# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)
## (An Autonomous Institute)

## 'A' GRADE ACCREDITED BY NAAC

## Evaluation Scheme & Syllabus For
## Master of Technology (Electronics and Communication Engineering)
## (Effective from the Session: 2024-25)

## APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK

## 1. DEFINITION OF CREDIT

| 1 | 1 Lecture (L) per week | 1 Credit |
|---|---|---|
| 2 | 2 Practical (Lab) per week | 1 Credit |
| 3 | 2 Seminar per Week | 2 Credit |
| 4 | 4 Project per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credits of 86* for a student to be eligible to get Post Graduate degree in Engineering.

## 3. STRUCTURE OF POSTGRADUATE ENGINEERING PROGRAM (M. TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 32* |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | 8* |
| 3 | Multidisciplinary Open Elective Courses | 6* |
| 4 | Foundation Elective Courses | 3* |
| 5 | Mandatory Learning Course | 3* |
| 6 | Seminar | 6* |
| 7 | Lab Courses | 4* |
| 8 | Project | 2* |
| 9 | Dissertation | 22* |
| | **Total Credits** | 86* |

*Minor variation is allowed as per need of the respective disciplines.*

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 3 | Multidisciplinary Open Elective Courses | OEC |
| 4 | Foundation Elective Courses | FLC |
| 5 | Mandatory Learning Course | MLC |
| 6 | Seminar | SM |
| 7 | Lab Courses | LC |
| 8 | Project | PROJ |
| 9 | Dissertation | DISS |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**
**Scheme of Studies and Examination**

**M.Tech (Electronics & Communication Engineering) – 1st Semester**
*W.e.f.* **2024-25**

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration inHours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTECE-101A | Satellite Communication and Space Technology | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-MTECE-103A | Information Theory and Coding Techniques | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-MTECE-105A | Advanced Digital Signal Processing and Systems | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-MTECE-107A | Data Networks and Communication Protocols | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-MTECE-109A | Microprocessor and Embedded Systems | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 6 | Lab Course | LC-MTECE-111A | Satellite Communication Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 7 | Lab Course | LC-MTECE-113A | Microprocessor & Micro Controller Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Seminar | SM-MT-115A | Seminar-I | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| | | | **Total Credits** | | | | | **24** | 300 | 300 | 50 | **650** | |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR
## Scheme of Studies and Examination
## M.Tech (Electronics & Communication Engineering) – 2nd Semester
### *W.e.f.* 2024-25

| Sr. No. | Category | Course Code | Course Title | Lecture (L) | Tutorial (T) | Practical (P) | Total Load Per Week | Credits | Assessment | End Semester Examination | | Total | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional CoreCourses | PCC-MTECE-102A | Optical Communication | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional CoreCourses | PCC-MTECE-104A | Advanced VLSI Design and Semiconductor Technologies | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Elective Courses | Refer Table -I | -------- | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Multidisciplinary Open Elective Courses | Refer Table -II | -------- | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Foundation Elective Courses | Refer Table -III | --------- | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Lab Course | LC-MTECE-106A | VLSI Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Lab Course | LC-MTECE-108A | Optical Communication Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Seminar | SM-MT-110A | Seminar-II | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| | **Total** | | | | | | | **22** | 300 | 300 | 50 | **650** | |

## Professional Elective Courses: Table-1

| S. No | Course Code | Course Name |
|---|---|---|
| 1 | PEC-MTECE-112A | Electronic System Design |
| 2 | PEC-MTECE-114A | Image Processing |
| 3 | PEC-MTECE-116A | Advanced Mathematics for Engineers |
| 4 | PEC-MTECE-118A | Modern Wireless Networks & Technologies |

## Table-II

Students of all M.Tech programmes are required to study one Multidisciplinary open elective course in each of the 2$^{nd}$ and 3$^{rd}$ Semesters and one foundation elective course in 2$^{nd}$ Semester for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

### Multidisciplinary Open Elective –I Courses

| SN | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | OEC-130A | Basic of Economics | Management Department |
| 2 | OEC-132A | Fundamentals of Management | Management Department |
| 3 | OEC-134A | Disaster Management | Civil Engineering |
| 4 | OEC-136A | Industrial Safety | Fire Technology and Safety |
| 5 | OEC-138A | Indian Literature in Translation-I | Applied Sc. & Humanities (English) |
| 6 | OEC-140A | Environmental Issues | Applied Sc. & Humanities (Chemistry) |
| 7 | OEC-142A | Quantitative Techniques | Applied Sc. & Humanities (Mathematics) |
| 8 | OEC-144A | Sources of Energy-I | Electrical Engineering |
| 9 | OEC-146A | Operation Research | Mechanical Engineering |
| 10 | OEC-148A | Multimedia Communication | Electronics and Communication Engineering |
| 11 | OEC-150A | Introduction to Information Technology | Computer Sc. & Applications |
| 12 | OEC-152A | Cyber Forensics and Security | Computer Sc. & Engineering |
| 13 | OEC-154A | Computer Science and Principles | Computer Sc. & Engineering |
| 14 | OEC-156A | Software Engineering Practice | Computer Sc. & Engineering |

## Table-III
## Foundation Elective

| SN | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | FEC-158A | Basics of Accounting | Management Department |
| 2 | FEC-160A | Basics of E-commerce | Management Department |
| 3 | FEC-162A | Elements of Banking | Management Department |
| 4 | FEC-164A | Computer Fundamentals | Computer Science and Engineering |
| 5 | FEC-166A | Communication and Soft Skills | Applied Science and Humanities (English) |
| 6 | FEC-168A | Entrepreneurship Development | Management Department |
| 7 | FEC-170A | Electronics Engineering | Electronics and Communication Engineering |

| Course Code | **PCC-MTECE-101A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Satellite Communication and Space Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>● Learn about the history, advantages and applications of satellite communication systems.<br>● Study the effects of environmental factors on satellite signal propagation.<br>● Explore orbital mechanics and satellite launching processes.<br>● Gain insights into the design of satellite communication links.<br>● Understand modulation, detection techniques of satellite systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define fundamental concepts and operational terminologies of satellite communication systems. |
| **CO2** | Explain launch mechanisms, Earth station parameters, subsystems, link design equations and environmental effects influencing signal propagation and satellite performance. |
| **CO3** | Apply Kepler's laws, orbital determination techniques, modulation methods, detection techniques, and error rate performance to optimize satellite communication systems. |
| **CO4** | Analyze synchronization techniques, multiple access methods, security protocols and their effects on satellite communication performance. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** Brief History of the evolution & growth of communication satellites, Satellite frequency allocation & Band spectrum, Subsystems, Geostationary and Geosynchronous satellites, Active & Passive satellites, Advantages and applications of satellite communication, Satellite Frequency Reuse Techniques, Space Debris and Collision Avoidance. |
| **Unit-II** | **Orbital Mechanism and Launching of satellite:** Kepler`s Laws, LEO, MEO, GEO and HEO satellites and their characteristics, Look angle, Azimuth angle, Elevation angle, orbital determination, Mechanism of launching a Satellite, Overview to launch vehicles.<br>**Satellite Link Design:** General link design equation, Complete link design,<br>Earth Station parameters, Delay Transponders, Eclipse effects. |

| | |
|---|---|
| **Unit-III** | **Propagation effects:** Introduction, Free space path loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and commands of satellites. **Modulation and Detection Techniques:** QPSK, OQPSK and MSK. Coherent and non coherent detection, Error rate performance of QPSK and MSK. |
| **Unit-IV** | **Synchronization:** Principle and techniques, Multiple Access Techniques (FDMA, TDMA system: concept and configuration, system timing frames format), VSAT, Random access, TELSAT and INSAT system, GPS systems, Satellite Security and Encryption. |

**Suggested Readings:**

- Satellite Communications by Dennis Roddy, TMH
- Satellite Communication by D.C. Aggarwal, Khanna Publishers
- Satellite Communication by T. Pratt and C.W. Boston, John Willey and sons
- Satellite Communication by Monojit Mitra, PHI
- Fundamentals of satellite Communication by K.N.Raja Rao, PHI
- Satellite Communications by Sapna Katiyar , Katson Books

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Space Debris and Collision Avoidance | https://www.youtube.com/watch?v=OlZfC_6b-dY |
| | Active & Passive satellite. Applications of satellite communication | https://www.youtube.com/watch?v=Xf7AqkTiZf4 |
| **Unit-II** | Overview of launch vehicle technologies | https://www.youtube.com/watch?v=SMX4-rIlIak |
| | Satellite and Orbits, Types of Orbits | https://www.youtube.com/watch?v=GGncz-DKkeU |
| | Propagation Effects in Satellite Communication | https://www.youtube.com/watch?v=-ltobgKDdWU |
| **Unit-III** | Rain Attenuation | https://youtu.be/ulCRyxC5H3o |
| **Unit-IV** | Satellite Cyber security and Encryption | https://www.youtube.com/watch?v=AltCfizF_4w |
| | Multiple Access Techniques (FDMA, TDMA, CDMA) | https://www.youtube.com/watch?v=HFNbkmub6MQ |

| Course Code | **PCC-MTECE-103A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Information Theory and Coding Techniques** | | | | |
| Scheme and Credits | **L** | **T** | **P** | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>● Understand key concepts in information theory, like information and redundancy.<br>● Explore methods to detect and correct errors in data.<br>● Study linear block codes and their use for error correction.<br>● Compare the effectiveness of different coding methods for error correction. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the fundamental concept of information, entropy, mutual and joint information for efficient encoding schemes used in communication system. |
| **CO2** | Understand the principle of various channel encoding/decoding schemes used in communication system. |
| **CO3** | Apply various error detection and correction techniques used in communication system like linear block code, cyclic code & hamming code etc. |
| **CO4** | Analyze the various parameters and coding schemes to maximize the efficiency rate of communication system. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Information Theory:** Concept of Information and Entropy, Shannon's theorems, Channel Capacity Self information, Discrete and Continuousentropy, Mutual and joint information, Redundancy. |
| **Unit-II** | **Coding Theory:** Source encoding & channel encoding, Error detection & Correction, Various codes for channel coding, Rate Distortion functions. |
| **Unit-III** | **Information Theory Codes:** 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 & Viterbi decoding algorithm. |
| **Unit-IV** | **Performance of codes:** Performance of linear block codes & convolution code, code incurable error probability Upper & lower bounds. |

**Suggested Readings:**

- Digital Modulation and Coding by Wilson, Pearson
- Communication System by B.P. Lathi, Oxford
- Information Theory, Coding & Cryptography by Ranjan Bose, TMH
- Principles of Digitals Communication by J. Dass. , S.K. Malik & P.K. Chatterjee
- Information Theory and Coding by Nitin Mittal, Bharat
- Information Theory and Coding by Murlidhar Kulkarni, K.S. Shivaprakasha, Wiley

**Useful Video Links:**

| Unit No. | Topics | Links |
|----------|--------|-------|
| **Unit-I** | Huffman Coding | https://www.youtube.com/watch?v=uDS8AkTAcIU |
| **Unit-II** | Introduction to Rate Distortion Theory | https://youtu.be/qmCTnAoMSc8 |
| **Unit-III** | Convolution Codes | https://youtu.be/9JTXHsZVutM |
| **Unit-IV** | Block Code & Amp; its Properties | https://youtu.be/5d9O530dUKQ |

| Course Code | **PCC-MTECE-105A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Advanced Digital Signal Processing and Systems** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>● Learn discrete Fourier transforms, properties of DFT and its applications to linear filtering.<br>● Understand the characteristics of digital filters, design digital FIR filters and apply these filters to filter undesirable signals in various frequency bands.<br>● Design digital IIR filters and apply these filters to filter undesirable signals in various frequency bands.<br>● Understand the effects of finite precision representation on digital filters. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the fundamental concepts, properties and principles of discrete time signals and systems. |
| **CO2** | Explain the classifications, characteristics and applications of Fourier, Z-transforms and digital filters to design digital systems for signal processing. |
| **CO3** | Apply discrete signal processing techniques for digital filter design and system implementations. |
| **CO4** | Analyze the realization, effects and methods for designing digital filters in digital signal processing systems. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction of DSP:** Introduction to Signal Processing, Discrete Linear Systems, superposition Principle, Unit-Sample response, stability & causality Criterion.<br>**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-II | **DFT & FFT & Z transform with Applications:** Discrete Fourier transform, properties of DFT, Circular Convolution, Fast Fourier Transform, and 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 of infinite length & continuous time signals, computation of fourier series & time sequences from spectra. |
|---|---|
| Unit-III | **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-IV | **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. |

**Suggested Readings:**

- Digital Signal Processing by Alam V. Oppenheim & Ronald W. Schafer, PHI
- Digital Signal Processing by JG Proakis, (PHI) 3rd Edition
- Communication System by B.P. Lathi, Oxford
- Theory & application of digital Signal Processing by Rabiner & Gold, PHI
- Introduction to Digital Signal Processing by Roman kuc, McGraw hill Edition

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Basics of DSP | https://youtu.be/4hVWXQEVYSA?si=B-MsPfL1cjndXsO_ |
| Unit-II | Fourier Transform | https://youtu.be/l2I2hys8uGQ?si=noWoflLMPtI4Fl3q_ |
| | Fast Fourier Trans form | https://youtube.com/playlist?list=PL4K9r9dYCOoqmykdiyCq2jyAb0zwO0p-b&si=4ZF8MysP1h5rBUKs_ |
| Unit-III | Z-Transform | https://youtu.be/RlJi-83X9BE?si=61F8TehDlP0s0xSu |
| Unit-IV | FIR and IIR Filter | https://youtu.be/1vgCyZefR1Y?si=mVqWV4RwexTS2or8_ |

| Course Code | **PCC-MTECE-107A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Data Networks and Communication Protocols** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>● Introduce the fundamentals of data communication networks.<br>● Understand the functions of various topologies and switching techniques.<br>● Understand the functions of various protocols of the Data link layer.<br>● Examine various layer Protocols of OSI & TCP/IP models. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the fundamental concepts of analog and digital transmission of data communication network. |
| **CO2** | Understand various switching techniques and topologies of data communication network. |
| **CO3** | Apply various detection and correction techniques used in data communication network. |
| **CO4** | Analyze various communication architectures and their protocols in data communication network. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Data Transmission:** Overview of Data Communication and networking, Analog And Digital Data Transmission, Transmission Impairments, Various Transmission Media, Data Encoding.<br>**Digital Data Communication Techniques** : Asynchronous And Synchronous Transmission, Error Detection and correction techniques, Physical interfaces |
| **Unit-II** | **Data Link Control:** Link Configurations, Protocol principles (Error control, Flow control), Bit Oriented and character oriented protocol, Data link layer services, Link Control.<br>**Multiplexing:** F.D.M. Synchronous TDM, Statistical TDM |
| **Unit-III** | **Communication Networking Techniques:** Communication Networks, Circuit Switching, Message Switching, Packet Switching, Local Networking Technology, The bus / tree topology, the ring topology, Medium Access control protocols (CSMA/CD, Token ring, FDDI, DQDB). |

| Unit-IV | **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/ Application protocols<br>**ISDN Networks**: Concepts & Architecture, Protocols |
|---|---|

**Suggested Readings:**

- Data and Computer Communication by William Stallings, PHI
- Data communications and networking by Forouzan, TMH
- Computer Networking by Andrew Tanenbaum, PHI
- Data communications and network by Godbole, TMH
- Data Communication and networks by Dr. Sanjay Sharma, Katson
- Introduction to data communications and networking by Wayne Tomasi, Pearson

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Communication Networks–An Introduction and Overview | https://www.youtube.com/watch?v=VwN91x5i25g&list=PLBlnK6fEyqRgneraVKkEXrwyLVx2vJUvt |
| Unit-II | Multiplexing | https://www.youtube.com/watch?v=L5jJIN8Z4lo |
| Unit-III | Switching Techniques Circuit Switching | https://www.youtube.com/watch?v=yZV3y-usK_g |
| Unit-IV | ISDN Networks | https://www.youtube.com/watch?v=CGXkmyRLSLk |

| Course Code | **PCC-MTECE-109A** |
|---|---|
| Category | Professional Core Course |
| Course Title | **Microprocessor and Embedded Systems** |

| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
|---|---|---|---|---|---|
| | 4 | 0 | 0 | 4 | |

| Course Objectives | The objectives of this course are to<br>● Understand microprocessor architecture, registers, ALU, and memory addressing techniques.<br>● Explore microprocessor instruction sets, addressing modes, and I/O communication protocols.<br>● Learn 8051 microcontroller architecture, programming, and interrupt handling.<br>● Study Intel x86 and Motorola 68XXX families, including instruction sets and hardware features.<br>● Develop microprocessor-based systems, focusing on design, testing, and regulatory compliance. |
|---|---|
| Assessment | 40 Marks |
| End Semester Examination | 60 Marks |
| Total | 100 Marks |
| Duration of Exam | 03 Hours |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Recall the basic concepts of microprocessors, microcontrollers and different peripheral chips. |
| **CO2** | Understand the features, commands and architecture design of different microprocessors and microcontrollers. |
| **CO3** | Applying interfacing between microprocessors/microcontrollers and peripheral chips. |
| **CO4** | Differentiate architecture, pin configuration and working operations of different microprocessors and microcontrollers. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Design of basic microprocessor architectural Concepts:** Microprocessorarchitecture of 8086, Pentium series, word Lengths, addressable memory,Microprocessor's speed architectural characteristics, registers, instructions<br>**Microprocessor Instructions & Communication:** Instruction Set, Mnemonics, Basic Instruction Types, Addressing modes, Microprocessor I/O devices, Polling and Interrupts. |
| **Unit-II** | **Microcontroller:** Introduction to 8051 architecture and programming model,Internal RAM and registers, I/O ports, Interrupt system & Instruction sets, ARM controller, Sleep mode of low power 8051 microcontroller. |

| Unit-III | **Advanced microprocessors:** Intel X86 family of advanced Microprocessor, programming model for XX86 family. Motorola 68 XXX family of microprocessor, 68 XXX addressing modes, instruction set, multi-core processor. |
|---|---|
| Unit-IV | **Microprocessor I/O:** Data Communication, parallel I/O serial communication, Serial interface and UART modems, I/O devices, D/A, A/D interface, special I/O devices, viz timers and sensors<br>**Developing Microprocessor Based Products:** Introduction to the Design Process, Preparing the specifications, Developing a design, Implementing and Testing and design, Regulatory Compliance Testing, design tool for Microprocessor Development. |

**Suggested Readings:**

- Microprocessors Principals and Application by C.M. Gilmore, MGH
- Embedded System, Architecture & Programming by Rajkamal, TMH
- Inter Series of microprocessors by Berry B. Berry, PHI
- Microprocessor & Interfacing by D. V. Hall, TMH
- Microprocessor Based System Design by Peatman, Pearson
- Fundamentals of Microprocessor and Microcontroller by B. Ram, Dhanpat Rai Publications

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Microprocessor and Microcontroller in Computer system | https://www.youtube.com/watch?v=SBh6dJMM6AI&list=PLxCzCOWd7aiHL7mF_dRsj4Q9x1NNaZqkh |
| Unit-II | 8086 Basics of Buses & Memory | https://youtu.be/RFDZbZWPMvg |
| Unit-III | Addressing Modes | https://www.youtube.com/watch?v=Bu8CZSI-1zc |
| Unit-IV | D/A, A/D Interface | https://www.youtube.com/watch?v=bkQVpZoRw9g |

| Course Code | **LC-MTECE-111A** |
|---|---|
| Category | Lab Course |
| Course Title | **Satellite Communication Lab** |
| Scheme and Credits | L \| T \| P \| **Credits** <br> 0 \| 0 \| 2 \| 1    **Semester-I** |
| Course Objectives | The objectives of this course are to <br> ● Understand transmission and reception processes in satellite communication systems. <br> ● Identify various components, their working, applications and setups of satellite communication links. <br> ● Understand various parameters and assess the effect on link quality in satellite communication. <br> ● Study propagation delay, GPS data analysis and radiation patterns for effective satellite communication design. |
| Assessment | 25 Marks |
| End Semester Examination | 25 Marks |
| Total | 50 Marks |
| Duration of Exam | 03 Hours |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Show the process of transmitting/receiving the signals in a satellite communication link. |
| **CO2** | Understand the working of satellite transmitter, receiver and transponder for setting up the satellite communication link. |
| **CO3** | Demonstrate carrier to noise ratio, signal to noise ratio and radiation pattern of parabolic reflector. |
| **CO4** | Analyze and measure the propagation delay of signals in satellite communication link. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To Study the process of Transmitting Signals. |
| 2 | To Study the base band Signal in a Satellite Link. |
| 3 | To estimate the S/N Ratio. |
| 4 | To set up a digital satellite Communication Link. |
| 5 | To plot the radiation pattern of a parabolic reflector. |
| 6 | To Study Satellite Communication Receivers. |
| 7 | To set up a PC to PC Satellite Communication. |
| 8 | To measure the propagation delay of a signal in a Sat.Com. Link. |
| 9 | To transmit & receive the function generator waveform through a Sat.Com. Link. |
| 10 | To set up an active satellite communication link & study their differences. |
| 11 | To study different GPS data like longitude, latitude & different types of dilute of precision using a GPS receiver. |
| 12 | Study of Data and PN Sequence Generation. |

**Note:** At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

**Useful Video Links:**

| Exp No. | Topics | Links |
|---------|--------|-------|
| 1 | To study uplink transmitter, downlink receiver and transponder | https://www.youtube.com/watch?v=sWYJcoV4mlY |
| 2 | To Estimate S/N Ratio | https://www.youtube.com/watch?v=_DBFZxLV9fM |
| 3 | To Study GPS Data like Latitude, Longitude & Types of Dilution of Precision using GPS Receiver | https://www.youtube.com/watch?v=xaU-43WHLPU |

| Course Code | **LC-MTECE-113A** | | | | |
|---|---|---|---|---|---|
| Category | Lab Course | | | | |
| Course Title | **Microprocessor & Micro Controller Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to <br> ● Learn assembly programming for number conversion, input/output operations using 8086 microprocessor. <br> ● Develop microcontroller programming skills to generate frequencies and interface displays using ALP. <br> ● Write assembly programs for basic arithmetic, string manipulation, and number checks in ALP. <br> ● Interface microcontrollers with displays and implement frequency generation and communication protocols. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the programming concepts of 8086 and 8051. |
| **CO2** | Interpret the 8086 and 8051 instruction set for developing the program |
| **CO3** | Apply various interfacing peripheral chips used with microprocessors. |
| **CO4** | Analyze and compare the programme output carried out by different microprocessors and microcontrollers. |

### List of Experiments

| Sr. No. | Contents |
|---|---|
| 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 Numbers. |
| 5 | Write an ALP to display a string on screen**.** |
| 6 | Write an ALP reverse a string. |
| 7 | To study the Microcontroller Kit. |
| 8 | Write an ALP to generate 10 KHz frequency square wave. |
| 9 | Write an ALP to generate 10 KHz & 100KHz frequency using interrupt. |
| 10 | Write an ALP to interface intelligent LCD display. |
| 11 | Write an ALP to interface one microcontroller with other using serial / parallelcommunication. |
| 12 | Write an ALP to interface intelligent LED display. |
| 13 | Write an ALP to check whether the No. is Palindrome. |

**Note:** At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

**Useful Video Links:**

| Exp. No. | Topics | Links |
|---|---|---|
| 1 | To study the architecture of 8086 Kit. | https://www.youtube.com/watch?v=GZibA34SU0c |
| 2 | Write an ALP to convert a hexadecimal No. todecimal No. in single step execution DEBUG). | https://www.youtube.com/watch?v=Y0Si2lYHuiE |
| 3 | To study the Microcontroller Kit. | https://www.youtube.com/watch?v=4zIabWC5lpQ |
| 4 | Write an ALP to generate 10 KHz & 100KHz frequency using interrupt. | https://www.youtube.com/watch?v=7uXxEQ_Noys |
| 5 | Write an ALP to interface intelligent LCD display. | https://www.youtube.com/watch?v=vB-43ITmRsA |
| 6 | Write an ALP to check whether the No. is Palindrome. | https://www.youtube.com/watch?v=LJfQxc56_pI |

| Course Code | **SM-MT-115A** | | | | |
|---|---|---|---|---|---|
| Category | Lab Course | | | | |
| Course Title | **Seminar-I** | | | | |
| Scheme and Credits | **L** | **T** | **P** | **Credits** | **Semester-I** |
| | 0 | 0 | 2 | 2 | |
| Course Objectives | The objectives of this course are to<br>● Develop students' ability to effectively present research topics and findings by effective communication.<br>● Improve problem-solving and critical thinking skills of the students.<br>● Expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies and methodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This is a course designed to help M.Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
|---|---|
| **Approval Process** | The selected paper or topic must be approved by the faculty members/ committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | **CO1** |
| 2 | Literature Survey | 10 | **CO2** |
| 3 | Content Relevancy | 10 | **CO3** |
| 4 | Presentation Skills | 10 | **CO4** |
| 5 | Q&A Response | 10 | **CO5** |

| Course Code | **PCC-MTECE-102A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Optical Communication** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand core principles of optical fiber communication.<br>• Learn about optical sources and detectors.<br>• Analyze optical communication system design.<br>• Explore advanced coherent systems and detection methods | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Recall the fundamental concepts of optical communication systems. |
| **CO2** | Understanding of various modes of optical fibers such as mono and multi-mode and fiber characteristics like scattering, dispersion and bending etc. |
| **CO3** | Demonstrate different light sources and photodiodes used in mobile communication. |
| **CO4** | Analyze various parameters of optical fibres such as attenuation, absorption, noise and bandwidth etc. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction**: Elements, Advantages and Applications of optical fiber communication, elements of the fiber communication link, ray theory and electromagnetic mode theories for optical propagation, step-index and graded-index fibers and numerical aperture.<br>**Optical fibers, Losses & Dispersion:** Attenuation, absorption, linear and nonlinear scattering losses, overall fiber dispersion losses, polarization, fiber bending losses, multimode step-index and graded-index fibers, single-mode fibers, plastic-clad and all-plastic fibers, optical fiber cables, dispersion- shifted and dispersion-flattened fibers. |

| | |
|---|---|
| **Unit-II** | **Optical Sources**: Introduction, LED for optical communication, Burrus-type double-heterostructure, surface-emitting LEDs, shaped-geometry, edge- emitting LEDs, LED-to-fiber launch systems, Semiconductor lasers: theory, modulation and characteristics, Fabry-Perot lasers, quantum-well lasers, and distributed-feedback lasers. <br> **Photo Detectors**: PIN photodiodes: Theory and characteristics of PIN photodiodes, Avalanche photodiode detectors: Theory, bandwidth, and noise. |
| **Unit-III** | **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, subcarrier modulation, distribution system, <br> optical TDM subcarrier multiplexing, WDM. |
| **Unit-IV** | **Coherent Systems**: Coherent receiver and their noises, homodyne and heterodyne detection techniques, polarization control, Homodyne receiver: Reusability and laser linewidth, Heterodyne receiver: Synchronous, asynchronous, and self-synchronous demodulation, phase diversity receivers. |

**Suggested Readings:**

- Optical Fiber Communication by Gerd Keiser, TMH.
- Optical Communication by JH Franz & Jain VK, Narosa Publications.
- Optical Communication by John M. Senior, PHI.
- Optical Communications by Martin Sibley, Springer
- Optical Communication System by Satinder Bal Gupta, Ashish Goel, University Science Press
- Optical Communication System by Sapna Katiyar, S.K. Kataria and Sons

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Semiconductor Photo-Diodes Fiber Optic Communication Technology | https://www.youtube.com/watch?v=ougKUUM3hJA&list=PLHj96QRJ0kOhH8xoXXrOgkMf9ZOvjhqYl |
| **Unit-II** | P-N & PIN Photo detectors | https://www.youtube.com/watch?v=H5VSrybJ6XU |
| **Unit-III** | Semiconductor Photo-Diodes | https://www.youtube.com/watch?v=S9jMMALKKKs |
| **Unit-IV** | Effect of Modulation Techniques on Power Budgeting in Optical Fiber System | https://www.youtube.com/watch?v=G5i62xsSiB0 |

| Course Code | **PCC-MTECE-104A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Advanced VLSI Design and Semiconductor Technologies** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Provide a strong foundation in MOS and CMOS transistor technology and fabrication processes.<br>• Teach layout design rules and the design of key CMOS circuits, including inverters and pass transistors.<br>• Explore VLSI architectural concepts, including scaling, combinational and sequential logic, and PLAs.<br>• Develop practical skills in designing and analyzing digital circuits like ALUs and sequential systems, addressing real-world VLSI challenges | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Recall basic steps of fabrication and electrical properties of MOS circuits. |
| **CO2** | Understand the structure, operation, and characteristics of the MOS transistor. |
| **CO3** | Demonstrate stick diagram of different logic functions and switching characteristics of CMOS inverter. |
| **CO4** | Analyze the subsystem design, scaling effects on the MOS circuits and its limitations. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| UnitNo. | Contents |
|---|---|
| **Unit-I** | **MOS Technology**: Basic MOS transistors, enhancement and depletion mode transistors, NMOS and CMOS processes, thermal aspects of processing, production of masks. |
| **Unit-II** | **Electrical Properties of MOS Circuit**: Parameters of MOS transistors, pass transistors, NMOS inverter, pull-up to pull-down ratio for an NMOS inverter, CMOS inverters, MOS transistor circuit model, latch-up in CMOS circuits. |
| **Unit-III** | **Design Processes**: MOS layers, stick diagrams, design rules, CMOS process, double-metal single-poly silicon.<br>**Basic Circuit Concepts:** Sheet resistance, area capacitance, delay units, inverter delay, super buffers, propagation delays. |

| Unit-IV | **Subsystem Design & Layout**: Architectural issues in VLSI, switch logic, gate logic, Examples of Combinational logic, Clocked sequential circuits, other system consideration. Scaling of MOS circuits: Scaling factor, limitations, scaling of wires and interconnection, PLA and Finite state Machines. <br> **Design Examples**: Design of an ALU subsystem, carry-lookahead adder, parallelism. |
|---|---|

**Suggested Readings:**

- Basic VLSI Design System & Circuits by Pucknell D. A. and Eshrachain K, PHI, 1988.
- VLSI Design Techniques for Analog and Digital Circuit by Geiger, Rr, Allen P. E. Strader N. R.,MGH1990`
- Modern VLSI Design by Wolf, Pearson SZE, "VLSI Technology", TMH
- Digital VLSI Design With Verilog by John Williams, Springer
- VLSI Design by A Shanthi, A Kavitha, New Age
- Principles of CMOS VLSI Design by Neil H. E. Weste, Kamran Eshraghian, Pearson

**Useful Video Links:**

| Unit No. | Topics | Video links |
|---|---|---|
| Unit-I | Review of MOS technology | https://www.youtube.com/watch?v=D7dHSXRQVag |
| Unit-II | Electrical properties of MOS circuit | https://www.youtube.com/watch?v=G9wXgTLU4A4 |
| Unit-III | Design processes | https://www.youtube.com/watch?v=_3fs0vA46Rc |
| Unit-IV | Subsystem Design & Layout | https://www.youtube.com/watch?v=vUnKDl8M_QM |

| | |
|---|---|
| Course Code | **PEC-MTECE-112A** |
| Category | Professional Elective Course |
| Course Title | **Electronic System Design** |
| Scheme and Credits | L T P Credits **Semester-II**<br>4 0 0 4 |
| Course Objectives | The objectives of this course are to<br>• Implement MSI/LSI circuits including arithmetic units, multiplexers and bus-oriented systems.<br>• Design sequential circuits using flip-flops, counters, registers,and analyze clocking aspects.<br>• Develop system controllers using ROM, PLA, PAL and understand CPLD/FPGA implementations.<br>• Analyze asynchronous finite state machines considering races, hazards and MEV design approaches |
| Assessment | 40 Marks |
| End Semester Examination | 60 Marks |
| Total | 100 Marks |
| Duration of Exam | 03 Hours |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Remember the fundamental components of MSI and LSI circuits, including arithmetic circuits, comparators, multiplexers, and bus-oriented structures. |
| **CO2** | Understand the working principles of sequential machines, including flip-flops, counters, shift registers, and state diagrams in synchronous circuits. |
| **CO3** | Apply the principles of system controller design to develop MSI decoders, ROM, PLA, PAL, CPLD, and FPGA-based systems. |
| **CO4** | Analyze asynchronous finite state machines, focusing on identifying and mitigating hazards, cycles, and races using excitation maps and MEV methods. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **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<br>System, Propagation Delay. |
| **Unit-II** | **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<br>Memory. |

| | |
|---|---|
| **Unit-III** | **Multi Input System Controller Design:** 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, 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-IV** | **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 Developed By MEV Method. |

**Suggested Readings:**

- An Engineering Approach to Digital Design by Fletcher, PHI.
- Switching and Finite Automata Theory by Z. Kohavi, TMH.
- Digital Design by Mano, PHI.
- Verilog Digital System Design by Z Navabi, TMH
- Digital System Design with VHDL by Mark Z Wolinski, Pearson
- Digital System Design and Microprocessors by John P Hayes, TMH

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | MSI and LSI Circuits And Their Applications | https://www.youtube.com/watch?v=XBcHnz08ZW8&list=PL803563859BF7ED8C&index=28 |
| **Unit-II** | Sequential Machines | https://www.youtube.com/watch?v=MiuMYEn3dpg&list=PL803563859BF7ED8C&index=24 |
| **Unit-III** | Multi Input System Controller Design | https://www.youtube.com/watch?v=XMGE_v323oA |
| **Unit-IV** | Asynchronous Finite State Machines | https://www.youtube.com/watch?v=FZAHhQ1v7B0&list=PL803563859BF7ED8C&index=23 |

| Course Code | **PEC-MTECE-114A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Image Processing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Study the fundamentals of digital image processing.<br>• Explore image enhancement, restoration, and compression techniques using various methods.<br>• Use Fourier and wavelet transforms in processing and analysis tasks.<br>• Learn image segmentation, representation and Contents methods for pattern recognition and interpretation | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | **Skills Demonstrated** |
|---|---|
| **CO1** | Remember the fundamental concepts of digital image processing systems, including image acquisition, storage, processing, communication, and display. |
| **CO2** | Understand the principles of image transforms, enhancement techniques, and spatial and frequency domain methods to improve image quality and representation. |
| **CO3** | Apply restoration techniques, including Wiener filtering, constrained least square restoration, and image compression standards, to process degraded or redundant images. |
| **CO4** | Analyze various image segmentation methods, such as edge and boundary detection, thresholding, and region-oriented segmentation, for effective representation and pattern recognition in images. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | **Contents** |
|---|---|
| **Unit-I** | **Introduction:** Elements of Digital Image Processing Systems, Image Acquisition, Storage, Processing Communication Display.<br>**Digital Image Fundamentals**: Visual Perception, simple image 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<br>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. <br> **Image Enhancement**: Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo- morphic felling, generation <br> of spatial marks, Color image processing. |
| **Unit-III** | **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. <br> **Image Compression**: Redundancy models, error free compression, Lossy compression, Image compression standards. |
| **Unit-IV** | **Image Segmentation**: Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation use of motion in segmentation. <br> **Representation and Contents**: Image analysis, Pattern and their classes, Decision theoretical methods, Structural methods, Interpretation. |

**Suggested Readings:**

- Fundamentals of Digital Image Processing by Anil K Jain, PHI.
- Digital Image Processing by Rafael C. Gonzalez and Richard E. Woods, Pearson.
- Digital Image Processing & Analysis by Chanda & Majumder, PHI.
- Digital Image Processing by Wilhelm Burger, Mark James Burger, Springer
- Digital Image Processing by William K Pratt, Wiley
- Digital Image Processing by Madhuri A Joshi, PHI

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Digital Image Processing Systems | https://www.youtube.com/watch?v=DSGHkvQBMbs&list=PLuv3GM6-gsE08DuaC6pFUvFaDZ7EnWGX8 |
| **Unit-II** | Digital image processing | https://www.youtube.com/watch?v=q0AnFKYl7sg&list=PLLDC70psjvq7765_splMFlBmM37NWnOj3 |
| **Unit-III** | Image Restoration | https://www.youtube.com/watch?v=5qxrzD6ODHc |
| **Unit-IV** | Image Segmentation | https://www.youtube.com/watch?v=bYWa7AuzIUQ |

| Course Code | **PEC-MTECE-116A** | | | |
|---|---|---|---|---|
| Category | Professional Elective Course | | | |
| Course Title | **Advanced Mathematics for Engineers** | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to <ul><li>Understand Fourier transforms, their properties and applications in signal analysis and differential equations.</li><li>Learn Z-transform techniques, inverse evaluation, and properties for analyzing discrete-time systems and stability.</li><li>Solve linear systems using various methods.</li><li>Apply conformal mapping, variational calculus and optimization techniques engineering and mathematical modeling</li></ul> | | | |
| Assessment | 40 Marks | | | |
| End Semester Examination | 60 Marks | | | |
| Total | 100 Marks | | | |
| Duration of Exam | 03 Hours | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | **Skills Demonstrated** |
|---|---|
| **CO1** | Remember the fundamental concepts of Fourier and Z-Transforms, including their properties, theorems, and relationships with other transforms. |
| **CO2** | Understand the methods for solving linear systems of equations, including Gaussian elimination, Crout's triangularization, and iterative approaches like Jacobi's and Gauss-Seidel methods. |
| **CO3** | Apply conformal mapping techniques and transformations, such as linear, bi-linear, and Schwarz-Christoffel transformations, to solve problems in complex analysis. |
| **CO4** | Analyze problems in calculus of variations by deriving and solving Euler-Lagrange equations, and use advanced methods such as the Rayleigh-Ritz and Galerkin methods for practical applications. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | **Contents** |
|---|---|
| **Unit-I** | **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 and Laplace transform. |
| **Unit-II** | **Z –Transform:** Introduction, Properties of Z- Transform, Evaluation of inverse Z – Transform. |
| **Unit-III** | **Matrices and Linear System of Equations:** Solution of linear simultaneous equations by Gaussian elimination and its modification, Crout's triangularization method, Iterative methods- Jacobins method, Gauss-Seidal method, Determination of Eigen values by iteration. |

| Unit-IV | **Conformal Mapping:** Conformal mapping, linear transformations, Bi- linear transformations, Schwarz's-Christoffel transformations.<br>**Calculus Of Variations:** Euler-Lagrange's differential equation,The Brachistochrone problems and other applications. Isoperi-metric problem, Hamilton's Principle and Lagrange's Equation. Rayleigh-Ritz method,<br>Galerkin method. |
|---|---|

**Suggested Readings:**

- Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.
- Fourier Series and Boundary Values Problems by Churchill, McGraw Hill.
- Calculus of Variations by Galfand & Fomin, PHI.
- Complex Variables & Applications by Churchill, McGraw Hill.
- Calculus of Variations by Elsgole, Addison Wesley.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Fourier Transform | https://www.youtube.com/watch?v=lkAvgVUvYvY |
| Unit-II | Properties of Z- Transform | https://www.youtube.com/watch?v=rGFrWzW0cjE |
| Unit-III | Solution of linear simultaneous equations by Gaussian elimination and its modification | https://www.youtube.com/watch?v=T4c1YCU3xr8 |
| Unit-IV | Euler-Lagrange's differential equation | https://www.youtube.com/watch?v=aI4VvpiU5Fg |

| Course Code | **PEC-MTECE-118A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Modern Wireless Networks & Technologies** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to <br> • Explain mobile radio systems, cellular concepts, and capacity strategies in wireless networks. <br> • Describe mobile radio propagation models, signal fading, and diversity techniques. <br> • Analyze spread spectrum and multiple access methods for mobile communication. <br> • Evaluate wireless standards, protocols, and mobile data networking methods. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define various wireless mobile communication systems like Pager, cordless & telephone system. |
| **CO2** | Understand different models, standards and protocols used in wireless and mobile communication system. |
| **CO3** | Demonstrate various multiple access techniques and handoffs used in wireless and mobile communication system. |
| **CO4** | Analyze various parameters like interference, coverage, trunking & grade of services in wireless and mobile communication system. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each 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.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **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. 5G Network Basics and Architecture: Overview |
| **Unit-II** | **Mobile radio propagation:** Mechanism, free space path loss, log-distance path loss models, Okumara model, Hata model, PCS model, Wideband PCS microcell model, indoor propagation models, Jake's channel model, Multi path characteristics of radio waves, signal fading, Time dispersion, Doppler spread, coherence time LCR, fading statistics, diversity techniques |

| Unit-III | **Introduction to spread spectrum communication, multiple access techniques used in mobile wireless communication:** FDMA/TDMA/CDMA, OFDMA, Cellular CDMA, packet radio protocols, CSMA, reservation protocols, capacity of cellular CDMA, soft HO |
|---|---|
| Unit-IV | **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 wireless channels, mobile data networking (mobile IP), wireless data services, IS-95, GPRS |

**Suggested Readings:**

- Wireless Communications by Principles and practices by T. S. Rappaport, Edition - PHI 1996.
- Mobile Cellular Telecommunications, Analog and Digital Systems by William C. Y. Lee 2nd Edition, MGH-1995.
- Wireless Digital communications, Modulation and Spread Spectrum Applications by Kamilo Feher, PHI 2001.
- Mobile Communications by Jochen Schillar, Pearson Education 2009.
- Wireless Communications and Networking by William Stallings, Pearson
- Wireless Communications and Networking by Jon W. Mark, Weihua Zhuang, Pearson

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | 5G: Next Gen network | https://www.youtube.com/watch?v=mo1lNRKnayA |
| Unit-II | Diversity techniques | https://www.youtube.com/watch?v=zQBGYc3VzV4 |
| Unit-III | FDMA/TDMA/CDMA, SDMA Techniques | https://www.youtube.com/watch?v=sArkTtUMDgg&t=15s |
| Unit-IV | GSM standards, mobility management, and location tracing | https://www.youtube.com/watch?v=MZTtY1Sz-O4 |

| Course Code | LC-MTECE-106A | | | |
|---|---|---|---|---|
| Category | Lab Course | | | |
| Course Title | **VLSI Lab** | | | |
| Scheme and Credits | L | T | P | **Credits** |
| | 0 | 0 | 2 | 1 |

(Scheme and Credits: **Semester-II**)

| | |
|---|---|
| Course Objectives | The objectives of this course are to<br>• Design CMOS Logic Circuits: Develop skills to design and simulate CMOS circuits like inverters, NAND, and NOR gates using SPICE.<br>• Implement Complex Digital Circuits: Learn to create and simulate advanced circuits such as D-latches, half adders, and full adders using CMOS technology.<br>• Master Layout Design: Gain hands-on experience in designing layouts for PMOS, NMOS, and CMOS gates in layout editors.<br>• Optimize Circuit Performance: Analyze and enhance circuit performance for parameters like speed, power, and signal integrity through simulation. |
| Assessment | 25 Marks |
| End Semester Practical Examination | 25 Marks |
| Total Marks | 50 |
| Duration of Exam | 3 hours |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Understand the layout of various combinational and sequential circuits. |
| **CO2** | Demonstrate the half adder using NAND gate and full adder using half adder. |
| **CO3** | Apply the SPICE program for CMOS inverter, NAND and NOR gate. |
| **CO4** | Analyze the designing steps of the CMOS inverter with equal rise and fall time. |

## List of Experiments

| Sr. No. | Contents |
|---|---|
| 1 | Write a spice programme for CMOS inverter with following details.<br>pmos L = .8ym W=12.0um, nmos = 8um W=2.4um, nmos (kp=60u Vto=0.6v) pmos(kp=20u Vto=-0.8v) |
| 2 | Write a spice programme for CMOS nand gate with following details :<br>Vdd=5 volt, pmos L=.8 um W=20um, nmos L = 8um W=um, nmos (kp=45u V to = 1.0v) pmos (kp=25u Vto=-1.2v) |
| 3 | Write a spice programme for CMOS nor gates with following details :<br>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 with following specification : L=2U W=100U for n&p-mos, For n-mos Kn'=60U Vto = 0.6V) for p-mos kp=20UVto=0.8V) |

| 5 | Design a half adder using nand gates with following specifications :<br>for n-mos : L=20 W=100U, for p-mos L=2U W=650U, for n- mos Kn'=600Vto=0.6V)<br>for P-mos Kp=20U Vto=0.8v) |
|---|---|
| 6 | Design a full adder using half adder designed above |
| 7 | Design the layout for PMOS in layout editor. |
| 8 | Design the Layout for NMOS in layout editor. |
| 9 | Design the layout for CMOS inverter with equal rise and fall time in layout editor. |
| 10 | Design the layout for 2-Input NAND gate. |
| 11 | Design the layout for 2-Input NOR gate. |
| 12 | Design the layout for clocked S-R flip-flop. |

**Note:** At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

**Useful Video Links**

| Exp No. | Topics | Links |
|---------|--------|-------|
| 1 | Write a spice programme for CMOSinverter with following details.<br>pmos L = .8ym W=12.0um, nmos = 8umW=2.4um, nmos (kp=60u Vto=0.6v) pmos(kp=20u Vto=-0.8v) | https://www.youtube.com/watch?v=aeGXhmxSWRY |
| 2 | Design a d-latch with clk time period=6nsusing 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=20UVto=0.8V) | https://www.youtube.com/watch?v=LPP7HScUvgk |
| 3 | Design a half adder using nand gates withfollowing specifications :<br>for n-mos : L=20 W=100U, for p- mos L=2U W=650U, for n- mos Kn'=600 Vto=0.6V) for P-mos Kp=20U Vto=0.8v) | https://www.youtube.com/watch?v=ABId0PQZBhc |
| 4 | Design the layout for PMOS in layouteditor. | https://www.youtube.com/watch?v=oOblwp65WFA |

| Course Code | **LC-MTECE-108A** | | | | |
|---|---|---|---|---|---|
| Category | Lab Course | | | | |
| Course Title | **Optical Communication Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand the principles and working mechanisms of optical devices in fiber optic communication<br>• Develop practical skills in setting up fiber optic communication links.<br>• Analyze the performance characteristics of fiber optic components.<br>• Explore modulation techniques in fiber optic systems. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 3 hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | **Skills Demonstrated** |
|---|---|
| **CO1** | Show the various components used in optical communication system. |
| **CO2** | Understand the analog/digital communication links and also the characteristics of light sources and photodiodes. |
| **CO3** | Demonstrate modulation and demodulation techniques used in optical fibers communication. |
| **CO4** | Analyze different parameters of optical fiber such as attenuation, bending and numerical aperture etc. |

**List of Experiments**

| Sr. No. | **Contents** |
|---|---|
| 1 | Study the working of optical devices. |
| 2 | Study of fiber-optic transmitter and detector. |
| 3 | Determination of numerical aperture of optical fiber. |
| 4 | Study of characteristics of LED. |
| 5 | Study of characteristics of LASER diode. |
| 6 | Setting a fiber-optic analog link. |
| 7 | Setting a fiber-optic digital link. |
| 8 | Study of modulation and demodulation of light source by direct amplitude modulation techniques. |

| 9 | Forming a PC-to-PC communication link using optical fiber and RS-232. |
|---|---|
| 10 | Setting up a fiber-optic voice link. |
| 11 | Study of modulation and demodulation of light source by PPM technique. |
| 12 | Study of modulation and demodulation of light source by PWM technique. |
| 13 | Study of propagation loss and sending loss in optical fiber. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus

**Useful Video Links**

| Exp No. | Topics | Links |
|---|---|---|
| 1 | Study of optical devices. | https://www.youtube.com/watch?v=oOyMmARcVDM |
| 2 | Determination of numerical aperture of optical fiber | https://www.youtube.com/watch?v=D9op3IBtQLI |
| 3 | Study of characteristics of LED. | https://www.youtube.com/watch?v=1YewZMlQ6zo |
| 4 | Setting a fiber optic analog link. | https://www.youtube.com/watch?v=dhcOFSB7ex8 |

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| Course Code | **SM-MT-110A** | | | | |
|---|---|---|---|---|---|
| Category | Seminar | | | | |
| Course Title | **Seminar-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 0 | 0 | 2 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Develop students' ability to effectively present research topics and findings by effective communication.<br>• Improve problem-solving and critical thinking skills of the students.<br>• Expose students to the latest trends and advancements byreviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies and methodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This is a course designed to help M. Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| Topic Selection | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
|---|---|
| **Approval Process** | The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | **CO1** |
| 2 | Literature Survey | 10 | **CO2** |
| 3 | Content Relevancy | 10 | **CO3** |
| 4 | Presentation Skills | 10 | **CO4** |
| 5 | Q&A Response | 10 | **CO5** |