**GURUGRAM UNIVERSITY**
**SCHEME OF STUDIES AND EXAMINATION**
**M.TECH 1st YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)**
**SEMESTER - 1**

| Sl. No | Course Code | Subject | Credit Pattern | | | | Examination Schedule (Marks) | | | | Duration of Exam (Hours) | No of Hours /week |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Total Credits | Marks of Class work | Theory | Practical | Total | | |
| 1 | 16ECE21C1 | Advance Microprocessor &Microcontroller | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 | 4 |
| 2 | 16ECE21C2 | Satellite and Space Communication | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 | 4 |
| 3 | 16ECE21C3 | Information and Communication Theory | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 | 4 |
| 4 | 16ECE21C4 | Advanced Digital Signal Processing | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 | 4 |
| 5 | 16ECE21C5 | Data Communication Networks | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 | 4 |
| 6 | 16ECE21C6 | Seminar | - | | - | 2 | 50 | - | - | 50 | | 2 |
| 7 | 16ECE21CL1 | Satellite Lab | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 | 4 |
| 8 | 16ECE21CL2 | Advance Microprocessor & Microcontroller Lab | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 | 4 |
| | | **TOTAL** | **26** | | | | | | | | | |

NOTE:

**Examiner will set nine question in total. Question One will be compulsory and will comprise short answer type questions from all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.**

**GURUGRAM UNIVERSITY**
**SCHEME OF STUDIES AND EXAMINATION**
**M.TECH 1st YEAR (ELECTRONICS & COMMUNICATION ENGINEERING)**
**SEMESTER 2**

| Sl. No | Course No. | Subject | Credit Pattern | | | | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | T | P | Total Credits | Marks of Class works | Theory | Practical | Total | |
| 1 | 16ECE22C1 | Wireless Mobile Communication | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 |
| 2 | 16ECE22C2 | Optical Communication | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 |
| 3 | 16ECE22C3 | Seminar | - | | - | 2 | 50 | - | - | 50 | |
| 4 | 16ECE22CL1 | VLSI Lab | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 |
| 5 | 16ECE22CL2 | Optical Communication Lab | - | - | 2 | 2 | 50 | - | 50 | 100 | 3 |
| 6 | 16ECE22D1 or 16ECE22D2 or 16ECE22D3 or 16ECE22D4 | Elective-1 | 4 | 0 | - | 4 | 50 | 100 | - | 150 | 3 |
| 7 | | OpenElective | | | | 3 | | | | | |
| 8 | | FoundationElective | | | | 2 | | | | | |
| | | **TOTAL** | | | | **23** | | | | | |

**NOTE: Examiner will set nine questions in total. Question One will be compulsory and will comprise short answer type questions from all sections and remaining eight questions to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one fromeach Unit.**

**Elective 1 : Choose any one from the following four papers:**

16ECE22D1 - ElectronicSystem Design
16ECE22D2 - Image Processing
16ECE22D3 – ADVANCED MATHEMATICS FOR ENGINEERS
16ECE22D4 - VLSIDesign

**Open Elective:** Acandidatehas to select this paperfrom thepool ofOpen Electives provided bytheUniversity.

**Foundation Elective:** A candidate has to select this paper from the pool of Foundation Electives provided bythe University.

**16ECE21C1 ADVANCED MICROPROCESSOR & MICROCONTROLLERS**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

**COURSE OUTCOMES:** After the completion of the course the student will be able to:

CO1 Understand the operation and architecture of Intel microprocessor 8085, 8086, Motorola 68 XXX family microprocessor, Microcontroller 8051 including Instruction Set Architecture, assembly language programming, timing and speed of operation.
CO2 Learn the operation of circuits for user interaction through switches, keyboard and display devices.
CO3 Understand the operation and architecture of Intel 8085, 8086, Motorola 68 XXX family microprocessor including Instruction Set Architecture, assembly language programming, timing and speed of operation.
CO4 Understand the motivation and need for peripheral operations circuits for digital data exchange, timer, serial communication, merits of direct memory access, interrupt controller and other circuits.

## SECTON - A

**Designofbasic microprocessor architecturalConcepts :** Microprocessor architecture, word Lengths, addressable memory, Microprocessor's speed architectural characteristics,registers, instruction, memory addressing architecture, ALU,GPR'sControllogic&internaldatabus.
**MicroprocessorInstructions& Communication:**InstructionSet ,Mnemonics, Basic Instruction Types, Addressing modes
,MicroprocessorI/OconnectingI/OputtoMicroprocessor,Polling andInterrupts,InterruptandDM.Controllers.

**SECTION B**

**Microcontroller:**Introduction8051 architectureand programming model. Internal RAM and registers, I/O parts,Interruptsystem&Instructionsets.

**SECTION C**

**Advanced microprocessors:**Intel X86 family of advancedMicroprocessor, programming model for 86 family. X85 addressingmodes,instructionset,hardware.Motorola68XXX familyof microprocessor,68XXXaddressingmodes,instruction set,hardware.

**SECTION D**

**MicroprocessorI/O:**DataCommunication,parallelI/Oserialcommunication,Serialinterface and UARTmodems,I/Odevices,D/A,A/Dinterface,specialI/Odevices.
**DevelopingMicroprocessorBasedProducts:**IntroductiontotheDesignProcess,Preparingthe specifications,Developinga design, Implementing and Testing and design, Regulatory Compliance Testing, design tool for Microprocessor Development.

**TextBooks:**

C.M.Gilmore,“MicroprocessorsPrincipalsandApplication”,MGH

Rajkamal, “Embedded System, Architecture &Programming”,TMH

**ReferenceBooks:**

BerryB. Berry, “ InterSeries ofmicroprocessors”, PHI

D. V. Hall, “Microprocessor &Interfacing”,TMH

Peatman,“MicroprocessorBasedSystemDesign”,Pearson

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9**

**questions.**

**16ECE21C2 SATELLITE AND SPACE COMMUNICATION**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams : | 100 | 4 |
| | | | Sessionals : | 50 | |
| | | | Total : | 150 | 4 |
| | | | Durationof Exam : | 3 hrs. | |

## Section-A

**COURSE OUTCOMES:** After the completion of the course the student will be able to:

CO1 understand the working of satellite in space.
CO2 understand orbital parameters of satellite in space.
CO3 take up R&D in Satellite and space communication.

**Introduction :** Brief History of evolution & growth of communication satellite, Synchronous satellite, Satellite frequency allocation & Band spectrum, Advantages of satellite communication, Active & Passive satellite. Applications of satellite communication.

## Section-B

**Orbits of satellite**:Kepler`s Laws , Low, medium and Geo synchronous main characteristics, Angle period, Returning period, Angle of Evaluation, Propagation Delay, Orbital Spacing.
**Satellite Links**: Design of down links, up link design, Delay transponders, Earth Stations, Antennas and Earth coverage, Altitude and eclipses

## Section-C

**Earth space propagation effects**: Free space loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and command of satellites. **Detection:** QPSK offset QPSK and MSK. Coherent and non coherent detection. Error rate performance.

## Section-D

**Synchronization:** Principle and techniques, Multiple Access Techniques, FDMA, TDMA system: concept and configuration, system timing frames format, VSAT, Random access, space communication, TELSAT and INSAT system. GPS systems

**Text Books**

1. Satellite Communications : Dennis Roddy, TMH
2. Satellite Communication : D.C. Aggarwal ; KhannaPublishers.

**Reference Books**

1 J. Martin: Communication Satellite System, PH Englewood.
2 Satellite Communication: T. Pratt and C.W. Boston, John Willey and sons
3 Satellite Communication : Monojit Mitra, PHI
4 Fundamentals of satellite Communication: K.N.Raja Rao, PHI

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the**

**four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE21C3 INFORMATION& COMMUNICATION THEORY**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

**COURSE OUTCOMES (CO):**

By the end of this course the student will

CO1 be aware about the trends in communication technology and how it impacts channel performance.

CO2 Be able to learn about Source encoding & channel encoding.

CO3 understand various channel coding techniques & their performances.

CO4 be able to design communication model with less probability of error.

**SECTION A**

**Information Theory:** Concept of Information and Entropy, Shanon's theorems, Channel Capacity Self information, Discrete and Continuous entropy, Mutual and joint information, Redundancy.

**SECTION B**

**Coding Theory:** Source encoding & channel encoding, Error detection & Correction, Variouscodesforchannelcoding,Rate Distortionfunctions.

**SECTION C**

**Codes used in Information Theory:** Linear block codes, systematic linear codes& optimum coding for Binary symmetric channel, The Generator & parity check matrices, Syndrome decoding & Symmetric channels, Hamming codes, Weight enumerator, Perfect codes, BCH codes, Idempotent & Mattson Solomon polynomials, Reed Solomon codes, Justeen codes, MDS codes & generalized BCH codes, Convolution codes & Viterbidecodingalgorithm.

**SECTION D**

**Performance of codes:** Performanceof linearblock codes & convolution codes, code incurable error probability Upper & lowerbounds.

**Textbooks:**


1. Blahut R.E. , Theory and practice of error control codes, AWL1983.
2. Wilson,DigitalModulationandcoding,Pearson


**ReferenceBooks:**


1. B.P. Lathi,CommunicationSystem,Oxford
2. Ranjan Bose, Information Theory, Coding & Cryptography, TMH
3. J. Dass. , S.K. Malik &P.K. Chatterjee, Principles of digitals communication

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE21C4 ADVANCED DIGITAL SIGNAL PROCESSING**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

**COURSE OUTCOMES:** After the completion of the course the student will be able to:

CO1 Possess basic background in digital signal processing area necessary for supporting subjects such as: communication principles, computer networks, speech processing, audio processing, image and video processing

CO2 Possess necessary background for advance studies in DSP, especially for taking the subject Advanced Digital Signal Processing, or other multimedia signal processing subjects.

CO3 Analyze the basic of properties of signals and systems like time invariance, stability, causality, linearity etc. Compute the linear and Circular convolutions of discrete time sequences.

CO4 Understand the basic theories behind DTFT/DFT/Z/FFT for practical applications.

CO5 have a comprehensive understanding of analysis and design of linear-phase FIR digital filters used in decimation & interpolation, and their computationally efficient implementation techniques.

**SECTION A**

**Introduction of DSP:** Introduction to Signal Processing, Discrete Linear Systems, superposition Principle, Unit-Sample response, stability& causality Criterion.

**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.

**SECTION B**

**DFT & FFT & Z transform with Applications:** Discrete Fouriertransform,propertiesof DFT, Circular Convolution, Fast Fourier Transform, Realizations of DFT. The Z-transform, the system function of a digital filter, Digital Filter implementation from the system function, the inverse Z- transform, properties & applications, Special computation of finite sequences,sequence ofinfinitelength&continuoustimesignals,computationoffourier series & time sequences fromspectra.

**SECTION C**

**Digital Filter Structure & Implementation:** Linearity, time- invariance & causality, the discrete convolution, the transfer function,stabilitytests,steadystateresponse,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,Phaseequalizer,digitalallpass filters.

**SECTION D**

**Implementation of Filters:** Realization block diagrams, Cascade & parallel realization, effect of infinite-word length, transfer function of degree 1&2, Sensitivity comparisons,effects offiniteprecisionarithmeticonDigitalfilters.

**TextBooks**


1. Alam V. Oppenheim & Ronald W. Schafer, "Digital Signal Processing" PHI.
2. JG Proakis, "DigitalSignal Processing", (PHI)3rd Edition.


**ReferenceBooks**


1. Rabiner & Gold, "Theory & application of digital Signal Processing", PHI 1992.

Roman kuc, "Introduction to Digital Signal Processing," McGrawhillEdition.


NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

**16ECE21C5 DATA COMMUNICATION NETWORKS**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exam : | 100 | 4 |
| | | | Sessionals : | 50 | |
| | | | Total : | 150 | 4 |
| | | | Durationof Exam : | 3 hrs. | |

**Course outcomes:**

By the end of this course the students will be able

CO1. To understand the working nature of different communication networks, communication system and their components.

CO2. To understand the various transmission media used in data communication system.

CO3. To understand the various layers and their functions and to identify the different types of network topologies and their protocols.

**SECTION A**

**Introduction to Data Transmission:** Overview of Data Communication and networking, Analog And Digital Data Transmission,TransmissionImpairments, Various Transmission Media,DataEncoding.

**Digital Data Communication Techniques** : Asynchronous And Synchronous Transmission,ErrorDetectionandcorrection techniques,Physicalinterfaces

**SECTION B**

**DataLinkControl:** LinkConfigurations,Protocolprinciples (Error control, Flow control), Bit Oriented and character orientedprotocol,Datalink layerservices,Link Control.

**Multiplexing:** F.D.M. Synchronous TDM, Statistical TDM

**SECTION C**

**Communication Networking Techniques:** Communication Networks, Circuit Switching, Message Switching, Packet Switching,LocalNetworkingTechnology,Thebus / tree topology, the ring topology, Medium Access control protocols (CSMA/CD, Token ring, FDDI, DQDB).

**SECTION D**

**Computer Communication Architecture:** OSI and TCP/IP Model, Protocol And Architecture, Networking Access protocols, Inter Networking, Transport layer Protocols, Session Service And Protocols, and Presentation/ Applicationprotocols

**ISDN Networks**: Concepts & Architecture, Protocols

**TextBooks :**


1. WilliamStallings,"DataandComputerCommunication", PHI,4th Ed.
2. Forouzan,"Datacommunicationsandnetworking",TMH


**ReferenceBooks:**

1. AndrewTanenbaum,“ComputerNetworking”,PHI
2. Godbole,“Datacommunicationsandnetwork”,TMH

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE21C6** **SEMINAR**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 2 | Sessional : | 50 | |
| | | | Total : | 50 | 2 |

At the end of this course the student shall be able to

CO1 prepare the topic and contents on a technical topic

CO2 speak on a technical topic effectively

CO3 enhance communication skills

Every student will be required to present a seminar talk on a topic approved by the Deptt. except on his/herdissertation. The committee constituted by the Head of the Deptt. will evaluate the presentation and will award one of the grades out of A+,A,B,C,D and E.

A Studentwhois awarded the 'F' grade will berequired to repeat the seminar on the same topic.

**16ECE21CL1** **SATELLITE LAB**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 4 | Exams | : 50 | |
| | | | Sessionals | : 50 | |
| | | | Total | : 100 | 2 |
| | | | Durationof Exam | : 3 hrs. | |

**COURSE OUTCOMES:** After the completion of the course the student will be able to:

CO1 practically understand the working of satellite in space.
CO2 practically understand orbital parameters of satellite in space.
CO3 take up R&D in Satellite and space communication.

1. ToStudytheprocessofTransmittingSignal.
2. ToStudytheBasebandSignalinaSatelliteLink.
3. Toestimate C/NRatio.
4. ToestimateS/NRatio.
5. TosetupdigitalsatelliteCommunicationLink.
6. To Study Black &Whiteand Color T.V.
7. Toplotradiationpatternofparabolicreflector.
8. ToStudySatelliteCommunicationReceiver.
9. Tosetupa PC to PC Sat. Com.Linkusing RS –232 port.
10. To measure the propagation delay of signal in a Sat.Com. Link.
11. Totransmit&receivethefunctiongeneratorwaveformthroughaSat.Com. Link.
12. To set up a active & passive satellite communication link & studytheirdifference.

**NOTE:**

Theschemeofawardingthegradestoastudentinthecoursewillbesuppliedbythe University totheexaminer

**16ECE21CL2 ADVANCED MICROPROCESSOR & MICROCONTROLLER LAB**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 4 | Exams | : 50 | |
| | | | Sessionals | : 50 | |
| | | | Total | : 100 | 2 |
| | | | Durationof Exam | : 3 hrs. | |

**Course outcomes:**

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

CO1. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.

CO2. Work with standard microprocessor real time interfaces including, serial ports, digital-to-analog converters and analog-to-digital converters;

CO3. Analyze abstract problems and apply a combination of hardware and software to address the problem;

(A few experiments may be designed & included in this list dependinguponthe infrastructureavailableintheinstitute)

1. Tostudythearchitectureof8086Kit
2. WriteanALPtoconvertahexadecimalNo. todecimalNo. in single step execution (DEBUG)
3. WriteanALPtoentera wordfromkeyboardandtodisplay
1. WriteanALPforadditionoftwonedigitNumbers.
2. Write an ALPto displayastring
3. Write an ALP reverse a string
4. Writean ALPtocheck whetherthe No. isPalindrome
5. TostudytheMicrocontrollerKit
6. Writean ALPtogenerate10 KHzfrequency square wave
7. WriteanALPtogenerate10KHz&100KHzfrequencyusing interrupt
8. WriteanALPtointerfaceintelligentLCDdisplay
9. WriteanALPtointerfaceintelligentLEDdisplay
10. Write an ALP to Switch ON alarm when Microcontroller receiveinterrupt
11. WriteanALPtointerfaceonemicrocontrollerwithotherusing serial/parallel communication.

**NOTE:** The scheme of awarding the grades to a student in the coursewill besupplied by theUniversitytotheexaminer.

**16ECE22C1 WIRELESS MOBILE COMMUNICATION**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

## Course Outcomes

After completion of this course students will be able

CO1 To understand the concept of cellular communication
CO2 To understand the basics of wireless communication
CO3 Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations.
CO4 Knowledge of IS-95 CDMA mobile communication standard, its architecture, logical channels, advantages and limitations.
CO5 Knowledge of 3G mobile standards and their comparison with 2G technologies.

**SECTION A**

**Introduction to mobile radio systems:** Paging systems, cordless telephone system, Cellular telephone systems- Cellular concept, frequency reuse, channel assignment strategies, Interference and system capacity, trunking and grade of service, cell splitting, sectoring, microcell zone concept,HO strategies.

**SECTION B**

**Mobileradiopropagation:** mechanism,freespacepathloss, log-distance path loss models, Okumara model, Hata model, PCSmodel,WidebandPCSmicrocellmodel,indoor propagation models,Jake'schannelmodel,Multipathcharacteristicsofradio waves,signal fading,Timedispersion,Dopplerspread,coherencetimeLCR,fadingstatistics,diversity techniques

**SECTION C**

**Introduction to spread spectrum communication, multiple access techniques used in mobile wireless communication:** FDMA/TDMA/CDMA, Cellular CDMA, packet radio protocols, CSMA, reservation protocols, capacity of cellular CDMA, soft HO

**SECTION D**

**Wireless systems and standards**: GSM standards, signaling and call control, mobility management, location tracing, wireless data networking, packet error modeling on fading channels, Performance analysis of link and transport layer protocols over wirelesschannels, mobiledatanetworking(mobileIP),wireless data services, IS-95, GPRS

**Text Books:**

1. T. S. Rappaport, "wireless Communications: Principles and practices", PHI 1996.

2.William C. Y. Lee, " Mobile Cellular Telecommunications, Analog and Digital Systems",

2nd ed,MGH-1995.

**ReferenceBooks:**

1. KavehPahlavan & Allen H. Levesque, “Wireless Information Networks”, Wiley series in Telecommunications and signal processing.

KamiloFeher:WirelessDigitalcommunications,ModulationandSpreadSpectrumApplications PHI2001.

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE22C2** **OPTICAL COMMUNICATION**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

**Course Outcome:-**

At the end of this course

CO1 - The students have learned about all components of Optical Communication.

CO2 - Gained the fundamental knowledge about optical communication in designing of optical link.

CO3 - studied the optical transmitter and receiver and their desired characteristics

**SECTION A**

**Introduction:** Advantage of optical fiber communication, Elements of fiber communication link, Ray theory .and electromagnetic mode theory for optical propagation,stepindex andgradedindexfibers,NumericalAperture.

**Opticalfibers,Losses&Dispersion**:Attenuation,Absorption, Linearandnon-linearscattering losses, Dispersion, overall fiber dispersion, polarization, fiber bending losses, multimode step index and graded index fibers, single mode fiber, plastic clad and all- plastic fibers, optical fiber cables, dispersion shifted and dispersion flattered fibers, practical fiber profiles.

**SECTION B**

**Optical Sources**: Basic concepts: LED for Optical Communication, Burrus type double hetro-structure, Surface emitting LEDs, Shape geometry, Edge emitting LEDs, LED to fiber launchsystemssemiconductorLasersTheory, modulation andcharacteristics,Fabry-Perotlasersquantumwelllasersand distributedfeedbacklasers.

**Photo Detectors**: P.I.N Photo Diodes: Theory and their characteristics, Avalanche photo diode detectors, Theory and theirbandwidthnoiseinAPD.

**SECTION C**

**Optical fiber communication System**: Optical transmitter circuit : LED and laser drive circuits, optical receiver circuit; Structure, Pre amplifier, AGC, Equalization, Optical power budgeting line loading , analog systems : analog modulation , direct modulation , sub carriermodulation ,distribution system, OpticalTDM sub-carriermultiplexing ,WDM .

**SECTION D**

**Coherent Systems :**Coherent receiver, Homodyne and heterodyne detection, noise in coherent receiver, polarization control, Homodyne receiver , Reusability and laser line-width, heterodyne receiver , synchronous, Asynchronous and self synchronous demodulation, phase diversity receivers.

**Textbooks:**

1. John Gowar, “OpticalCommunication Systems”,PHI.

2. GerdKeiser, “OpticalFiber Communication”, TMH

**ReferenceBooks:**

1. FranzJH&JainVK,“OpticalCommunication”,NarosaPublns

JohnM.Senior,“OpticalCommunication”,PHI

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE22D4** **VLSI DESIGN**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs | |

**SECTION A**

**COURSE OUTCOMES (CO):**

CO1 To be aware about the trends in semiconductor technology, and how it impacts scaling and performance.
CO2 Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters.
CO3 Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages.
CO4 To understand MOS transistor as a switch and its capacitance.
CO5 Student will be able to design digital systems using MOS circuits.

**SECTION A**

**Review of MOS technology:** Basic MOS Transistors, Enhancement and Depletion mode transistors, N MOS and C MOS process, thermal aspects of processing, Production of masks.

**SECTION B**

**Electrical properties of MOS circuit :** Parameters of MOS transistors, pass transistors, N MOS inverter, Pull-up to pull down ratio for an N MOS inverter, C MOS inverters, MOS transistor circuit model, Latch up onC MOS circuits.

**SECTION C**

**Design processes :** MOS Layers, stick diagrams, Design rules, AWAOXC MOS process description,doublemetalsingle poly silicon, C MOS process.
**Basiccircuitconcepts:** Sheetsresistance,areacapacitance, delay unit,inverter delay, super buffers,propagationdelays.

**SECTION D**

**Subsystem Design & Layout :** Architectural issues in VLSI, switch logic, gate logic, ExamplesofCombinationallogic,Clockedsequentialcircuits,othersystemconsideration.
**Scaling of MOS circuits :** Scaling factor, limitations, scaling of wires and interconnection,PLAandFinitestateMachines.
**Design Examples :** Design of an ALU subsystems, carry look ahead address, parallel.

**Text Books:**

1. PucknellD. A.andEshrachainK,"BasicVLSIDesignSystem & Circuits". (PHI), 1988.

Geiger, Rr, Allen P. E. Strader N. R., "VLSI Design TechniquesforAnalogand DigitalCircuit",MGH1990`

**ReferenceBooks:**

1. Wolf,“ModernVLSIDesign”,Pearson

SZE,“VLSITechnology”,TMH

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE22C3** **SEMINAR**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 2 | Sessional : | 50 | 2 |
| | | | Total : | 50 | 2 |

At the end of this course the student shall be able to

CO1 prepare the topic and contents on a technical topic

CO2 speak on a technical topic effectively

CO3 enhance communication skills

Every student will be required to present a seminar talk on a topic approved by the Deptt. except on his/herdissertation. The committee constituted by the Head of the Deptt. will evaluate the presentation and will award one of the grades out of A+,A,B,C,D and E.

A Studentwhois awarded the 'F' grade will berequired to repeat the seminar on the same topic.

**16ECE22CL1** **VLSI LAB**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 4 | Exams | : 50 | |
| | | | Sessionals | : 50 | |
| | | | Total | : 100 | 2 |
| | | | Durationof Exam | : 3 hrs. | |

**Course Outcomes:**

By the end of the course the students will be able to:

CO1. Compare various MOS technologies.

CO2. Foster ability to simulate combinational logic circuits.

CO3. Perform design layouts for logic gates, combinational logic circuits and sequential circuits.

CO4.Be able to understand interworking of various gates and there combinations for testing.

1. Write a spice programme for CMOS inverter with following details.

   pmos L = .8ym W=12.0um, nmos = 8um W=2.4um, nmos (kp=60u Vto=0.6v) pmos(kp=20u Vto=-0.8v)
2. WriteaspiceprogrammeforCMOSnandgatewithfollowing details: Vdd=5volt, pmos L=.8umW=20um,nmos L=8umW=um, nmos (kp=45u V to = 1.0v) pmos (kp=25u Vto=-1.2v)
3. WriteaspiceprogrammeforCMOSnorgateswithfollowing details: Vdd=5volt, pmos L=8um W=20um, nmos L=Burn W=8um, nmos (kp=45u Vto-1.0v) Pmos (kp=25u Vto=-1.2v)
4. Design a d-latch with clk time period=6ns using nand gates withfollowingspecification: L=2UW=100Uforn&p-mos,Forn-mosKn'=60U Vto=0.6V) for p-mos kp=20U Vto=0.8V)
5. Design a half adder using nand gates with following specifications : forn-mos : L=20W=100U, forp-mos L=2UW=650U,forn- mosKn'=600 Vto=0.6V) for P-mos Kp=20U Vto=0.8v)
6. Designafulladderusinghalfadderdesignedabove.
7. Designthelayout forPMOSinlayout editor.
8. DesigntheLayout forNMOSinlayout editor.

9. Designthelayout forCMOS inverter with equalrise andfall timeinlayouteditor.
10. Designthelayoutfor2-Input NANDgate.
11. Designthelayoutfor2-Input NORgate.
12. Designthe layoutforclockedS-Rflip-flop.

**16ECE22CL2 OPTICAL COMMUNICATION LAB**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| - | - | 4 | Exams | : 50 | |
| | | | Sessionals | : 50 | |
| | | | Total | : 100 | 2 |
| | | | Durationof Exam | : 3 hrs. | |

**COURSE OUTCOMES (CO):**

CO1 - Will be able to design the optical network of various layer & needs.

CO2 - To use optical source and decoders for the link for voice data communication.

CO3 - To maintain and keep the link serviceable for reliable communication.

(A few experiments may be designed & included in this list dependinguponthe infrastructureavailableintheinstitute)

1. Study ofopticaldevices.
2. Studyoffiberopticaldetector.
3. Studyoffiberopticaltransmitters
4. Determinationofnumericalapertureofopticalfiber
5. Study of characteristics of LED.
6. Studyof characteristicsof LASERdiode.
7. Settingafiberopticanaloglink.
8. Settingafiberopticdigitallink.
9. Study of modulation demodulation of light source by direct amplitudemodulation techniques.
10. FormingaPCtoPCcommunicationlinkusingopticalfiber& RS232.
11. Settingupafiberopticvoicelink.
12. Studyofmodulation&DemodulationoflightsourcebyPPM technique.
13. Studyofmodulation&DemodulationoflightsourcebyPWMtechnique.
14. Studyof Propagationloss &sending lossinopticalfiber.

**16ECE22D1** **ELECTRONIC SYSTEM DESIGN**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams : | 100 | 4 |
| | | | Sessionals : | 50 | |
| | | | Total : | 150 | 4 |
| | | | Durationof Exam : | 3 hrs. | |

**COURSE OUTCOMES:**

After the completion of the course the student will be able to:

CO1 Understand the operation and architecture flip flop, registers and multiplexer,
CO2 Design and operation of Clocked JK Flip Flop, Design Of Clock F/F, Output Decoders,
CO3 Learn to provide Clock And Power Supply Requirements,
CO4 Use of MSI Decoders, Multiplexers In System Controllers in the electronics circuit design.,
CO5 Application , design and testing of ROM, PLA And PAL

**SECTION A**

**Review of DigitalElectronicsconcept**

**MSI and LSI Circuits And Their Applications:** Arithmetic Circuits,Comparators, Multiplexers,CodeConverters,XORAnd AND-OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System,Propagation Delay.

**SECTION B**

**SequentialMachines:** TheConceptOfMemory,TheBinary Cell,TheCellAndThe BouncingSwitch,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 Registersand Memory.

**SECTION C**

**MultiInputSystemController Design:** SystemControllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation,SynchronizingTwoSystemAndChoosing Controller,Architecture,State Assignment,NextStateDecoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, ProgrammableSystemControllers,ROM,PLA AndPALBased Design. Introduction to the CPLD& FPGA.

## SECTION D

**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, Hazards In Circuit DevelopedByMEVMethod.

Text Books:

1. Fletcher,"AnEngineeringApproachtoDigitalDesign"PHI1990

2. Z. Kohavi,"SwitchingandFiniteAutomataTheory",TMH

**ReferenceBooks**

1. Markovitz, "Introduction to LogicDesign", TMH

2. Mano, " DigitalDesign",PHI

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

**16ECE22D2** **IMAGE PROCESSING**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams | : 100 | 4 |
| | | | Sessionals | : 50 | |
| | | | Total | : 150 | 4 |
| | | | Durationof Exam | : 3 hrs. | |

**Course Outcomes** : After this course students shall be able to

CO1: Review the fundamental concepts of a digital image processing system.
CO2: Analyze images in the frequency domain using various transforms.
CO3: Evaluate the techniques for image enhancement and image restoration.
CO4: Categorize various compression techniques.
CO5: Interpret Image compression standards.

**SECTION A**

**Introduction:** Elements of Digital Image Processing Systems, Image Acquisition, Storage, ProcessingCommunicationDisplay.

**DigitalImageFundamentals**:VisualPerception,simpleimage models, concept of uniform and nonuniform 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 perspectivetransformationstereoimaging.

**SECTION B**

**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 hostellingtheiralgorithmsandcomputerimplementations.

**Image Enhancement**: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP andhomo- morphic felling, generation of spatial marks, Color image processing.

**SECTION C**

**Image Restoration**: Degradation model, digitalization of circulate and block circulate metrics, Algebraic approved invoice filtering, wiener filter, constrained least square restoration, Interactiverestorationinspatialdomaingeometrictransformation.

**Image Compression**: Redundancy models, error free compression, Lossy compression, Image compression standards.

**SECTION D**

**Image Segmentation**: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding,Regionaloriented segmentationuseofmotioninsegmentation.

**Representation and Description**: Image analysis, Pattern and their classes, Decision theoretical methods, Structural methods,Interpretation.

**Text Books:**


1. AnilKJain,“FundamentalsofDigitalImageProcessing”, PHI Edition1997.
2. KeennethRCastleman,“DigitalImageProcessing”,Pearson


**ReferenceBooks:**


1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Pearson
2. Chanda&Majumder,“DigitalImageProcessing&Analysis”,PHI

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**

**16ECE22D3 ADVANCED MATHEMATICS FORENGINEERS**

| L | T | P | | Marks | Credits |
|---|---|---|---|---|---|
| 4 | - | - | Exams : | 100 | 4 |
| | | | Sessionals : | 50 | |
| | | | Total : | 150 | 4 |
| | | | Duration of Exam : | 3 hrs. | |

**Course Outcomes** : After the course students shall be able to

CO1: Analyze the fundamental concepts of Fourier Transform and Z-Transform and their applications.

CO2: Evaluate the exact and numerical methods for solution of Linear system of Equations.

CO3: Interpret the Conformal mapping and their properties for function of complex variables.

**SECTION A**

**Fourier Transforms**: Introduction, Fourier Integral Theorem, Fourier Sine and Cosine Integral, Complex form of Fourier Integrals, Fourier Transforms, Inverse Fourier Transform, Properties, Modulation Theorem, Convolution Theorem for Fourier Transforms, Parseval's Identity, Fourier Transforms of derivative of functions, Relation between Fourier andLaplacetransform.

**SECTION B**

**Z –Transform** : Introduction, Properties of Z- Transform, Evaluation of inverse Z – Transform.

**SECTION C**

**Matrices AndLinear System Of Equations:** Solution of linear simultaneous equations by Gaussian elimination and its modification, Crout's triangularization method, Iterative methods- Jacobinsmethod,Gauss-Seidalmethod,DeterminationofEigen valuesbyiteration.

**SECTION D**

**Conformal Mapp ing:** Conformal map ping, line ar transformations, Bi-linear transformations,Schwarz's-Christoffel transformations.

**CalculusOfVariations:**Euler-Lagrange'sdifferentialequation, The Brachistochrone problems and other applications. Isoperi-metricproblem, Hamilton's Principle and Lagrange's Equation. Rayleigh-Ritzmethod,Galerkinmethod.

**Text Book:**


1. Dr. B.S. Grewal;"HigherEngineeringMathematics",Khanna Publishers
2. Churchill, "FourierSeries and BoundaryValues Problems", McGraw Hill.
3. Galfand&Fomin,"Calculusof Variations", PrenticeHall.


**ReferenceBooks:**


1. Churchill,"ComplexVariables&Applications",McGrawHill.
2. Elsgole, "Calculus of Variations", AddisonWesley.

3. I.N.Sneddon.TheUseofIntegralTransforms",TataMcGraw Hill.

**NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.**