आईएफटीएम विश्वविद्यालय, मुरादाबाद, उत्तर प्रदेश

IFTM University, Moradabad, Uttar Pradesh

NAAC ACCREDITED

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Study and Evaluation Scheme of
Master of Technology
[Session 2020-21]

Electronics & Communication Engineering:	**Master of Technology**
Course level:	**PG Degree**
Duration:	**Two years (four semesters)**
Medium of Instruction:	**English**
Minimum required attendance:	**75%**
Maximum credits:	**58**

Electronics & Communication Engineering Outcome:

Students successfully completing this course will be able to:

- Ability to design and conduct experiments as well as to analyze and interpret data.
- Ability to analyze the problem, subdivide into smaller tasks with well defined interface for interaction among components, and complete within the specified time frame and financial constraints.
- Ability to propose original ideas and solutions, culminating into a modern, easy to use tool, by a larger section of the society with longevity.
- Ability to design, implements, and evaluate secure hardware and/or software systems with assured quality and efficiency.
- Ability to communicate effectively the engineering solution to customers/users or peers.
- Ability to understand contemporary issues and to get engaged in lifelong learning by independently and continually expanding knowledge and abilities.

IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

M.Tech. E&C Engineering, YEAR - I (EFFECTIVE FROM 2018 – 2019)

YEAR I, SEMESTER-I

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total L	Credits T
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	MEC-101	Advanced Semiconductor Devices & circuits	3	1	0	20	10	30	70	100	4
2.	MEC-102	Advanced Digital Communication	3	1	0	20	10	30	70	100	4
3.	MEC-103	Advanced Digital Signal Processing	3	1	0	20	10	30	70	100	4
4.	MEC-010	VLSI Technology	3	1	0	20	10	30	70	100	4
		TOTAL	**12**	**4**	**00**	**-**	**-**	**-**	**-**	**400**	**16**

YEAR I, SEMESTER-II

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total L	Credits T
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	MEC-201	Advanced Information Theory and Coding	3	1	0	20	10	30	70	100	4
2.	MEC-202	Advanced Digital Logic Design	3	1	0	20	10	30	70	100	4
3.	MEC-203	Wireless Communication Systems	3	1	0	20	10	30	70	100	4
4.	MEC-020	VLSI Design	3	1	0	20	10	30	70	100	4
		TOTAL	**12**	**4**	**00**	**-**	**-**	**-**	**-**	**400**	**16**

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (I Semester)

MEC-101: ADVANCED SEMICONDUCTOR DEVICES & CIRCUITS

Objectives: The objective of this course is to gain an understanding crystal properties of semiconductor material, Excess carriers in semiconductors, Junctions-equilibrium conditions, BJT operations and Optoelectronic devices and negative conductance microwave devices.

UNIT-I **(10 Sessions)**
Crystal properties and energy bands and charge carriers in semiconductors, semiconductor materials, crystal lattices, bulk crystal growth, epitaxial growth, bonding forces and energy bands in solids ,charge carriers in semiconductors, carrier concentrations drift of carriers in electric and magnetic fields, invariance of the fermi level at equilibrium

UNIT-II **(8 Sessions)**
Excess carriers in semiconductors, optical absorption, luminescence, carrier lifetime and photoconductivity, diffusion of carriers.

UNIT-III **(10 Sessions)**
Junctions-equilibrium conditions, forward and reverse biased junctions; steady state conditions, reverse –bias breakdown (zener, avalanche and other breakdown diodes),transient and a-c conditions, deviations from the simple theory, effects of contact potential on carrier injection, recombination and generation in the transition region, ohmic losses, graded junctions, metal - semiconductor junctions, hetrojunctions

UNIT-IV **(12 Sessions)**
Bipolar junction transistor-fundamentals of bjt operation, amplification with bjts, BJT fabrication, minority carrier distributions and terminal currents, generalized biasing, switching, other important effects (drift in base region, base narrowing, injection level),frequency limitations of transistors (capacitance and charging times, transit time effect), heterojunction bipolar transistors

UNIT-V **(10 Sessions)**
Optoelectronic devices and negative conductance microwave devices-photodiodes, light-emitting-diodes, lasers, semiconductor lasers, tunnel diodes, the IMPATT diodes, the Gunn diodes

Course Outcomes:
Students completing this course will be able to:

- Crystal properties and energy bands and charge carriers in semiconductors
- optical absorption, luminescence, carrier lifetime and photoconductivity
- Junctions-equilibrium conditions
- Bipolar junction transistor-fundamentals of bjt operation

Suggested Readings:

1. B.G.Streetman,"Solid State Devices".
2. Millman and Halkas"Integrated Circuits".
3. A.S.sedre and K.C.Smith"Microelectronics Devices".

Website sources:

- www.nptel.ac.in
- en.wikipedia.org
- www.sanfoundary.co.in
- Grade up online course on transistors (www.gradeup.org)

Note: Latest editions of all the suggested readings must be used.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (I Semester)

MEC-102: ADVANCED DIGITAL COMMUNICATION

Objective: The objective of this course introducing and understanding advanced topics in digital communications and providing students with up-to-date knowledge of the techniques used in modern communication systems and the principles underlying their design.

Unit I **(08 Sessions)**

Introduction Elements of a digital communication system – Communication channels and their characteristics–Mathematical models for channels. Representation of Band Pass Signals and digitally modulated signals, Signal Space representation, Spectral Characteristics of Digitally Modulated Signals.

Unit II **(08 Sessions)**

Optimum Receivers for AWGN Channels: Optimum Receiver for signals Corrupted by AWGN, Maximum likelihood Sequence Detector. Performance of Optimum receiver for memoryless modulation, Optimum receiver for CPM, Optimum Receiver for Signals with random Phase in AWGN Channel, Performance analysis for wire line and radio communication systems.

Unit III **(08 Sessions)**

Channel Capacity and Coding: Source coding, measurement of information, Coding for Discrete Sources, Channel Models and channel capacity, Random Selection of codes, Linear block codes, Cyclic Codes (hard & soft decision coding & decoding) Convolutional codes - Tree, Trellis and State diagrams – Systematic, Non-recursive and recursive convolutional codes – The inverse of a convolutional Encoder and Catastrophic codes – Decoding of convolutional codes - Maximum likelihood decoding, Viterbi algorithm and other decoding algorithms. Probability of error of Convolutional Codes, Comparison of error rates in coded and uncoded transmission.

Unit IV **(08 Sessions)**

Pulse Shaping and Equalization Pulse shaping: Characterization of Band limited channels, ISI – Nyquist criterion, Design of band limited signals with Controlled ISI, Optimum Receiver for Channels with ISI and AWGN.

Equalization: Linear equalization, Decision feedback equalization, ML detectors, Iterative equalization – Turbo equalization. Adaptive linear equalizer, Adaptive decision feedback equalization, Blind equalization.

Unit V **(08 Sessions)**

Multichannel and Multicarrier Systems: Multichannel Digital communication in AWGN channel, Multicarrier communication.Spread Spectrum Digital Communication, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread spectrum Signals, Synchronization of spread spectrum system. Introduction to multiple Access Techniques.

Course Outcomes:

Students completing this course will be able to:

- Identify and describe modern digital communication techniques with applications to transmission like multi-carrier transmission and OFDM, spread-spectrum techniques, modern coding techniques, CDMA and multiuser systems, multiple-antenna systems, diversity, and receiver architectures (e.g., equalization, iterative processing, multi-user processing).
- Identify and describe standardized technologies in the field, in particular 3G, 4G and different WLAN standards.

Suggested readings:

1. John G. Proakis and Masoud Salehi, "Digital Communications," 5th edition, Tata McGraw Hill, 2008.
2. H. Taub, D L Schilling, Goutom Saha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
3. B.P. Lathi, "Modern Digital and Analog communication Systems", 4th Edition, Oxford University Press, 2010.
4. Marvin K. Simon, Sami M. Hinedi and William C. Lindsey, "Digital Communication Techniques: Signal Design and Detection" Prentice Hall of India, 2009.

Website sources:

- https://www.edx.org/course/communication
- www.nptel.ac.in
- en.wikipedia.org

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (I Semester)

MEC-103: ADVANCED DIGITAL SIGNAL PROCESSING

Objective: The objective of this course is to make students familiar with the most important methods in DSP, including digital filter design, transform-domain processing and importance of signal processors.

UNIT I **(10Sessions)**

SIGNALS AND SYSTEMS: Basic elements of digital signal Processing –Concept of frequency in continuous time and discrete time signals –Sampling theorem –Discrete time signals. Discrete time systems –Analysis of Linear time invariant systems –Z transform –Convolution and correlation.

UNIT II **(08Sessions)**

FAST FOURIER TRANSFORMS: Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms Use of FFT algorithms in Linear Filtering and correlation.

UNIT III **(08Sessions)**

IIR FILTER DESIGN: Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT IV **(07Sessions)**

FIR FILTER DESIGN: Symmetric & Anti-symmetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

UNIT V **(07Sessions)**

FINITE WORD LENGTH EFFECTS: Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling – analytical model of sample and hold operations – Application of DSP – Model of Speech Wave Form – Vocoder.

Course Outcomes:

After the successful completion of the course, student should be able to:

1. Know the analysis of discrete time signals.
2. To study the modern digital signal processing algorithms and applications.
3. Have an in-depth knowledge of use of digital systems in real time applications
4. Apply the algorithms for wide area of recent applications.

Suggested Reading:

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2000, 2nd Edition.
2. Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2002.
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill, 2001, Second Edition.

Website Sources:

1. en.wikipedia.org
2. www.studynama.com
3. onlinecourses.nptel.ac.in
4. www.gupshupstudy.com
5. www.tutorialspoint.com

Note: Latest editions of all the suggested readings must be used.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (I Semester)

MEC – 010: VLSI Technology

Objective: The objective of this course is to familiarize the students with the advanced VLSI Technology processes and industrial manufacturing of Integrated circuits. This course also helps them to understand the advanced concepts of diffusion system, Ion- implantation, metallization, packaging technologies and VLSI process in various technologies involved in fabrication.

UNIT I **(08Sessions)**
Introduction to IC Technology, Device miniaturization, IC Fabrication facilities, clean room and pure water system. Silicon crystal Growth, Wafer preparation and specifications, Chemical cleaning. Epitaxy: Vapour-Phase Epitaxy for silicon, chemistry of growth, Molecular beam epitaxy.

UNIT II **(08Sessions)**
Native films, thermal oxidation of silicon, oxidation techniques and systems, Evaluation of Native films. Lithography, Optical lithography, Electron beam lithography, X-ray lithography.

UNIT III **(08Sessions)**
Diffusion Equations, Diffusion profiles, Solid Liquid and Gaseous Sources, diffusion from an unlimited source, diffusion from a limited source. Diffusion systems for Silicon. Ion-Implantation: Ion Implantation systems, Implantation Damage, Annealing.

UNIT IV **(08Sessions)**
Metallization: Applications, ohmic contacts. Thin film Vacuum Evaporation technique, Evaporator Systems, Sputtering. Assembling Techniques and Packaging of VLSI chips. Package Types, Packaging design considerations.

UNIT V **(08Sessions)**
VLSI process Integration, NMOS IC Technology, C MOS IC Technology, Fabrication Process sequence. Yield and Reliability: Mechanisms of yield Loss in VLSI, Processing Effects, Circuit sensitivities, Point Defects, Reliability requirements for VLSI.

Course Outcomes:
Students completing this course will be able to:

- To understand the basics of Silicon crystal Growth, Wafer preparation and specifications.To be aware about the trends in semiconductor technology.
- To understand various Diffusion and metallization techniques.
- To learn advances technologies of NMOS, PMOS, CMOS with Fabrication

Suggested Readings:

1. VLSI Technology, S.M.Sze, McGrawHill
2. VLSI Fabrication Principles of Silicon and Gallium Arsenide, SorabK.Ghandhi, JOHN Wiley & Sons
3. The Science and Engineering of Microelectronics Fabrication, Stephen A. Campbell, Oxford University Press.

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

Note: Latest editions of all the suggested readings must be used.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (II Semester)

MEC-201: ADVANCED INFORMATION THEORY AND CODING

Objective: The objective of this course to introduce the principles and applications of information theory. The course will study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies; how these are used to calculate the capacity of a communication channel, with and without noise; coding schemes, including error correcting codes.

Unit – I **(08Sessions)**

Elements of information theory: Measurement of information and the Entropy Function, Entropies defined, and why they are measures of information, marginal entropy, jointentropy, Conditional entropy and the Chain Rule for Entropy.
Sources with and without Memory: Sources coding theorem, Prefix, Variable and Fixed- length Codes. Error CorrectingCodes

Unit – II **(08Sessions)**

Channel Types, Properties, Noise and Channel Capacity: Perfect communication through a noisy channel. The binary symmetric channel, theirclassification and capacity of a noiseless discrete channel. The Hartley and Shannon lawsfor channel capacity.

Unit – III **(08Sessions)**

Continuous Information; Density; Noisy Channel Coding Theorem: Extensions of the discrete entropies and measures to the continuous case. Signal-to-noiseratio; power spectral density, Gaussian channels, Relative significance of bandwidth andnoise limitations. The Shannon rate limit and efficiency for noisy continuous channels.

Unit – IV **(08Sessions)**

Error Control Coding: Linear blocks codes and their properties, hard-decision decoding, cyclic codes,Convolution codes, Soft-decision decoding, Viterbi decoding algorithm.

Unit – V **(08Sessions)**

Advanced Coding Techniques and Cryptography:BCH codes, Trellis coded modulation, introduction to cryptography, overview of encryption techniques, symmetric cryptography, DES, IDEA, asymmetric algorithms, RSA algorithm.

Course Outcomes:
Students completing this course will be able to:

- Calculate the information content of a random variable from its probability distribution
- Relate the joint, conditional, and marginal entropies of variables in terms of their coupled probabilities
- Define channel capacities and properties using Shannon's Theorems
- Construct efficient codes for data on imperfect communication channels
- Understand the basic concepts of cryptography

Suggested readings:

1. Ranjan Bose, Information Theory, Coding and Cryptography, Tata McGraw Hill
2. Richard B. Wells, Applied Coding and Information Theory for Engineers, Pearson
3. R.W.Hamming , Coding and Information Theory, 2nd edition, Prentice Hall
4. R.G.Gallager, Information Theory and Reliable Communication, Wiley
5. R.J. McEliece, The Theory of Information and Coding.Addison –Wesley
6. M.Mansuripur, Introduction to information Theory: Prentice Hall,1987
7. Taub & Schilling, Principles of communication, McGraw Hill
8. Thomas Cover & Joy Thomas, Elements of Information Theory, John Wiley &Sons

Website sources:

- https://www.edx.org/course/Informatiom theory and coding
- www.nptel.ac.in
- en.wikipedia.org

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (II Semester)

MEC-202: Advanced Digital Logic Design

Objective: The objective of this course is to familiarize the students with digital integrated circuits including testing, fabrication, circuit design, implementation methodologies, design methodologies, software's and future trends such as VHDL in the fields of digital electronics.

UNIT I **(08Sessions)**

Introduction to Digital Design Concepts: Design Constraints and Logic Representation of System,Levels of abstraction, typical design process, Hazard-free design. Axiomatic definition of Boolean algebra, Basic theorems of Boolean algebra. Boolean functions, Digital logic gates. Extension to multiple inputs and multiple operators. Gate implementations.

UNIT II **(08Sessions)**

Analog interfacing: A/D conversion concepts, Analog & Digital Conversion related errors. Function Minimization by using K – Map, XOR patterns and Reed - Muller Transformation Forms

UNIT III **(08Sessions)**

Combinational Logic Design and Implementation: Multiplexer/Decoder, Encoders, Code Converters, Magnitude Comparators, Parity Generators, Error Checking Systems, Combinational Shifters, Steering Logic and Tri-State Gate Applications, Introduction to VHDL Description of Combinational Primitives PLA/Pal/GAL, ROM, CPLD and FPGA level customized design, ALU.

UNIT IV **(08Sessions)**

Sequential Logic Design and Implementation: Practical Synchronous and asynchronous circuit design. Design and Implementation of sequential digital system, state representation, analysis of digital systems, synchronization, design criteria, design procedure. High level modeling of digital systems, controller realization, Timing & Frequency consideration, system examples.

UNIT V **(08Sessions)**

Synchronous FSM Design Considerations and Application, Fault, Fault coverage in digital circuits, internal scan test methodology, BIST and Boundary scan (JTAG) techniques.

Course Outcomes:

Students completing this course will be able to:

- To comprehend the advanced issues related to the development of digital integrated circuits including hazards, sequential circuit design, implementation methodologies, testing, design methodologies using VHDL and other tools for future trends.
- To use tools covering the back-end design stages for faults in digital integrated circuits.
- To developadvance knowledge which helps them to better understand the subjects like communication, VLSI Design and Chip manufacturing etc.

Suggested Readings:

1. An Engineering Approach to Digital Design, W. I. Fletcher, Pearson Education.
2. Digital Design – 4 edition; M. Morris Mano, Prentice Hall.
3. Digital Design principles and practices, 3RD Edition, J. F. Wakerly. Prentice Hall International.
4. Z. Kohavi, Switching and Finite Automata Theory, McGraw-Hill

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (II Semester)

MEC-203: WIRELESS COMMUNICATION SYSTEMS

Objective: To get an understanding of mobile radio communication principles, types and to study the recent trends adopted in cellular and wireless systems and standards.

Unit I **(08Sessions)**

Mobile Communication: Types of Mobile Communication Systems, Mobile radio systems around the world, Trends in cellular radio and personal communications.

Cellular Design Fundamentals: Frequency reuse, Channel alignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems, mechanism for capacity improvement-cell splitting, cell sectoring, and micro cell zone concept.

Unit II **(08Sessions)**

Multiple access schemes : TDMA, FDMA, CDMA, WCDMA, OFDMA, Random Multiple access Scheme, Packet Radio Protocols, CSMA, Reservation Protocols, Capacity of Cellular systems. GSM Architecture & Protocols, GSM Burst structure, Carrier and Burst Synchronization, Design Consideration. Security Aspects, Power Control strategies.

Unit III **(08Sessions)**

CDMA Digital Cellular Standards, Services and Security Aspects, Network Reference Model and Key Features, Advantages over TDMA, CDMA WLL System. Recent developments.

Unit IV **(08Sessions)**

Multipath Propagation: Fading, Large scale path loss, reflection, Diffraction, Scattering, Outdoor Propagation model-Okumura Model, Hata Model, Indoor Propagation Models. Small-scale multipath propagation, Types of small scale fading, Rayleigh and Ricean distributions. Diversity Schemes.

Unit V **(08Sessions)**

Introduction to 3G Wireless Networks: WiFi, WiMax, and Bluetooth, AMPS, MATS-D, CD-900.

Course Outcomes:

Students completing this course will be able to:

- Explain and apply the concepts telecommunication switching, traffic and networks
- Analyze the telecommunication traffic.
- Analyze radio channel and cellular capacity.
- Explain and apply concepts of GSM and CDMA system.
- Analyze the concept of multipath propagation
- Assess the latest wireless technologies

Suggested readings:

1. Wireless Communication, Rappart (PHI)
2. Mobile and personal Communication Systems and services, Raj Pandya (PHI)
3. Mobile Communication, Lee (TMH)

Website sources:

- http://www.wideskills.com/
- www.nptel.ac.in
- en.wikipedia.org

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-I Year (II Semester)

MEC -020: VLSI DESIGN

Objective: The objective of this course is to familiarize the students with the advanced VLSI Design processes and industrial manufacturing of Integrated circuits. This course also helps them to understand the advanced concepts of CMOS, BiMOS implantation, packaging design and various technologies involved in fabrication. This course helps student to learn software language like HDL and VHDL for research in the field of VLSI.

UNIT I **(08Sessions)**

Introduction to integrated circuit technology, basic MOS transistors, Enhancement and Depletion mode transistor, n-MOS fabrication, CMOS fabrication, BiCMOS. Electrical properties of MOS circuits, MOS transistor threshold voltage, Trans-conductance, output conductance, figure of merit

UNIT II **(08Sessions)**

n- MOS inverter, Pull-up to Pull-down ratio for an n-MOS inverter, Alternative forms of Pull-up, CMOS inverter, Latch up in CMOS, the Pass Transistor.Stick diagrams, n MOS design style; CMOS design style, Design rules and layout, Lambda-based design rules

UNITIII **(08Sessions)**

Basic circuit concept, sheet resistance, area capacitance of layers, delay time, inverter delays, propagation delays, scaling of MOS circuits, scaling models and scaling factors, limitation of scaling, limits of miniaturization,

UNIT IV **(08Sessions)**

Subsystem design and layout, some architecture issues, switch logic, gate logic, combinational logic, clocked sequential circuits.CMOS Design methods, programmable logic, Reprogrammable Gate arrays, FPGA architecture, CMOS standard cell Design.

UNIT V **(08Sessions)**

Design- capture tools, HDL and VHDL design, schematic design, layout design, floor planning, chip composition.
VLSI Testing, Fault types and models, controllability and observablity, Ad HOC Testable design techniques, scan-based techniques, Built-In self-Test (BIST) Techniques, current monitoring I_{DDQ} Test.

Course Outcomes:

Students completing this course will be able to:

- To identify the various IC fabrication methods.
- To express the Layout of advance MOS circuit using Lambda based design rules.
- To differentiate various latest FPGA architectures.
- To Design an application using software's.
- To develop concepts of modeling a digital system using Hardware Description Language

Suggested Readings:

1. Basic VLSI design, Dougles A. Pucknel, K. Eshriaghian, PHI.
2. Principles of CMOS VLSI Design- A system Perpective, by Niel H.E Weste, K. Eshriaghian, Pearson Education.
3. CMOS Digital Integrated Circuit Analysis and Design, Sung.mo Kang and Yusuf Leblebici, Tata McGraw-Hill

Website Sources:

- ndl.iitkgp.ac.in
- online courses.nptel.ac.in
- en.wikipedia.org
- www.tutorialspoint.com
- www.vlab.co.in

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD

STUDY & EVALUATION SCHEME

M.Tech. E&C Engineering, YEAR - II (EFFECTIVE FROM 2018 – 2019)

YEAR II, SEMESTER-III

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total L	Credits T
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
THEORY											
1.	MEC-301	Optical Fiber Communication	3	1	0	20	10	30	70	100	4
2.	MEC-	Elective –III	3	1	0	20	10	30	70	100	4
3.	MEC-	Elective –IV	3	1	0	20	10	30	70	100	4
PRACTICALS / PROJECT											
5.	MEC-351	Seminar	0	0	4	-	100	100	-	100	2
6.	MEC-352	Dissertation*	0	0	4	-	50	50	50	100	2
		TOTAL	**09**	**03**	**08**	**-**	**-**	**-**	**-**	**500**	**16**

Dissertation to be continued in IV Semester.

YEAR II, SEMESTER-IV

S.N.	Course Code	Course Name	Periods			EVALUATION SCHEME				Course Total L	Credits T
						Internal Exam			End Sem Exam		
			L	T	P	Mid Sem Exam	AS +AT	Total			
PRACTICALS / PROJECT											
1.	MEC-451	Dissertation	0	0	20	-	250	250	250	500	10
		TOTAL	**-**	**-**	**20**	**-**	**-**	**-**	**-**	**500**	**10**

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-II Year (III Semester)

MEC – 301: OPTICAL FIBER COMMUNICATIONS

Objective: The objective of this course is to expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

Unit I **(09Sessions)**

Review of Optical Fiber Communication:
Need of optical transmission, Fiber optic communication system, Advantage of OFC, Basic optical laws and transmission parameters, Geometrical optics description: Step Index Fiber & Graded Index Fiber, Mode Theory for optical propagation, Modes in planar wave, Phase & Group Velocity,**Signal Degradation in OFS:** Attenuation, Material Absorption, Scattering Loss, Bending Loss, Information Capacity Determination, Group Delay, Material Dispersion, Waveguide Dispersion, Higher order Dispersion, Polarization Mode Dispersion.

Unit II **(07Sessions)**

Optical Transmitter: Basic Concept: Emission and absorption Rates, p-n junctions, Non-radiative recombination, semiconductor materials, LED: Power current relationship, LED spectrum, LASER Diodes, ILD & its characteristics, Optical Gain, Feedback and Laser threshold.
Optical Receivers: Optical detection principles & devices, Detection response time, p-i-n photo-diode, Avalanche photodiode, Receiver operation: Digital Transmission, Error sources, Receiver configuration, Digital receiver performance, Probability of error, the quantum limit.

Unit III **(07Sessions)**

Digital and Analog Transmission System: Point to point links: System consideration, Link power budget, Rise time budget, First generation distance, Transmission distance for single mode fiber. Line coding: NRZ codes, RZ codes, error correction, noise effects on system performance, Overview of Analog links, carrier to noise ratio.

Unit IV **(06Sessions)**

Optical Amplifier: Basic application and types of optical amplifiers, Semiconductor optical amplifiers, Erbium doped fiber amplifiers: architecture and types, Amplifier-noise, Raman Amplifier, wavelength converters.

Unit V **(08Sessions)**

Optical Networks: Basic Networks, SONET/SDH networks, Operational principle of WDM networks, Nonlinear effects on network performance, Performance of WDM+EDFA system, Solitons, Optical CDMA & TDMA, Optical Switches/Cross Connect, Add/Drop Mux.

Course outcomes:
Students completing this course will be able to:

- Distinguish Step Index, Graded index fibers and compute mode volume.
- Explain the Transmission Characteristics of fiber and Manufacturing techniques of fiber/cable.
- Classify the construction and characteristics of optical sources and detectors.
- Discuss splicing techniques, passive optical components and explain noise in optical system.
- Design short haul and long-haul Analog/ Digital optical communication system and explain advanced optical transmission systems.

Suggested Readings:

- Fiber-optic communication system, Govind P. Agrawal 3RD Edition, Wiley Publication.
- Optical Fiber Communications by Gerdkeiser, 3RD edition, Mc. Graw Hill.
- Optical Fiber communications, John M Senior, 4th Edition, PHI India.
- Optical Networks, Black, Pearson education

Website Sources:

- https://www.stephouse.net/2015/07/compare-fiber-vs-wireless-services/
- https://www.rp-photonics.com/fiber_optic_links.html
- https://www.ofsoptics.com/

Note: Adhere to latest edition of the suggested readings.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-II Year (III Semester)

MEC 030: NEURAL NETWORK AND FUZZY LOGIC

Objective: The objective of this course is to familiarize the student with the concept of neural network that traces biological functions of human beings to create a system that work as humans.

Unit I **(08Sessions)**

Fundamentals of Neural Networks: Introduction, Biological Neurons and Memory, Structure & Function of a single Neuron, Artificial Neural Networks (ANN). Typical Application of ANN - Classification, Clustering, Pattern Recognition, Function Approximation. Basic approach of the working of ANN – Training, Learning and Generalisation.

Unit II **(08Sessions)**

Supervised Learning: Learning Processes, Single-layer Networks, Linear Separability, handling linearly non-separable sets. Training algorithm. Error correction & gradient decent rules. Multi-layer network- Architecture, Back Propagation Algorithm (BPA) – Various parameters and their selection, Applications, Feed-forward Network, Radial- Basis Function (RBF) network & its learning strategies.

Unit III **(08Sessions)**

Unsupervised Learning: Winner-takes all Networks, Hamming Networks. Adaptive Resonance Theory, Kohonen's Self-organising Maps.

Unit IV **(08Sessions)**

Neuro-dynamical models: Stability of Equilibrium states, Hopfield Network, Brain-state-in-a-Box network, Bidirectional associative memories**.**

Unit V **(08Sessions)**

Fuzzy Logic: Basic concepts of Fuzzy Logic, Fuzzy Vs. Crisp set Linguistic variables, membership functions, operations of fuzzy sets, Crisp relations, Fuzzy relations, Approximate reasoning, fuzzy IF-THEN rules, variable inference, techniques, defuzzification techniques, Fuzzy rule based systems. Applications of fuzzy logic.

Course Outcome:

Students completing this course will be able to:

- Analyze the working process of networks that help machines perform dedicated tasks
- Understand the concept of artificial intelligence
- Understand the concept of recursive learning of machines
- Analyse the key points of neural network working methodology.

Suggested Readings:

1. Satish Kumar – Neural Network: A classroom approach, TMH
2. Simon Haykin- Artifical Neural Network, PHI India
3. Hagan, Demuth & Beale – Neural Network Design.
4. T. J. Ross – Fuzzy logic with engineering applications

Website Sources:

- www.nptel.ac.in
- www.gradeup.in
- en.wikipedia.org
- www.ainetworks.in

Note: Latest edition of the suggested readings must be used.

IFTM UNIVERSITY, MORADABAD
Master of Technology (M. Tech) Electronics & Communication Engineering
M. Tech.-II Year (III Semester)

MEC 031: OPTICAL NETWORKS

Objective: The objective of this course is to familiarize the students with the optical fiber technology provide better connectivity in short span of time for the end user.

UNIT I **(08Sessions)**

Introduction to Optical Networks: Principles and Challenges and its Generation, Characteristics of Optical Fibre in non linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters.

Unit II **(08Sessions)**

Optical Amplifiers: Tun-able Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing, Spectral efficiency, Crosstalk, Introduction of Soliton systems.

Unit III **(08Sessions)**

SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.

Unit IV **(08Sessions)**

WDM Network Design Cost Trade-offs: Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution

Unit V **(08Sessions)**

Optical Switching :OTDM, Synchronisation, Header Processing, Buffering, Burst Switching. Deployment Considerations-SONET/SDH core Network

Course Outcome:

Student completing this course will be able to:

- Understand the switching technology used in circuits
- Understand the basic of communication through fibre
- Analyse the concept of wavelength dependent systems
- Understand the route /topology of networks.

Suggested Readings:

1.R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations
3. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

Website Sources:

- www.nptel.ac.in
- en.wikipedia.org
- www.gradeup.in
- www.networks.in

Note: Latest editions of the suggested readings must be used.