KUVEMPU UNIVERSITY
Department of Electronics
Jnanasahyadri –577 451

Scheme of M.Sc. Electronics Syllabus (NEW)

I Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 1.1	Programming in C++	75	25	4	100
ELH - 1.2	Microwave Devices & Antennas	75	25	4	100
ELH - 1.3	Pic & Arm Microcontroller	75	25	4	100
ELH - 1.4	Signals and Systems	75	25	4	100
ELP - 1.5	Microcontroller Lab	40	10	2	50
ELP - 1.6	Programming in C++ Lab	40	10	2	50
ELP – 1.7	S & S -Lab	40	10	2	50
			TOTAL	**22**	**550**

Seminars: Network Analysis, Advance digital systems

II Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 2.1	Control systems	75	25	4	100
ELH - 2.2	Digital design using Verilog	75	25	4	100
ELH - 2.3	Digital Signal Processing	75	25	4	100
ELS	**Soft Core Subject**	75	25	4	100
ELE - 2.5	Basic Electronics (Ele)	40	10	2	50
ELP - 2.6	Control system Lab	40	10	2	50
ELP - 2.7	Digital Signal Processing Lab	40	10	2	50
ELP – 2.8	VHDL Lab	40	10	2	50
			TOTAL	**24**	**600**

Soft Core Subjects: ELS -2.4.1 Power Electronics
ELS -2.4.2 Wireless Communication & Satellite Communication

Seminars: Linear Algebra, Statistics

III Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH - 3.1	Advanced Digital Communication	75	25	4	100
ELH - 3.2	Advanced Computer Networks	75	25	4	100
ELH - 3.3	Image Processing	75	25	4	100
ELS	**Soft Core Subject**	75	25	4	100
ELE - 3.5	Fundamentals of Digital Electronics (Ele)	40	10	2	50
ELP - 3.6	Advanced Digital Communication Lab	40	10	2	50
ELP - 3.7	CCNLab	40	10	2	50
ELP – 3.8	Image processing Lab	40	10	2	50
ELR-3.9	Industrial Training	40	10	2	50
			TOTAL	**26**	**650**

Soft Core Subjects: ELS -3.4.1 Information theory & coding
ELS -3.4.2 Multimedia

Seminars: Artificial Intelligence, Internet of Things

IV Semester:

SUBJECT CODE	SUBJECT	TH/PR	IA	CREDITS	TOTAL
ELH- 4.1	VLSI Design	75	25	4	100
ELH- 4.2	Machine Learning	75	25	4	100
ELH- 4.3	Embedded systems	75	25	4	100
ELH – 4.4	Pattern Recognition	75	25	4	100
ELH- 4.5	Pattern recognition Lab	40	10	2	50
ELP – 4.6	VLSI Lab	40	10	2	50
ELP- 4.7	Project Work + Industrial visit	75	25	4	100
			TOTAL	**24**	**600**

TOTAL MARKS AND CREDITS

SL.NO	SEMESTER	CREDITS	MARKS
1	FIRST	22	550
2	SECOND	24	600
3	THIRD	26	650
4	FOURTH	24	600
GRAND TOTAL		**96**	**2400**

ELH: 1.1 PROGRAMMING IN C++

Course objectives: This course will enable students to explain fundamentals of data structures and their applications essential for programming/problem solving, Analyze Linear Data Structures: Stack, Queues, Lists, Analyze Non Linear Data Structures: Trees, Assess appropriate data structure during program development/Problem Solving, Analyze the operations of Linear Data structures: Stack, Queue and Linked List and their applications.

UNIT I **20hrs**

Introduction: Object oriented programming, characteristics of an object-oriented language.

C++ programming language: Tokens, keywords, identifier and constants, basic data types, userdefined data types, derived data types, arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators.

Decision making, branching and looping: if, if-else, else-if, switch statement, break, continue andgo to statement, for loop, while loop and do loop.

Functions: Function definition, function arguments and passing, returning values from functions, referencing arguments, function overloading, virtual functions, library functions, local, static and global variables.

UNIT II **20hrs**

Data Structures: Arrays, pointers, storage classes dynamic memory allocation, introduction to stacks, queues, linked list and trees.**Classes and objects:** Classes and objects, member functions, class constructors and destructors,array of objects, operator overloading.**Class inheritance:** Derived class and base class, multiple inheritance, polymorphism.

UNIT III **20 hrs**

Managing Console I/O Operation: C++ streams, C++ stream classes, unformatted I/O operations, formatted console I/O operations, managing output with manipulators.**Working with files:** Classes for file stream operations, opening and closing a file, detecting end-offile, file modes, file pointers and their manipulations, updating a file, error handling during file operations, command-line arguments.**Templates: c**lass templates, class templates with multiple parameters, function templates, functiontemplates withmultiple parameters, overloading of template function, member function templates, non-type template arguments.**Exception handling:** basics of exception handling, exception handling mechanism, throwingmechanism, catching mechanism, rethrowing an exception, specifying exception.

Introduction to the standard template library: components of STL, containers, algorithms,iterators, application of container classes, function objects.

Manipulating strings: creating string objects, manipulating string objects, relational operations,string characteristics, accessing characters in strings, comparing and swapping.

Text Book:

1. Object- oriented programming with C++: Balagurusamy E, TMH, 2005

References:

1. The Waite group's object oriented programming in Turbo C++: Robert Lafore, Galgotia Publication. Pvt. Ltd, 2005.

ELH - 1.2 MICROWAVES AND ANTENNAS

Course objectives: This course will enable students to: Describe the microwave properties and its transmission media. Describe microwave devices for several applications. Understand the basics of antenna theory. Select antennas for specific applications

UNIT I 20 hrs

Microwave Tubes: Introduction, Reflex Klystron Oscillator, Mechanism of Oscillations, Modes of Oscillations, Mode Curve

Microwave Network theory: Symmetrical Z and Y-Parameters for Reciprocal Networks,S matrix representation of Multi-Port Networks.

Microwave Passive Devices: Coaxial Connectors and Adapters, Attenuators, PhaseShifters, Waveguide Tees, Magic tees.

Microwave Transmission Lines: Microwave Frequencies, Microwave devices, Microwave Systems, Transmission Line equations and solutions, Reflection Coefficient and Transmission Coefficient, Standing Wave and Standing Wave Ratio, Smith Chart, Single Stub matching.

UNIT II **20hrs**

Antenna Basics: Introduction, Basic Antenna Parameters, Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Antenna Apertures, Effective Height, Bandwidth, Radio Communication Link, Antenna Field Zones & Polarization

Electric Dipoles: Introduction, Short Electric Dipole, Fields of a Short Dipole (General and Far Field Analyses), Radiation Resistance of a Short Dipole, Thin Linear Antenna (Field Analyses), Radiation Resistances of Lambda/2 Antenna.

Point Sources and Arrays: Introduction, Point Sources, Power Patterns, Power Theorem, Radiation Intensity, Field Patterns, Phase Patterns, Arrays of Two Isotropic Point Sources, Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of equal Amplitude and Spacing.

UNIT III **20 hrs**

Antenna Types

Loop and Horn Antenna: Introduction, Small loop, Comparison of Far fields of Small Loop and Short Dipole, The Loop Antenna General Case, Far field Patterns of Circular Loop Antenna with Uniform Current, Radiation Resistance of Loops, Directivity of Circular Loop Antennas with Uniform Current, Horn antennas Rectangular Horn Antennas.Helical Antenna, Helical Geometry, Practical Design Considerations of Helical Antenna, Yagi-Uda array, Parabola General Properties, Log Periodic Antenna.

Strip Lines: Introduction, Micro Strip lines, Parallel Strip lines, Coplanar Strip lines,Shielded Strip Lines.

Text Books:

1. Microwave Devices and circuits- Liao, Pearson Education.
3.Antennas and Wave Propagation, John D. Krauss, Ronald J Marhefka and Ahmad S Khan,4th Special Indian Edition , McGraw- Hill Education Pvt. Ltd., 2010.
3. .Electromagnetic Waves and Radiating systems – E CJordanand K G Balmin , Printice-hall

Reference Books:

1. Microwave Engineering – Sushrut Das, Oxford Higher Education, 2ndEdn, 2015.

ELH: 1.3 PIC & ARM MICROCONTROLLER

Course objectives: This course will enable students to: Study of architecture of Basic Microcontroller, PIC & ARM microcontrollers. Program PIC & ARM microcontrollers Understand Interface of microcontroller and peripherals

UNIT I 20 hrs

Microcotrollers: Introduction, different types of microcontrollers, embedded microcontrollers, processor architectures. Harvard vs. Princeton, CISC vs. RISC architectures, microcontroller memory types, microcontroller features, clocking, I/O pins, interrupts, timers, peripherals.

PIC16F887 microcontroller

Core features, pin diagram, device overview, memory organization, I/O ports, oscillator module, Timer), Timer1 and Timer2 Module, comparator module, Analog-to-digital converter (ADC) module, data EEPROM and flash program memory control, enhanced capture/compare/PWM module, EUSART, master synchronous serial port (MSSP) module, special features of the CPU, insruction set, addressing modes.

UNIT II 20hrs

ARM Processor: Introduction to embedded systems, arm embedded systems, arm processor fundamentals: Registers, current program status register, pipeline exceptions, interrupts the vector table, core extentions, arm processor families. Arm instruction Set: Introduction, data processing instructions, branch instructions, load store instructions, software interrupt instructions, program status register instructions and co-processor instructions. Architectural support for high level languages: Data types , floating point data types, arm floating point architecture, expressions, conditional statements, loops, functions and procedures.

UNIT III 20 hrs

Interfacing with pic microcontroller: Interfacing of stepper motor and Rotating stepper motor by N steps clockwise/anticlockwise with speed control. Generate sine, square, saw tooth, triangular and staircase waveform using DAC interface. Display of 4- digit decimal number using the multiplexed 7-segment display interface. LCD (2X16) interfacing. Analog to digital conversion using internal ADC and display the result on LCD. Speed control of DC motor using PWM (pulse delay to be implemented using timers). Interfacing of matrix keyboard (4X4). Serial communication between microcontroller and PC.

TEXT BOOKS

1.Joseph Yiu, “The Definitive Guide to the ARM Cortex-M3”, 2nd Edition, Newnes, (Elsevier), 2010.

2.“The 8051 Microcontroller and Embedded Systems – using assembly and C ”, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.

Reference Book

1. “Microcontrollers: Architecture, Programming, Interfacing and System Design**”,** Raj Kamal, Pearson Education, 2005.

ELH - 1.4 SIGNALS AND SYSTEMS

Course objectives: This course will enable students to: Understand Classify signals and systems
Analyze the signals in time domain using convolution difference/differential equations Classify signals into different categories based on their properties. Determine performance of a system in time & frequency domain Analyze Linear Time Invariant (LTI) systems in time and transform domains. Determine stability of a system using Z-Transforms. Build basics for understanding of courses such as signal processing, control system and communication

UNIT I 20hrs

Classification of signals: Definition of signal and systems, communication and control systems as examples. Sampling of analog signals, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power.
Elementary signals/Functions: Exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sync functions. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding. Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non- causal, static and dynamic, stable and unstable, invertible.

UNIT II 20hrs

Time domain representations for Linear Time Invariant (LTI) systems: Introduction, convolution, impulse response representation for LTI systems, properties of impulse response representation for LTI systems, differential and difference equations, representation of LTI systems, block diagram representations

Fourier representation of signals: Discrete time periodic signals, Discrete Time Fourier Series (DTFS), continuous time periodic signals, Fourier series, discrete time non periodic signals, Fourier transforms, properties of Fourier representations

UNIT III 20hrs

Application of Fourier representations: Fourier transform representations for periodic signals, convolution and modulations Fourier transform representation for discrete time signals, sampling, reconstruction of continuous time signals
Z, Transforms: Introduction, Z-transform, properties of Region of Convergence (ROC), Properties of Z - transforms, inversion of Z- transforms, transform analysis of LTI systems, unilateral Z, transforms

Text books:

1.Simon Haykin, Barry Van Veen, “Signals and Systems”, John Wiley & Sons (Asia) Pvt. Ltd. 2002.

Reference books:

1.John G Proakis and Dinitris G Manolakis, Digital Signal Processing, Principles Algorithms and Applications, PHI, 3rd edn. 1997
2.Ganesh Rao and Satish Tunga, “Signals and Systems”, Pearson/Sanguine Technical Publishers, 2004
3. J S Chittode, Signals &Systems,Technical Publications 2009

ELH 2.1 CONTROL SYSTEMS

Course objectives: This course will enable students to: Know the basic features, configurations and application of control systems. Know various terminologies and definitions of control systems. Learn how to find a mathematical model of electrical, mechanical and electro-mechanical systems. Know how to find time & frequency response from the transfer function. Determine the stability of a system in the time & Frequency domain Model a control system in continuous and discrete time using state variable techniques

UNIT I 20hrs

Modeling of Systems: The control system, Mathematical models of physical systems – Introduction, Differential equations of physical systems – Mechanical systems, Friction, Translational systems (Mechanical accelerometer, Levered systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems. Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded), Time Response of feed back control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order
systems, steady – state errors and error constants.

UNIT II 20hrs

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion. Frequency domain analysis and stability: Correlation between time and frequency response, Bode Plots, Experimental determination of transfer function. Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, (Systems with transportation lag excluded) Introduction to lead, lag and lead-lag compensating networks.

UNIT III 20hrs

Introduction to Digital Control System: Introduction, Spectrum Analysis of Sampling process, Signalreconstruction, Difference equations. Introduction to State variable analysis: Introduction, Concept of State, State variables & State model, State model for Linear Continuous & Discrete time systems, Diaganolisation.Design of Control Systems: Introduction, Design with the PD Controller, Design with the PI Controller, Design with the PID Controller, Design with Phase-Lead Controller, Design with Phase - Lag Controller, Design with Lead-Lag Controller.

Text book :

1. J. Nagarath and M.Gopal, “Control Systems Engineering”, New Age International (P) Limited, Publishers, Fourth edition – 2005

Reference books:

1. “Modern Control Engineering “, K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002.
2. “Concepts of Control Systems”, P. S. Satyanarayana; Dynaram publishers, B’lore, 2001
3. “Control Systems – Principles and Design”, M. Gopal, TMH, 1999

ELH - 2.2 Digital design using Verilog

Course objectives: This course will enable students to:Differentiate between Verilog and VHDL descriptions. Learn different Verilog HDL and VHDL constructs. Familiarize the different levels of abstraction in Verilog. Understand Verilog Tasks and Directives. Understand timing and delay Simulation. Learn VHDL at design levels of data flow, behavioral and structural for effective modeling of digital circuits.

UNIT I 20hrs

Overview of Digital Design Digital systems and embedded systems, real world circuits, models, design, methodology, combinational basics: Combinational components and verification of combinational circuits, sequential basics: Sequential data paths and control clocked synchronous timing methodology.
Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL-flow, why Verilog HDL?, trends in HDLs. **Hierarchical Modeling Concepts:** Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block.

UNIT II 20hrs

Basic Concepts: Lexical conventions, data types, system tasks, compiler directives. **Modules and Ports:** Module definition, port declaration, connecting ports, hierarchical name referencing.

Gate-Level Modeling
Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. **Dataflow Modeling:** Continuous assignments, delay specification, expressions, operators, operands, operator types.

UNIT III 20hrs

Behavioral Modeling
Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, Multiway branching, loops, sequential and parallel blocks.
Tasks and Functions: Differences between tasks and functions, declaration, invocation.

Text Book:

1. Verilog HDL: A Guide to Digital Design and Synthesis, 2nd Edition, Samir Palnitkar, 2003, Prentice-Hall, Inc.

Reference Book:

1.The Verilog HDL, 5th Edition, Donald E. Thomas, Philip R. Moorby, Donald B. Thomas, 2002, Kluwer Academic Publication

ELH - 2.3 DIGITAL SIGNAL PROCESSING

Course objectives: This course will enable students to: Understand the frequency domain sampling and reconstruction of discrete time signals. Study the properties and the development of efficient algorithms for the computation of DFT. Realization of FIR and IIR filters in different structural forms. Learn the procedures to design of IIR filters from the analog filters using impulse invariance and bilinear transformation. Study the different windows used in the design of FIR filters and design appropriate filters based on the specifications.

UNIT I **20hrs**

Discrete Time Signals In Frequency domain: Discrete Time Fourier Transform (DTFT**) Discrete Fourier transform (DFT):** Introduction, Definition of DFT: Linearity, Circular shift of a sequence, Symmetry properties, Circular convolution, Linear convolution using DFT. **Computation DFT:** Introduction to FFT, Decimation-in-time FFT algorithm and in-place computations, and Decimation-in-frequency FFT algorithm and in-place computations,

LTI DTS in Frequency domain, transfer function, frequency response

UNIT II **20hrs**

Digital Filters: simple digital filters, All pass functions, complimentary transfer functions, digital two pairs, Sampling and reconstruction. **Analog Filter Design:** The filter problem, maximally flat low-pass filter approximation, Chebyshev Filter approximation, Frequency transformation. **Digital Filter Structures:** Direct, parallel, cascade, ladder and lattice for IIR, Possible realizations for FIR, including pollyphase, all pass structures, tunable filters

UNIT III **20hrs**

Digital Filter Design: IIR Filter Design: using Impulse invariance and Bi Linear transformations,Spectral transformations, FIR Filter Design using winnowing, frequency sampling and computer aids. Difference between IIR and FIR .

Text books:

1) “Digital Signal Processing”, Rabiner and Gold, Prentice Hall of India Ltd.
2) “Network Analysis and Synthesis”, F.F. Kuo, John Wiley & Sons, 7th Edition

Reference books:

1) “Digital Signal Processing”, Proakis, Prentice Hall of India Ltd.
2) “Digital Signal Processing”, Sanjit. K. Mitra, Tata-McGraw Hill.

ELE - 2.5 BASIC ELECTRONICS (ELE)

Course Objectives: This course offered to other discipline students to provide basic knowledge of electronics. It gives a overview of building blocks of electronic devises and systems.

UNIT I **16hrs**

Amplifiers & oscillators: Decibels and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier(Qualitative discussions only), Series voltage negative feedback and Additional effects of Negative feed back(Qualitative discussions only), The Barkhausen Criterion for Oscillations, BJT RC phase shift oscillator, Hartley ,Colpitts and crystal oscillator (Qualitative discussions only).

Introduction to operational amplifiers: Ideal OPAMP, Saturable property of an OP AMP inverting and non inverting OPAMP circuits, need for OPAMP, Characteristics and applications - voltage follower, addition, subtraction, integration, differentiation.

Communication Systems: Introduction, Elements ofCommunication Systems, Modulation: Amplitude Modulation, Spectrum Power, AM Detection (Demodulation), Frequency and Phase Modulation. Amplitude and Frequency Modulation:

UNIT II **16 hrs**

Transducers: Introduction, Passive Electrical Transducers, Resistive Transducers, Resistance Thermometers, Thermistor. Linear Variable Differential Transformer (LVDT). Active Electrical Transducers, Piezoelectric Transducer, Photoelectric Transducer. Voltmeter, Ammeter, Multimeter, Oscilloscope.

Flip-Flops: Introduction to Flip-Flops, NAND Gate Latch/ NOR Gate Latch, RS Flip-Flop,
Microcontrollers: Introduction to Microcontrollers, 8051 Microcontroller Architecture and an example of Microcontroller based stepper motor control system (only Block Diagram approach).

Textbooks:

1. Integrated Electronics: Millman and Halkias
1. Electronic Instrumentation – H. S Kalsi
2. Basic electronics – D. P. Kothari and I J Nagrath
3. Digital Electronics – Morris Mano

Referencebooks:

1. Basic Electronics – Punagin.

ELS: 2.4.1 POWER ELECTRONICS

Course objectives: This course will enable students to learn: Thyristors, power MOSFETs, power transistors, IGBT, MCT, LTT, smart power devices. Thyristor circuits: Converters, Inverters and motors operation and design.

UNIT I 20hrs

Introduction - Applications of Power Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, types of Power Electronic Circuits. Power Transistors: Power BJTs: Steady state characteristics. Power MOSFETs: device operation, switching characteristics, IGBTs: device operation, output and transfer characteristics.

Thyristors - Introduction, Principle of Operation of SCR, Static Anode- Cathode Characteristics of SCR, Two transistor model of SCR, Gate Characteristics of SCR, Turn-ON Methods, Turn-OFF Mechanism, Turn-OFF Methods: Natural and Forced Commutation – Class A and Class B types, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit.

UNIT II 20hrs

Controlled Rectifiers - Introduction, principle of phase controlled converter operation, Single phase full converters, Single phase dual converters. AC Voltage Controllers - Introduction, Principles of ON-OFF Control, Principle of Phase Control, Single phase control with resistive and inductive loads.

Cycloconverters: Principle of cycloconverter operation, single-phase to single-phase circuit step-up and step-down cycloconverter, three-phase half wave cycloconverter, output voltage equation of a cycloconverter, load commutated cycloconverter. Principle of operation, single-phase voltage source inverters, basic series and parallel inverter circuits, types of inverters, three-phase bridge inverters, voltage control in single-phase inverters, pulse-width modulated inverters, current source inverters.

UNIT III 20hrs

Choppers: Basic principle, control strategies, step-up and step-down choppers, types of chopper circuits, forced and load commutated chopper circuits.

Introduction to motors: Classification of motors.DC motors: Working principle of DC motor, shunt motor, series motor, starter, closed loop control of DC drive, PLL control of DC drive.

AC motors: Working principle of AC motor, types of AC motors, torque speed characteristics of induction motor, single phase induction motor drive, three phase induction motor drive, speed control of induction motor – stator voltage control and V/F control, synchronous motor, working principle of synchronous motor.

Text Books:

1. Power Electronics: Bimbhra P S, Khanna publishers, 2003.
2. Power Electronics Circuit devices and applications: Rashid M H, PHI,

References:

1. Thyristor Engineering: Berde M S, Khanna publishers,
2. Power Electronics: VedamSubrahmanyam, New Age International, 2002
3. Modern Power Electronics and AC Drives: BimalK.Bose, Pearson education, 2002.
4. Power Electronics: Mohan, Undeland, Robbins, John Wiley, 2003

ELS: 2.4.2 WIRELESS COMMUNICATION AND SATELLITE COMMUNICATION

UNIT I 20hrs

Wireless Communication Systems: Evolution of mobile radio communications. Examples of wireless communication systems. Paging systems. Cordless telephone systems. Comparison of various wireless systems. Modern Wireless Communication Systems: Second generation cellular networks. Third generation wireless networks. Wireless in local loop. Wireless local area networks. Blue tooth and Personal area networks.

Cellular System Design Fundamentals: Spectrum Allocation. Basic Cellular System. Frequency reuse. Channel assignment strategies. Handoff Strategies. Interference and system capacity, Trunking and grade off service. Improving coverage and capacity, cell splitting.

UNIT II 20 hrs

Multiple Access Techniques For Wireless Communication: introduction to multiple access. FDMA. TDMA. Spread spectrum multiple access. Space division multiple access. Packet radio. Capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks. Development of wireless networks. Fixed network transmission hierarchy. Traffic routing in wireless networks. Wireless data services. Common channel signaling.

Orthogonal Frequency Division Multiplexing: Basic Principles of Orthogonality. Single Versus Multi channel Systems. OFDM Block Diagram and its explanation. OFDM Signal mathematical representation.

UNIT III 20hrs

Satellite Orbits and Trajectories: Definition, Basic Principles, Orbital parameters, Injection velocity and satellite trajectory, Types of Satellite orbits, Orbital perturbations, Satellite stabilization, Orbital effects on satellite's performance, Eclipses, Look angles: Azimuth angle, Elevation angle.

Satellite subsystem: Power supply subsystem, Attitude and Orbit control, Tracking, Telemetry and command subsystem, Payload. Earth Station: Types of earth station, Architecture, Design considerations, Testing, Earth station Hardware, Satellite tracking.

Communication Satellites: Introduction, Related Applications, Frequency Bands, Payloads, Satellite Vs. Terrestrial Networks, Satellite Telephony, Satellite Television, Satellite radio, Regional satellite Systems, National Satellite Systems.

TEXT BOOKS:

1.Theodore S. Rappaport . "Wireless Communications and Applictions," Pearson Education – 2003

2. Dennis Roddy, Satellite Communications, 4th Edition, McGraw- Hill International edition, 2006

Reference Book

3. Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015, ISBN: 978-81-265-2071-8.