FACULTY OF ENGINEERING

SCHEME OF EXAMINATION & COURSE OF CONTENTS

BE IV Year Programme (ELECTRONICS & TELECOMMUNICATION ENGINEERING)

INSTITUTE OF ENGINEERING & TECHNOLOGY (www.iet.dauniv.ac.in)

Scheme for B.E. IV (Electronics & Telecommunication)
# Scheme for B.E. IV (Electronics & Telecommunication)

**B. E. IV YEAR ELECTRONICS & TELECOMMUNICATION ENGINEERING**

Th- Theory, CW – Class Work, SW – Sessional Work, Pr – Practical

<table>
<thead>
<tr>
<th>Semester VII</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.No</td>
<td>Sub Code</td>
</tr>
<tr>
<td>1</td>
<td>4ET501</td>
</tr>
<tr>
<td>2</td>
<td>4ET502</td>
</tr>
<tr>
<td>3</td>
<td>4ET503</td>
</tr>
<tr>
<td>4</td>
<td>4ET504</td>
</tr>
<tr>
<td>5</td>
<td>Elective-I</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester VIII</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.No</td>
<td>Sub Code</td>
</tr>
<tr>
<td>1</td>
<td>4ET551</td>
</tr>
<tr>
<td>2</td>
<td>4ET552</td>
</tr>
<tr>
<td>3</td>
<td>4ET553</td>
</tr>
<tr>
<td>4</td>
<td>4ET554</td>
</tr>
<tr>
<td>5</td>
<td>Elective-II</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
</tr>
</tbody>
</table>

**List of Elective Subjects**

<table>
<thead>
<tr>
<th>Semester VII, Elective -I</th>
<th>Semester VIII, Elective-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.No</td>
<td>Sub Code</td>
</tr>
<tr>
<td>1</td>
<td>4ET505</td>
</tr>
<tr>
<td>2</td>
<td>4ET506</td>
</tr>
<tr>
<td>3</td>
<td>4ET507</td>
</tr>
<tr>
<td>4</td>
<td>4ET508</td>
</tr>
<tr>
<td>5</td>
<td>4ET509</td>
</tr>
</tbody>
</table>

Scheme for B.E. IV (Electronics & Telecommunication)
### Course Objective

To provide a comprehensive hands on experience to the students about the development of a complete project starting from analysis to testing. The students can also take a research project for innovating a new idea and its implementation.

The major emphasis (but not limited to) shall be given on Microcontroller, Microprocessors, Analog and Digital Electronics/Communication, VLSI and VHDL etc these are practice oriented areas of interest. The students shall be making the system, application or simulation packages depending upon the idea, technology chosen and expertise available. The architectural issues shall be important while the exposure to the technology needs to be gained by the students through thorough practice.

The students (in a batch) shall be required to be continuous interaction with the guide for the advice, guidance and facilities periodically and show the progress. They shall also be taking a certificate in the diary for satisfactory remarks or comments. Batch size shall be decided as per need and the quantum of the project.

The students shall make presentation and submit an originally drafted project reports periodically and at the end of the semester.

[1] Reference books and web links of the relevant material the must be consulted as advised by the guide.

Note: The requirement of relevant book may be submitted by the guide to the HOD/ Director for procurement.
### Objectives:
To introduce in-depth understanding of all the processes involved in digital communication systems.

### Prerequisite:
Knowledge of analog communication engineering and Fourier techniques.

## COURSE OF CONTENTS

### Unit I
Review of Fourier Techniques and Its Application For Linear System Analysis, Sampling & Quantization, Digital Coding Techniques, PCM, DPCM, ADPCM, DM, ADM, Vocoders, Line Coding NRZ, RZ, Biphase, Duo Binary Etc., Their Comparison and Spectrum Associated with their Waveforms.

### Unit II

### Unit III
Information Theory & Channel Coding: Concept of Amount of Information, Entropy, Information Rate, Coding To Increase Average Information per Bit, Shannon Theorem & Its Application, Channel Capacity, Capacity of Gaussian Channel, Binary Symmetric Channel, Binary Erasure Channel, Calculation of Channel Capacity for different channels, Shannon Hartley Theorem, Bandwidth & S/N Trade Off.

### Unit IV
Source coding techniques: Kraft Inequality, Shannon Fano and Huffman Coding. Error control coding: Linear Block Codes, Systematic Linear Blocks Codes, Parity Check Matrix, Syndrome Testing, Cyclic code, Hamming Code, BCH Code, Convolution Codes, maximum Likelihood Decoding, Viterbi decoding.

### Unit V
Fading Channels- Small scale fading, Large scale fading, Signal Time Spreading, Time Variance of the Channel caused by the Motion, Mitigating the degradation effects of Fading, Equalization, Linear and Non-Linear Equalization, Algorithms for adaptive Equalization, Diversity Techniques and its types.

## References:
1. Taub & Schilling, *Principles of Communication system*, TMH.
Course Objective: The objective of this course is to give students the knowledge and understanding of the basic concepts of Microwave and its components. It gives emphasis to the basic microwave components theories, modeling, analysis, design and also their physical behaviors.

Perquisites: Basic Knowledge of EMFT, Analog Electronic

COURSE OF CONTENTS

Unit I
Microwave components-microwave frequencies, devices, systems, units of measure, hybrid circuits, waveguide tees, magic tees (hybrid trees), hybrid rings (rat-race circuits), waveguide corners, bends and twists, directional couplers, two-hole directional couplers, z & abcd parameters- introduction to s parameters, s matrix of a directional coupler, hybrid couplers, circulators and isolators, microwave circulators, microwave isolators.

Unit II
Microwave linear-beam tubes (o type) and microwave crossed-field tubes (m type): limitations of conventional vacuum tubes, klystrons, reentrant cavities, velocity-modulation process, bunching process, output power, beam loading, multicavity klystron amplifiers, beam-current density, output current output power of 2-cavity klystron, 4-cavity klystron, reflex klystrons, velocity modulation, power output and efficiency, electronic admittance, helix TWTs, slow-wave structures, amplification process, convection current, axial electric field, wave modes, gain consideration, microwave crossed-field tubes, magnetron oscillators, cylindrical, coaxial and tunable magnetron.

Unit III
Negative resistance devices, transferred electron devices (teds) and avalanche transit-time devices: tunnel diode, gunn-effect diodes, gaas diode, background, gunn effect, RWH theory, differential negative resistance, two-valley model theory, high-field domain, modes of operation, LSA, INP, CDTE diodes, microwave generation, amplification, avalanche transit-time devices, read diode, physical description, avalanche multiplication, carrier, external current, output power, quality factor, impatt, trapatt and baritt diodes their physical structures, negative resistance, power output and efficiency microwave performance, parametric devices, physical structures, nonlinear reactance and manley - Rowe power relations, parametric amplifiers, applications.

Unit IV
Strip lines and monolithic microwave integrated circuits-Microstrip lines, characteristic impedance, losses, quality factor, parallel strip lines, distributed lines, characteristic impedance, attenuation losses, coplanar strip lines, shielded strip lines, references, problems, monolithic microwave integrated circuits, introduction, materials, substrate materials, conductor materials, dielectric materials, resistive materials, monolithic microwave integrated-circuit growth, mimic fabrication techniques, fabrication example.

Unit V
Microwave communication and microwave measurements-microwave communication and their applications, microwave antennas, slotted line vswr measurement, vswr through return loss measurements, power measurement, impedance measurement insertion loss and attenuation measurements- measurement of scattering parameters - measurement of 1 db, dielectric constant measurement of a solid using waveguide, microwave and its applications in medical home industry etc.

References:
[1].Samuel Y.LIAO, Microwave Devices and Circuits, 3/e, Prentice Hall of India-2003
[4].David M.Pozar, Microwave Engineering, 2/e, John Wiley & Sons 2003

Scheme for B.E. IV (Electronics & Telecommunication)
Course objective: The objective of this course is to give students the knowledge and understanding of the basic concepts of antenna and radio wave propagation. It gives emphasis to the antenna theories, modeling, analysis and design and also the physical behaviors along with the radio wave propagation problems in telecommunication field.

Prerequisite: Knowledge of Electromagnetic field and theory, Fundamentals of Physics

COURSE OF CONTENTS

Unit I
Introduction to types of antennas, radiation mechanism, current distribution on thin wire antenna, radiation pattern like isotropic, directional and omnidirectional, Radiation intensity, gain, directive gain, directivity, antenna efficiency, effective area, effective length, reciprocity theorem, radar equation, beam efficiency, bandwidth, polarization Antenna temperatures, FBR, radiation resistance, Equivalent noise temperature of antenna.

Unit II
Poynting theorem, wave equation in terms of electromagnetic potentials and their solution, short electric dipole, retarded vector potential, small current element, small dipole, Finite length dipole, Half wavelength dipole, Infinite perfect conductors, ground effects.

Unit III
Introduction to various form of array, array of n isotropic sources of equal and unequal amplitude and uniform spacing, design consideration of Braodside, Endfire, Dolph Tchebyscheff arrays, continous arrays, rectangular arrays, planar array, binomial array circular array, and superdirectivity.

Unit IV
Hertz and Marconi antenna, ground and antenna losses, High frequency antenna, Dipole antenna, Harmonic antenna and inverted V antenna, Rhombic Antenna, RDF, Loop antenna, Adcock Antennas & direction finder, Folded Antenna, Yagi Uda Antenna, Corner Reflected Antenna, Helical Antenna, Horn Antenna, Slot Antenna, Microstrip Antenna, LPDA, Microwave Antenna, Antenna with parabolic reflector, Lens Antenna, Antenna Measurements.

Unit V
Modes of propogation, Sky wave propagation, Effect of earth’s magnetic filed on Ionospheric radio wave propagation, Virtual heights, MUF, LUF, Skip distance, OWF, Ionospheric abnormalities, Multihop propagation, Duct propagation, VLF and ELF propagations.

References:
Course Objectives: To provide the knowledge of different generation mobile communication system, cellular concept and the aspects of mobile radio environment which is very different than conventional communication system.

Prerequisite: It is expected to know the following concepts: Electromagnetic spectrum, analog and digital modulation techniques, channel coding, random variable and random process.

COURSE OF CONTENTS

Unit I
Introduction to wireless communication system, Concept of cellular mobile system, Frequency reuse, Channel assignment strategies, Handoff strategies, interference and system capacity, Trunking and grade of service improving coverage & capacity in cellular system.

Unit II

Unit III
Wireless systems and standards: GSM: Mobile services, system architecture, radio interface, Protocols, localization and calling, handover, security, Frame structure, GSM channel types New data services: HSCSD, GPRS, EDGE, DECT: System architecture.

Unit IV

Unit V
Fundamentals of channel coding, Block codes, Convolution codes. Speech coding for wireless system applications: Introduction to DSP techniques in wireless telephone and broadcast system, speech coding techniques for audio and voice: Waveform coders and Vocoders, Channel vocoder, Formant vocoder, Voice-Excited vocoder, Cepstrum vocoder, Liner predictive coders (LPC), Multipulse Excited LPC, Code Excited LPC, Residual Excited LPC.

References:
Course Objective: To enable the students to translate a functional system description into appropriate digital blocks coded in VHDL. Perform synthesis, place, and route of a digital design into a target FPGA. Introduction of Analog and mixed signal design using VHDL-AMS

Prerequisite: Digital Design, C language.

COURSE OF CONTENTS

Unit I  Introduction to VLSI and HDL


Digital system design process, Hardware simulation, Levels of abstraction, VHDL requirements, Elements of VHDL.

Top down design, VHDL operators, Timing, Concurrency, Objects and classes.

Unit II  Behavioral Modeling

Signal assignments, Concurrent and sequential assignments, Entity Declaration, Architecture Body, Behavioral Modeling, Process statement, Loop control statements, Multiple Processes, Delay Models, Signal Drivers.

Unit III  Dataflow and Structural Modeling Techniques

Data flow Modeling, Concurrent Assignment statements, Block statements, Resolution Functions, Structural Modeling, Component declaration and Instantiation, Generate statements.

Unit IV  Advance Topics in VHDL


Unit V  Design for Synthesis and Introduction to VHDL-AMS

Language directed view of synthesis, Inference from CSA statements, Inference from within Process, Inference using Signals v/s variables, Latch v/s Flip Flop Inference, Wait statements, Synthesis Hints, Synthesis for dataflow and structural models.

Introduction to VHDL-AMS, Free quantities, Terminal and Branch quantities, Attributes, Simultaneous statements, Analog structure description, Discontinuities and break statements, step specifications, Mixed signal description, Design Processing.

References:
[4]. Peter J. Ashenden, The Designer's Guide to VHDL-AMS,
Course Objective: To provide the fundamentals of optical communication systems and its various elements.

Prerequisite: Knowledge of Electromagnetic fields & waves and basic concepts of Lasers and optical fiber

COURSE OF CONTENTS

Unit I
Introduction to optical fiber communication systems, Advantages of optical fiber communication over conventional electrical communication, review of optical fiber fundamentals, ray theory transmission, electromagnetic mode theory for optical propagation, cylindrical fiber; modes, mode coupling, step index fibers, graded index fibers, single mode fiber; cutoff wavelength, mode field diameter & spot size, effective refractive index.

Unit II
Transmission characteristics of optical fibers; attenuation, material absorption losses in silica glass fibers, linear scattering losses, nonlinear scattering losses, fiber bend loss, dispersion; intermodal dispersion, intra modal dispersion, modal noise, overall fiber dispersion, dispersion shifted fiber.

Unit III
Optical sources: Lasers & LEDs; review of basic concepts, semiconductor injection laser (injection laser diode), efficiency, injection laser characteristics; threshold current temperature dependence, dynamic response, frequency chirp, noise, reliability, comparison of LED & Lasers. Optical detectors: optical detection principle, absorption, quantum efficiency, responsivity, long wavelength cutoff, pin photodiode, avalanche photodiode, benefits and drawbacks with the avalanche photodiode.

Unit IV
Introduction to receiver, types of noise, receiver noise, p-n & p-i-n photodiode receiver, APD receiver. Optical Amplifiers; Semiconductor Optical Amplifiers (SOAs), Erbium doped fiber amplifiers, crosstalk in SOAs. Nonlinear effects; self phase modulation, cross phase modulation, four wave mixing, solitons.

Unit V
WDM concepts & components- overview of WDM, passive optical couplers; 2X2 fiber coupler, star couplers, Mach Zehender interferometer multiplexers, fiber grating filters, dielectric thin film filters.

References:
Course Objective: This course presents the fundamental of analog and Digital CMOS VLSI design with different VLSI design methodologies and combinational, sequential and semiconductor memory circuit design. It also covers the limitations of CMOS in NANO technology with introduction to the NANO Technology.

Prerequisite: Knowledge of semiconductor devices is required.

COURSE OF CONTENTS

Unit I
VLSI design flow, VLSI design style, introduction to the basic fabrication processes (wafer preparation, oxidation, diffusion, etching, metallization and lithography, etc.), Fabrication process Flow: basic Steps, the CMOS n-well Process. Metal oxide semiconductor (MOS) structure, Types of MOSFET: Enhancement and Depletion. Structure and operation of MOS transistor.

Unit II
Threshold voltage equation and energy band diagram of MOSFET, controlling of threshold voltage, MOSFET current – Voltage Characteristics. Transconductance, Drain conduction. Aspect ration, process parameters, second order effects, MOS small signal and Large signal model, MOS capacitances. Stick diagram rules for nMOS and CMOS technology, lambda based and micron based design rules. Layout design for CMOS inverter.

Unit III
Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation. Limitations of CMOS in NANO scale circuit design.

Unit IV
CMOS logic, pseudo NMOS logic, pass transistor logic, Transmission Gate logic and Dynamic logic circuit design. Designing of Combinational logic circuit, sequential logic circuit design and semiconductor memory circuit.

Unit V
Basic concept of analog VLSI design, Common source stage, source follower, single ended and differential operation, common mode response, active current mirror, frequency response of amplifier, introduction to the operational amplifier.

References:
[1]. Sung-mo Kang and Yusuf Leblebici, CMOS Digital Integrated Circuit analysis and Design,
[2]. Tata McGraw-Hill, 3/e,
[4]. R. Jacob Baker, Harry W. Li and David E. Boyce, CMOS Circuit design, layout and Simulation, PHI, IEE压, Series Edition,
[6]. Neil H.E. Weste and Kamran Esharhian, Principal of CMOS VLSI design, PHI, 2/e
[7]. Jan M. Rabaey, Digital Integrated Circuit, PHI, 2/e
Course Objective: Students should get knowledge about satellites, their various aspects and about satellite communication. Different access techniques used and Navigations aids provided by satellites.

Prerequisite: Digital Communications, Antenna and Wave Propagation.

COURSE OF CONTENTS

Unit I

Unit II

Unit III

Unit IV
Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA: Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA, On-board signal processing for TDMA / FDMA operation, Satellite switched TDMA. Code-Division Multiple Access - Direct-Sequence spread spectrum - code signal c(t) - autocorrelation function for c(t) - Acquisition and trackling - Spectrum spreading and dispreading - CDMA throughput – Problems, Internet using satellites.

Unit V
Satellites and Navigational aids, Radio and satellite navigation, GPS- Global Positioning Satellite, GPS location GPS receivers and codes, satellite signal acquisition GPS navigation message, GPS signal levels, time accuracy, GPS receiver operation, Differential GPS Mobile Services - VSATs - Radarsat - Orbcomm. DTH-(direct to home)

References:
Course Objective: To provide students with a broad coverage of concepts, theories and analysis methods for probability, random variables and stochastic processes, which serve as the foundation for advanced courses in communication system, signal processing, image processing and computer engineering fields.

Prerequisite: Fundamental concept of Probability and random variables.

COURSE OF CONTENTS

Unit I
Basic concept of probability, Random Variable, Moments, Important Probability Distributions, Functions of Several Random Variable, Laws of Large numbers, Continuous Random Variables, Expectations.

Unit II

Unit III

Unit IV
Mean Square Error Filters, Observation linear filters, Steepest Descent, Linear estimation of random vectors, Recursive Linear Filter, Linear filters via canonical expansions, Binary Filters.

Unit V
Markov Chains, Steady State distributions for Discrete time and Continuous time Markov Chains, Markov Random Fields, Random Boolean Model, Open and Closed Queuing Networks, Non-exponential service time distributions and multiple job types, Random sets.

References:

Scheme for B.E. IV (Electronics & Telecommunication)
Objective: To provide an introduction to Operating System concepts and its design issues.

Prerequisite: Computer Organization.

COURSE OF CONTENTS

Unit I Introduction
Role of OS: Types of OS, Batch Systems; Multiprogramming; Time Sharing; Distributed & Real time OS. Computer structure and OS: System Architecture – I/O, Storage, Processors; System components- OS Services, System Calls , System Programs; System Design, Implementation and Generation.

Unit II Process Management

Unit III Process Synchronization and Deadlock

Unit IV Memory Management

Unit V I/O management and other issues

References:
[3]. Tanenbaum, Modern Operating Systems, PHI.
[7]. Sumitabha Das, Unix Concepts & Applications: includes SCO Unix & Linux, Tata McGraw Hill.
Course Objective: To introduce the concepts of making computer systems intelligent through computational methods and techniques.

Prerequisite: Data Structure.

COURSE OF CONTENTS

Unit I
AI and AI Techniques; Problems, Problem space and Sate space; Production systems; Search techniques and algorithms.

Unit II
Knowledge Representation- Issues and Methods; Predicate logic- resolution and unification; Forward and backward Reasoning; Logic programming & Prolog.

Unit III
Symbolic computation- Uncertainty; Rule based systems; Statistical Reasoning; Fuzzy Logic; Expert systems; Decision support systems.

Unit IV
Semantic networks; Frames and Scripts; Conceptual Dependency; Game playing; Planning overview; Understating; Learning.

Unit V
Natural language processing- parsing, semantic analysis, ATN and RTNs; Connectionists models- neural networks; Speech and vision processing; Robotic actions.

References:
## Course Objective:
Advancements in semiconductor devices create a revolution in power transmission, distribution, and utilization. This course helps students to understand the basic concepts of power semiconductor devices which make students to analyze and design switch mode power electronic converters for various applications including microprocessor power supplies, renewable energy systems, and motor drives.

## Prerequisite:
Knowledge of Basic Electronics.

## COURSE OF CONTENTS

### Unit I
power semiconductor diodes and Transistors, Thyristors, Characteristic, turn on methods, Switching, Gate Characteristic, Ratings, Protection, Heating, Cooling, Mounting, Serial/Parallel operation, Introduction to other member of Thyristors family like PUT, SUS, SCS, SITHs, Diac, Triac, RCT, GTO, Firing Circuits of Thyristors, Pulse Transformer in firing circuits, Triac Firing circuit.

### Unit II
Thyristors Commutation techniques, Phase Control Rectifiers, Principal of phase Control, Full-wave controlled Converters, Single-Phase Full-wave Converters, Single-Phase Two-pulse Converters with Discontinuous Load Current, Three Phase- Thyristors Converters circuits, Dual Converters, Types of AC voltage controllers, Integral Cycle Control, Single-phase Voltage Controllers, sequence control of AC voltage controllers

### Unit III

### Unit IV
Principle of Cycloconverter, Three Phase Half wave Cycloconverter, Output voltage equation for a Cycloconverter. SMPS, UPS, HVDC transmission, Static Switches, Circuit Breakers, Solid State Relays, Resonant Converters

### Unit V
Concepts of Electric drive, DC drive, Choppers drives, AC drives, Induction-Motor Drives, Speed control of Three-Phase induction Motors, Synchronous Motor Drives,

## References:
[3]. Sen, *Power Electronics*, TMH.
[7]. Dr.P.S. Bimbhra, *Power Electronics*, 3/e, Khanna Publishers, New Delhi
Course Objective: Give the student an introduction to the techniques and processes of Multimedia Communications. To create an understanding in the student of the fundamentals of Digital Video and Audio, Graphics, Text, Animation, and Interactivity.

Prerequisite: It is expected to know the following concepts: Introductory preparation in mathematical analysis, matrix theory, probability, computer programming, and speech coding.

COURSE OF CONTENTS

Unit I

Unit II
Converging technologies, Functions & subsystems (input, development & output). Multimedia PC workstation components. Multimedia platform, Multimedia H/w, System software, Multimedia OS File system (tiff, bmp, pcx, gif, jpeg etc.) Multimedia communication system.

Unit III
2D/3D animation fundamentals, color modules digital imaging, still and moving images, Video application, video capture, animation video, processing, video recovery techniques, Creating videos on the desktop, Television (Broadcast TV, HDTV), Compression standards, AVO, AVI file formats, NTSC, PAL, video/audio conferencing techniques and standards.

Unit IV

Unit V
Multimedia communication system, application subsystem: collaborative computing, session management, transport subsystem: requirement, transport layer and network layer, Quality of service and resource management: Basic concept, establishment and closing of the multimedia call, managing resources during multimedia transmission, architectural issue.

References:
[1]. Judith Jeffcote, Multimedia in Practice, PHI
[2]. Ralf Steinmetz, Klara Nahrstedt, Multimedia Computing, Communication & Applications
[3]. John Villamil, Casanova, Multimedia, Production, Planning & Delivery, PHI

Scheme for B.E. IV (Electronics & Telecommunication)