracking with surveillance RADAR, Acquisition, Radar receiver, Display Duplexers
Electronic Navigation
Introduction, loop antenna, loop i/p ckts, Aural null detection finder, Goniometer, Adcock detection finder, VHF omni-directional range finder, The LF/MF four course radio range
Navigation Systems and Clutter
VOR receiving equipment, Loran-A, DECCA navigation system, DME, TACAN, Surface clutters Radar equation, Sea clutter, Land clutter

Text Book:

1. Skolnik M. I. / "Introduction to Radar Systems"/ McGraw-Hill
2. Nagraja, N.S. / "Elements of Electronic Navigation"/ Tata McGraw Hill / 2nd Ed.

Reference Book:

1. Nathanson, Fred E. / "Radar An Overview Design Principles"/ Prentice–Hall (India)
2. Toomay, J.C. / "Principles of Radar"/ Prentice–Hall (India)

Fuzzy Logic with Electronics Engineering Applications (IET 715)

Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship;
Membership Functions; Fuzzification and De-Fuzzification process; Fuzzy to Crisp Conversions; Lambda cuts;
Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic; Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison
Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems
Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode.

Text Books:

1. Ibrahim Ahmad / "Introduction To Applied Fuzzy Electronics"/ Oxford University Press / Prentice-Hall (India).

Reference Books:

1. Ross, Timothy, J. / "Fuzzy Logic with Engineering Applications," / John Wiley & Sons / 2nd Edition.

2. Ahmad M. Ibrahim, / "FUZZY LOGIC for Embedded Systems Applications"/ Newnes Publication/ Elsevier Science (USA).

Elective II

Telecommunication Switching (IET 821)

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

Telecommunication Traffic Engineering: The unit of traffic, congestion, traffic measurement, lost call systems.

Basic Queueing Theory: Poisson Process, The M/M/1 Queueing systems, Little's Theorem, state dependent queues, Birth-death process, M/G/1 queue: mean value analysis, Nonpreemptive priority queueing systems.

Fundamentals of Circuit Switching: Simple model, circuit switching: queued mode, point-to-point circuit switching, cost criteria for switching, multistage switching networks, representing connections by Paull's matrix, strict-sense non-blocking networks, Rearrangeable networks, recursive construction of switching networks, The Cantor network.

Time division switching: space and time switching, time division switching networks, Blocking probability analysis of multistage switches: Lee approximation, Improved approximate analysis of blocking switch.

Fundamentals of Packet Switching: Statistical multiplexing, Delay in packet switching, jitter and jitter control, generic switch architecture, routing, forwarding, switching and buffering. Switch implementation, buffering schemes: output queued system and input queued system, hybrid system

Text Book:

1. Schwartz, M. / "Telecommunication Networks: Protocols. Modeling and Analysis" / Pearson Education
2. Flood J.E. / "Telecommunications Switching, Traffic and Networks" / Pearson Education
3. Joseph Y.Hui / "Switching and Traffic Theory for Integrated Broadband Networks" / Kluwer Academic publishers, 1990

Reference Book:

1. Thaygrajan, V. / "Electronics Switching System" / Prentice-Hall (India)
2. Bellamy, J.C. / "Digital Telephony" / John Wiley
3. NIIT / "Telecommunication & Internetworking"/ Prentice-Hall (India)
4. V.E. Benes / "Mathematical Theory of connecting Networks & Telephone Traffic" / Academic Press, 1965.

Digital System Design Using VHDL (IET 822)

Introduction to VHDL: VHDL description, combinational networks, modeling flip flop using VHDL, VHDL model for multiplexer, comliance and simulation of VHDL, codes, modeling a sequential machine, variables, signals and constants, mays VHDL operators, VI-IDL functions, VHDL procedures, packages and libraries, VHDL model for a counter.
Advanced VHDL: Attributes, transport and inertial delays, operator over loading, multi valued logic and signal resolution, IEEE-1164, standard logic, generic, generates statements, synthesis ofVHDL codes, s nthesis exam les, file handlin and TEXTIO.
Design of Networks for Arithmetic Operations: Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary numbers, design of binary divider.
Digital Design with SM Chart: state machine charts, derivation of SM charts, realisation of SM charts, implementation of dice game, a\temative realisation of SM charts using microprogramming, linked state machine.
Floating Point Arithmetic: Representation of floating point numbers, floating point multiplication, other floating point operations. Designing with Programmable Gate Arrays and Complex Programmable Logic Devices: Xinx 3000 series FPGAs, Xinx 4000 series FPGAs, using one hot state assignment.
Memory Models For Memories and Buses: Static RAM, a simplified 486 bus model, interfacing memory to microprocessor bus.
Design Examples: UART design, description of MC68HC05, microcontroller, design of microcontroller CPU, complete microcontroller design, Design of ARM Processor

Text Book:

1. Carles H Roth Jr, "Digital System Design using VHDL", Thomson Learning, 2002.

Reference Books:

1. Stephen Brown & Zvonko Vranesic, "Fundamentals of digital logic design with VHDL, TMH, 2nd Ed., 2007.
2. Jhon F Vakerly, "Digital design", PHI, 4th Ed.

VLSI System Design (IET 823)

Implementation Strategies for Digital ICs
From Custom to Semi custom and Structured-Array, Design Approaches, Custom Circuit Design Cell-Based Design Methodology, Array-Based Implementation Approaches,
Coping with Interconnect
Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques
Timing Issues in Digital Circuits
Timing Classification of Digital Systems, Design Methodology: Design Verification,
Designing Arithmetic Building Blocks
Data paths in Digital Processor Architectures, The Multiplier, The Shifter, Other Arithmetic Operators, Power and Speed Trade-offs in Data path Structures,
Designing Memory and Array Structures: Introduction, The Memory Core, Memory Peripheral Circuitry, Memory Reliability and Yield, Power Dissipation in Memories, Case Studies in Memory Design
Architecture Design:
VHDL, Register-Transfer Design, High Level Synthesis,
Validation and Test of Manufactured Circuits
Introduction, Test Procedure, Design for Testability, Test-Pattern Generation

Text Book:

1. Rabaey, John. M. and Chandrakasan, Anantha and Nikolic, Borivoje / "Digital Integrated Circuits, A Design perspective" / Pearson Education / 2nd Ed.
2. Wayne, Wolf / "Modern VLSI Design- Systems on Silicon" / Addison-Wesley / 2nd Ed.

Reference Book:

1. Kang, Sun-mo and Leblebici, Yusuf / "CMOS Digital integrated Circuits, Analysis & Design"/ Tata McGraw-Hill /
2. Pucknell, Douglas A. and Eshraghian, Kamran / "Basic VLSI Design"/ Prentice – Hall (India).
3. Razavi, Behzad / "Design of Analog CMOS integrated circuits" / Tata McGraw-Hill.
4. Geiger, R.L., Allen, P.E. and Strader, N.R. / "VLSI: Design Techniques for Analog & Digital Circuits" / McGraw-Hill.
5. Weste, N.H.E. & Eshraghian, K. / "Principles of CMOS VLSI Design" / Pearson Education Asia
6. Gopalan, K. / "introduction to Digital Microelectronics Circuits" / Tata McGraw- Hill.
7. Millman and Grabel / "Microelectronics"/ McGraw –Hill.
8. Tsividis, Yannis / "Operation & Modeling of the MOS Transistor" / Oxford University.

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Image Processing (IET 824)

Digitized Image & Its Properties: Basic Concepts, Image Digitization, Digital Image Properties
Data Structure for Image Analysis: Label of Image Data Representation, Traditional Image Data Structures, Hierarchical Data Structures
Image Processing: Pixel Brightness, Transformation, Geometric Transformation, Local Preprocessing, Image Restoration
Segmentation: Thresholding, Edge Based Segmentation, Region Based Segmentation, Matching
Shape Representation: Region Identification, Contour Base Representation, Region Based Shape Representation, Shape Classes
Image Transforms: Two Dimensional Orthogonal and Unitary Transforms, Properties of Unitary Transforms, Two Dimensional DFT, Cosine Transforms, Sine Transforms, Hudmard Transforms, KK Transforms, SVD Transforms
Image Enhancement: Point Operation, Histogram Modeling, Transform Operation
Image Data Compression: Image Data Properties, Discrete Image Transforms in Image Data Compression, Predictive Compression Methods, Vector Quantization, Hierarchical and Progressive Compression Methods, Comparison of Compression Methods, Coding, JPEG and MPEG Image Compression.
3-D Vision, Geometry and Radiometry: 3-D Vision Tasks, Geometry For 3-D Vision, Radiometry and 3-D Vision, 3-D Model Based Vision, 2-D Based Representation of a 3-D Scheme.

Text Books:

1. Milan Sonya, Vaclav Hlavac & Roger Boyle / "Image Processing Analysis And Machine Vision"/ Vikas Publishing House
2. A.K. Jain / "Digital Image Processing" / Pearson Education

Reference Books:

1. Chanda, B. & Majumder, D. D. / "Digital Image Processing & Analysis" / Prentice Hall (India)

Advanced Semiconductor Devices (IET 825)

Energy Bands & Charge Carriers in Semiconductors: Bonding Forces & Energy Bands in Solid, Charge Carriers in Semiconductors, Carrier Concentrations, Drift of Carriers in Electric & Magnetic, Fields, Invariance of the Fermi Level at Equilibrium,
Excess Carriers in Semiconductors: Optical Absorption, Luminescence, Carrier, Lifetime & Photo Conductivity, Diffusion of Carriers
Junctions: Fabrication of P-N Junctions, Equilibrium Condition, Forward & Reverse Bias Junctions, Reverse Bias Breakdown, Transient & AC Conditions, Deviations From the Simple Theory, Metal Semiconductor Junctions, Hetero-Junction
Field Effect Transistors: Transistor Operation, the Junction FET, the Metal Semiconductor FET, the Metal insulator, Semiconductor FET, MOSFET, BJT
Fundamentals of BJT Operation: Amplification with BJT, BJT Fabrication, Minority Carrier Distributions & Terminal Currents, Generalized Biasing, Switching, Other Important Effects, Freq. Limitation of Transistors, Hetero-Junction BJT
Optoelectronic Devices: Photodiodes, Light Emitting Diodes, Lasers, Semiconductor Lasers

Text Book:

1. Streetman, B.G. & Banerjee, Sanjay / "Solid State Electronic Devices" / Prentice Hall (India) / 5th Ed.

Reference Books:

1. Karl, Hess / "Advance Theory of Semiconductor Devices" / Prentice Hall (India)
2. Sze, S.M. / "Physics of Semiconductor Devices" / Wiley Eastern Limited
3. Watson, H.A. / "Microwave Semiconductor Devices and Their Circuit Applications" / Tata McGraw-Hill.
4. Bell, David A. / "Electronic Devices & Circuits" / Prentice Hall (India).
5. Nair, B. Somanathan / "Electronic Devices & Applications"/ Prentice Hall (India)
6. Roy, Sitesh Kumar & Mitra, Monojit / "Microwave Semiconductor Devices"/ Prentice Hall (India)
7. Salivahanan, S. & Kumar, Suresh N. & Vallavraj / "Electronic Devices & Circuits" / Tata McGraw-Hill.
8. Neamen, Donald A./ "Semiconductor Physics & Devices" / Tata McGraw-Hill..
9. Das Gupta, N. / "Semiconductor Devices Modeling & Technology" / Prentice Hall (india)
10. Muller, Richard &Kamins, Theodone L./ "Device Electronics for IC"/ John Wiley.

Elective III

Information Theory and Coding (IET 831)

Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measures for Continuous Random Variables, Source Coding Theorem, Huffman Coding, The Lempel- Ziv Algorithm, Rate Distortion Function, Optimum Quantizer Design,

Channel Capacity and Coding: Introduction, Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem, The Shannon Limit, Random Selection of Codes,

Linear Block Codes for Error Correction: Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes

Hamming Codes, Optimal Linear Codes, Cyclic Codes, Introduction to Cyclic Codes, Polynomials

The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Fire Code, Golay Codes, Cyclic Redundancy Check (CRC) Codes

Introduction to BCH Codes, Primitive Elements, Minimal Polynomials, Generator Polynomials in Terms of Minimal Polynomials, Some Examples of BCH Codes, Decoding of BCH Codes

Reed-Solomon Codes, Implementation of Reed-Solomon Encoders and Decoders

Nested Codes,

Convolutional Codes: Introduction to Convolutional Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolutional Codes (Analytical Representation), Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Veterbi Decoding of Convolutional Codes, Distance Bounds for Convolutional Codes, Performance Bounds, Known Good Convolutional Codes, Turbo Codes, Turbo Decoding.

Trellis Codes Modulation: Introduction to TCM, The concept of Coded Modulation, Mapping by Set Partitioning, Ungerboeck's TCM Design Rules, TCM Decoder, Performance Evaluation for AWGN Channel, Computation of d_{free}, TCM for Fading Channel

Text Books:

1. Bose, Ranjan / "Information Theory, Coding & Cryptography" / Tata McGraw Hill /

Reference Books:

1. Van Lint**,** J.H./ "Introduction to Coding Theory" / Springer
2. Proakis, John G. / "Digital Communications" / McGraw Hill
3. Sathyanarayana, P.S. / "Probability Information and Coding Theory"/ Dynaram Publications, Bangalore
4. Gallager / "Information Theory and Reliable Communication"
5. Shulin & Costello/ "Error Correcting Codes" / Prentice Hall (India).
6. Taub & Schilling / "Principles of Communication Systems" / Tata McGraw Hill

Embedded Systems (IET 832)

Introduction: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design

Hardware Fundamentals for the embedded 'developers Digital circuit parameters- Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's, Watchdog Timers, Hardware design and development.

Custom Single Purpose Processors: Optimizing program, FSMD, Data path & FSM.

General purpose processors and ASIP's (Application Specific Instruction set Programming): Software and operation of general purpose processors-Programmers, View Development Environment-ASIPs Microcontrollers-DSP Chips.

Introduction to Microcontrollers and Microprocessors: Embedded versus external, memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures.

8051 Microcontrollers: Assembly language, architecture, registers, Addressing modes, Instruction set, I/O ports and memory organization Interrupts Timer/counter, and serial communication.

RTOS: Tasks, states, Data, Semaphores and shared data, Operating system, services, Message queues, Mailboxes.

Advanced Processor: (only architectures) 80386, 80486 and ARM (References)

Communication basics: Microprocessor Interfacing, I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel Protocols and wireless protocols.

Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Kev board, Latch Interconnection, PPI.

Text Books:

1. Embedded System Design-Frank Vahid / Tony Givargis, John WilIey@2005
2. Microcontroller (Theory and Applications) / Ajay V Deshmukh, / Tata McGraw-Hill@2005.
3. An Embedded Software Primer-David E. Simon, Pearson Education @ 1999

Reference Books:

1. 8051 Microcontroller and Embedded Systems / Muhammad Ali Mazidi and Janice Gillispie /
2. Microcontrollers (Architecture, Implementation and Programming) / Kenneth Hintz, Daniel Tabak / TMH 2005.
3. 8051 Microcontrollers and Embedded Systems / Sampath Kumar / Katson Books/ 2nd Ed 2006

Architecture and Applications of Digital Signal Processors (IET 833)

DSP Processors: DSP Hardware & Circuits; 8-bit, 16-bit and 32-bit DSP Processors; Analog Devices, Motorola and Texas Instruments DSP Devices and their Comparison. Data width and dynamic range, Limitations of DSPs.
Architecture: DSP System, ADSP-2100 Family base Architecture, MAC & Shifter block diagrams, TMS Architectures; TMS-320CIX, TMS 320C3X, TMS 320C4X , TMS 320C5X, and TMS 320C67X, A Fast ADC/DAC on board.
Instruction Set: Instruction Sets of TMS 32CXXX Series, Certain application programs: ADC/DAC, Filter design, Function Generation etc.
Applications: Filtering, Voice/Speech processing, Telecommunication, Imaging, Instrumentation, Military applications.

Text Book:

1. Sen M. Kuo & Woon-Seng S. Gan, "Digital Signal Processors-architectures, implementation and applications" / Pearson Education / Ist Ed. /
2. K. Padmanabhan, S. Ananthi & R.V. Rajeshwaran / "A Practical Approach to Digital Signal Processing"
3. TMS , Data Manual
4. ADSP Data Manual

Reference Book:

1. Motorola Data Manual.
2. Robiner, L.R. & Gold, B. / "Theory and application of Digital Signal Processing" / Prentice–Hall (India) 1996
3. Oppenheim, A.V. & Schafer R.W. / "Digital Signal Processing" / Prentice–Hall (India) 1995.

Optical Networks (IET 834)

Review of Optical Communication: Propagation of Signals in Optical fibers, Characteristics of optical fibers: attenuation, dispersion and nonlinear effects.
Devices: Couplers, Isolators, Circulators, Multiplexers, Filters, Optical Amplifiers, Tunable Lasers, Switches, Wavelength Converters
Optical Multiplexing Techniques: Wavelength division multiplexing, time division multiplexing, code division multiplexing**.**
Conventional Optical Networks: SONET/SDH, FDDI, IEEE 802.3 etc.
Access networks: Enhanced HFC, FTTC, PON etc.
Design Issues: Cost Trade-offs, LTD and RWA problems (only introduction)
Network Survivability: Basic Concepts, Protection in SONET/SDH, Optical Layer Protection Schemes,
Optical Switching: Fundamental limits on optical switching elements, switching architectures**,** Photonic packet switching, Burst Switching.

Text Books:

1. Ramaswami, Rajiv & Sivarajan, Kumar N. / "Optical Networks a Practical perspective"/ Morgan Kaufmann Publishers / 2nd Ed.
2. Tanenbaum. Andrew S./ "Computer Networks"/ Prentice Hall (India)
3. Black, Uyless / "Optical Networks Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Murthy, C. Siva Ram & Gurusamy, Mohan / "WDM Optical Networks Concepts, Design & Algorithms" / Prentice Hall (India)
2. Mukherjee, B. / "Optical WDM Networks" / Springer
3. Lu Ruan, and Dingzhu Du / "Optical networks: Recent Advances" / Springer

Biomedical Signal Processing (IET 835)

Introduction to Bio-Medical Signals:
Classification, Acquisition and Difficulties during Acquisition. Basics of Electrocardiography, Electroencephalography, Electromyography, & electro-retinography, Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.
ECG: Measurement of Amplitude and Time Intervals, QRS Detection(Different Methods), ST Segment Analysis, Removal of Baseline Wander And Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.
Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length Coding
EEG: Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep / Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation.
EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, -Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, Maximum Likelihood Method.
EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Canceling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets

Text Books:

1. Biomedical Digital Signal Processing, Willis J Tomkin, Phi.
2. Biomedical Signal Processing, D.C Reddy McGrawhill
3. Biomedical Instrumentation and Measurement., Cropunwell, Weibel and Pfeifer, PHI.

Reference Book:

1. Biomedical Signal Processing, Amon Cohen, volume I & Licrc Press.
2. Biomedical Signal Analysis A Case Study Approach, Rangaraj M. Rangayyan, John Wiley and Sons Inc.
3. Medical instrumentation Application and Design, john G. Webster, john Wiley & Sons Inc.