

**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**R – 2009**

**I TO VII SEMESTER CURRICULA AND SYLLABI**  
**B.E. (PART-TIME) ELECTRONICS AND COMMUNICATION ENGINEERING**  
**SEMESTER I**

S. NO	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	PTMA2111	<u>Applied Mathematics</u>	3	0	0	3
2.	PTPH2111	<u>Applied Physics</u>	3	0	0	3
3.	PTCY2111	<u>Applied Chemistry</u>	3	0	0	3
4.	PTEC2151	<u>Electric Circuits and Electron Devices</u>	3	1	0	4
<b>PRACTICAL</b>						
5.	PTEC2155	<u>Circuits &amp; Devices Laboratory</u>	0	0	3	2
<b>TOTAL</b>			<b>12</b>	<b>1</b>	<b>3</b>	<b>15</b>

**SEMESTER II**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	PTMA 2211	<u>Transforms and Partial Differential Equations</u>	3	0	0	3
2.	PTEC 2201	<u>Electromagnetic Fields and Waves</u>	3	0	0	3
3.	PTEC 2202	<u>Electronic Circuits- I</u>	3	0	0	3
4.	PTEC 2206	<u>Signals and Systems</u>	3	1	0	4
<b>PRACTICAL</b>						
5.	PTEC 2204	<u>Electronic Circuits Lab</u>	0	0	3	2
<b>TOTAL</b>			<b>12</b>	<b>1</b>	<b>3</b>	<b>15</b>

**SEMESTER III**

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
PTEC2251	<u>Electronic Circuits II</u>	3	1	0	4
PTEC2252	<u>Communication Theory</u>	3	1	0	4
PTEC2203	<u>Digital Electronics</u>	3	1	0	4
PTEC2254	<u>Linear Integrated Circuits</u>	3	0	0	3
<b>PRACTICAL</b>					
PTEC2257	<u>Electronics circuits II and simulation lab</u>	0	0	3	2
<b>TOTAL</b>		<b>12</b>	<b>3</b>	<b>3</b>	<b>17</b>

**SEMESTER IV**

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
PTEC2301	<u>Digital Communication</u>	3	0	0	3
PTEC2302	<u>Digital Signal Processing</u>	3	1	0	4
PTEC2303	<u>Computer Architecture and Organization</u>	3	0	0	3
PTEC2305	<u>Transmission Lines and Wave guides</u>	3	1	0	4
<b>PRACTICAL</b>					
PTEC2307	<u>Communication System Lab</u>	0	0	3	2
<b>TOTAL</b>		<b>12</b>	<b>2</b>	<b>3</b>	<b>16</b>

**SEMESTER V**

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
PTEC2304	<u>Microprocessors and Microcontrollers</u>	3	1	0	4
PTEC2352	<u>Computer Networks</u>	3	0	0	3
PTEC2353	<u>Antenna and Wave Propagation</u>	3	1	0	4
PTEC2354	<u>VLSI Design</u>	3	0	0	3
<b>PRACTICAL</b>					
PTEC2308	<u>Microprocessor and Microcontroller Lab</u>	0	0	3	2
<b>TOTAL</b>		<b>12</b>	<b>2</b>	<b>3</b>	<b>16</b>

**SEMESTER VI**

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
PTEC2401	<u>Wireless Communication</u>	3	0	0	3
PTEC2402	<u>Optical Communication and Networking</u>	3	0	0	3
PTEC2403	<u>RF and Microwave Engineering</u>	3	0	0	3
	Elective I	3	0	0	3
<b>PRACTICAL</b>					
PTEC2405	<u>Optical &amp; Microwave Lab</u>	0	0	3	2
<b>TOTAL</b>		<b>12</b>	<b>0</b>	<b>3</b>	<b>14</b>

**SEMESTER VII**

CODE NO.	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
	Elective II	3	0	0	3
	Elective III	3	0	0	3
	Elective IV	3	0	0	3
	Elective V	3	0	0	3
<b>PRACTICAL</b>					
PTEC2451	Project Work	0	0	12	6
<b>TOTAL</b>		<b>12</b>	<b>0</b>	<b>12</b>	<b>18</b>

## LIST OF ELECTIVS

### ELECTIVE - I

CODE NO.	COURSE TITLE	L	T	P	C
PTEC2021	<u>Medical Electronics</u>	3	0	0	3
PTEC2022	<u>Operating Systems</u>	3	0	0	3
PTEC2023	<u>Solid State Electronic Devices</u>	3	0	0	3
PTIT2064	<u>Speech Processing</u>	3	0	0	3
PTMA2264	<u>Numerical Methods</u>	3	0	0	3
PTCS2021	<u>Multicore Programming</u>	3	0	0	3
PTEC2027	<u>Advanced Microprocessors</u>	3	0	0	3

### ELECTIVE - II

CODE NO.	COURSE TITLE	L	T	P	C
PTEC2028	<u>Internet and Java</u>	3	0	0	3
PTEC2029	<u>Digital Image Processing</u>	3	0	0	3
PTEC2030	<u>Advanced Digital Signal Processing</u>	3	0	0	3
PTEC2031	<u>Electromagnetic Interference and Compatibility</u>	3	0	0	3
PTCS2060	<u>High Speed Networks</u>	3	0	0	3
PTEC2033	<u>Power Electronics</u>	3	0	0	3
PTEC2034	<u>Television and Video Engineering</u>	3	0	0	3

### ELECTIVE - III

CODE NO.	COURSE TITLE	L	T	P	C
PTCS2053	<u>Soft Computing</u>	3	0	0	3
PTGE2022	<u>Total Quality Management</u>	3	0	0	3
PTEC2035	<u>Cryptography and Network Security</u>	3	0	0	3
PTEC2036	<u>Information Theory</u>	3	0	0	3
PTEC2037	<u>Multimedia Compression &amp; Communication</u>	3	0	0	3
PTEC2038	<u>Nano Electronics</u>	3	0	0	3
PTEC2039	<u>Parallel and Distributed Processing</u>	3	0	0	3

### ELECTIVE - IV

CODE NO.	COURSE TITLE	L	T	P	C
PTEC2041	<u>Avionics</u>	3	0	0	3
PTGE2071	<u>Intellectual Property Rights</u>	3	0	0	3
PTGE2025	<u>Professional Ethics in Engineering</u>	3	0	0	3
PTEC2042	<u>Embedded and Real Time Systems</u>	3	0	0	3
PTEC2043	<u>Wireless networks</u>	3	0	0	3
PTEC2044	<u>Telecommunication Switching and Networks</u>	3	0	0	3
PTEC2045	<u>Satellite Communication</u>	3	0	0	3

**ELECTIVE - V**

<b>CODE NO.</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PTEC2046	<u>Advanced Electronic system design</u>	3	0	0	3
PTEC2047	<u>Optoelectronic Devices</u>	3	0	0	3
PTEC2048	<u>Telecommunication System Modeling and Simulation</u>	3	0	0	3
PTEC2049	<u>Radar and Navigational Aids</u>	3	0	0	3
PTEC2050	<u>Mobile Adhoc Networks</u>	3	0	0	3
PTEC2051	<u>Wireless Sensor Networks</u>	3	0	0	3
PTEC2052	<u>Remote Sensing</u>	3	0	0	3
PTEC2053	<u>Engineering Acoustics</u>	3	0	0	3
PTEC2054	<u>Optical Networks</u>	3	0	0	3

**UNIT I MATRICES****9**

Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley – Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms .

**UNIT II FUNCTIONS OF SEVERAL VARIABLES****9**

Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

**UNIT III ANALYTIC FUNCTION****9**

Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions  $w = a + z$ ,  $az$ ,  $1/z$ , - Bilinear transformation.

**UNIT IV COMPLEX INTEGRATION****9**

Line Integral – Cauchy's theorem and integral formula – Taylor's and Laurent's Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

**UNIT V LAPLACE TRANSFORMS****9**

Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals – Initial and Final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

**TOTAL : 45 PERIODS****TEXT BOOKS**

1. Grewal B.S., Higher Engineering Mathematics (40<sup>th</sup> Edition), Khanna Publishers, Delhi (2007).
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., New Delhi (2007).

**REFERENCE BOOKS**

1. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education (2007).
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt Ltd., New Delhi (2006).

**UNIT I            ULTRASONICS****9**

Introduction – Production – magnetostriction effect - magnetostriction generator- piezoelectric effect - piezoelectric generator- Detection of ultrasonic waves properties – Cavitations - Velocity measurement – acoustic grating - Industrial applications – drilling, welding, soldering and cleaning – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C –scan displays, Medical applications - Sonograms

**UNIT II            LASERS****9**

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping. Einstein's A and B coefficients - derivation. Types of lasers – He-Ne, CO<sub>2</sub>, Nd-YAG, Semiconductor lasers - homojunction and heterojunction (Qualitative)- Industrial Applications - Lasers in welding, heat treatment and cutting – Medical applications - Holography (construction and reconstruction).

**UNIT III           FIBER OPTICS & APPLICATIONS****9**

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Double crucible technique of fibre drawing - Splicing, Loss in optical fibre – attenuation, dispersion, bending - Fibre optical communication system (Block diagram) - Light sources - Detectors - Fibre optic sensors – temperature and displacement - Endoscope.

**UNIT IV           QUANTUM PHYSICS****9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton effect - Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one-dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

**UNIT V            CRYSTAL PHYSICS****9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy - Crystal defects – point, line and surface defects- Burger vector.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2008).
2. Arumugam M. ' Engineering Physics', Anuradha Publications, Kumbakonam, (2007)
3. Sankar B.N and Pillai S.O. 'A text book of Engineering Physics', New Age International Publishers, New Delhi, 2007.

**REFERENCES:**

1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003)
2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005.
3. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6<sup>th</sup> Edition, Thomson Brooks/Cole, Indian reprint (2007)

**UNIT I WATER TREATMENT AND POLLUTION CONTROL 9**

Treatment of water –impurities and disadvantages of hard water-Domestic and Industrial treatment - zeolite and ion exchange processes-Portable water-Boiler feed water – conditioning of boiler feed water. Scale and sludge formation –prevention –caustic embrittlement-boiler corrosion–priming and foaming Sewage treatment–Primary, secondary and tertiary treatment–significance of DO, BOD and COD-desalination – reverse osmosis. Control of water,air and land pollution.

**UNIT II FUELS 9**

Classification of fuels-Proximate and ultimate analysis of coal- coke manufacture-Otto Hoffman by product method-cracking-thermal and catalytic (fixed bed and fluidized bed)-petroleum-refining-factions-composition and uses synthetic petrol-fischer drops methods-Bergius process- knocking-octane number and cetane number-Preparation, composition and uses of producer gas , water gas and natural gas. Flue gas analysis- Orsat apparatus- gross and net calorific values- calculation of minimum requirement of air(simple calculations)- Explosive range –spontaneous ignition temperature

**UNIT III THERMODYNAMICS AND SURFACE CHEMISTRY 9**

Second law of thermodynamics-entropy and its significance- criteria for spontaneity- free energy-Gibbs, Helmholtz and Gibbs-Helmholtz equation-applications and problems – Adsorption –types of adsorption- adsorption of gases on solids- adsorption isotherm-Freundlich and Langmuir isotherms-adsorption of solutes from solutions- applications

**UNIT IV ELECTROCHEMISTRY - CORROSION AND CATALYSIS 9**

Reversible and irreversible cells-electrode potentials-types of electrodes-cell reactions-Nernst equations- electrochemical and galvanic series-fuel cells and solar cells-corrosion-chemical and electrochemical-factors affecting corrosion-sacrificial anode-impressed current cathodic protection-surface treatment and protective coating- Catalysis – classification-characteristics of catalysis – auto catalysis- enzyme catalysis

**UNIT V POLYMERS-COMPOSITES AND NANOCHEMISTRY 9**

Polymers-definition-classification-thermoplastics and thermosetting plastics differences Preparation, properties and uses of polystyrene, bakelite, PET, polyurethane, Teflon, ureaformaldehyde, polycarbonates-Elastomers-Preparation, properties of Buna-S, nitrile, neoprene and butyl rubber, silicon rubber. Composites-FRP. Nanochemistry-introduction to nanochemistry- preparation and properties of nonmaterial-nano rods, nano wires-nanotubes-carbon nanotubes and their applications.

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Dhara S S A text book of Engineering Chemistry, S.Chand & Co Ltd, New Delhi,2002
2. Jain. P.C and Monica Jain, Engineering Chemistry,Dhanpet Rai & Sons, New Delhi 2001

**REFERENCE BOOKS:**

1. Puri B R.,Sharma L R and Madhan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co. Jalandar-2000.
2. G.B. Sergeev, Nanochemistry.Elsevier Science, New York,2006
3. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras (2006).







**UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9**

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

**UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9**

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

**UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9**

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. Grewal, B.S. “Higher Engineering Mathematics”, Khanna Publications (2007)

**REFERENCES:**

1. Glyn James, “Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. “Higher Engineering Mathematics” Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, “A Text Book of Engineering 7<sup>th</sup> Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

**PTEC 2201 ELECTROMAGNETIC FIELDS AND WAVES L T P C  
3 0 0 3**

**UNIT I STATIC ELECTRIC FIELD 9**

Introduction to co-ordinate systems , Gradient , Divergence , Curl , Divergence theorem, Stokes theorem , Coulombs law , Electric field intensity , Principle of superposition , Electric scalar potential , Electric flux density. Gauss’s law and its application, Permittivity, Polarization, Boundary relation, Capacitance, Dielectric strength ,Energy and Energy density, Poisson and Laplace equation and their application, Numerical problems

**UNIT II STATIC MAGNETIC FIELD 9**

Magnetic field of a current carrying element ,Amperes law , The Biot – Savart law , Magnetic flux Density and Field intensity , Gauss law for magnetic fields , Torque, Magnetic moment ,Magneto motive force , Permeability , Vector potential , Field computation, Inductance, Energy in an Inductor and Energy density, Boundary relation, Hysterisis, Reluctance and Permeance. Numerical problems

**UNIT III TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9**

Faradays law , Transformer and Mutual induction ,Maxwell’s equation , Self and Mutual inductance ,Displacement current , Amperes law and its inconsistency for time varying fields , Boundary relation , Poynting vector , Comparison of field and circuit theory , Numerical problems.

**UNIT IV PLANE EM WAVES IN ISOTROPIC MEDIA 9**  
 Wave equation from Maxwell's Equation, Uniform plane waves in perfect dielectric and conductors, Polarization, Reflection and Refraction of plane waves at different boundaries, Surface impedance, Numerical problems

**UNIT V APPLICATION OF STATIC FIELDS AND COMPUTATIONAL METHODS 9**  
 Deflection of a charged particle, CRO, Ink Jet Printer, Electro static generator, Magnetic Separator, Cyclotron, Velocity selector and Mass Spectrometer, Electromagnetic pump, Introduction to field computation methods-FDM,FEM,MOM , Numerical problems

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. David .K.Cheng, "Field and wave Electromagnetics" , 2<sup>nd</sup> edition, Pearson education, 2004.
2. Mathew.N.O.Sadiku, "Elements of Electromagnetics", Oxford University Press,2006

**REFERENCES:**

1. Karl E.Longman and Sava V.Savov, "Fundamentals of Electro-Magnetics" , Prentice Hall of India, 2006
2. Kraus, Fleisch, "Electromagnetics with Applications", McGraw-Hill, 2005
3. W.H.Hayt and A.Buck,"Engineering ElectroMagnetics" , 7<sup>th</sup> Edition, Mcgraw Hill,2006
4. Ashutosh Pramanik," ElectroMagnetism" ,Prentice Hall of India, 2006
5. Nannapaneni Narayana Rao," Elements of Engineering ElectroMagnetics", 6<sup>th</sup> edition, Prentice Hall of India, 2006

**PTEC 2202 ELECTRONIC CIRCUITS - I L T P C**  
**3 0 0 3**

**UNIT I BIASING OF DISCRETE BJT AND MOSFET 9**  
 DC Load line , operating point, Various biasing methods for BJT - Design – Stability - Bias compensation, Thermal stability, Design of biasing for MOSFET and JFET

**UNIT II BJT AMPLIFIERS 9**  
 Small signal Analysis of Common Emitter-AC Loadline, Voltage swing limitations, Common collector and common base amplifiers – JFET amplifiers - Differential amplifiers- CMRR- Darlington Amplifier-Bootstrap technique - Cascaded stages - Cascode Amplifier

**UNIT III MOSFET AMPLIFIERS 9**  
 Small signal Analysis of Common source, Source follower and Common Gate amplifiers - CMOS Inverters –DC Analysis of CMOS Inverters – Voltage transfer curve – BiMOS Cascode - Design of NMOS inverter using resistive load – Noise Margin – VTC.

**UNIT IV IC MOSFET AMPLIFIERS 9**  
 Single stage IC MOS amplifiers – Active Loads – Depletion MOS, Enhancement MOS, MOS in Triode region, NMOS current source and PMOS Current source, their equivalent circuits and load line on the VI characteristics– Current steering circuit using MOSFET — CMOS common source amplifier and CMOS Common source follower – CMOS differential amplifier - CMRR

**UNIT V HIGH FREQUENCY ANALYSIS AND LARGE SIGNAL AMPLIFIERS 9**

Short circuit current gain, cut off frequency –  $f_{\alpha}$  and  $f_{\beta}$  unity gain and bandwidth - Miller effect–frequency Analysis of CS and CE Amplifiers-Determinations of BW of Single stage and Multistage Amplifier- Analysis of Class A, Class B, Class AB with darlington output stage and with output stage utilizing MOSFETs – Class C, Class D, Class E power amplifiers.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 5th Edition, Oxford University Press, 2004.
2. Donald .A. Neamen, Electronic Circuit Analysis and Design –2<sup>nd</sup> edition, Tata McGraw Hill, 2007.

**REFERENCES:**

1. Behzad Razavi, “ Design of Analog CMOS Integrated Circuits”, Tata McGraw Hill, 2007.
2. Paul Gray, Hurst, Lewis, Meyer “Analysis and Design of Analog Integrated Circuits”, 4<sup>th</sup> Edition, John Willey & Sons 2005
3. Millman .J. and Halkias C.C, “Integrated Electronics”, McGraw Hill, 2001.
4. D.Schilling and C.Belove, “Electronic Circuits”, 3<sup>rd</sup> edition, McGraw Hill, 1989.

**PTEC 2206 SIGNALS AND SYSTEMS L T P C  
3 1 0 4**

**UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9**

Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential, classification of CT and DT signals –periodic and aperiodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

**UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9**

Fourier series analysis- spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in Signal Analysis.

**UNIT III LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS 9**

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis- State variable equations and matrix representation of systems.

**UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9**

Baseband Sampling of CT signals- Aliasing, DTFT and properties, Z-transform & properties.

**UNIT V LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS 9**

Difference Equations-Block diagram representation-Impulse response-Convolution sum-DTFT and Z Transform analysis of Recursive & Non-Recursive systems- State variable equations and matrix representation of systems.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Allan V. Oppenheim, S. Wilsky and S.H. Nawab, Signals and Systems, Pearson, Indian Reprint, 2007.
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons, Inc, 2004.

**REFERENCES:**

1. H P Hsu, Rakesh Ranjan“ Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint, 2007
2. Edward W. Kamen, Bonnie S. Heck, Fundamentals of Signals and Systems Using the Web and MATLAB, Pearson, Indian Reprint, 2007
3. John Alan Stuller, An Introduction to Signals and Systems, Thomson, 2007
4. M.J. Roberts, Signals & Systems, Analysis using Transform methods & MATLAB, Tata McGraw Hill (India), 2007.
5. Robert A. Gabel and Richard A. Roberts, Signals & Linear Systems, John Wiley, III edition, 1987.

**PTEC 2204****ELECTRONIC CIRCUITS LAB****L T P C  
0 0 3 2**

1. Frequency Response of CE amplifier
2. Frequency response of CB amplifier
3. CC Amplifier - buffer
4. Frequency response of CS Amplifiers
5. Class A and Class B power amplifiers.
6. Differential Amplifiers- Transfer characteristic.
7. CMRR Measurement
8. Cascode amplifier
9. Cascade amplifier.

**TOTAL: 45 PERIODS****PTEC 2251****ELECTRONIC CIRCUITS II****L T P C  
3 1 0 4****AIM**

The aim of this course is to familiarize the student with the analysis and design of feed back amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators.

**OBJECTIVES**

On completion of this course the student will understand

- The advantages and method of analysis of feedback amplifiers
- Analysis and design of LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time base generators.





**AIM**

To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

**OBJECTIVES**

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

**UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 12**

**Minimization Techniques:** Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization.

**Logic Gates:** AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR- Implementations of Logic Functions using gates, NAND-NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

**UNIT II COMBINATIONAL CIRCUITS 12**

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor - Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators - code converters - Magnitude Comparator.

**UNIT III SEQUENTIAL CIRCUITS 12**

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo-n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

**UNIT IV MEMORY DEVICES 12**

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – 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 Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL





**UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9**

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

**UNIT III ANALOG MULTIPLIER AND PLL 9**

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

**UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 8**

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode  $R-2R$  Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type - Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

**UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs 9**

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2007.
2. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 2000.

**REFERENCES:**

1. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001
2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005.
3. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education, 4<sup>th</sup> Edition, 2001.
4. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996.
5. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004.
6. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006.
7. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.

**DESIGN OF FOLLOWING CIRCUITS**

1. Series and Shunt feedback amplifiers:  
Frequency response, Input and output impedance calculation
2. RC Phase shift oscillator, Wien Bridge Oscillator
3. Hartley Oscillator, Colpitts Oscillator
4. Tuned Class C Amplifier
5. Integrators, Differentiators, Clippers and Clampers
6. Astable, Monostable and Bistable multivibrators

**SIMULATION USING PSPICE:**

1. Differential amplifier
2. Active filters : Butterworth 2<sup>nd</sup> order LPF, HPF (Magnitude & Phase Response)
3. Astable, Monostable and Bistable multivibrator - Transistor bias
4. D/A and A/D converters (Successive approximation)
5. Analog multiplier
6. CMOS Inverter, NAND and NOR

**LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 30 STUDENTS  
(3 per Batch)**

S.No	Name of the equipments / Components	Quantity Required	Remarks
1	Variable DC Power Supply	8	(0-30V)
2	Fixed Power Supply	4	+ / - 12V
3	CRO	6	30MHz
4	Multimeter	6	Digital
5	Multimeter	2	Analog
6	Function Generator	6	1 MHz
7	Digital LCR Meter	1	
8	PC with SPICE Simulation Software	6	
<b>Consumables (Minimum of 25 Nos. each)</b>			
9	BC107, BF195, 2N2222, BC147		
10	Resistors 1/4 Watt Assorted		
11	Capacitors		
12	Inductors		
13	Diodes, Zener Diodes		
14	Bread Boards		

**AIM**

To introduce the basic concepts of Digital Communication in baseband and passband domains and to give an exposure to error control coding techniques.

**OBJECTIVES**

- To study signal space representation of signals and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To understand baseband and bandpass signal transmission and reception techniques.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

**UNIT I DIGITAL COMMUNICATION SYSTEM 8**

Introduction to Analog Pulse Communication Systems – Digital Communication Systems – Functional description, Channel classification, Performance Measure; Geometric representation of Signals, Bandwidth, Mathematical Models of Communication Channel.

**UNIT II BASEBAND FORMATTING TECHNIQUES 10**

Sampling – Impulse sampling, Natural Sampling, Sampler Implementation; Quantisation – Uniform and Non-uniform; Encoding Techniques for Analog Sources- Temporal waveform encoding, Spectral waveform encoding, Model-based encoding, Comparison of speech encoding methods.

**UNIT III BASEBAND CODING TECHNIQUES 9**

Error Control Codes - Block Codes, Convolutional Codes, Concept of Error Free Communication; Classification of line codes, desirable characteristics and power spectra of line codes.

**UNIT IV BASEBAND RECEPTION TECHNIQUES 9**

Noise in Communication Systems; Receiving Filter – Correlator type, Matched Filter type; Equalising Filter - Signal and system design for ISI elimination, Implementation, Eye Pattern analysis; Synchronisation; Detector – Maximum Likelihood Detector, Error Probability, Figure-of-Merit for Digital Detection.

**UNIT V BANDPASS SIGNAL TRANSMISSION AND RECEPTION 9**

Memory less modulation methods - Representation and Spectral characteristics, ASK, PSK, QAM, QPSK, FSK; Bandpass receiving filter, Error performance – Coherent and Non-coherent detection systems.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Amitabha Bhattacharya, "Digital Communications", Tata McGraw Hill, 2006.
2. Simon Haykin, "Digital Communications", John Wiley, 2006.

**REFERENCES:**

1. John.G. Proakis, "Fundamentals of Communication Systems", Pearson Education, 2006.
2. Michael. B. Pursley, "Introduction to Digital Communication", Pearson Education, 2006.
3. Bernard Sklar, Digital Communication, 2<sup>nd</sup> Edition, Paerson Education, 2006
4. Herbert Taub & Donald L Schilling – Principles of Communication Systems ( 3<sup>rd</sup> Edition ) – Tata McGraw Hill, 2008.
5. Leon W. Couch, Digital and Analog Communication Systems, 6<sup>th</sup> Edition, Pearson Education, 2001.

**AIM**

To study the signal processing methods and processors.

**OBJECTIVES**

- o study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

**UNIT I DISCRETE FOURIER TRANSFORM 9**

DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

**UNIT II INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9**

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Realization using direct, cascade and parallel forms.

**UNIT III FINITE IMPULSE RESPONSE DIGITAL FILTERS 9**

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Hamming, Hanning and Blackmann Windows – Frequency sampling method –Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

**UNIT IV FINITE WORD LENGTH EFFECTS 9**

Fixed point and floating point number representations – Comparison – Truncation and Rounding errors - Quantization noise – derivation for quantization noise power – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors - signal scaling

**UNIT V MULTIRATE SIGNAL PROCESSING 9**

Introduction to Multirate signal processing-Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

**L: 45, T: 15, TOTAL= 60 PERIODS**

**TEXT BOOKS:**

1. John G Proakis and Manolakis, “ Digital Signal Processing Principles, Algorithms and Applications”, Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007

**REFERENCES:**

1. E.C. Ifeachor and B.W. Jervis, “ Digital signal processing – A practical approach”, Second edition, Pearson, 2002.
2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata McGraw Hill, 1998.
3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

**AIM**

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

**OBJECTIVES**

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

**UNIT I INTRODUCTION 9**

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

**UNIT II DATA PATH DESIGN 9**

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

**UNIT III CONTROL DESIGN 9**

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

**UNIT IV MEMORY ORGANIZATION 9**

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

**UNIT V SYSTEM ORGANIZATION 9**

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

**TOTAL : 45 PERIODS**

**TEXTBOOKS:**

1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanescic and Safat G. Zaky, " Computer Organisation", V edition, McGraw-Hill Inc, 1996.

## REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Paraami, "Computer Architecture", BEH R002, Oxford Press.
3. P.Pal Chaudhuri, , "Computer organization and design", 2<sup>nd</sup> Ed., Prentice Hall of India, 2007.
4. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall, 1992.

**PTEC2305**

**TRANSMISSION LINES AND WAVEGUIDES**

**L T P C**  
**3 1 0 4**

## AIM

To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.

## OBJECTIVES

- To become familiar with propagation of signals through lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

## UNIT I FILTERS

**9**

The neper - the decibel - Characteristic impedance of Symmetrical Networks – Current and voltage ratios - Propagation constant, - Properties of Symmetrical Networks - Filter fundamentals – Pass and Stop bands. Behaviour of the Characteristic impedance. Constant K Filters - Low pass, High pass band, pass band elimination filters - m - derived sections – Filter circuit design – Filter performance – Crystal Filters.

## UNIT II TRANSMISSION LINE PARAMETERS

**9**

A line of cascaded T sections - Transmission lines - General Solution, Physical Significance of the equations, the infinite line, wavelength, velocity, propagation, Distortion line, the telephone cable, Reflection on a line not terminated in  $Z_0$ , Reflection Coefficient, Open and short circuited lines, Insertion loss.

## UNIT III THE LINE AT RADIO FREQUENCY

**9**

Parameters of open wire line and Coaxial cable at RF – Line constants for dissipation - voltages and currents on the dissipation less line - standing waves – nodes - standing wave ratio - input impedance of open and short circuited lines - power and impedance measurement on lines –  $\lambda / 4$  line, Impedance matching – single and double-stub matching circle diagram, smith chart and its applications – Problem solving using Smith chart.

## UNIT IV GUIDED WAVES BETWEEN PARALLEL PLANES

**9**

Application of the restrictions to Maxwell's equations – transmission of TM waves between Parallel planes – Transmission of TE waves between Parallel planes. Transmission of TEM waves between Parallel planes – Manner of wave travel. Velocities of the waves – characteristic impedance - Attenuators

**UNIT V      WAVEGUIDES****9**

Application of Maxwell's equations to the rectangular waveguide. TM waves in Rectangular guide. TE waves in Rectangular waveguide – Cylindrical waveguides. The TEM wave in coaxial lines. Excitation of wave guides. Guide termination and resonant cavities.

**L: 45, T: 15, TOTAL= 60 PERIODS****TEXT BOOK:**

1. John D.Ryder, "Networks, lines and fields", Prentice Hall of India, 2<sup>nd</sup> Edition, 2006.

**REFERENCES:**

1. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education, 2006.
2. Joseph Edminister, Schaum's Series, Electromagnetics, TMH, 2007.
3. G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2006.

**PTEC2307****COMMUNICATION SYSTEMS LABORATORY****L T P C  
0 0 3 2**

1. Amplitude modulation and Demodulation.
2. Frequency Modulation and Demodulation
3. Pulse Modulation – PAM / PWM / PPM
4. Pulse Code Modulation
5. Delta Modulation, Adaptive Delta Modulation.
6. Digital Modulation & Demodulation – ASK, PSK, QPSK, FSK (Hardware & MATLAB)
7. Designing, Assembling and Testing of Pre-Emphasis / De-emphasis Circuits.
8. PLL and Frequency Synthesizer
9. Line Coding
10. Error Control Coding using MATLAB.
11. Sampling & Time Division Multiplexing.
12. Frequency Division Multiplexing,

**TOTAL : 45 PERIODS**



**AIM**

To learn the architecture, programming, interfacing and rudiments of system design of microprocessors and microcontrollers.

**OBJECTIVES**

- To introduce microprocessors and basics of system design using microprocessors.
- To introduce h/w architecture, instruction set and programming of 8085 microprocessor.
- To introduce the h/w architecture, instruction set and programming of 8086 microprocessor.
- To introduce the peripheral interfacing of microprocessors.
- To introduce through case studies, the system design principles using 8085 and 8086.
- To introduce the h/w architecture, instruction set, programming and interfacing of 8051 microcontroller.

**UNIT I INTRODUCTION TO 8 BIT AND 16 BIT MICROPROCESSORS – H/W ARCHITECTURE 9**

Introduction to microprocessor, computer and its organization, Programming system, Address bus, data bus and control bus, Tristate bus, clock generation, Connecting Microprocessor to I/O devices, Data transfer schemes, Architectural advancements of microprocessors. Introductory System design using microprocessors, 8086 – Hardware Architecture, External memory addressing, Bus cycles, some important Companion Chips, Maximum mode bus cycle, 8086 system configuration, Memory Interfacing, Minimum mode system configuration, Maximum mode system configuration, Interrupt processing, Direct memory access.

**UNIT II 16 BIT MICROPROCESSOR INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING 9**

Programmer's model of 8086, operand types, operand addressing, assembler directives, instruction set - Data transfer group, Arithmetic group, logical group, control transfer group, miscellaneous instruction groups, programming.

**UNIT III MICROPROCESSOR PERIPHERAL INTERFACING 9**

Introduction, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255, Sample-and-Hold Circuit and Multiplexer, Keyboard and Display Interface, Keyboard and Display Controller (8279), Programmable Interval timers (Intel 8253, 8254), D-to-A converter, A-to-D converter, CRT Terminal Interface, Printer Interface.

**UNIT IV 8 BIT MICROCONTROLLER- H/W ARCHITECTURE, INSTRUCTION SET AND PROGRAMMING 9**

Introduction to 8051 Micro-controller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions, Programming

**UNIT V SYSTEM DESIGN USING MICRO PROCESSOR & MICROCONTROLLER 9**

Case studies – Traffic light control, washing machine control, RTC Interfacing using I2C Standard- Motor Control- Relay, PWM, DC & Stepper Motor.

**L: 45, T: 15, TOTAL= 60 PERIODS**





**UNIT II WIRE ANTENNAS AND ANTENNA ARRAYS 9**

Wire antennas: Short dipole, Radiation resistance and Directivity, Half wave Dipole, Monopole, Small loop antennas. Antenna Arrays: Linear Array and Pattern Multiplication, Two-element Array, Uniform Array, Polynomial representation, Array with non-uniform Excitation-Binomial Array

**UNIT III APERTURE ANTENNAS 9**

Aperture Antennas: Magnetic Current and its fields, Uniqueness theorem, Field equivalence principle, Duality principle, Method of Images, Pattern properties, Slot antenna, Horn Antenna, Pyramidal Horn Antenna, Reflector Antenna-Flat reflector, Corner Reflector, Common curved reflector shapes, Lens Antenna.

**UNIT IV SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS 9**

Special Antennas: Long wire, V and Rhombic Antenna, Yagi-Uda Antenna, Turnstile Antenna, Helical Antenna- Axial mode helix, Normal mode helix, Biconical Antenna, Log periodic Dipole Array, Spiral Antenna, Microstrip Patch Antennas.

Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.

**UNIT V RADIO WAVE PROPAGATION 9**

Calculation of Great Circle Distance between any two points on earth, Ground Wave Propagation, Free-space Propagation, Ground Reflection, Surface waves, Diffraction, Wave propagation in complex Environments, Tropospheric Propagation, Tropospheric Scatter. Ionospheric propagation: Structure of ionosphere, Sky waves, skip distance, Virtual height, Critical frequency, MUF, Electrical properties of ionosphere, Effects of earth's magnetic fields, Faraday rotation, Whistlers.

**TUTORIAL = 15 TOTAL = 45 + 15 =60 PERIODS**

**TEXTBOOKS:**

1. E.C.Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education / PHI, 2006
2. A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press, 2007.

**REFERENCES:**

1. John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications", Tata McGraw-Hill Book Company, 3 ed, 2007.
2. G.S.N.Raju, Antenna Wave Propagation, Pearson Education, 2004.
3. Constantine A. Balanis, Antenna Theory Analysis and Design, John Wiley, 2<sup>nd</sup> Edition, 2007.
4. R.E.Collins, "Antenna and Radiowave propagation",
5. W.L Stutzman and G.A. Thiele, "Antenna analysis and design", John Wiley, 2000.

**AIM**

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

**OBJECTIVES**

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

**UNIT I CMOS TECHNOLOGY 9**

A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal I-V effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues

**UNIT II CIRCUIT CHARACTERIZATION AND SIMULATION 9**

Delay estimation, Logical effort and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation

**UNIT III COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN 9**

Circuit families –Low power logic design – comparison of circuit families – Sequencing static circuits, circuit design of latches and flip flops, Static sequencing element methodology- sequencing dynamic circuits – synchronizers

**UNIT IV CMOS TESTING 9**

Need for testing- Testers, Test fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan

**UNIT V SPECIFICATION USING VERILOG HDL 9**

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

**TOTAL : 45 PERIODS**

**TEXTBOOKS:**

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

**REFERENCES:**

- 1 D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
- 2 Wayne Wolf, Modern VLSI design, Pearson Education, 2003
- 3 M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997
- 4 J.Bhasker: Verilog HDL primer, BS publication,2001
- 5 Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003

1. Programs for 16 bit Arithmetic operations (Using 8086).
2. Programs for Sorting and Searching (Using 8086).
3. Programs for String manipulation operations (Using 8086).
4. Programs for Digital clock and Stop watch (Using 8086).
5. Interfacing ADC and DAC.
6. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
7. Interfacing and Programming 8279, 8259, and 8253.
8. Serial Communication between two MP Kits using 8251.
9. Interfacing and Programming of Stepper Motor and DC Motor Speed control.
10. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
11. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
12. Communication between 8051 Microcontroller kit and PC.

**TOTAL : 45 PERIODS**

**AIM**

To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

**OBJECTIVES**

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
- It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides idea about analog and digital modulation techniques used in wireless communication.
- It also deals with the different types of equalization techniques and diversity concepts.. It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques.
- It deals with advanced transceiver schemes and second generation and third generation wireless networks.

<b>UNIT I</b>	<b>SERVICES AND TECHNICAL CHALLENGES</b>	<b>9</b>
Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.		
<b>UNIT II</b>	<b>WIRELESS PROPAGATION CHANNELS</b>	<b>9</b>
Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models.		
<b>UNIT III</b>	<b>WIRELESS TRANSCEIVERS</b>	<b>9</b>
Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying, $\pi/4$ -Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.		
<b>UNIT IV</b>	<b>SIGNAL PROCESSING IN WIRELESS SYSTEMS</b>	<b>9</b>
Principle of Diversity, Macrodiversity, Microdiversity, Signal Combining Techniques, Transmit diversity, Equalisers- Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.		
<b>UNIT V</b>	<b>ADVANCED TRANSCEIVER SCHEMES</b>	<b>9</b>
Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, Second Generation(GSM, IS-95) and Third Generation Wireless Networks and Standards		
<b>TOTAL : 45 PERIODS</b>		

**TEXT BOOKS:**

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.

**REFERENCES :**

1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007

<b>PTEC2402</b>	<b>OPTICAL COMMUNICATION AND NETWORKING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**AIM**

To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.

To study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.

## **OBJECTIVES**

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

## **UNIT I INTRODUCTION 9**

Introduction, Ray theory transmission- Total internal reflection-Acceptance angle – Numerical aperture – Skew rays – Electromagnetic mode theory of optical propagation – EM waves – modes in Planar guide – phase and group velocity – cylindrical fibers – SM fibers.

## **UNIT II TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS 9**

Attenuation – Material absorption losses in silica glass fibers – Linear and Non linear Scattering losses - Fiber Bend losses – Midband and farband infra red transmission – Intra and inter Modal Dispersion – Over all Fiber Dispersion – Polarization- non linear Phenomena. Optical fiber connectors, Fiber alignment and Joint Losses – Fiber Splices – Fiber connectors – Expanded Beam Connectors – Fiber Couplers.

## **UNIT III SOURCES AND DETECTORS 9**

Optical sources: Light Emitting Diodes - LED structures - surface and edge emitters, mono and hetero structures - internal - quantum efficiency, injection laser diode structures - comparison of LED and ILD

Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise -Noise sources , Signal to Noise ratio , Detector response time.

## **UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS 9**

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration – Probability of Error – Quantum limit.

Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

## **UNIT V OPTICAL NETWORKS 9**

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks – Wavelength Routed Networks – Non linear effects on Network performance – Performance of WDM + EDFA system – Solitons – Optical CDMA – Ultra High Capacity Networks.

**TOTAL : 45 PERIODS**

## **TEXT BOOKS:**

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000



## REFERENCES:

1. J.Gower, "Optical Communication System", Prentice Hall of India, 2001
2. Rajiv Ramaswami, "Optical Networks " , Second Edition, Elsevier , 2004.
3. Govind P. Agrawal, " Fiber-optic communication systems", third edition, John Wiley & sons, 2004.
4. R.P. Khare, "Fiber Optics and Optoelectronics", Oxford University Press, 2007.

**PTEC2403**

**RF AND MICROWAVE ENGINEERING**

**L T P C**  
**3 0 0 3**

### AIM

To enable the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.

### OBJECTIVES

- To study about multi- port RF networks and RF transistor amplifiers
- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

### **UNIT I TWO PORT RF NETWORKS-CIRCUIT REPRESENTATION 9**

Low frequency parameters-impedance ,admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor, applications of RF

### **UNIT II RF TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS 9**

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks, frequency response, T and  $\pi$  matching networks, microstripline matching networks

### **UNIT III MICROWAVE PASSIVE COMPONENTS 9**

Microwave frequency range, significance of microwave frequency range - applications of microwaves. Scattering matrix -Concept of N port scattering matrix representation- Properties of S matrix- S matrix formulation of two-port junction. Microwave junctions - Tee junctions -Magic Tee - Rat race - Corners - bends and twists - Directional couplers - two hole directional couplers- Ferrites - important microwave properties and applications – Termination - Gyrator- Isolator-Circulator - Attenuator - Phase changer – S Matrix for microwave components – Cylindrical cavity resonators.

### **UNIT IV MICROWAVE SEMICONDUCTOR DEVICES 9**

Microwave semiconductor devices- operation - characteristics and application of BJTs and FETs -Principles of tunnel diodes - Varactor and Step recovery diodes - Transferred Electron Devices -Gunn diode- Avalanche Transit time devices- IMPATT and TRAPATT devices. Parametric devices -Principles of operation - applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) - Materials and fabrication techniques

**UNIT V MICROWAVE TUBES AND MEASUREMENTS****9**

Microwave tubes- High frequency limitations - Principle of operation of Multicavity Klystron, Reflex Klystron, Traveling Wave Tube, Magnetron. Microwave measurements: Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift.

**TOTAL : 45 PERIODS****TEXT BOOK:**

1. Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2. Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006

**REFERENCES:**

1. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill.
2. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Inc., 2004.
3. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
4. Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2001
5. D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.

**PTEC2405****OPTICAL & MICROWAVE LAB****L T P C  
0 0 3 2****MICROWAVE EXPERIMENTS:**

1. Reflex Klystron – Mode characteristics
2. Gunn Diode – Characteristics
3. VSWR, Frequency and Wave Length Measurement
4. Directional Coupler – Directivity and Coupling Coefficient – S – parameter measurement
5. Isolator and Circulator – S - parameter measurement
6. Attenuation and Power measurement
7. S - matrix Characterization of E-Plane T, H-Plane T and Magic T.
8. Radiation Pattern of Antennas.
9. Antenna Gain Measurement

**OPTICAL EXPERIMENTS:**

1. DC characteristics of LED and PIN Photo Diode.
2. Mode Characteristics of Fibers
3. Measurement of Connector and Bending Losses.
4. Fiber Optic Analog and Digital Link
5. Numerical Aperture Determination for Fibers
6. Attenuation Measurement in Fibers

**TOTAL : 45 PERIODS**

**AIM**

To make students to understand the applications of electronics in diagnostic and therapeutic area.

**OBJECTIVE**

- To study the methods of recording various biopotentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

**UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9**

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

**UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9**

PH, PO<sub>2</sub>, PCO<sub>2</sub>, PHCO<sub>3</sub>, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

**UNIT III ASSIST DEVICES AND BIO-TELEMETRY 9**

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

**UNIT IV RADIOLOGICAL EQUIPMENTS 9**

Ionising radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

**UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9**

Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

**TOTAL : 45 PERIODS**

**TEXTBOOK:**

1. Leslie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.

**REFERENCES:**

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.

**AIM**

To have a thorough knowledge of the scheduling, memory management, I/O and File System in an Operating system. To have an introduction to distributed operating systems.

**OBJECTIVES**

- To have an overview of components of an operating system
- To have a thorough knowledge of Process management, Storage management, I/O and File Management.
- To have an understanding of a distributed operating system.

**UNIT I OPERATING SYSTEM OVERVIEW 9**

Introduction – Multiprogramming – Time sharing – Multi-user Operating systems – System Call – Structure of Operating Systems

**UNIT II PROCESS MANAGEMENT 9**

Concept of Processes – Interprocess Communication – Racing – Synchronisation – Mutual Exclusion – Scheduling – Implementation Issues – IPC in Multiprocessor System – Threads

**UNIT III MEMORY MANAGEMENT 9**

Partition – paging – segmentation – virtual memory concepts – relocation algorithms – buddy systems – Free space management – Case study.

**UNIT IV DEVICE MANAGEMENT AND FILE SYSTEMS 9**

File concept – access methods – directory structure – File system mounting – file sharing – protection – file system implementation – I/O Hardware – Application I/O Interface – Kernel I/O subsystem – Transforming I/O to Hardware Operations – Streams – Disk Structure – Disk Scheduling Management – RAID structure

**UNIT V MODERN OPERATING SYSTEMS 9**

Concepts of distributed operating systems – Real time operating system – Case studies: UNIX, LINUX and Windows 2000.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Abraham Silberschatz, Peter Galvin and Gagne, 'Operating System Concepts', Seventh Edition, John Wiley, 2007.
2. William Stallings, 'Operating Systems – Internals and Design Principles', Fifth Edition, Prentice Hall India, 2005.

**REFERENCE BOOKS:**

1. Andrew Tanenbaum, 'Modern Operating Systems', 2<sup>nd</sup> Edition, Prentice Hall, 2003.
2. Deital.H.M, "Operating Systems - A Modern Perspective", Second Edition, Addison Wesley, 2004.
3. Mukesh Singhal, Niranjana G.Shivaratri, "Advanced Concepts in Operating Systems", Tata McGraw Hill, 2001.
4. D.M.Dhamdhere, "Operating Systems – A Concept based Approach", Second Edition, Tata McGraw Hill, 2006.
5. Crowley.C, "Operating Systems: A Design – Oriented Approach", Tata McGraw Hill, 1999.
6. Ellen Siever, Aaron Weber, Stephen Figgins, 'LINUX in a Nutshell', Fourth Edition, O'reilly, 2004.

**AIM**

To have fundamental knowledge about structure and V-I characteristics of PN Junction diode, Zener diode, MOSFET, BJT, Opto electronic devices, high frequency devices and high power devices.

**OBJECTIVES**

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions. Fabrication of different semiconductor devices, Varactor diode, Zener diode, Schottky diode, BJT, MOSFET, etc.
- To study VI Characteristics of devices and its limitations in factors like current, power frequency.
- To learn photoelectric effect and fabrication of opto electronic devices.
- To learn high frequency and high power devices.

**UNIT I CRYSTAL PROPERTIES AND GROWTH OF SEMICONDUCTORS****9**

Semiconductor materials - Periodic Structures - Crystal Lattices - Cubic lattices - Planes and Directions - Diamond lattice - Bulk Crystal Growth - Starting Materials - Growth of Single Crystal Ingots - Wafers - Doping - Epitaxial Growth - Lattice Matching in Epitaxial Growth - Vapor - Phase Epitaxy - Atoms and Electrons - Introduction to Physical Models - Experimental Observations - Photoelectric Effect - Atomic spectra - Bohr model - Quantum Mechanics - Probability and Uncertainty Principle - Schrodinger Wave Equation - Potential Well Equation - Potential well Problem - Tunneling.

**UNIT II ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS****9**

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators - Direct and Indirect Semiconductors - Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors - Electrons and Holes - Electrons and Holes in Quantum Wells - Carrier Concentrations - Fermi Level - Electron and Hole Concentrations at Equilibrium - Temperature Dependence of Carrier Concentrations - Compensation and Space Charge Neutrality - Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility - Drift and Resistance - Effects of Temperature and Doping on Mobility - High field effects - Hall Effect - invariance of Fermi level at equilibrium - Fabrication of p-n junctions, Metal semiconductor junctions.

**UNIT III METAL OXIDE SEMICONDUCTOR FET****9**

GaAs MESFET - High Electron Mobility Transistor - Short channel Effects - Metal Insulator Semiconductor FET - Basic Operation and Fabrication - Effects of Real Surfaces - Threshold Voltage - MOS capacitance Measurements - current - Voltage Characteristics of MOS Gate Oxides - MOS Field Effect Transistor - Output characteristics - Transfer characteristics - Short channel MOSFET V-I characteristics - Control of Threshold Voltage - Substrate Bias Effects - Sub threshold characteristics - Equivalent Circuit for MOSFET - MOSFET Scaling and Hot Electron Effects - Drain - Induced Barrier Lowering - short channel and Narrow Width Effect - Gate Induced Drain Leakage.

**UNIT IV OPTOELECTRONIC DEVICES 9**  
 Photodiodes - Current and Voltage in illuminated Junction - Solar Cells - Photo detectors - Noise and Bandwidth of Photo detectors - Light Emitting Diodes - Light Emitting Materials - Fiber Optic Communications Multilayer Heterojunctions for LEDs - Lasers - Semiconductor lasers - Population Inversion at a Junction Emission Spectra for p-n junction - Basic Semiconductor lasers - Materials for Semiconductor lasers.

**UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9**  
 Tunnel Diodes, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode - transferred - electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5<sup>th</sup> Edition, PHI, 2003.

**REFERENCES:**

1. Donald A. Neaman, Semiconductor Physics and Devices, 3<sup>rd</sup> Edition, TMH, 2002.
2. Yannis Tsvividis, Operation & Mode line of MOS Transistor, 2<sup>nd</sup> Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & Aamitava Das Gupta, Semiconductor Devices Modeling a Technology, PHI, 2004.
4. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

**PTIT2064 SPEECH PROCESSING L T P C**  
**3 0 0 3**

**AIM**

To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech analysis and speech compression

**OBJECTIVE**

- To introduce the models for speech production
- To develop time and frequency domain techniques for estimating speech parameters
- To introduce a predictive technique for speech compression
- To understand speech recognition, synthesis and speaker identification.

**UNIT I MECHANICS OF SPEECH 9**  
 Speech production: Mechanism of speech production, Acoustic phonetics - Digital models for speech signals - Representations of speech waveform: Sampling speech signals, basics of quantization, delta modulation, and Differential PCM - Auditory perception: psycho acoustics.

**UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9**  
 Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude, Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function.

**UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9**

Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates - Spectrographic displays - Pitch and formant extraction - Analysis by Synthesis - Analysis synthesis systems: Phase vocoder, Channel Vocoder - Homomorphic speech analysis: Cepstral analysis of Speech, Formant and Pitch Estimation, Homomorphic Vocoders.

**UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9**

Basic Principles of linear predictive analysis – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm, – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

**UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9**

Algorithms: Dynamic time warping, K-means clustering and Vector quantization, Gaussian mixture modeling, hidden Markov modeling - Automatic Speech Recognition: Feature Extraction for ASR, Deterministic sequence recognition, Statistical Sequence recognition, Language models - Speaker identification and verification – Voice response system – Speech synthesis: basics of articulatory, source-filter, and concatenative synthesis – VOIP

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Thomas F, Quatieri, Discrete-Time Speech Signal Processing, Prentice Hall / Pearson Education, 2004.

**REFERENCES:**

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall -1979
3. L.R. Rabiner and B. H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1993.
4. J.R. Deller, J.H.L. Hansen and J.G. Proakis, Discrete Time Processing of Speech Signals, John Wiley, IEEE Press, 1999.

**PTMA2264**

**NUMERICAL METHODS**

**L T P C  
3 0 0 3**

**AIM**

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

**OBJECTIVES**

At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses are summarized as follows:

- i. The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigen value problem of a matrix can be obtained numerically where analytical methods fail to give solution.

- ii. When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- iii. The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- iv. Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

**UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**

Solution of equation –Fixed point iteration:  $x=g(x)$  method - Newton’s method – Solution of linear system by Gaussian elimination and Gauss-Jordon method– Iterative method - Gauss-Seidel method - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method and by Jacobi method for symmetric matrix.

**UNIT II INTERPOLATION AND APPROXIMATION 9**

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton’s forward and backward difference formulas.

**UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson’s 1/3 and 3/8 rules – Romberg’s method – Two and Three point Gaussian quadrature formulae – Double integrals using trapezoidal and Simpsons’s rules.

**UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9**

Single step methods: Taylor series method – Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne’s and Adam’s predictor and corrector methods.

**UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9**

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Veerarjan, T and Ramachandran, T. ‘Numerical methods with programming in ‘C’ Second Edition, Tata McGraw-Hill Publishing.Co.Ltd. (2007).
2. Sankara Rao K, ‘Numerical Methods for Scientists and Engineers’ – 3<sup>rd</sup> edition Printice Hall of India Private Ltd, New Delhi, (2007).

**REFERENCE BOOKS:**

1. Chapra, S. C and Canale, R. P. “Numerical Methods for Engineers”, 5<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi, 2007.
2. Gerald, C. F. and Wheatley, P.O., “Applied Numerical Analysis”, 6<sup>th</sup> Edition, Pearson Education Asia, New Delhi, 2006.
3. Grewal, B.S. and Grewal,J.S., “ Numerical methods in Engineering and Science”, 6<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2004



- UNIT I INTRODUCTION TO MULTIPROCESSORS AND SCALABILITY ISSUES 9**  
Scalable design principles – Principles of processor design – Instruction Level Parallelism, Thread level parallelism. Parallel computer models -- Symmetric and distributed shared memory architectures – Performance Issues – Multi-core Architectures - Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture.
- UNIT II PARALLEL PROGRAMMING 9**  
Fundamental concepts – Designing for threads – scheduling - Threading and parallel programming constructs – Synchronization – Critical sections – Deadlock. Threading APIs.
- UNIT III OPENMP PROGRAMMING 9**  
OpenMP – Threading a loop – Thread overheads – Performance issues – Library functions. Solutions to parallel programming problems – Data races, deadlocks and livelocks – Non-blocking algorithms – Memory and cache related issues.
- UNIT IV MPI PROGRAMMING 9**  
MPI Model – collective communication – data decomposition – communicators and topologies – point-to-point communication – MPI Library.
- UNIT V MULTITHREADED APPLICATION DEVELOPMENT 9**  
Algorithms, program development and performance tuning.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
2. Michael J Quinn, Parallel programming in C with MPI and OpenMP, Tata Mcgraw Hill, 2003.

**REFERENCES:**

1. John L. Hennessey and David A. Patterson, “ Computer architecture – A quantitative approach”, Morgan Kaufmann/Elsevier Publishers, 4<sup>th</sup>. edition, 2007.
2. David E. Culler, Jaswinder Pal Singh, “Parallel computing architecture : A hardware/ software approach” , Morgan Kaufmann/Elsevier Publishers, 1999.

**AIM**

To learn the architecture and programming of advanced microprocessors.

**OBJECTIVES**

- To introduce the concepts of advanced microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of advanced microprocessors.
- To introduce the concepts and architecture of RISC processor.

**UNIT I 80186, 80286, 80386 AND 80486 MICROPROCESSORS 9**

80186 Architecture, Enhancements of 80186 – 80286 Architecture – Real and Virtual Addressing Modes – 80386 Architecture – Special Registers – Memory Management – Memory Paging Mechanism – 80486 Architecture – Enhancements – Cache Memory Techniques – Exception Handling – Comparison of Microprocessors (8086 – 80186 – 80286 – 80386 – 80486).

**UNIT II PENTIUM MICROPROCESSORS 9**

Pentium Microprocessor Architecture – Special Pentium Registers – Pentium Memory Management – New Pentium Instructions – Pentium Pro Microprocessor Architecture – Special features – Pentium II Microprocessor Architecture – Pentium III Microprocessor Architecture – Pentium III Architecture – Pentium IV Architecture – Comparison of Pentium Processors.

**UNIT III RISC PROCESSORS I 9**

PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching – dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basics of P6 micro architecture – Pipelining – out-of-order core pipeline – Memory subsystem.

**UNIT IV RISC PROCESSORS II (Superscalar Processors) 9**

Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

**UNIT V PC HARDWARE OVERVIEW 9**

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces and Controller, Memory and I/O Port Addresses.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486 PENTIUM, PENTIUM Pro, PII, PIII & IV Architecture, Programming & Interfacing, Pearson Education , 2004.
2. John Paul Shen, Mikko H.Lipasti, "Modern Processor Design", Tata Mcgraw Hill, 2006.

**REFERENCES:**

1. Douglas V.Hall, "Microprocessors and Interfacing", Tata McGraw Hill, II Edition 2006.
2. Mohamed Rafiqzaman, "Microprocessors and Microcomputer Based System Design", II Edition, CRC Press, 2007.

**AIM**

To learn the basics of Internetworking, Routing, World Wide Web, Java Programming with simple case studies.

**OBJECTIVES**

- To learn Internetworking with TCP/IP.
- To learn routing for high speed multimedia traffic
- To learn the fundamentals in WWW, HTML and XML.
- To learn Java for Networking application
- To understand the basic concepts in E-com, Network operating system and Web design.

**UNIT I INTERNETWORKING WITH TCP / IP 9**  
Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

**UNIT II INTERNET ROUTING 9**  
Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation (RSVP), IP switching.

**UNIT III WORLD WIDE WEB 9**  
HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design, HTML, Dynamic HTML, CGI, Java script.

**UNIT IV INTRODUCTION TO JAVA 9**  
The java programming environment, Fundamental Programming structures, Objects and Classes, Inheritance, Event handling, Exceptions and Debugging, Multithreading , RMI.

**UNIT V JAVA PROGRAMMING 9**  
Networking with Java, Swing: Applets and Applications, Menu's & Tool Bars, Java and XML – Creating packages, Interfaces, JAR files & Annotations, Javabeans, JDBC.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5<sup>th</sup> edition, Pearson Education, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education. (Unit-III), 2007.
3. Steven Holzner et. al, "Java 2 Programming" , Black Book, Dreamtech Press, 2006. (Unit –IV & V)

**REFERENCES:**

1. Cay S.Hortsmann, Gary Cornwell, "Core Java 2", Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, " TCP/IP Illustrated, The Protocol" , Vol I , Pearson Education, 1<sup>st</sup> Edition, 2006.
3. Behrouz A. Farouzon , "TCP/IP Protocol Suite, 3<sup>rd</sup> edition , Tata McGraw Hill, 2007
4. Chris Bates, " Web Programming Building Internet Applications", Wiley Publications.
5. Kogent Solutions Inc., " Java Server Programming", Black Book, Dreamtech Press, 2007 Platinum edition.

**AIM**

To introduce the student to various image processing techniques.

**OBJECTIVES**

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.

**UNIT I            DIGITAL IMAGE FUNDAMENTALS            9**

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

**UNIT II            IMAGE ENHANCEMENT            9**

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Conharmonic mean filters, Homomorphic filtering, Color image enhancement.

**UNIT III            IMAGE RESTORATION            9**

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

**UNIT IV            IMAGE SEGMENTATION            9**

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

**UNIT V            IMAGE COMPRESSION            9**

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

**REFERENCES:**

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D.E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,



**AIM**

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

**OBJECTIVES**

- To understand EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards

**UNIT I BASIC CONCEPTS 9**

Definition of EMI and EMC with examples, Classification of EMI/EMC - CE, RE, CS, RS, Units of Parameters, Sources of EMI, EMI coupling modes - CM and DM, ESD Phenomena and effects, Transient phenomena and suppression.

**UNIT II EMI MEASUREMENTS 9**

Basic principles of RE, CE, RS and CS measurements, EMI measuring instruments- Antennas, LISN, Feed through capacitor, current probe, EMC analyzer and detection technique open area site, shielded anechoic chamber, TEM cell.

**UNIT III EMC STANDARD AND REGULATIONS 8**

National and International standardizing organizations- FCC, CISPR, ANSI, DOD, IEC, CENELEC, FCC CE and RE standards, CISPR, CE and RE Standards, IEC/EN, CS standards, Frequency assignment - spectrum conversation.

**UNIT IV EMI CONTROL METHODS AND FIXES 10**

Shielding, Grounding, Bonding, Filtering, EMI gasket, Isolation transformer, opto isolator.

**UNIT V EMC DESIGN AND INTERCONNECTION TECHNIQUES 9**

Cable routing and connection, Component selection and mounting, PCB design- Trace routing, Impedance control, decoupling, Zoning and grounding

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Prasad Kodali.V – Engineering Electromagnetic Compatibility – S.Chand&Co – New Delhi – 2000
2. Clayton R.Paul – Introduction to Electromagnetic compatibility – John Wiley & Sons – 1992

**REFERENCES**

1. Keiser – Principles of Electromagnetic Compatibility – Artech House – 3<sup>rd</sup> Edition – 1994
2. Donwhite Consultant Incorporate – Handbook of EMI / EMC – Vol I - 1985

**AIM**

To highlight the features of different technologies involved in High Speed Networking and their performance.

**OBJECTIVES**

- Students will get an introduction about ATM and Frame relay.
- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.
- Students will be provided with different levels of quality of service (Q.S) to different applications.

**UNIT I HIGH SPEED NETWORKS 9**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: WIFI and Wi Max Networks applications, requirements – Architecture of 802.11

**UNIT II CONGESTION AND TRAFFIC MANAGEMENT 8**

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

**UNIT III TCP AND ATM CONGESTION CONTROL 12**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

**UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 8**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

**UNIT V PROTOCOLS FOR QOS SUPPORT 8**

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

**REFERENCES:**

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition , Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

**AIM**

Application of Electronic knowledge in industry for rectification of polyphase supply voltage and for control of motor speed and for thermal heating.

**OBJECTIVES**

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

**UNIT I POWER ELECTRONICS DEVICES 9**

Characteristics of power devices – characteristics of SCR, diac, triac, SCS, GTO, PUJT – power transistors – power FETs – LASCR – two transistor model of SCR – Protection of thyristors against over voltage – over current,  $dv/dt$  and  $di/dt$ .

**UNIT II TRIGGERING TECHNIQUES 9**

Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering with microprocessor – forced commutation – different techniques – series and parallel operations of SCRs.

**UNIT III CONTROLLED RECTIFIERS 9**

Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

**UNIT IV INVERTERS 9**

Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.

**UNIT V INDUSTRIAL APPLICATIONS 9**

DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Muhamed H.Rashid : Power Electronics Circuits, Devices and Applications, 3<sup>rd</sup> Edition. 2004 PHI.
2. M.D. Singh and K.B. Kanchandani, Power Electronics, 2<sup>nd</sup> Edition, TMH, 2007.

**REFERENCES:**

1. Sen: Power Electronics, TMH, 1987.
2. Dubey: Thyristorised Power Controllers, Wiley Eastern 1986.
3. Vithayathil: Power Electronics – Principles and Applications, McGraw-Hill, 1995.
4. Lander: Power Electronics, 3<sup>rd</sup> Edition, McGraw-Hill, 1994.
5. Jacob, Power Electronics, Thomson Learning, 2002.
6. V.R. Moorthy, Power Electronics, Oxford University Press, 2005.



**AIM**

Television Technology has now become a vital tool to the information revolution that is sweeping across the countries of the world. The syllabus aims at a comprehensive coverage of Television Systems with all the new developments in Television Engineering

**OBJECTIVES**

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering

**UNIT I FUNDAMENTALS OF TELEVISION 9**

Aspect ratio-Image continuity-Number of scanning lines-Interlaced scanning-Picture resolution-Camera tubes-Image Orthicon-Vidicon- Plumbicon- Silicon Diode Array Vidicon- Solid-state Image scanners- Monochrome picture tubes- Composite video signal- video signal dimension-horizontal sync. Composition-vertical sync. Details-functions of vertical pulse train- Scanning sequence details. Picture signal transmission-positive and negative modulation- VSB transmission- Sound signal transmission-Standard channel bandwidth.

**UNIT II MONOCHROME TELEVISION TRANSMITTER AND RECEIVER 9**

TV transmitter-TV signal Propagation- Interference- TV Transmission Antennas-Monochrome TV receiver- RF tuner- UHF, VHF tuner-Digital tuning techniques-AFT-IF subsystems-AGC Noise cancellation-Video and Sound inter-carrier detection-Vision IF subsystem- DC re-insertion-Video amplifier circuits-Sync operation- typical sync processing circuits-Deflection current waveforms, Deflection oscillators- Frame deflection circuits- requirements- Line deflection circuits-EHT generation-Receiver antennas.

**UNIT III ESSENTIALS OF COLOUR TELEVISION 9**

Compatibility- Colour perception-Three colour theory- Luminance, Hue and saturation-Colour television cameras-Values of luminance and colour difference signals-Colour television display tubes-Delta-gun Precision-in-line and Trinitron colour picture tubes-Purity and convergence- Purity and static and Dynamic convergence adjustments-Pincushion-correction techniques-Automatic degaussing circuit- Gray scale tracking-colour signal transmission- Bandwidth-Modulation of colour difference signals-Weighting factors-Formation of chrominance signal.

**UNIT IV COLOUR TELEVISION SYSTEMS 9**

NTSC colour TV systems-SECAM system- PAL colour TV systems- Cancellation of phase errors-PAL-D Colour system-PAL coder-PAL-Decoder receiver-Chromo signal amplifier-separation of U and V signals-colour burst separation-Burst phase Discriminator-ACC amplifier-Reference Oscillator-Ident and colour killer circuits-U and V demodulators- Colour signal matrixing. Sound in TV



**UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8**  
 Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press, 2006.

**REFERENCES:**

1. Elaine Rich & Kevin Knight, Artificial Intelligence, Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.
2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
4. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston, 1996.
6. Amit Konar, “Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain”, CRC Press, 2008.

**PTGE2022 TOTAL QUALITY MANAGEMENT L T P C**  
**3 0 0 3**

**UNIT I INTRODUCTION 9**  
 Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

**UNIT II TQM PRINCIPLES 9**  
 Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS & TECHNIQUES I 9**  
 The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

**UNIT IV TQM TOOLS & TECHNIQUES II 9**  
 Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.



**UNIT III AUTHENTICATION AND HASH FUNCTION 9**

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard

**UNIT IV NETWORK SECURITY 8**

Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.

**UNIT V SYSTEM LEVEL SECURITY 8**

Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson Education, Third Edition, 2003.
2. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007

**REFERENCES:**

1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003
3. Wade Trappe and Lawrence C. Washington , " Introduction to Cryptography with coding theory" , Pearson Education, 2007.
4. Wenbo Mao, " Modern Cryptography Theory and Practice" , Pearson Education , 2007
5. Thomas Calabrese, "Information Security Intelligence : Cryptographic Principles and Applications", Thomson Delmar Learning,2006.
6. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.

**PTEC2036**

**INFORMATION THEORY**

**L T P C  
3 0 0 3**

**AIM**

To introduce the fundamental concepts of information theory.

**OBJECTIVES**

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

**UNIT I QUANTITATIVE STUDY OF INFORMATION 8**

Basic inequalities, Entropy, Kullback-Leibler distance, Mutual information, Bounds on entropy, Fisher information , Cramer Rao inequality, Second law of thermodynamics , Sufficient statistic , Entropy rates of a Stochastic process

<b>UNIT II</b>	<b>CAPACITY OF NOISELESS CHANNEL</b>	<b>8</b>
Fundamental theorem for a noiseless channel ,Data compression , Kraft inequality , Shannon-Fano codes , Huffman codes , Asymptotic equipartition , Rate distortion theory		
<b>UNIT III</b>	<b>CHANNEL CAPACITY</b>	<b>9</b>
Properties of channel capacity , Jointly typical sequences , Channel Coding Theorem, converse to channel coding theorem, Joint source channel coding theorem ,		
<b>UNIT IV</b>	<b>DIFFERENTIAL ENTROPY AND GAUSSIAN CHANNEL</b>	<b>9</b>
AEP for continuous random variables, relationship between continuous and discrete entropy, properties of differential entropy, Gaussian channel definitions, converse to coding theorem for Gaussian channel, channels with colored noise, Gaussian channels with feedback .		
<b>UNIT V</b>	<b>NETWORK INFORMATION THEORY</b>	<b>11</b>
Gaussian multiple user channels , Multiple access channel , Encoding of correlated sources , Broadcast channel , Relay channel , Source coding and rate distortion with side information , General multi-terminal networks.		
<b>TOTAL : 45 PERIODS</b>		

**TEXT BOOK:**

1. Elements of Information theory – Thomas Cover, Joy Thomas : Wiley 1999

**REFERENCE:**

1. Information theory, inference & learning algorithms – David Mackay year?

**PTEC2037      MULTIMEDIA COMPRESSION AND COMMUNICATION      L T P C**  
**3 0 0 3**

**AIM**

To introduce the fundamental concepts of information theory.

**OBJECTIVES**

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

**UNIT I            MULTIMEDIA COMPONENTS            9**  
Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

**UNIT II            AUDIO AND VIDEO COMPRESSION            9**  
Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, 4.

**UNIT III TEXT AND IMAGE COMPRESSION 9**

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel ziv-welsh Compression-image compression

**UNIT IV VOIP TECHNOLOGY 9**

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VOIP applicability

**UNIT V MULTIMEDIA NETWORKING 9**

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Fred HAlshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multideai: making it work”, 7/e, TMH 2007
3. Kurose and W.Ross” Computer Networking “a Top down approach, Pearson education

**REFERENCES:**

1. Marcus goncalves “Voice over IP Networks”, Mcgaraw hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education
4. Ranjan Parekh, “Principles of Multimedia”, TMH 2006

**PTEC2038**

**NANO ELECTRONICS**

**L T P C  
3 0 0 3**

**UNIT I INTRODUCTION TO NANOTECHNOLOGY 9**

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation – plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials;

**UNIT II FUNDAMENTALS OF NANOELECTRONICS 9**

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

**UNIT III SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9**

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

Quantum transport devices based on resonant tunneling:- Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

**UNIT IV CARBON NANOTUBES 9**

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of an all carbon nanotube nanoelectronics.

**UNIT V MOLECULAR ELECTRONICS 9**

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

1. Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons and Burkhard Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. T.Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007
3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003

**PTEC2039 PARALLEL AND DISTRIBUTED PROCESSING L T P C  
3 0 0 3**

**AIM:**

To learn the concepts of parallel processing and distributed computing bringing out the differences among various architectures and systems.

**OBJECTIVES:**

- To introduce parallel processing and parallel architectures
- To introduce the concepts of shared memory based and thread based implementations.
- To learn the two modes of distributed computing using message passing and remote procedure calls.
- To learn introductory techniques of parallel debugging, and be introduced to other parallel paradigms.
- To introduce basic concepts of distributed data bases and distributed operating systems.





<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to aircraft – Axes system – Parts, importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.		
<b>UNIT II</b>	<b>RADIO NAVIGATION</b>	<b>9</b>
Types of Radio Navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS		
<b>UNIT III</b>	<b>INERTIAL AND SATELLITE NAVIGATION SYSTEMS</b>	<b>9</b>
Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Block diagram, Platform and strap down INS. Satellite Navigation - GPS		
<b>UNIT IV</b>	<b>AIR DATA SYSTEMS AND AUTOPILOT</b>	<b>9</b>
Air data quantities – Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Stall warning, Altitude warning. Autopilot – basic principles – longitudinal and lateral autopilot.		
<b>UNIT V</b>	<b>AIRCRAFT DISPLAYS</b>	<b>9</b>
Display technologies – LED, LCD, CRT, Flat Panel Display. Primary Flight parameter displays - Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit.		

**TOTAL : 45 PERIODS**

**TEXTBOOKS:**

1. Albert Helfrick. D, 'Principles of Avionics', Avionics communications Inc., 2004
2. Collinson, R.P.G, 'Introduction to Avionics', Chapman and Hall, 1996.

**REFERENCES:**

1. Middleton, D.H, 'Avionics Systems', Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.
2. Spitzer, C.R. 'Digital Avionics Systems', Prentice Hall, Englewood Cliffs, N.J., USA 1993.
3. Spitzer, C.R, 'The Avionics Handbook', CRC Press, 2000.
4. Pallet, E.H.J, 'Aircraft Instruments and Integrated Systems', Longman Scientific

- UNIT I** **9**  
Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).
- UNIT II** **9**  
IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.
- UNIT III** **9**  
International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).
- UNIT IV** **9**  
Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO- Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.
- UNIT V** **9**  
Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Subbaram N.R. “ Handbook of Indian Patent Law and Practice “, S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

**REFERENCES:**

1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707\_gibbs.html.

**UNIT I ENGINEERING ETHICS 9**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

**UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

**UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

**UNIT IV RESPONSIBILITIES AND RIGHTS 9**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

**UNIT V GLOBAL ISSUES 9**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

**TOTAL : 45 PERIODS****TEXT BOOKS :**

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.

**REFERENCES :**

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

**AIM**

To give sufficient background for undertaking embedded and real time systems design.

**OBJECTIVES**

- To introduce students to the embedded systems, its hardware and software.
- To introduce devices and buses used for embedded networking.
- To explain programming concepts and embedded programming in C and C++.
- To explain real time operating systems and inter-task communication.

**UNIT I INTRODUCTION TO EMBEDDED COMPUTING 9**

Complex systems and microprocessors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

**UNIT II COMPUTING PLATFORM AND DESIGN ANALYSIS 9**

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

**UNIT III PROCESS AND OPERATING SYSTEMS 9**

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems –Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

**UNIT IV HARDWARE ACCELERATES & NETWORKS 9**

Accelerators – Accelerated system design – Distributed Embedded Architecture – Networks for Embedded Systems – Network based design – Internet enabled systems.

**UNIT V CASE STUDY 9**

Hardware and software co-design - Data Compressor - Software Modem – Personal Digital Assistants – Set–Top–Box. – System-on-Silicon – FOSS Tools for embedded system development.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, Morgan Kaufmann Publisher, 2006.

**REFERENCE BOOKS:**

1. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007.
- K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, dreamtech press, 2005.
2. Tim Wilmshurst, “An Introduction to the Design of Small Scale Embedded Systems”, Pal grave Publisher, 2004.
3. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
4. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier,2006.

**AIM**

To study some fundamental concepts in wireless networks.

**OBJECTIVES**

- To understand physical as wireless MAC layer alternatives techniques.
- To learn planning and operation of wireless networks.
- To study various wireless LAN and WAN concepts.
- To understand WPAN and geo-location systems.

**UNIT I MULTIPLE RADIO ACCESS 9**

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks , Handoff and Roaming Support, Security and Privacy.

**UNIT II WIRELESS WANS 9**

First Generation Analog, Second Generation TDMA – GSM, Short Messaging Service in GSM, Second Generation CDMA – IS-95, GPRS - Third Generation Systems (WCDMA/CDMA 2000)\

**UNIT III WIRELESS LANS 9**

Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, Physical Layer- MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

**UNIT IV ADHOC AND SENSOR NETWORKS 9**

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

**UNIT V WIRELESS MANS AND PANS 9**

Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2<sup>nd</sup> Ed., 2007.
2. Dharma Prakash Agrawal & Qing-An Zeng, "Introduction to Wireless and Mobile Systems", Thomson India Edition, 2<sup>nd</sup> Ed., 2007.

**REFERENCES:**

1. Vijay. K. Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2007.
2. Kaveth Pahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002.
3. Gary. S. Rogers & John Edwards, "An Introduction to Wireless Technology", Pearson Education, 2007.
4. Clint Smith, P.E. & Daniel Collins, "3G Wireless Networks", Tata McGraw Hill, 2<sup>nd</sup> Ed., 2007.

**AIM**

To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.

To introduce a mathematical model for the analysis of telecommunication traffic.

**OBJECTIVES**

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

**UNIT I MULTIPLEXING 9**

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

**UNIT II DIGITAL SWITCHING 9**

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

**UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT 9**

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

**UNIT IV DIGITAL SUBSCRIBER ACCESS 9**

ISDN: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

**UNIT V TRAFFIC ANALYSIS 9**

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

**TOTAL: 45 PERIODS**

**TEXTBOOKS:**

1. J. Bellamy, "Digital Telephony", John Wiley, 2003, 3<sup>rd</sup> Edition.
2. JE Flood, "Telecommunications Switching, Traffic and Networks", Pearson.

**REFERENCES:**

1. R.A.Thomson, "Telephone switching Systems", Artech House Publishers, 2000.
2. W. Stalling, " Data and Computer Communications", Prentice Hall, 1993.
3. T.N.Saadawi, M.H.Ammar, A.E.Hakeem, "Fundamentals of Telecommunication Networks", Wiley Interscience, 1994.
4. W.D. Reeve, "Subscriber Loop Signaling and Transmission Hand book", IEEE Press(Telecomm Handbook Series), 1995.
5. Viswanathan. T., "Telecommunication Switching System and Networks", Prentice Hall of India Ltd., 1994.

**PTEC2045****SATELLITE COMMUNICATION****L T P C**  
**3 0 0 3****AIM**

To enable the student to become familiar with satellites and satellite services.

**OBJECTIVES**

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

**UNIT I SATELLITE ORBITS 9**

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

**UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN 10**

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

**UNIT III SATELLITE ACCESS 9**

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption

**UNIT IV EARTH SEGMENT 8**

Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.



**UNIT V            SATELLITE APPLICATIONS****9**

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

**TOTAL : 45 PERIODS****TEXT BOOKS:**

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4<sup>th</sup> Edition, 2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

**REFERENCES:**

1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech House Boston London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book Co., 1983.
6. Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP professional Books, 1990.
7. G.B.Bleazard, 'Introducing Satellite communications NCC Publication, 1985.
8. M.Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003

**PTEC2046****ADVANCED ELECTRONIC SYSTEM DESIGN****L T P C  
3 0 0 3****AIM**

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

**OBJECTIVES**

- To study RF component such as resonator, filter, transmission lines, etc...
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

**UNIT I            INTRODUCTION TO RF DESIGN****9**

RF behaviour of passive components, Chip components and circuit board considerations, Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks, ABCD and scattering parameters, Analysis of amplifier using scattering parameter. RF filter – Basic resonator and filter configurations – Butterworth and Chebyshev filters. Implementation of microstrip filter design. Band pass filter and cascading of band pass filter elements.



**AIM**

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

**OBJECTIVES**

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

**UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9**

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

**UNIT II DISPLAY DEVICES AND LASERS 9**

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking, laser applications.

**UNIT III OPTICAL DETECTION DEVICES 9**

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

**UNIT IV OPTOELECTRONIC MODULATOR 9**

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

**UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9**

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

**TOTAL : 45 PERIODS**

**TEXTBOOK**

1. Pallab Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998

**REFERENCES**

1. S C Gupta, Opto Electronic Devices and Systems, Prentice Hal of India,2005.
2. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall, 1995.

**AIM**

To model the random variables and random process applied to telecommunication system and to learn the methods of system simulation and performance evaluation.

**OBJECTIVES**

- To learn simulation of random variables and random process
- To learn modeling of radio communication channels
- To understand various simulation techniques
- To understand simulation methodologies and performance evaluation
- To analyse some digital communication optical communication and satellite communication techniques as case studies through simulation.

**UNIT I SIMULATION METHODOLOGY 9**

Introduction, Aspects of methodology, Performance Estimation, Sampling frequency, Low pass equivalent models for bandpass signals, multicarrier signals, Non-linear and time varying systems, Post processing, Basic Graphical techniques and estimations

**UNIT II SIMULATION OF RANDOM VARIABLES RANDOM PROCESS 9**

Generation of random numbers and sequence, Gaussian and uniform random numbers Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelated noise, Goodness of fit test.

**UNIT III MODELING OF COMMUNICATION SYSTEMS 9**

Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.

**UNIT IV ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION 9**

Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.

**UNIT V SIMULATION AND MODELING METHODOLOGY 9**

Simulation environment, Modeling considerations, Performance evaluation techniques, error source simulation, Validation.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. MC.Jeruchim, P.Balaban and Sam K Shanmugam, Simulation of communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.

**REFERENCES:**

1. Averill.M.Law and W.David Kelton,Simulation Modeling and Analysis, McGraw-Hill Inc., 2000.
2. Geoffrey Gorden, System Simulation, 2<sup>nd</sup> Edition, Prentice Hall of India, 1992.
3. W.Turin, Performance Analysis of Digital Communication Systems, Computer Science Press, New York, 1990.
4. Jerry banks and John S.Carson, Discrete Event System Simulation, Prentice Hall of India, 1984.
5. William H. Tranter, K. Sam shanmugam, Theodore s. Rappaport, K.Kurt L.Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore) Pvt Ltd, 2004.

**AIM**

To make the student understand the principles of Radar and its use in military and civilian environment

Also to make the student familiar with navigational aids available for navigation of aircrafts and ships.

**OBJECTIVES**

- To derive and discuss the Range equation and the nature of detection.
- To apply Doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore.

**UNIT I INTRODUCTION TO RADAR 9**

Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies –Applications of Radar – The Origins of Radar

**THE RADAR EQUATION**

Introduction- Detection of Signals in Noise- Receiver Noise and the Signal-to-Noise Ratio-Probability Density Functions- Probabilities of Detection and False Alarm-Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters-System losses – Other Radar Equation Considerations

**UNIT II MTI AND PULSE DOPPLER RADAR 9**

Introduction to Doppler and MTI Radar- Delay –Line Cancelers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) - Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing - Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics -Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

**UNIT III DETECTION OF SIGNALS IN NOISE 9**

Introduction – Matched –Filter Receiver –Detection Criteria – Detectors –Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction -Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas - Phase Shifters - Frequency-Scan Arrays  
**Radar Transmitters-** Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources - Other aspects of Radar Transmitter.

**Radar Receivers** - The Radar Receiver - Receiver noise Figure - Superheterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

**UNIT IV****9****Introduction** - Introduction - Four methods of Navigation .**Radio Direction Finding** - The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders - The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders**Radio Ranges** - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR - Recent Developments.**Hyperbolic Systems of Navigation (Loran and Decca)** - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C - The Decca Navigation System - Decca Receivers - Range and Accuracy of Decca - The Omega System**UNIT V DME and TACAN****9**

Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment

**Aids to Approach and Landing** - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System(MLS)**Doppler Navigation** - The Doppler Effect - Beam Configurations - Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems.**Inertial Navigation** - Principles of Operation - Navigation Over the Earth - Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems.**Satellite Navigation System** - The Transit System - Navstar Global Positioning System (GPS)**TOTAL : 45 PERIODS****TEXTBOOK**

1. Merrill I. Skolnik , " Introduction to Radar Systems", Tata McGraw-Hill (3<sup>rd</sup> Edition) 2003.
2. N.S.Nagaraja, Elements of Electronic Navigation Systems, 2<sup>nd</sup> Edition, TMH, 2000.

**REFERENCES**

1. Peyton Z. Peebles:, "Radar Principles", Johnwiley, 2004
2. J.C Toomay, " Principles of Radar", 2<sup>nd</sup> Edition –PHI, 2004

**PTEC2050****MOBILE ADHOC NETWORKS****L T P C  
3 0 0 3****UNIT I INTRODUCTION****9**

Introduction to adhoc networks – definition, characteristics features, applications. Charectistics of Wireless channel, Adhoc Mobility Models:- Indoor and out door models.

**UNIT II MEDIUM ACCESS PROTOCOLS****9**

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

**UNIT III NETWORK PROTOCOLS 9**  
 Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

**UNITIV END-END DELIVERY AND SECURITY 9**  
 Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

**UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G 9**  
 Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2<sup>nd</sup> edition, Pearson Education. 2007
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

**REFERENCES:**

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobilead hoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The handbook of adhoc wireless networks, CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network Research," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
3. A survey of integrating IP mobility protocols and Mobile Ad hoc networks, Fekri M.
4. Abduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, v 9.no.1 2007
5. V.T.Raisinhani and S.Iyer "Cross layer design optimization in wireless protocol stacks"Comp. communication, vol 27 no. 8, 2004.
6. V.T.Raisinhani and S.Iyer,"ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks",World Wireless cong., San francisco,CA,May 2004.
7. V.Kawadia and P.P.Kumar,"A cautionary perspective on Cross-Layer design,"IEEE Wireless commn., vol 12, no 1,2005.

**PTEC2051 WIRELESS SENSOR NETWORKS L T P C**  
**3 0 0 3**

**UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 8**  
 Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

**UNIT II ARCHITECTURES 9**  
 Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

**UNIT III NETWORKING SENSORS 10**  
 Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

**UNIT IV INFRASTRUCTURE ESTABLISHMENT 9**  
 Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

**UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9**  
 Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

**REFERENCES:**

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks Technology, Protocols, And Applications", John Wiley, 2007.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

**PTEC2052 REMOTE SENSING L T P C**  
**3 0 0 3**

**UNIT I REMOTE SENSING 9**  
 Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck’s law – Stefan-Boltzman law.

**UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9**  
 Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface:Imaging spectrometry and spectral characteristics.





**AIM**

This course aims at providing an overview of engineering acoustics.

**OBJECTIVES**

- To provide mathematical basis for acoustics waves
- To introduce the concept of radiation reception absorption and attenuation of acoustic waves.
- To present the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To describe the architecture and environmental inclusive of reverberation and noise.
- To give a detailed study on loud speakers and microphones.

**UNIT I ACOUSTICS WAVES 9**

Acoustics waves - Linear wave equation – sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – spherical waves – Describer scales.

**Reflection and Transmission:** Transmission from one fluid to another normal and oblique incidence – method of images.

**UNIT II RADIATION AND RECEPTION OF ACOUSTIC WAVES 9**

Radiation from a pulsating sphere – Acoustic reciprocity – continuous line source - radiation impedance - Fundamental properties of transducers.

**Absorption and attenuation of sound**

Absorption from viscosity – complex sound speed and absorption – classical absorption coefficient

**UNIT III PIPES RESONATORS AND FILTERS 9**

Resonance in pipes - standing wave pattern absorption of sound in pipes – long wavelength limit – Helmholtz resonator - acoustic impedance - reflection and transmission of waves in pipe - acoustic filters – low pass, high pass and band pass.

**Noise, Signal detection, Hearing and speech**

Noise, spectrum level and band level – combing band levels and tones – detecting signals in noise – detection threshold – the ear – fundamental properties of hearing – loudness level and loudness – pitch and frequency – voice.

**UNIT IV ARCHITECTURAL ACOUSTICS: 9**

Sound in endosure – A simple model for the growth of sound in a room – reverberation time - Sabine, sound absorption materials – measurement of the acoustic output of sound sources in live rooms – acoustics factor in architectural design.

**Environmental Acoustics:**

Weighted sound levels speech interference – highway noise – noise induced hearing loss – noise and architectural design specification and measurement of some isolation design of portions.

**UNIT V TRANSDUCTION 9**

Transducer as an electives network – canonical equation for the two simple transducers transmitters – moving coil loud speaker – loudspeaker cabinets – horn loud speaker, receivers – condenser – microphone – moving coil electrodynamics microphone piezoelectric microphone – calibration of receivers.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Lawrence E.Kinsler, Austin, R.Frey, Alan B.Coppens, James V.Sanders, Fundamentals of Acoustics, 4th edition, Wiley, 2000.

**REFERENCES:**

1. Beranek , “Acoustics” - Tata McGraw-Hill

**PTEC2054****OPTICAL NETWORKS****L T P C  
3 0 0 3****UNIT I OPTICAL SYSTEM COMPONENTS 9**

Light propagation in optical fibers – Loss & bandwidth, System limitations, Non-Linear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

**UNIT II OPTICAL NETWORK ARCHITECTURES 9**

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture.

**UNIT III WAVELENGTH ROUTING NETWORKS 9**

The optical layer, Node Designs, Optical layer cost tradeoff, Routing and wavelength assignment, Virtual topology design, Wavelength Routing Testbeds, Architectural variations.

**UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9**

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks; Access Networks – Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

**UNIT V NETWORK DESIGN AND MANAGEMENT 9**

Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations; Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

**TOTAL : 45 PERIODS****TEXT BOOK:**

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition 2004.

**REFERENCES :**

1. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, 1st Edition, 2002.
2. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.

An institutional affiliation means you have a formal connection with a nonprofit, sponsoring university, or place of employment that has agreed to be the legal recipient of the grant and to administer the funding and official paperwork on behalf of the primary applicant. The affiliated institution must: Have legal status to operate. Agree to be legally responsible for meeting the grant terms and conditions, including receiving and administering financing. I am using my employer as a reference. So on my application, it asks for reference name, number, title and institutional affiliation. Like what am I supposed to put for reference title and institutional affiliation? if you are writing analysing paper or something similar and you are asked to provide the instutional affiliations of the authors you would put their university, or the company or whatever alone, no need to write addresses, or departments etc.