M.TECH. (FULL TIME)
ELECTRONICS AND COMMUNICATION ENGINEERING
CURRICULUM & SYLLABUS

Faculty of Engineering and Technology
PDM University Bahadurgarh

PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER-I

MODULE CODE	SUB-CATEGORY	MODULE	L	T	P	C	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
ECEN5101	PC	ADVANCED DIGITAL SIGNAL PROCESSING	4	0	0	4	50	100	150
ECEN5102	PC	COMPUTER COMMUNICATION	3	0	0	3	25	75	100
ECEN5103	PC	ADVANCED SATELLITE COMMUNICATION	3	0	0	3	25	75	100
ECEN5104	PC	ADVANCED SATELLITE COMMUNICATION LAB	0	0	2	1	25	25	50
ECEN5105	PC	ADVANCED MICROPROCESSOR AND MICROCONTROLLER	4	0	0	4	50	100	150
ECEN5106	PC	ADVANCED MICROPROCESSOR AND MICROCONTROLLER LAB	0	0	2	1	25	25	50
ECEN5107	SP	SPECIAL PROBLEM	0	0	2	1	25	25	50
	GE	ELECTIVE- A	4	0	0	4	50	100	150
GRAND TOTAL			**18**	**0**	**6**	**21**	**275**	**525**	**800**

L = Lecture
T = Tutorial
P = Practical
C = Credit Point

ELECTIVES

MODULE CODE	GENERIC ELECTIVE - A
SAPA0320	SAP (ABAP)ψ
SAPM0321	SAP (MM)ψ
SAPS0322	SAP (SD)ψ
SAPH0323	SAP (HCM)ψ
SAPS0324	SAP (FI)ψ
CCNA0325	CCNA ψ
MATH0303	NUMERICAL METHODS

ψ Additional fee, if any, shall be borne by the student.

PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Advanced Digital Signal Processing

L	T	P
4	0	0

MODULE CODE	ECN5101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

This subject enables the students to design IIR and FIR digital filters, implement the concept of DFT & FFT algorithms and applying the DSP applications in engineering field:

1. To acquire basic knowledge of Digital Signal Processing.
2. To inculcate the knowledge of ASP and DSP fundamentals.
3. To enable to solve Fourier transform and inverse Fourier transform.
4. To get familiar with the concept of DFT and Z transform in the designing of LTI systems.
5. To understand the concept of Digital filter structure and applications.
6. To gain knowledge of Implementation of filters.

LEARNING OUTCOMES:

1. Able to understand basic aspects of ADSP in the industry.
2. Able to understand ASP and DSP in practical circuits.
3. Get familiar with working of various applications based on FT and IFT.
4. Ability to analyze the behavior of analog and digital filters in different forms.
5. Able to measure different parameters of filters in practical circuits.
6. Able to use and design FIR and IIR filters.
7. Acquiring problem solving skills in the research work.

MODULE CONTENTS:

Unit I: Introduction of DSP Introduction to Signal Processing, Discrete Linear Systems, superposition Principle, Unit-Sample response, stability & causality Criterion.
Unit II: Fourier Transform & inverse Fourier transform Frequency domain design of digital filters, Fourier transform, use of Fourier transform in Signal processing, The inverse Fourier transform, Sampling continuous function to generate a sequence, Reconstruction of continuous -time signals from Discrete time sequences.
Unit III: DFT & Z transform with Applications Discrete Fourier transform, properties of DFT, Linear filtering methods based of the DFT, Digital Filter implementation from the system function, The Z-transform, the system function of a digital filter, the inverse Z transform, properties & applications, Special computation of finite sequences, sequence of infinite length& continuous time signals, computation of Fourier series & time sequences from spectra.
Unit IV: Efficient computation of the DFT Principal Of FFT, Fast Fourier Transform Algorithms, Applications of FFT Algorithms, A linear filtering approach to computation of the DFT. Application of DFT, Design of Notch filter, Circular Convolution.
Unit V: Digital Filter Structure & Implementation Linearity, time- invariance & causality, the discrete convolution, the transfer function, stability tests, steady state response, Amplitude & Phase characteristics, stabilization procedure, Ideal LP Filter, Physical reliability & specifications, FIR Filters, Truncation windowing & Delays, design example, IIR Filters: Review of design of analog filters & analog frequency transformation, Digital frequency transformation, Design of LP filters using impulse invariance method, Bilinear transformation, Phase equalizer, digital all pass filters.
Unit VI: Implementation of Filters Realization block diagrams, Cascade & parallel realization, effect of infinite-word length, transfer function of degree 1&2, Sensitivity comparisons, effects of finite precision arithmetic on Digital filters.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Digital Signal Processing by Alam V. Oppenheim & Ronald W. Schafer, PHI publications. 2. Digital Signal Processing- 3rd edition by J G Proakis, PHI publications

REFERENCEBOOKS	1. Theory & application of Digital Signal Processing by Rabiner & Gold, PHI publications 1992. 2. Digital Signal Processing, by S. K. Mitra, TMH Edition 2006

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Class Test		x	x	x	x		x
Quiz			x	x		x	
Assignment	x	x	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	D	e	f	g	h	i	j	k
Course Learning Outcomes	1	2	4	3	2,5		6			7	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Computer Communication

L	T	P
3	0	0

MODULE CODE	ECEN5102
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to application of networking and its concept so that learner will be able to useit in real life scenario. Some of the objectives of the course are:

1. To acquire basic knowledge of Computer Communication Networks.
2. To inculcate the knowledge of layered structure of OSI and TCP/IP.
3. To be able to design different networking topologies.
4. To get familiar with the concept of routing and switching.
5. To understand the concept of IP addressing.
6. To gain knowledge of security using cryptography.

LEARNING OUTCOMES:

1. Able to understand the concept of technologies used in communication especially in ISP.
2. Able to understand various applications used in the field of telecom.
3. Get familiar with working of latest technologies like ISDN, Frame Relay, and ATM.
4. Ability to differentiate between the routing and switching used in any telecom industry.
5. Able to secure their network using different techniques.

MODULE CONTENTS:

Unit I: Data communication: Introduction to Data communication. Concept of analog and digital signals. Bandwidth. Transmission media. Wired and wireless connectivity. FDM, TDM and CDMA, Circuit and packet switching, Frame relay and ATM switching, ISDN.
Unit II: Network architecture: Basics of OSI and TCP/IP reference models, Example architecture of other reference models.
Unit III: Network protocols: Local area network protocols, IEEE standards for LAN: its functions and protocols, Fibre optic networks, Satellite networks.
Unit IV: Internet Protocol: Internet protocol, Routing algorithms, IP addressing schemes, Internetworking and sub netting.
Unit V: Transport and application layer: Transport and application layer design issues, Connection management, Transport protocol on top of X.25, File transfer and access management.
Unit VI: Cryptography: Traditional cryptography, The Data Encryption Standard, Key distribution problem, Public cryptography, Authentication and digital signatures.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Data communication & Networking by Stallings, PHI 2. Computer Networks, Tanenbaum, PHI
REFERENCEBOOKS	1. Modelling and Analysis of Computer Communication Networks by Jeremiah F. Hayes, PHI 2. Data communications and networking by Forouzan, TMH 3. Data communications and network, Godbole, TMH

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

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MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**
Class Test		x	X	X	x
Quiz	X	x	X		x
Assignment		x	X	X	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	D	E	f	g	h	i	j	k
Course Learning Outcomes	1	1,2		1,5	1	2	2,3,4	4,5	2	6	2

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Advanced Satellite Communication

L	T	P
3	0	0

MODULE CODE	ECEN5103
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to satellite communication so that learner will be able to know the working of satellite in an orbit and about the earth & space segment. Some of the objectives of the course are:

1. To acquire basic knowledge of satellite communication.
2. To inculcate the knowledge of satellite links.
3. To get familiar with the different space link terms.
4. To get familiar with the different earth space propagation effects.
5. To understand the concept of multiple access techniques and network aspects.
6. To get the knowledge of special purpose communication satellites.

LEARNING OUTCOMES:

1. Able to understand basic aspects of satellite communication used in any kind of industry.
2. Able to understand various satellite applications in day to day life.
3. Get familiar with working of various components of a satellite communication.
4. Ability to analyze the behavior of satellite and space links.
5. Able to analyze various multiple access techniques used in satellite communication.
6. Able to know the importance of special purpose satellites in day to day life

MODULE CONTENTS:

Unit I: Introduction Satellite communication, Low, Medium and Geo synchronous Geo stationary satellites, Angle period, Returning period, Angle of Evaluation, Propagation Delay, Orbital Spacing.
Unit II: Satellite Links: Delay transponders, Earth Stations, Antennas and Earth coverage, Altitude and eclipses.
Unit III: Space links Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temperature, G/T Ratio, Noise Figure, Design of Downlinks, Domestic Satellite Systems Using Small Earth stations, Uplink Design, Design of Satellite Link for Specified (C/N).
Unit IV: Earth space propagation effects Frequency window, Free space loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and command of satellites.
Unit V: Multiple access techniques and network aspects Single access vs. multiple access, FDMA, TDMA, Code division multiple access (CDMA), Single channel per carrier (SCPC) access, Demand assignment techniques, Mobile satellite network design, SPADE.
Unit VI: Special purpose communication satellites BDS, INMARSAT, INTELSAT, VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), SARSAT (Search & Rescue satellite) , Satellite communication with respect to fibre Optic Communication, LANDSAT, Defence satellite.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Dennis Roddy, "Satellite Communications", Third Edition, McGraw Hill International Editions, 2001 2. Timothy Pratt, "Satellite Communication", Addison Wesley. 3. J. Martin: Communication Satellite System, PH Englewood. 4. D.C. Aggarwal: Satellite Communication, Khanna Publishers.
REFERENCEBOOKS	1. Bruce R. Elbert, "The Satellite Communication Applications Hand Book, Artech House Boston,1997. 2. Wilbur L. Pritchard, Hendri G. Suyderhood, Robert A. Nelson," Satellite Communication Systems Engineering", 2nd Edition, Prentice Hall, New Jersey, 1993

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**
Class Test			x	x	x	x
Quiz	x	x				x
Assignment		x	x		x	

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	D	e	f	g	h	i	j	k
Course Learning Outcomes	4	1	3,5		5			4	6		

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Advanced Satellite Communication Lab

L	T	P
0	0	2

MODULE CODE	ECEN5104
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

1. To get familiar with satellite transmitter and receiver.
2. To understand the base band signal in a satellite link.
3. To get familiar with noise ratio.
4. To get familiar with active and passive satellites.
5. To get familiar with satellite communication links.

LEARNING OUTCOMES:

1. Creates satellite communication setup skills.
2. Able to measure various noise ratios.
3. Able to understand various satellite applications in day to day life.
4. Able to calculate various parameters related to satellite communication.
5. Able to use various satellite equipment in industry.

LIST OF EXPERIMENTS:

1.	To Study the process of Transmitting Signal.
2.	To Study the Base band Signal in a Satellite Link.
3.	To Study Satellite Communication Receiver.
4.	To estimate S/N Ratio.
5.	To set up digital satellite Communication Link.
6.	To measure the propagation delay of signal in a Sat.Com. Link.
7.	To transmit & receive the function generator waveform through a Sat.Com. Link.
8.	To set up a active & passive satellite communication link & study their difference.
9.	To estimate C/N Ratio.
10.	To set up a PC to PC Sat. Com. Link using RS –232 port.
Experiments based on advanced topics:	
11.	To Study Black & White and Color T.V.
12.	To plot radiation pattern of parabolic reflector.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

PDM UNIVERSITY
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SEMESTER - I

Advanced Microprocessors & Microcontroller

L	T	P
4	0	0

MODULE CODE	ECEN5105
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation.

1. Understand fundamental operating concepts behind microprocessors and microcontrollers.
2. Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications.
3. Design microprocessor based solutions to problems.
4. Understand Low-Level and Embedded C Programming.
5. Apply this knowledge to more advanced structures.

LEARNING OUTCOMES:

1. Students should be able to solve basic binary math operations using the microprocessor/ microcontroller.
2. Students should be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor / microcontroller.
3. Students should be able to program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
4. Students should be able to apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.

MODULE CONTENTS:

Unit I: Design of basic microprocessor architectural Concepts: Microprocessor architecture, word Lengths, addressable memory, Microprocessor's speed architectural characteristics, registers, instruction, memory addressing architecture, ALU, GPR's Control logic & internal data bus.
Unit II: Microprocessor- 8086 Register Organization, Architecture, Memory Organization, Operation Bus IO Addressing, Minimum Mode, Maximum Mode operation, Interrupts & Service Routines.
Unit III: Programming of 8086 Addressing Modes, Instruction Format-Instruction, Assembly language Programs in 8086
Unit IV: Interfacing Devices I/O and Memory Interfacing concepts, Programmable Peripheral Interface (8255),Programmable Interval Timer (8254), Programmable Interrupt Controller (8259A), Programmable DMA Controller (8257) ,Programmable Communication Interface (8251) ,Programmable Keyboard and Display Controller (8279)
Unit V: Microcontroller-8051 Register Set, Architecture of 8051 microcontroller, IO and Memory Addressing , Interrupts, Instruction Set, Addressing Modes, Timer , Serial Communication & Interrupts Programming
Unit VI: Recent Advances in Microprocessor: Salient features of Pentium1, Pentium2, pentium3, Pentium-4.

RECOMMENDED BOOKS:

TEXT BOOKS	1. A.K.Ray and K.M.Bhurchandi, "Advanced Microprocessors and Peripherals",Tata McGrawHill,2000. 2. Muhammad Ali Mazidi and Janice Gillispie Mazidi, " The 8051 – Microcontroller and Embedded systems",7th Edition, Pearson Education , 2004. 3. Andrew N. Sloss, Dominic Symes, Chris Wright and John Rayfield, "ARM System Developer's Guide, Designing and Optimizing System Software", Elsevier, 2004.
REFERENCEBOOKS	1. David Seal, "ARM Architecture Reference Manual", Pearson Education, 2007. 2. Michael J. Pont, "Embedded C", Addison Wesley, 2002

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Class Test				x	X	x	x
Quiz	x	x	x				
Assignment		x	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	D	e	f	g	h	I	j	k
Course Learning Outcomes	1	2	4	3		1,2	4				4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Advanced Microprocessors & Microcontroller Lab

L	T	P
0	0	2

MODULE CODE	
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

This course introduces the assembly language programming of 8086 and 8051 microcontroller. It gives a practical training of interfacing the peripheral devices with the 8086 microprocessor. Objectives of the course are:

1. To introduce the basic concepts of microprocessor and to develop the assembly language Programming skills and real time applications of Microprocessor as well as microcontroller
2. To make the students well equipped with programming skills so that they will be able to design Different micro-processor based system
3. To make the students understand recent developments in micro-processors & micro-controllers
4. To make them understand various hardware & software concepts & real time problem solving techniques.

LEARNING OUTCOMES:

On completion of this lab course the students will be able to:

1. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
2. Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters.
3. Troubleshoot interactions between software and hardware.
4. Analyze abstract problems and apply a combination of hardware and software to address the problem.

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LIST OF EXPERIMENTS:

1.	To study the architecture of 8086 Kit
2.	Write an ALP to convert a hexadecimal No. to decimal No. in single step execution (DEBUG)
3.	Write an ALP to enter a word from keyboard and to display
4.	Write an ALP for addition of two one digit Number
5.	Write an ALP to display a string
6.	Write an ALP reverses a string
7.	Write an ALP to check whether the No. is Palindrome
8.	To study the Microcontroller Kit
9.	Write an ALP to generate 10 KHz frequency square wave
10.	. Write an ALP to generate 10 KHz & 100KHz frequency using interrupt
11.	Write an ALP to interface intelligent LCD display
12.	Write an ALP to interface intelligent LED display
Experiments based on advanced topics:	
13.	Write an ALP to Switch ON alarm when Microcontroller receive interrupt
14.	Write an ALP to interface one microcontroller with other using serial / parallel communication

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	50
2	External Assessment	1	50

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2,4		1	2	1,4	1,2			3	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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PDM UNIVERSITY
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SEMESTER - I

Special Problem

L	T	P
0	0	2

MODULE CODE	ECEN5107
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

A special problem is an individual study in a specialized area under the direction of a faculty of the Department. Student will select a problem after discussing with guide and completes it under his/her supervision. Each special problem must culminate in a written final report, which is to be submitted to the committee appointed by the Head of the Department who will evaluate the performance and award the marks.

PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - I

Numerical Methods:

L	T	P
4	0	0

MODULE CODE	MATH0303
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of this subject is to develop understanding of different methods related to error, area numerically, using different techniques to enhance skills of numerical methods as mentioned below:

1. To achieve knowledge and understanding of different types of error, interpolation, extrapolation and capabilities to solve by different methods with wide range of problems in science and engineering.
2. To get familiar with concepts of nonlinear equations and develop ability to solve simple Complex problems.
3. To understand direct and indirect methods solve simultaneous linear equations and their applications in engineering problems.
4. To learn basic concepts of area solve by integration and its application in realistic decision making.
5. To acquire knowledge of ordinary and partial differential equations solve by different methods and assess their effectiveness in problem solving.

LEARNING OUTCOMES:

1. Able to understand the evolution of techniques and basic terminology.
2. Exposure to various methods and techniques and their compatibilities.
3. Enhance the knowledge regarding different types of error, linear, non-linear and ordinary and partial differential equations.
4. Able to understand the basic techniques and start to implement in real life.
5. Ability to find the largest Eigen values and corresponding Eigen vector.

MODULE CONTENTS:

Unit I: Errors in Numerical Calculation Introduction, Numbers and their accuracy, Absolute, relative and Percentage errors and their analysis, General error formula. Interpolation and Curve Fitting: Newton's forward and backward; Gauss forward and backward; central difference interpolation formulae; Lagrange's and Newton divided difference interpolation formula, Interpolating with a cubic spline, Bezier curves and B-spline curves, Curve fitting by Least squares approximations.
Unit II: Nonlinear equations Bisection method, Regula False method, Secant method, Iteration Method, Newton's Raphson method, Giraffe's methods, Muller's method.
Unit III: Simultaneous linear equations Gauss Elimination method, Gauss-Jordan method, LU- decomposition Method, Jacobi's method, Gauss- Seidal method, Relaxation method.
Unit IV: Numerical differentiation and Integration Derivatives from differences tables, higher order derivatives, Newton-cotes integration formula, Trapezoidal rule, Simpson's rules, Boole's rule and Weddle's rule, Romberg's Integration.
Unit V: Numerical solution of ordinary differential equations Taylor series methods, Euler and modified Euler method, Runge-Kutta methods, Milne's method, Adams-Moulton method.
Unit VI: Numerical solution of partial differential equations Finite difference approximation of partial derivatives, solution of Laplace equation (standard 5-point formula only), one dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method). Eigen Value Problems: Power method, Jacobi, Given's and Householder's methods for symmetric matrices.

RECOMMENDED BOOKS:

TEXT BOOKS	5. Applied Numerical analysis: Curtis F Gerald and Patrick, G Wheatley-Pearson Education. 6. Numerical Methods*:* Fairs & Burden, Brooks Cole, 2001. 7. Numerical Methods in Engineering and Science, B S Grewal, Khanna Publishers.
REFERENCE BOOKS	3. Numerical Methods for Scientific and Engineering computations, M.K. Jain, S.R.K. Iyenger and R.K. Jain-Wiley Eastern Ltd. 4. Numerical Methods for engineers, Steven C. Chapra, Raymond P. Can ale, McGraw Hill.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks for theory and 50 marks for practical.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	x		x		x	
Quiz			x		x	x
Assignment	x	x		x		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,2,3,4,5	1,2,3,5	1,23,5	1,2,3,4,5	2,3.5	2,3,4	1,2,4	1,2,4	1,3,4	2,5	1,2,4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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SEMESTER-II

MODULE CODE	CATEGORY	MODULE	L	T	P	C	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
ECEN5108	PC	NEURAL NETWORK AND FUZZY LOGIC	4	0	0	4	50	100	150
ECEN5109	PC	ADVANCED OPTICAL COMMUNICATION	3	0	0	3	25	75	100
ECEN5110	PC	ADVANCED OPTICAL COMMUNICATION LAB	0	0	2	1	25	25	50
ECEN5111	PC	ADVANCED VLSI DESIGN	3	0	0	3	25	75	100
ECEN5112	PC	ADVANCED VLSI DESIGN LAB	0	0	2	1	25	25	50
ECEN5113	SP	SEMINAR	0	0	2	1	25	25	50
RESM0101	PC	RESEARCH METHODOLOGY	4	0	0	4	50	100	150
	PE	ELECTIVE-I	4	0	0	4	50	100	150
GRAND TOTAL			**10**	**0**	**6**	**21**	**275**	**525**	**800**

L = Lecture
T = Tutorial
P = Practical
C = Credit Point

ELECTIVES

MODULE CODE	PROGRAM ELECTIVE I
ECEN5214	OPTIMIZATION TECHNIQUES
ECEN5215	RELIABILITY ENGINEERING

PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – II

Neural Network and Fuzzy Logic

L	T	P
4	0	0

MODULE CODE	ECEN5108
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

This subject enables the students to design neural network, implement the concept of fuzzy logic and applying their applications in engineering field:

1. To acquire basic knowledge of neural network and fuzzy logic.
2. To inculcate the knowledge of fuzzy knowledge based control.
3. To enable to get knowledge of early and recent applications of fuzzy theory.
4. To get familiar with the concept of elements of fuzzy logic controllers.
5. To understand the concept of nonlinear fuzzy logic controllers.
6. To gain knowledge of multilayer perception classifiers.

LEARNING OUTCOMES:

1. Able to understand basic aspects of neural network in the industry.
2. Able to understand fuzzy logic and neural network.
3. Get familiar with working of consumer product applications.
4. Ability to analyse the essential elements of fuzzy logic controllers.
5. Able to measure various parameters of fuzzification.
6. Able to use PID like fuzzy logic controllers.
7. Acquiring problem solving skills in the research work.

MODULE CONTENTS:

Unit I: Neural Networks & Fuzzy Logics 1. Neural networks characteristics, History of development in neural networks principles, Artificial neural net terminology, Model of a neuron, Topology, Learning, types of learning, Supervised, Unsupervised, Re-inforcement learning. Knowledge representation and acquisition.
Unit II: Basic Hop field model, Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen`s feature maps.
Unit III: Radial basis function neural networks, Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network, and ART networks.
Unit IV: Applications of neural nets such as pattern recognition, Optimization, Associative memories, speech and decision-making. VLSI implementation of neural networks.
Unit V: Basic concepts of fuzzy logic, Fuzzy vs. Crisp set, Linguistic variables, Membership functions, Operations of fuzzy sets, Fuzzy IF- THEN rules, Variable inference techniques.
Unit VI: Defuzzification, Basic fuzzy inference algorithm, Fuzzy system design, FKBC & PID control, Antilock Breaking system (ABS), Industrial application

RECOMMENDED BOOKS:

TEXT BOOKS	1. D. Driankov, H. Hellendoorn and M. Reinfrank, "An Introduction to Fuzzy Control," Narosa Publishing House, New Delhi. 2. J.M. Zurada, "Artifical Neural System," Jaico Pub. House, Bombay. 3. Simon Haykin, "Neural Networks-A Comprehensive Foundation," PHI.
REFERENCEBOOKS	1. Y. Yegnanrayana, "Artificial Neural Networks", PHI 2. Li-Ming Fu, "Neural Networks in Computer Intelligence," TMH. 3. Junhong Nie & Derek Linkens, "Fuzzy Neural Control," PHI.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Class Test	x		x		x		x
Quiz		X	x	x		x	x
Assignment	x	X	x		x	x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	E	f	g	h	i	j	k
Course Learning Outcomes	1	2	3	4	1,4		6			7	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
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SEMESTER - II

Advanced Optical Communication

L	T	P
3	0	0

MODULE CODE	ECEN5109
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to get familiar with most major areas of optical communications as well as delve deeply into a few state-of-the-art research topics in the field.

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. To get familiar with the various optical source materials, LED structures, quantum efficiency, Laser diodes
4. To inculcate the basic knowledge of the fiber optical receivers such as PIN APD diodes, noise performance in photo detector
5. To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

LEARNING OUTCOMES:

1. Students will be able to recognize and classify the structures of Optical fiber and types.
2. Students will be able to discuss the channel impairments like losses and dispersion.
3. Students will be able to analyze various coupling losses.
4. Students will be able to classify the Optical sources and detectors and to discuss their principle.
5. Students will be able to familiar with Design considerations of fiber optic systems.
6. Students will be able to perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.

MODULE CONTENTS:

Unit I: Introduction: Advantage of optical fiber communication, Elements of fiber communication link, Ray theory .and electromagnetic mode theory for optical propagation, step index and graded index fibers, Numerical Aperture.
Unit II: Optical fibers, Losses & Dispersion: Attenuation, Absorption, Linear and non-linear scattering losses, Dispersion, overall fiber dispersion, polarization, fiber bending losses, multimode step index and graded index fibers, single mode fiber, dispersion shifted and dispersion flattered fibers.
Unit III: Optical Source: LED Basic concepts: LED for Optical Communication, Burrus type double hetro-structure, Surface emitting LEDs, Shape geometry, Edge emitting LEDs, LED to fiber launch systems semiconductor
Unit IV: Optical Source: LASER Lasers Theory, modulation and characteristics, Fabry-Perot lasers, quantum well lasers and distributed feedback lasers.
Unit V: Photo Detectors: P.I.N Photo Diodes: Theory and their characteristics, Avalanche photo diode detectors: Theory and their band width noise in APD.
Unit VI: Optical fiber communication System: Optical transmitter circuit: LED and laser drive circuits, optical receiver circuit; Structure, Pre amplifier, AGC, Equalization, analog systems: analog modulation, direct modulation, sub carrier modulation, Optical TDM sub-carrier multiplexing, WDM.

RECOMMENDED BOOKS:

TEXT BOOKS	1. John Gowar, "Optical Communication Systems", PHI. 2. Gerd Keiser, "Optical Fiber Communication", TMH
REFERENCEBOOKS	1 Franz JH & Jain VK, "Optical Communication", Narosa Publns 2 John M. Senior, "Optical Communication", PHI

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	05
2.	Sessional Test	2	15
3.	Group Discussion	4	05
4.	End Semester Exam	1	75

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**
Class Test				x	x	x
Quiz	x	X	x			
Assignment		X	x			x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	E	f	g	h	i	j	k
Course Learning Outcomes	1	2,5	4	3		1,2	4				4,6

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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SEMESTER - II

Advanced Optical Communication Lab

L	T	P
0	0	2

MODULE CODE	ECEN5110
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

In this lab we study the latest communication techniques. The optical fiber communication technique is one of the developments in the field of communication.

1. To understand the working principle of optical sources, detector.
2. To develop understanding of simple optical communication link.
3. To learn about the characteristics and measurements in optical fiber
4. To study DC Characteristics of LED and PIN Photo diode.
5. To acquire knowledge of measurement of connector and bending losses.
6. To study Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital)

LEARNING OUTCOMES:

On completion of this lab course the students will be able to:

1. Calculate and simulate the attenuation and signal degradation due to intermodal and intramodal distortion.
2. Calculate power coupling losses due to connectors, splices, source output pattern and fiber numerical aperture.
3. Understand, compute and simulate the modes in step index fiber and graded index fiber.
4. Design, implement and test WDM communication system using its basic components.
5. Participate in team projects including design, inspection and optimization.
6. Understand the reliability issues of the highly delicate optical devices.

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LIST OF EXPERIMENTS:

1.	To Study optical devices.
2.	To Study fiber optical detector.
3.	To Study fiber optical transmitter.
4.	Determination of numerical aperture of optical fiber.
5.	To Study and analyse characteristics of LED.
6.	To Study and analyse characteristics of LASER diode.
7.	To understand setting of a fiber optic analog link.
8.	To understand setting ofa fiber optic digital link.
9.	Study of modulation demodulation of light source by direct amplitude modulation techniques.
10.	Forming a PC to PC communication link using optical fiber & RS 232.
11.	To set up a fiber optic voice link.
Experiments based on advanced topics:	
12.	Study of modulation & Demodulation of light source by PPM technique.
13.	Study of modulation & Demodulation of light source by PWM technique.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	B	c	D	e	f	g	h	i	j	k
Course Learning Outcomes	1,3	3	4,5	1,3,4	6	2		3,4			2,6

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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SEMESTER - II

Advanced VLSI Design

L	T	P
3	0	0

MODULE CODE	ECEN5111
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	75
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to provide knowledge about different fabrication steps, design layout, its different parameters and characteristics required to understand the advanced VLSI design and process.

1. Introduce the technology, design concepts, electrical properties and modelling of Very Large Scale Integrated circuits.
2. To know the basics of MOS Circuit Design & modeling
3. Design digital systems for a variety of applications, including microcomputers and special purpose computing systems
4. Understand the static and dynamic behaviour of MOSFETs (Metal Oxide Semiconductor Field Effect Transistors) and the secondary effects of the MOS transistor model.
5. Understand the consequence of scaling down the dimensions of transistors and its effect on device density, speed and power consumption.

LEARNING OUTCOMES:

1. To be aware about the trends in semiconductor technology, and how it impacts scaling and performance.
2. Able to differentiate the NMOS, PMOS and CMOS technologies.
3. Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverter
4. To understand MOS transistor as a switch and its capacitance.
5. Student will be able to design digital systems using MOS circuits.

MODULE CONTENTS:

Unit I: Introduction: Introduction to VLSI, Evolution of IC Technology, Moore's law, IC Classification ,Basics of MOS transistor , NMOS, CMOS and bipolar IC technologies, general I-V equation of MOS transistor, Second Order effects, Short Channel Effects, NMOS and CMOS fabrication Process, lithography, oxidation process, etching, epitaxy.
Unit II: The MOS Inverter : Inverter principle, the basic CMOS inverter, transfer characteristics, Noise margins, Propagation Delay, Power Consumption. Combinational MOS Logic Design: Static MOS design, Ratioed logic, Pass Transistor logic, complex logic circuits.
Unit III: Electrical properties of MOS circuit : Parameters of MOS transistor, pass transistors, N MOS inverter, Pull-up to pull down ratio for and N MOS inverter, C MOS inverters, MOS transistor circuit model, Latch up on C MOS circuits.
Unit IV: Basic circuit concepts: Sheets resistance, area capacitance, delay unit, inverter delay, super buffers, propagation delays, Combinational logic circuits.
Unit V: Subsystem Design & Layout : Architectural issues in VLSI, switch logic, gate logic, Examples of Combinational logic, Clocked sequential circuits, other system consideration..
Unit VI: Design Process: MOS Switches, Implementation of logic gates, CMOS layout: design rules, Double metal single poly silicon, Stick diagram and their rules, Scaling and its factor, limitations.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Pucknell D. A. and Eshrachain K, "Basic VLSI Design System& Circuits". (PHI), 1988. 2. Geiger, Rr, Allen P. E. Strader N. R., "VLSI DesignTechniques for Analog and Digital Circuit", MGH1990
REFERENCEBOOKS	1. Neil Weste and David Harris :" CMOS VLSI design" Pearson Education 2009. Wolf, "Modern VLSI Design", Pearson 2. SZE, "VLSI Technology", TMH 3. S. Kang & Y. Leblebici "CMOS Digital IC Circuit Analysis & Design"- McGraw Hill, 2003.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**
Class Test				x	x
Quiz	x	x	x		
Assignment		x	x		

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	B	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	2,4	1,2	3,5	5	3,4			5			3

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Approved refinement decisions due for implementation;
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SEMESTER - II

Advanced VLSI Design Lab

L	T	P
0	0	2

MODULE CODE	ECEN5112
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

The aim of teaching this subject is to provide knowledge about different fabrication steps, design layout, its different parameters and characteristics required to understand the advanced VLSI design and process.

1. To learn Hardware Descriptive Language (Verilog /VHDL)
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain.
3. To know the basics of MOS Circuit Design & modeling.
4. To be aware about the different software's used in VLSI like Tanner/ cadence/ Spice etc.
5. To understand the static and dynamic behaviour of MOSFETs and the secondary effects of the MOS transistor model.

LEARNING OUTCOMES:

1. Graduates will be able to integrate VLSI chip designs into larger complex system designs.
2. Graduates will be able to differentiate graphically the NMOS, PMOS and CMOS technologies.
3. Graduates will be able to simulate MOS transistor as a switch and its capacitance.
4. Student will be able to design combinational and sequential circuits.
5. Students will be able to Import the logic modules into FPGA Boards.

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LIST OF EXPERIMENTS:

1.	Design the layout of PMOS.
2.	Design the layout of NMOS.
3.	Design the layout of CMOS inverter.
4.	Design the layout of 2 I/P NAND gate.
5.	Design the layout of 3 I/P NAND gate.
6.	Design the layout of 2 I/P NOR gate.
7.	Design the layout of 3 I/P NOR gate.
8.	Design the layout of XOR Gate.
9.	Design a layout of HALF-ADDER.
10.	Simulation of NMOS and PMOS characteristics
Experiments based on advanced topics:	
11.	Design a half adder using nand gates with following specifications : for n-mos : L=20 W=100U, for p-mos L=2U W=650U, for nmos Kn'=600 Vto=0.6V) for P-mos Kp=20U Vto=0.8v)
12.	Design a d-latch with clk time period=6ns using nand gates with following specification : L=2U W=100U for n & p-mos, For n-mos Kn'=60U Vto = 0.6V) for p-mos kp=20U Vto=0.8V)

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	B	c	d	e	f	G	H	i	j	K
Course Learning Outcomes	1	2,4		1	2	1,4	1,2			3	

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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- Approved refinement decisions due for implementation;
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SEMESTER - II

Seminar

L	T	P
0	0	2

MODULE CODE	ECEN5113
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

Every student will be required to submit a report and present a seminar talk on a topic guided by a faculty.

The Head of the Department will constitute a committee to evaluate the presentation and award marks.

Note: The award will be scaled to 25 marks.

SEMESTER - II

Research Methodology

L	T	P
4	0	0

MODULE CODE	RESM0101
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

The aim of teaching this subject is to impart knowledge primarily related to research methodology so that learner will be able to understand the research design and represent the research work. Some of the objectives of the course are:

1. To acquire basic knowledge research.
2. To get familiar with different types of research design.
3. To understand the basic of data collection.
4. To get familiar with the different techniques of data analysis.
5. To acquire basic knowledge of technical writing.
6. To get the knowledge of using tools and techniques in research.

LEARNING OUTCOMES:

1. Able to understand importance of research and its type.
2. Able to understand research papers and type of research design.
3. Able to formulate the research problem.
4. Able to choose the appropriate data analysis tool.
5. Able to justify with the type of research by publishing it at appropriate platform.
6. Able to use different types of software and techniques in research writing.

MODULE CONTENTS:

Unit I: Introduction to Research and Problem Definition Meaning, Objective and importance of research, Types of research, steps involved in research, defining research problem.
Unit II: Research Design Research Design: Concept and Importance in Research, Features of a good research design, Exploratory Research Design: concept, types and uses, Descriptive Research Designs: concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. Literature Survey.
Unit III: Data collection Classification of Data, Methods of Data Collection, Sampling, Sampling techniques procedure and methods, Ethical considerations in research Problem Identification & Formulation: Hypothesis, Qualities of a good Hypothesis, Null Hypothesis & Alternative.
Unit IV: Data analysis Statistical techniques and choosing an appropriate statistical technique, Data processing softwares (e.g. SPSS etc.), Interpretation of results Data Preparation: Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis (Cross tabulations and Chi-square test)
Unit V: Technical Writing and reporting of research Types of research report: Dissertation and Thesis, research paper, review article, short communication, conference presentation etc., Referencing and referencing styles. Research Journals, Indexing and citation of Journals, Impact factor of Journals, Ethical issues related to publishing, Intellectual property Plagiarism and Self-Plagiarism.
Unit VI: Use of Tools and Techniques for Research Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases. methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

RECOMMENDED BOOKS:

TEXT BOOKS	1. C. R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques , New Age International publishers, Third Edition. 2. Ranjit Kumar, Research Methodology: A Step- by- Step Guide for Beginners, 2nd Edition, SAGE, 2005 3. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
REFERENCE BOOKS	1. Creswell, John W. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications, 2013. 2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press. 3. Select references from the Internet

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6
Class Test	x	x	x			
Quiz	x	x				x
Assignment		x	x	x	x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	B	c	d	e	f	g	h	i	j	K
Course Learning Outcomes	3,4	5	3,5	1,2	1		1		4		2

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – II

Optimization Techniques

L	T	P
4	0	0

MODULE CODE	ECEN5214
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

Successful completion of the course will enable the students to:

1. Understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
2. Develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
3. Apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

LEARNING OUTCOMES:

1. The students will be able to get awareness about the real world problems, their understanding and ability to formulate mathematical models of these problems. For example: Finance, Budgeting, Investment, Agriculturist, Transportation, Cable network, Traveling salesman and many more such problems.
2. Students will be able to understand the major limitations and capabilities of deterministic operations research modeling as applied to problems in industry or government..
3. The student will learn to handle, solve and analyzing problems using linear programming and other mathematical programming algorithms.
4. The students will also be able to learn different techniques to solve Non- Linear Programming Problems.
5. The students will be able to understand multistage decision problems..

MODULE CONTENTS:

Unit I : Introduction Optimization concepts, Euclidean space, convex functions, gradient vector, Hessian matrix, formulation of engineering problems amenable to optimization, direct approach and indirect methods.
Unit II: Classical optimization Techniques: Maxima minima for functions of several variables, necessary and sufficient conditions, formulation of nonlinear optimization problems with equality and inequality constraints,
Unit III: Solution Techniques: Solution techniques using Lagrange's multiplier and khun-tuckker conditions.
Unit IV: Uni dimensional optimization Elimination methods, interpolation methods.
Unit V: Multivariable optimization: Concepts of Hill climbing, methods of steepest descent, Newton Raphson methods, Fletcher power method, constrained optimization.
Unit VI: Other techniques: Principle of optimality, solution for simple multistage problems, Dynamic Programming, Geometric Programming.

RECOMMENDED BOOKS:

TEXT BOOKS	1. S.S. Rao, " Engineering Optimization ", New Age International Publishers 2. Chander Mohan," ", Optimization Techniques", New Age science
REFERENCEBOOKS	1. Edwin K.P. Chong ::Introduction to Optimization:, Wiley edition

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Class Test	X		x		x		X
Quiz		x	x	X		x	X
Assignment	X	x	x		x	x	X

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	C	D	e	f	g	h	i	j	K
Course Learning Outcomes	1,2,7	4	5,6		3		6	4,5	2	7	5,7

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – II

Reliability Engineering

L	T	P
4	0	0

MODULE CODE	ECEN5215
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: The Question paper will comprise of seven questions distributed over three sections A, B and C. Section A comprises of very short answer type questions and is compulsory. Section B and Section C Comprise of short answer type and Long answer type questions and will have internal choices.

OBJECTIVES:

Successful completion of the course will enable the students to:

1. Summarize reliability engineering and its management throughout the product life cycle.
2. Perform reliability engineering analysis.
3. Compare the characteristics and differences in common Life Testing methodologies.
4. Compute reliability engineering parameters and estimates for applications in mechanical and electronic devices and manufacturing environments.
5. Application of course objectives in an open-ended project including a formal design review.

LEARNING OUTCOMES:

1. Understand the maintenance function and its objectives and know how to prepare report about the maintenance function.
2. Gain the necessary knowledge about the types of maintenance and know how to use them when design maintenance systems.
3. Gain the necessary knowledge about failure distributions and apply failure analysis Techniques.
4. Estimate components reliability both for the independent & dependent cases as well as related characteristics.
5. Estimate systems reliability both for the independent & dependent cases as well as related characteristics and design systems for better reliability.
6. Estimate systems maintainability as well as related characteristics and design systems for better maintainability.
7. Gain the necessary knowledge about the maintenance resources planning and apply various planning techniques.

MODULE CONTENTS:

Unit I: Introduction Definition of Relability , Need for Reliability engineering, Caiuses of failures, catastrophic failures and degradation failures. Characteristics types of failures, useful life of components, Exponential case of chance failures, Reliability measure4s, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Rayleigh, Weibull, Gamma distribution,Markov chains, failures data analysis.
Unit II: Reliability in Systems : Reliability Block Diagrams, series systems, parallel systems, K- out of M systems, Open and short circuit failures, standly systems. Reliability Analysis of Nonseries Parallel system, Cut-set approach, Bayes Theorem Method.
Unit III: Reliability Prediction Objective of reliability Prediction, Classification, Information sources for failure rate data, prediction methodologies, general requirement, role and limitations of reliability prediction.
Unit IV: Redundancy Techniques for reliability : Forms of maintenance, measures of maintainability and availability, maintainability function, availability function, two unit parallel system with repair, Markov model for two unit systems, preventive maintenance provisioning of spares.
Unit V: Reliability Testing Kinds of testing, components reliability measurements parametric methods, confidence limits, accelerate testing, equipment acceptance testing.
Unit VI: Economics of Reliability Engineering : Reliability cost, effect of reliability on cost. reliability achievement cost models, replacement policies

RECOMMENDED BOOKS:

TEXT BOOKS	1. KK Agarwal, " Reliability Engineering ", Kluwer Academic Netherlands. 2. B Singh," Quality Control Reliability Analysis", Khanna Publishers. 3. Balaguruswamy : Reliability Engineering
REFERENCEBOOKS	1. KB Mishra : Reliability Prediction & Analysis : A methodology oriented treatment, Elseveir, Netherlands. 2. Ebeling," Introduction to Reliability & Maintainability", TMH.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test	X		x		x		x
Quiz		x	x	x		x	x
Assignment	X	x	x		x	x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	B	C	D	e	F	g	h	i	j	k
Course Learning Outcomes	1,2	4	5		3		5	4,5,7	2		5,6

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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SEMESTER-III

MODULE CODE	CATEGORY	MODULE	L	T	P	C	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
ECEN6101	PC	IMAGE PROCESSING	4	0	0	4	50	100	150
ECEN6102	PC	WIRELESS AND MOBILE COMMUNICATION	4	0	0	4	50	100	150
ECEN6103	PC	ADVANCED DATA COMMUNICATION	3	1	0	3.5	50	100	150
ECEN6104	PC	ADVANCED DATA COMMUNICATION LAB	0	0	2	1	25	25	50
ECEN6105	DI	LITERATURE SURVEY (DISSERTATION STAGE 1)*	0	0	0	2	50	50	100
	PE	ELECTIVE-II	4	0	0	4	50	100	150
	GE	ELECTIVE- B	4	0	0	4	50	100	150
TOTAL CREDITS			**15**	**1**	**2**	**22.5**	**325**	**575**	**900**

L = Lecture
T = Tutorial
P = Practical
C = Credit Point

ELECTIVES

MODULE CODE	PROGRAM ELECTIVE II
ECEN6106	ADHOC SENSOR NETWORKS
ECEN6107	ELECTRONIC SYSTEM DESIGN

MODULE CODE	GENERIC ELECTIVE B
SAPA0320	SAP (ABAP)#
SAPM0321	SAP (MM)#
SAPS0322	SAP (SD)#
SAPH0323	SAP (HCM)#
SAPF0324	SAP (FI)#
CCNA0325	CCNA#
CSEN6301	ADVANCED COMPUTER NETWORK

#Additional fee, if any, shall be borne by the student.
*** Students are to earn 2 credits on review of litrature in 3rd semester out of 12 credits in total assigned to dissertation to be completed in 4th semester.**

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SEMESTER-III

Image Processing

L	T	P
4	0	0

MODULE CODE	
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The purpose of this course is to teach students the fundamentals of various image processing systems. The student will be able to incorporate these concepts into industry

1. To learn the fundamental concepts o image processing.
2. To study basic image processing operations.
3. To understand image analysis algorithms.
4. To expose students to current applications in the field of digital image processing.

LEARNING OUTCOMES:

1. Describe the basic issues and the scope (or principal applications) of image processing, and the roles of image processing and systems in a variety of applications;
2. Demonstrate a good understanding of the history and the current state-of-the-art image processing systems and applications which constantly push the boundaries and raise challenges in other fields of studies such as mathematics, physics, and computer systems engineering;
3. Identify areas of knowledge which are required, select an appropriate approach to a given image processing task, and critically evaluate and benchmark the performance of alternative techniques for a given problem by simulation using, e.g. MATLAB;
4. Implement image processing tasks with a high level of proficiency via software and hardware systems;
5. Identify potential applications of image processing to advancement of knowledge in sciences and engineering with benefits in, e.g., policing, public safety and security, and social issues such as privacy.
6. Demonstrate a high level of self-directed learning ability and good oral and written communication skills on technical topics of image processing and systems engineering

MODULE CONTENTS:

Unit I: Introduction : Elements of Digital Image Processing Systems, Image Acquisition, Storage, Processing Communication Display, Digital Image Fundamentals: Visual Perception, simple image models, concept of uniform and non uniform sampling & quantization, Relationships between pixels-neighbors of pixel, connectivity labeling of connected components. Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging.
Unit II: Image Transforms : Discrete Fourier transform, 2-D Fourier Transforms and its properties. Fast Fourier transform and its uses. Walsh, Hadamard Discrete cosine, Heir and slant transforms hostelling their algorithms and computer implementations.
Unit III: Image Enhancement: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homomorphic felling, generation of spatial marks, Color image processing.
Unit IV: Image Restoration: Degradation model, digitalization of circulate and block circulate metrics, Algebraic approved invoice filtering, wiener filter, constrained least square restoration, Interactive restoration in spatial domain geometric transformation.
Unit V: Image Compression: Redundancy models, error free compression, Lossy compression, Image compression standards.
Unit VI: Image Segmentation: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation use of motion in segmentation.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Edition 1997. 2. Keenneth R Castleman, " Digital Image Processing", Pearson
REFERENCE BOOKS	1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson 2. Chanda & Majumder, "Digital Image Processing & Analysis", PHI

PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER-III

Wireless and Mobile Communication

L	T	P
4	0	0

MODULE CODE	
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The purpose of this course is to teach students the fundamentals of wireless communication system. The student will be able to

1. Introduce various wireless systems and standards and their basic operation cases
2. To understand the techniques of radio spectrum allocation in multi-user systems and their impact on networks capacity.
3. Understand how the various signal processing and coding techniques combat channel uncertainties.
4. Learn to model radio signal propagation issues and analyze their impact on communication system performance.
5. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
6. To identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G and beyond mobile communication systems

LEARNING OUTCOMES:

1. To make students familiar with various generations of mobile communications.
2. To understand the concept of cellular communication.
3. To understand the basics of wireless communication.
4. Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations.
5. Knowledge of IS-95 CDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
6. Knowledge of 3G mobile standards and their comparison with 2G technologies.
8. To differentiate various Wireless LANs .

MODULE CONTENTS:

Unit I: Introduction An Introduction to Wireless Communication Systems : Introduction, Evolution of Mobile Radio Communication , Beginning of Radio, Wireless Mobile Communication, Applications of Wireless Communication , Disadvantages of Wireless Communication Systems , Examples of Wireless Communication Systems , Difference between Fixed Telephone Network and Wireless Telephone Network , Development of Wireless Communication ,Fixed Network transmission Hierarchy , Comparison of Wireless Communication Systems.
Unit-II: Modern Wireless Communication Systems Introduction, First Generation (1G), Second Generation (2G), Generation (2.5G) , Third Generation (3G), Evolution from 2Gto 3G, Fourth Generation (4G), Digital Cellular System Parameter, Differences Between Analog Cellular and Digital Cellular Systems, Wireless Local Loop [WLL], Wireless Local Area Networks (WLANs) , PAN(Personal Area Network), Bluetooth.
Unit-III: Radio Wave Propagation Introduction, Doppler Shift, Parameters of Multipath Channels, Fading, Diversity Techniques, Space Propagation Model, Phenomena of Propagation, Interleaving, Propagation Models; Outdoor Propagation Models: Longley-Ricemodel, Durkins Model, Okumura Model, Hata Model, Walfisch and Bertoni Model, Indoor Propagation Models; Log-distance Path Loss Model; Ericsson Multiple Breakpoint Model Cellular.
Unit-IV: System Design Fundamentals: Introduction, Frequency Reuse, Cellular Capacity Increasing Parameters, Channel Assignment Strategies, Hand-off Strategies, Hand-off Initiation, Type of Hand-off on the basis of Decision-making process, Channel Assignment Strategies for Hand-off, Interference , Tracking, Trunking and Grade of Service.
Unit-V: Multiple Access Techniques: Classification of multiple access protocols: contention less (scheduling) multiple access protocols, contention (random) multiple access protocols, Code division multiple access (CDMA) protocols - CDMA system concepts, spread spectrum multiple access, Code generation DSCDMA with imperfect power control, Near-far effect, multi user interference in the reverse link and forward link.
Unit- VI: Wireless Networking : Introduction, Difference Between Fixed Telephone Network and Wireless Telephone Network, ,Intelligent Cell Concept, Zone Divided Power Delivery Intelligent Cells, Processing Gain Intelligent Cells, Applications of Intelligent Cell Concept, Advantages of Intelligent Cells Implementation.

RECOMMENDED BOOKS:

TEXT BOOKS	1. T. S. Rappaport, Wireless Communication, Principles & Practice, Pearson Education. 2. Rajeshwar Dass, Wireless Communication Systems, I. K. International Pvt. Ltd 3. Mobile Communication: Jochen Schiller Pearson Education.
REFERENCE BOOKS	1. Kaveh Pahlavan & Allen H. Levesque, Wireless Information Networks, Wiley series in Telecommunications **2.** Kamilo Feher: Wireless Digital communication.

METHODS OF TEACHING AND STUDENT LEARNING

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ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test				x	x	x	x
Quiz	x	x	x				
Assignment		x	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2	4	3	1	1,2	4	1	3	2	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
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SEMESTER-III

Advanced Data Communication

L	T	P
3	0	0

MODULE CODE	
CREDIT POINTS	3
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The aim of teaching this subject is to get familiar with the ability to analyze the design parameters of a communication system.

6. Provide student with theoretical background and applied knowledge so that they can design an optimum Single and multi-carrier communication system under given power, spectral and error performance constraints.
7. To analyze the error performance of digital modulation techniques.
8. To explore M'ary signaling.
9. To learn synchronization and adaptive equalization techniques.
10. To acquire basic knowledge of different block and convolutional coding techniques.

LEARNING OUTCOMES:

At the end of course students will be able:

1. To understand the various blocks that constitutes a digital communication system and understands how they interrelate.
2. To qualitatively and quantitatively analyse and evaluate digital communication system.
3. To recognise the broad applicability of digital communication systems in society.
4. To use software tools to analyse, design and evaluate digital communication systems.
5. Use mathematical tools to analyse the performance of communication systems.

MODULE CONTENTS:

Unit I: Digital Modulation Techniques : BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery, M'ARY modulation: M ary modulation, M ary PSK, QAM, FSK, Comparison Power spectra QPSK, MSK, M ary, Bandwidth efficiency.
Unit II: Optimum Detection: Matched Filter, Error Rate due to Noise, intersymbol Interference, Nyquist's Criterion, Optimum Linear Receiver, and Geometric Representation of Signals, Coherent Detection of Signalsim Noise, Probability of Error.
Unit III: Coherent Digital Modulation Schemes: MPSK, MFSK, MQAM; Error Analysis, Non coherent FSK, Differential PSK, comparison of Digital Modulation Schemes, Bandwidth Efficiency, Pseudo-Noise Sequences and Spread Spectrum, Information Theory, Entropy, and Source-Coding
Unit IV: Coding Theory: Linear block codes, cyclic codes; encoding and decoding, Non-binary codes, convolutional Codes. Decoding of convolutional codes.
Unit V: Trellis Coded Modulation: Block Interleaving , convolutional Interleaving, Concept of Turbo code, Turbo Encoder, Feedback Decoder, Trellis coded modulation, TCM Encoding and decoding, TCM example, Reed Solomon Code, Performance over Burst Noise, Reed Solomon Encoding and Decoding.
Unit VI: Synchronization: Synchronization Introduction Receiver Synchronization, Frequency and Phase synchronization, Performance in Noise, Nonlinear loop analysis, Suppressed Carrier loops, Symbol synchronization Open loop and closed loop, CPM synchronization, Frame synchronization, Network synchronization, Open loop and closed loop transmitter synchronization.

RECOMMENDED BOOKS:

TEXT BOOKS	1. John .G.Proakis, "Digital Communication", McGraw Hill Inc 2001. 2. Simon Haykin, "Digital Communications", John Wiley and Sons, 1998. 3. B.P.Lathi, "Modern Digital and Analog and communication systems", 3rd Edition Oxford universitypress 1998
REFERENCEBOOKS	1. R.E.Zimer &R.L.Peterson: Introduction to Digital Communication, PHI, 2001. 2. Digital Communications Fundamentals and Applications, 2ed, Bernard Sklar, Pearson Education. 3. Edward A Lee & David G Messerschmitt: Digital Communication, 3rd Ed; Kluwer Academic Publishers, 2003.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5
Class Test	x			x	x
Quiz	x	x	x	x	
Assignment		x			

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,5	2	4,5	4	2,3		4	1,4			3

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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PDM UNIVERSITY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER - III

Advanced Data Communication Lab

L	T	P
0	0	2

MODULE CODE	
CREDIT POINTS	1
FORMATIVE ASSESMENT MARKS	25
SUMMATIVE ASSESMENT MARKS	25
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

OBJECTIVES:

This is an Advance communication Laboratory in which the students get to study the latest advances in communication like the advance modulation techniques like QPSK, MPSK, MSK, optical communication and study the different antennas used for the purpose of communication.

1. To get better understanding of digital modulation techniques and communication losses.
2. To design suitable modulator and demodulator for given application.
3. To understand the different advanced modulator techniques and their importance in real time applications like QPSK,DPSK etc.
4. Implementation and realization of Time Division Multiplexing modulation and demodulation.
5. To understand various codes in channel encoding scheme.

LEARNING OUTCOMES:

On completion of this lab course the students will be able to:

1. Understand clearly the concepts related to Digital Modulation techniques.
2. Design various error control codes in channel encoding scheme
3. Understand the importance of various Linear Integrated Circuits.
4. Understand various receiver and emphasis circuits.
5. Simulate end-to-end Communication Link and Simulate & validate the various functional modules of a communication system

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LIST OF EXPERIMENTS:

1.	To study different shapes generation like Sine wave, triangular and saw tooth wave.
2.	To study and perform amplitude modulation and demodulation.
3.	To perform DSBSC amplitude modulation and coherent detection.
4.	To study SSB amplitude modulation and coherent detection.
5.	To study and perform frequency modulation and demodulation.
6.	To study Pseudo-Random Binary Sequence Generation(Scrambling and Descrambling)
7.	To generate PAM signal and constellation diagram.
8.	To study QAM modulation and demodulation.
9.	To study Near-End Echo Canceller.
10.	To study Far-End Echo Canceller.
11.	To study BPSK Modulation and demodulation.
12.	To study Convolution coding and decoding.
Experiments based on advanced topics:	
13.	To study super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
14.	To study Pre-emphasis and De-emphasis in FM.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 50 marks for practical.

Practical:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1	Internal Assessment	2	25
2	External Assessment	1	25

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1,3	4	2,4		1,5			3,4			5

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
- Actions taken based on previous course review; and
- Report discussed and analysed; actions taken as a result of this process and are communicated to the main stakeholders.

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SEMESTER - III

Adhoc Sensor Networks

L	T	P
4	0	0

MODULE CODE	
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The purpose of this course is to teach students the fundamentals of wireless communication system. The student will be able to

1. To gain knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
2. routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
3. Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
4. Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards. This includes their designs, operations, plus approaches to interoperability.
5. Knowledge of sensor networks and their characteristics. This includes design of MAC layer protocols, understanding of power management, query processing, and sensor databases.
6. Hands-on experience in designing and implementing ad hoc network functionality using network simulation tools and Pocket PCs.

LEARNING OUTCOMES:

1. Students will be able to understand the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
2. Students will have an understanding of the principles and characteristics of wireless sensor networks (WSNs).
3. Students will be able to understand how proactive protocols function and their implications on data transmission delay and bandwidth consumption.
4. Student will be able to understand how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
5. Students will understands how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.

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MODULE CONTENTS:

Unit I: Introduction Introduction to Mobile Ad Hoc Networks, Technologies for Ad Hoc Network, Issues in Ad hoc wireless Networks, Ad Hoc network applications, Fundamentals of WLANs, IEEE 802.11 Architecture , protocols, performance and open issues. Introduction to IEEE 802.15.4, MAC Protocols for Ad Hoc Wireless Networks.
Unit II: Routing Protocols Issues, design goals and classification of MAC protocol, MACA and MACAW, Routing Protocols for Ad hoc wireless networks: Issues and classifications of routing protocols, AODV, DSR, DSDV, Multicasting Routing: Issues, Architecture reference model, and classifications of multicasting routing protocols.
Unit III: Transport layer & Security protocols Issues and design goals in designing transport layer protocols, TCP over Ad Hoc Wireless Networks: Traditional TCP, Feedback-Based TCP, TCP-BuS, Ad Hoc and Split TCP, Security in Ad hoc wireless networks: Network security requirements, Issues and challenges, Types of Network Security Attacks, and Key management, Secure routing in Ad hoc wireless networks.
Unit IV: Wireless Sensor Networks Introduction and overview of WSN, Applications of Sensor Networks, Sensor network architecture, Architecture of WSNs Hardware components, Energy consumption of sensor nodes, Operating systems and execution environments, some examples of sensor nodes, Network Architecture: Sensor networks scenarios, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.
Unit V: Communication Protocols Physical Layer and Transceiver design considerations in WSNs, Fundamentals of (wireless) MAC protocol: Low duty cycle protocols and wakeup concepts, Contention-based protocols, Schedule-based protocols, The IEEE 802.15.4 MAC protocol, Address and name management in wireless sensor networks, Localization and positioning.
Unit VI: Routing Challenges Routing protocols: Data Dissemination and Gathering, Routing Challenges and Design Issues in WSN, QoS in wireless sensor networks, Coverage and deployment, Advanced Application Support.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Ad HOC Wireless Networks: Architectures & Protocols , By C Siva Ram Murty & BS Manoj 2nd Ed, Pearson Education. 2. Protocols and Architectures for Wireless Sensor Networks, By Holger Karl and Andreas Willig Wiley Publisher (2014).
REFERENCE BOOKS	1. Wireless Sensor Networks Technology, Protocols, and applications by Kazem Sohraby, Daniel Minoli, Taieb Znati, John Wiley & Sons. 2. Handbook of Ad Hoc Wireless Network, By Mohmad Illayas, CRC press.

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	1	2	3	4	5	6	7
Class Test				x	x	x	x
Quiz	x	x	x				
Assignment		x	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2	4	3	1	1,2	4	1	3	2	4

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

- Problems encountered in the content delivery;
- Suggested remedies / corrective measures;
- Approved refinement decisions due for implementation;
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Electronic System Design

L	T	P
4	0	0

MODULE CODE	
CREDIT POINTS	4
FORMATIVE ASSESMENT MARKS	50
SUMMATIVE ASSESMENT MARKS	100
END SEMESTER EXAM DURATION	3 hrs.
LAST REVISION DATE	

INSTRUCTIONS: In total, EIGHT questions will be set. Question ONE will be compulsory and cover all units. Remaining seven questions are to be set taking at least one question from each unit. The students are to attempt five questions in total, first being compulsory.

OBJECTIVES:

The purpose of this course is to teach students the fundamentals of wireless communication system. The student will be able to

1. To gain knowledge of design and implementation of electronic system.
2. To gain knowledge of design and implementation of MSI and LSI circuits and their applications.
3. Understanding the design of different flip flops and synchronous sequential circuits.
4. Knowledge and designing of programmable system controller.
5. Knowledge and design of asynchronous machines.
6. To gain knowledge of different electronics systems and complete domain knowledge of digital electronics.

LEARNING OUTCOMES:

1. Students will be able to understand the principles of electronic system design.
2. Students will have an understanding of the principles and characteristics of MSI and LSI circuits and their applications.
3. Students will be able to understand how to design and implement flip flops.
4. Student will be able to understand designing of different controllers and their programming methods.
5. Students will understand analysis and design of asynchronous machines.

MODULE CONTENTS:

Unit I: Introduction: Review of Digital Electronics concept.
Unit II: MSI and LSI Circuits And Their Applications: Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR And AND-OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.
Unit III: Transport layer & Security protocols Sequential Machines: The Concept Of Memory, The Binary cell, The Cell And The Bouncing Switch, Set / Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.
Unit IV: Multi Input System: System Controllers, Design Phases And System Documentation, Defining the System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller.
Unit V: Controller Design: Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design. Introduction to the CPLD & FPGA.
Unit VI: Asynchronous Finite State Machines: Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, and Hazards in Circuit developed By MEV Method.

RECOMMENDED BOOKS:

TEXT BOOKS	1. Fletcher, "An Engineering Approach to Digital Design" PHI 1990 2. Z. Kohavi, "Switching and Finite Automata Theory", TMH
REFERENCE BOOKS	1. Markowitz, "Introduction to Logic Design", TMH 2. Mano, " Digital Design", PHI

METHODS OF TEACHING AND STUDENT LEARNING

The subject is delivered through lectures, on-line support, text book / course material reading and practical exercises. Some videos will be shown to demonstrate certain concepts and research areas will be discussed. Resource material is provided with the help of PDM Educational Directory Services (PEDS).

ASSESSMENT METHODOLOGIES:

This subject will be evaluated for a total of 150 marks.

Theory:

Assessment #	Type Of Assessment	Per Semester	Maximum Mark
1.	Class Test	4	10
2.	Sessional Test	2	30
3.	Group Discussion	4	10
4.	End Semester Exam	1	100

MAPPING OF ASSESSMENT METHODS AGAINST THE LEARNING OUTCOMES

Theory:

Assessments	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Class Test	x			x	x		x
Quiz	x	x	x				
Assignment		x	x			x	x

MAPPING OF COURSE LEARNING OUTCOMES

Program Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Learning Outcomes	1	2	4	3	1,3	1	4	1	3	2	3

EVALUATION

At the end of semester, course faculty will submit an evaluation / review report. The purpose of this report is to identify aspects that will be highlighted by students and faculty's feedback for the course with respect to its strengths as well as those areas which could be improved. The review report contains the following areas:

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SEMESTER - IV

MODULE CODE	CATEGORY	MODULE	L	T	P	C	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
ECEN6108	DI	DISSERTATION and VIVA (DISSERTATION STAGE 2)	-	-	-	10	250	250	500
GRAND TOTAL			**0**	**0**	**0**	**10**	**250**	**250**	**500**

L = Lecture

T = Tutorial

P = Practical

C = Credit Point