M.Tech (EI)

Two Year (Four Semesters)

Scheme of Instruction and Syllabus

(AICTE Model Curriculum)

(With effect from 2019 – 2020 admitted batch onwards)

Department of Electronics and Communication Engineering

AU College of Engineering (Autonomous)

Visakhapatnam-530 003

2019-2020

M.Tech (EI), Two Year (Four Semesters)

Scheme to be valid with effect from the admitted batch of 2019 – 2020

SEMESTER-I

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-1.1	Digital Signal Processing	3	-	70	30	100	3
MTEI-1.2	Electronic Instrumentation Techniques	3	-	70	30	100	3
MTEI-1.3	Elective I DSP Processors and Architecture/ Wireless communication and Networks/ Microprocessor systems	3	-	70	30	100	3
MTEI-1.4	Elective II EMI/EMC/ Bio Medical Instrumentation/ Artificial Intelligence and Neural Networks	3	-	70	30	100	3
MTEI-1.5	Research Methodology & IPR	3	-	70	30	100	2
MTEI-1.6	Audit Course	3	-	70	30	100	0
MTEI-1.7	Instrumentation LAB-I	-	3	-	100	100	2
MTEI-1.8	Signal Processing LAB	-	3	-	100	100	2
	Total	18	06	420	380	800	18

SEMESTER-II

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-2.1	Transducers and signal conditioners	3	-	70	30	100	3
MTEI-2.2	Data Acquisition Systems	3	-	70	30	100	3
MTEI-2.3	Elective – III Processor Control Instrumentation /Remote Sensing and Image Sensors /GPS and Applications		-	70	30	100	3
MTEI-2.4	Elective – IV Nano Technology and Applications /Microcontrollers and Embedded Systems /Digital Image Processing	3	-	70	30	100	3
MTEI-2.5	Audit Course	3	-	70	30	100	0
MTEI-2.6	Instrumentation LAB-II	-	3	-	100	100	2
MTEI-2.7	Microprocessor LAB	-	3	-	100	100	2
MTEI-2.8	Mini Project With Seminar	-	3	-	100	100	2
	Total	15	9	350	450	800	18

SEMESTER-III

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-3.1	Elective V Linear and Digital Systems Design / Optical Fibers and Applications/ /Application specific Integrated circuits(ASIC)	3	-	70	30	100	3
MTEI-3.2	Open Elective VLSI/ Business Analytics Industrial Safety Operational Research Cost Management of Engineering Projects	3	-	70	30	100	3
MTEI-3.3	Dissertation- I / Industrial Project	-	-	-	100	100	10
	Total	6		140	160	300	16

SEMESTER-IV

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-4.1	Dissertation- II	-	-	70	30	100	16
	Total			70	30	100	16

Note:

1. **At the end of 3rd semester project review is conducted by HOD with the committee consisting of the HOD, Chair Person of BOS and the Guide. In the Affiliated Colleges, Project (Preliminary) will be evaluated by concerned HOD and the thesis Guide of their respective colleges.**
2. **At the end of the 4th semester there will be a final viva voce for the project work conducted by the HOD with the committee consisting of HOD, Chair Person of BOS, the Guide and an External examiner nominated by the university.**

Audit Course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

Andhra University College of Engineering

Andhra University

Department of Electronics and Communication Engineering

PROGRAMME: 1

PROGRAMME: B.Tech (Electronics and Communication Engineering)

Programme Specific Outcomes (PSOs)

The Graduate of ECE will be able to:

PSO-1	Graduates will be able to apply fundamental knowledge of Electronics and Communication Engineering to identify, investigate and solve various real-life problems in the field of Electronics.
PSO-2	Graduates will be able to design and develop systems in the emerging electronics and communication allied disciplines to meet out the industry challenges.
PSO-3	Graduates will be able to demonstrate the leadership qualities and strive for the betterment of organization, environment and society with professional and ethical responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates of ECE will be able to:

1. To provide an in-depth knowledge in the fundamental and advanced areas of electronics and communication engineering and there by excel in professional career and/or higher education.

2. To train students in the software/hardware design of electronics and communication systems and can promote the development of research activity as well as innovation and entrepreneurship that caters to theneed of Industry and Society.

3. To develop technical skill set for solving real life problems.

4. To develop qualities like creativity, leadership, team work, and professional ethics for contributing towards the growth and development of society.

5. To inculcate in students professional and ethical attitude, and an ability to relate engineering issues to broader social context.

PROGRAMME OUTCOMES (POs)

Program Outcomes		**ECE Graduates will be able to**
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals to real time electronics and communication problems

PO2	Problem analysis	Provide solutions for ECE problems by Identify, formulate, review literature, analyze, designing and conducting experiments, interpreting and reporting the results.
PO3	Design/development of solutions	Design and develop solutions for complex engineering problems at feasible and optimal solutions that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply contextual knowledge to assess industrial, societal and safety related issues and understand consequent relevance to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with societyat large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME: 2

PROGRAMME: B.Tech + M.Tech (Electronics and Communication Engineering)

Programme Specific Outcomes (PSOs)

The Graduate of ECE will be able to:

PSO-1	Graduates will be able to apply fundamental knowledge of Electronics and Communication Engineering to identify, investigate and solve various real-life problems in the field of Electronics.
PSO-2	Graduates will be able to design and develop systems in the emerging electronics and communication allied disciplines to meet out the industry challenges.
PSO-3	Graduates will be able to demonstrate the leadership qualities and strive for the betterment of organization, environment and society with professional and ethical responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Graduates of ECE will be able to:

1. To provide an in-depth knowledge in the fundamental and advanced areas of electronics and communication engineering and there by excel in professionalcareer and/or higher education.

2. To train students in the software/hardware design of electronics and communication systems and can promote the development of research activity as wellas innovation and entrepreneurship that caters to theneed of Industry and Society.

3. To develop technical skill set for solving real life problems.

4. To develop qualities like creativity, leadership, team work, and professional ethics forcontributing towards the growth and development of society.

5. To inculcate in students professional and ethical attitude, and an ability to relate engineering issues to broader social context.

PROGRAMME OUTCOMES (POs)

Program Outcomes		**ECE Graduates will be able to**
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals to real time electronics and communication problems.
PO2	Problem analysis	Provide solutions for ECE problems by Identify, formulate, review literature, analyze, designing and conducting experiments, interpreting and reporting the results.

PO3	Design/development of solutions	Design and develop solutions for complex engineering problems at feasible and optimal solutions that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply contextual knowledge to assess industrial, societal and safety related issues and understand consequent relevance to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with societyat large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME: 3

PROGRAMME: M.Tech (Electronic Instrumentation)

Programme Specific Outcomes (PSOs)

The Post Graduate of EI will be able to:

PSO-1	Analyze specific problems relevant to Electronic Instrumentation by applying the knowledge of basic sciences, Instrumentation fundamentals and advancements to solve technical problems.
PSO-2	Electronic Instrumentation Engineers, including supportive and leadership roles in multidisciplinary domain and Design of electronic devices, software and hardware using the significant analytical knowledge in instrumentation by applying modern tools.
PSO-3	Apply and transfer interdisciplinary systems and Engineering approaches to the various areas like communication etc.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Post Graduates of EI will be able to:

1. Identify and apply appropriate experimental and analytical skills to solve real world problems in Electronic Instrumentation field to create innovative products and systems.
2. Develop technical skills and apply appropriate techniques to formulate and analyze engineering problems in Instrumentation and Process Control.
3. Pursue career in research in multidisciplinary areas of signal processing, image processing and instrumentation domain through self-learning and self-directed on futuristic cutting-edge technologies.
4. Analyze technical problems and develop feasible, optimal, environmentally and socially acceptable solutions by applying research skills, technological knowledge and modern tools while working individually and in teams.
5. Students will be able to function professionally in rapidly changing world due to advances in electronics and related technologies in order to contribute to the needs of the society.

PROGRAMME OUTCOMES (POs)

Program Outcomes		**EI Post Graduates will be able to**
PO1	Engineering knowledge	Acquire in depth knowledge in the domain of Electronic Instrumentation Engineering.

PO2	Problem analysis	Understand various Electronic and Instrumentation strategies and their applications for various types of systems.
PO3	Design/development of solutions	Design solutions for complex Electronic Instrumentation problems and design components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO4	Conduct investigations of complex problems	Demonstrate implementation skills using advanced software and processing techniques.
PO5	Modern tool usage	Use recent state-of-the-art simulation tools in the field of BioMedical engineering such as MATLAB, MULTISIM, PYTHON, LABVIEW and other Tools.
PO6	The engineer and society	Be capable of contribute positively to collaborative and multidisciplinary research to achieve common goals.
PO7	Environment and sustainability	Demonstrate knowledge and understanding of Electronic Instrumentation engineering and management principles and Undertake research in emerging areas of Instrumentation with due consideration to economical, Environment and financial factors.
PO8	Ethics	Become aware of social issues and become socially responsible and follow ethical practices to contribute to the community for sustainable development of society.
PO9	Individual and team work	Capable of analyzing the work independently and reflective learning while developing project in the team with multidisciplinary settings.
PO10	Communication	Communicate confidently, make effective presentations and write good reports to engineering community and society.
PO11	Project management and finance	Independently observe and examine critically the outcomes of his/her actions, apply corrective measures subsequently and move forward positively through a self-corrective approach.
PO12	Life-long learning	Recognize the need for life-long learning and have the ability to do it independently in the domain of Electronic Instrumentation engineering.

PROGRAMME: 4

PROGRAMME: M.Tech (Radar and Microwave)

Programme Specific Outcomes (PSOs)

The Post Graduate of R&M will be able to:

PSO-1	To analyze, design and develop solutions for the real time problems and to apply the technical knowledge for developing quality products for Radar and Microwave industry.	
PSO-2	To adapt to emerging information and communication technologies and to develop innovative ideas and solutions in Radar and Microwave.	
PSO-3	To design Radar and Microwave containing devices, software, and hardware by applying relevant modern tools.	

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Post Graduates of R&M will be able to:

1. Work in educational, R&D institutes, industry, and as an entrepreneur in Radar & Microwave.

2. Pursue their doctoral studies and research in institutes of high repute in India & abroad and develop independent and lifelong learning skills for continuous professional development.

3. Analyze technical problems and develop feasible, optimal, environmentally, and socially acceptable solutions by applying research skills, technical knowledge, and modern tools while working individually and in teams.

4. To inculcate the culture of research-oriented projects in the Radar and Microwave field.

5. Demonstrate an ability to communicate effectively and practice professional ethics and Social responsibility in their career.

PROGRAMME OUTCOMES (POs)

Program Outcomes		R&M Post Graduates will be able to
PO1	Engineering knowledge	Acquire in-depth knowledge of RF and Microwave communication with an ability to evaluate, analyze and Synthesize complex problems.
PO2	Problem analysis	Conceptualize and solve engineering problems, to arrive at optimal solutions, considering public health and safety, societal and environmental factors.
PO3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual, and as a number or leader in diverse teams and in multidisciplinary settings.

PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply there to one's own work, add a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME: 5

PROGRAMME: M.Tech (VLSI)

Programme Specific Outcomes (PSOs)

The Post Graduate of VLSI will be able to:

PSO-1	An ability to understand the concepts of VLSI and to master the latest tools and techniques used in the field of research and industry.
PSO-2	To adapt to emerging information and communication technologies and to develop innovative ideas and solutions in VLSI.
PSO-3	An understanding of social awareness & environmental wisdom along with ethical responsibility to achieve a successful career and to sustain passion and zeal for real world applications.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Post Graduates of VLSI will be able to:

1. Identify and apply appropriate experimental and analytical skills to solve real world problems in VLSI to create innovative products and systems.

2. Pursue their doctoral studies and research in institutes of high repute in India & abroad and develop independent and lifelong learning skills for continuous professional development.

3. Students will be able to function professionally in rapidly changing world due to the advances in VLSI and related technologies in order to contribute to the needs of the society.

4. Develop an ability to analyze the problem, understand the technical requirements, design and deliver engineering solutions and create effective product design.

5. To inculcate the culture of research-oriented projects in VLSI.

PROGRAMME OUTCOMES (POs)

Program Outcomes		**VLSI Post Graduates will be able to**
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals to real time electronics and communication problems.

PO2	Problem analysis	Provide solutions for ECE problems by Identify, formulate, review literature, analyze, designing and conducting experiments, interpreting and reporting the results.
PO3	Design/development of solutions	Design and develop solutions for complex engineering problems at feasible and optimal solutions that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply contextual knowledge to assess industrial, societal and safety related issues and understand consequent relevance to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with societyat large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME: 6

PROGRAMME: M.Tech (BioMedical Engineering)

Programme Specific Outcomes (PSOs)

The Post Graduate of BME will be able to:

PSO-1	Analyze specific problems relevant to BioMedical Engineering by applying the knowledge of basic sciences, BioMedical Instrumentation fundamentals and advancements to solve technical problems.
PSO-2	To adapt emerging technologies and to develop innovative ideas and solutions in Biomedical Engineering.
PSO-3	An ability to make use of acquired technical knowledge to get employed in the field of BioMedical.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Post Graduates of BME will be able to:

1. Identify and apply appropriate experimental and analytical skills to solve real world problems in the field of BioMedical Engineering to create innovative products and systems.
2. Develop technical skills and apply appropriate techniques to formulate and analyze engineering problems in BioMedical Instrumentation.
3. Pursue career in research in multidisciplinary areas of Biomedical signal processing, Biomedical image processing and instrumentation domain.
4. Analyze technical problems and develop feasible, optimal, environmentally and socially acceptable solutions by applying research skills, technological knowledge and modern tools while working individually and in teams.
5. Students will be able to function professionally in rapidly changing world due to advances in Biomedical and related technologies in order to contribute to the needs of the society.

PROGRAMME OUTCOMES (POs)

Program Outcomes		**BME Post Graduates will be able to**
PO1	Engineering knowledge	Acquire in depth knowledge in the domain of BioMedical Engineering.
PO2	Problem analysis	Understand various BioMedical strategies and their applications for various types of systems.

PO3	Design/development of solutions	Design solutions for complex Biomedical problems and design components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
PO4	Conduct investigations of complex problems	Demonstrate implementation skills using advanced software and processing techniques.
PO5	Modern tool usage	Use recent state-of-the-art simulation tools in the field of BioMedical engineering such as MATLAB, PYTHON, LABVIEW and other Tools.
PO6	The engineer and society	Be capable of contribute positively to collaborative and multidisciplinary research to achieve common goals.
PO7	Environment and sustainability	Demonstrate knowledge and understanding of BioMedical engineering and management principles and Undertake research in emerging areas of BioMedical with due consideration to economical, Environment and financial factors.
PO8	Ethics	Become aware of social issues and become socially responsible and follow ethical practices to contribute to the community for sustainable development of society.
PO9	Individual and team work	Capable of analyzing the work independently and reflective learning while developing project in the team with multidisciplinary settings.
PO10	Communication	Communicate confidently, make effective presentations and write good reports to engineering community and society.
PO11	Project management and finance	Independently observe and examine critically the outcomes of his/her actions, apply corrective measures subsequently and move forward positively through a self-corrective approach.
PO12	Life-long learning	Recognize the need for life-long learning and have the ability to do it independently in the domain of BioMedical engineering.

M.Tech (EI)

Two Year (Four Semesters)

Scheme of Instruction and Syllabus

(AICTE Model Curriculum)

(With effect from 2019 – 2020 admitted batch onwards)

Department of Electronics and Communication Engineering

AU College of Engineering (Autonomous)

Visakhapatnam-530 003

2019-2020

M.Tech (EI), Two Year (Four Semesters)

Scheme to be valid with effect from the admitted batch of 2019 – 2020

SEMESTER-I

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-1.1	Digital Signal Processing	3	-	70	30	100	3
MTEI-1.2	Electronic Instrumentation Techniques	3	-	70	30	100	3
MTEI-1.3	Elective I DSP Processors and Architecture/ Wireless communication and Networks/ Microprocessor systems	3	-	70	30	100	3
MTEI-1.4	Elective II EMI/EMC/ Bio Medical Instrumentation/ Artificial Intelligence and Neural Networks	3	-	70	30	100	3
MTEI-1.5	Research Methodology & IPR	3	-	70	30	100	2
MTEI-1.6	Audit Course	3	-	70	30	100	0
MTEI-1.7	Instrumentation LAB-I	-	3	-	100	100	2
MTEI-1.8	Signal Processing LAB	-	3	-	100	100	2
	Total	18	06	420	380	800	18

SEMESTER-II

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-2.1	Transducers and signal conditioners	3	-	70	30	100	3
MTEI-2.2	Data Acquisition Systems	3	-	70	30	100	3
MTEI-2.3	Elective – III Processor Control Instrumentation /Remote Sensing and Image Sensors /GPS and Applications		-	70	30	100	3
MTEI-2.4	Elective – IV Nano Technology and Applications /Microcontrollers and Embedded Systems /Digital Image Processing	3	-	70	30	100	3
MTEI-2.5	Audit Course	3	-	70	30	100	0
MTEI-2.6	Instrumentation LAB-II	-	3	-	100	100	2
MTEI-2.7	Microprocessor LAB	-	3	-	100	100	2
MTEI-2.8	Mini Project With Seminar	-	3	-	100	100	2
	Total	15	9	350	450	800	18

SEMESTER-III

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-3.1	Elective V Linear and Digital Systems Design / Optical Fibers and Applications/ /Application specific Integrated circuits(ASIC)	3	-	70	30	100	3
MTEI-3.2	Open Elective VLSI/ Business Analytics Industrial Safety Operational Research Cost Management of Engineering Projects	3	-	70	30	100	3
MTEI-3.3	Dissertation- I / Industrial Project	-	-	-	100	100	10
	Total	6		140	160	300	16

SEMESTER-IV

Code	Name of the Subject	Periods/Week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MTEI-4.1	Dissertation- II	-	-	70	30	100	16
	Total			70	30	100	16

Note:

1. **At the end of 3rd semester project review is conducted by HOD with the committee consisting of the HOD, Chair Person of BOS and the Guide. In the Affiliated Colleges, Project (Preliminary) will be evaluated by concerned HOD and the thesis Guide of their respective colleges.**
2. **At the end of the 4th semester there will be a final viva voce for the project work conducted by the HOD with the committee consisting of HOD, Chair Person of BOS, the Guide and an External examiner nominated by the university.**

Audit Course 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

DIGITAL SIGNAL PROCESSING

Credits: 3

Subject Code: MTEI – 1.1 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the optimization techniques used in designing the digital filters.
CEO2 To know the sampling rate requirement in the DSP applications.
CEO3 To know the significance of linear prediction.
CEO4 To implement DSP algorithms for various applications.
CEO5 To acquire the knowledge on Signal Processing Hardware.

Course Outcomes: At the end of the course the student will be able to

CO1 Make use of optimization methods for designing advanced digital filters.
CO2 Understand the concepts of Multirate DSP and filter banks.
CO3 Classify the different optimum linear filters.
CO4 Evaluate the DFT using various DSP algorithms.
CO5 Realize the DSP architecture for different operations.
CO6 Understand the signal Processing concepts in various applications.

Chapter – I : Advanced digital filter design techniques : Multiple band optimal FIR filters – design of filters with simultaneous constraints in time and frequency response, optimization methods for designing IIR filters, comparison of optimum FIR filters and delay equalized elliptic filters.

Learning outcomes: At the end of this unit the student will be able to

LO1 Design filters with simultaneous optimal constraints in time and frequency response.
LO2 Compare optimum FIR filter and delay equalized elliptic filter.

Chapter – II : Multirate DSP : The basic sample rate alteration – time – domain characterization, frequency – domain characterization : Cascade equivalences, filters in sampling rate alteration systems, digital filter banks and their analysis and applications, multi level filter banks, estimations of spectra from finite – duration observation of signals.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the basic sample rate alteration.
LO2 Analyze the multi-level filter banks and its applications.

Chapter – III : linear prediction and optimum liner filters : forward and backward linear prediction, AR Lattice and ARMA lattice – ladder filters, Wieners filters for filtering on prediction.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the forward and backward linear prediction.

LO2 Summarize the various filters for linear prediction.

Chapter – IV : DSP Algorithms : The Goertzel algorithm, the chirp – z transform algorithm the Levinson – Durbin algorithms, the Schur algorithm, and other algorithms, computations of the DFT, concept of tunable digital filters.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare the different DSP algorithms.

LO2 Understand the concept of tunable digital filters.

Chapter – V : Signal Processing Hardware : Multipliers, dividers, different forms of FIR Hardware, multiplexing, DTTR, TDM to FDM translator, realization of frequency synthesizer, FET hardware realization, different FFT architectures, special FFT processors, convolvers, Lincoln laboratory FDP and the compatible computer configurations.

Learning outcomes: At the end of this unit the student will be able to

LO1 Analyze the hardware of filters, translators and synthesizers.

LO2 Study the different FFT architectures and convolvers.

Chapter – VI : Applications of DSP :

a) Speech : Model of speech production, speech analysis – synthesis system vocoder analyzers and synthesizers, linear prediction of speech.

b) DTMF System

Learning outcomes: At the end of this unit the student will be able to

LO1 Implement the speech processing application.

LO2 Evaluate the DTMF System.

Suggested Books :

1. Theory and applications of digital signal processing by Lawrence R. Rabiner and Bernard

Gold, PHI

2. Digital Signal Processing. Principles, algorithms, and applications by John G. Proakis and Dimitris G. Manolakis, PHI, 1997.
3. Digital Signal Processing, A Computer – Based approach, by Sanjit K. Mitra, Tata Mc Graw-Hill, 1998

ELECTRONIC INSTRUMENTATION TECHNIQUES

Credits: 3

Subject Code: MTEI – 1.2 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the Principles and Design of Electronic Instruments.
CEO2 To provide an in-depth understanding of Oscilloscopes.
CEO3 To acquire the knowledge on operation of Display Systems.
CEO4 To understand the operation of different recorders and test instruments.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the different design concepts of electronic instruments.
CO2 Realize the design and functioning of Oscilloscopes.
CO3 Classify the different Display Systems and its performance.
CO4 Develop the ability to use recorders, X-Y plotters and computer based automated test instruments.

Principles and Design of Electronic Instruments : Digital voltmeters, Electronic counters, Frequency synthesizers, Wave analysers, Spectrum analysers, Sweep waveform generators and pulse generators, Lock-in amplifiers, Q-meters, High frequency impedance bridges, Ground loops, Electromagnetic and static pick-up, Interference, Shielding and grounding, Floating voltage measurements; Common signals and their effects.

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the design principles of Electronic Instruments.
LO2 Evaluate the Interference, Shielding and grounding effects.

Oscilloscopes: Sweep generators, Sweep modes, Storage oscilloscopes types, Erasing methods, Sampling oscilloscopes synchronous and random sampling, Time domain reflectomertry, Logic state analysers and their applications.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare the different types of Oscilloscopes.
LO2 Discuss the Logic state analysers and their applications.

Display System : Liquid crystal, Solid state CRT, Displays,

Recorders : Servo magnetic, U-V recorders, X-Y plotters. Computer based automated test instruments.

Learning outcomes: At the end of this unit the student will be able to

LO1 Analyze the different display systems.

LO2 Discuss the operation of recorders and plotters.

Text Book :

1. B.M. Oliver and J.M. Cage, ELECTRONIC MEASUREMENTS AND INSTRUMENTATION Kogakusha-McGraw Hill.

Reference :

1. Manufacturer’s Literature.

Elective-I
MICROPROCESSOR SYSTEMS

Credits: 3

Subject Code: MTEI – 1.3 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the evolution of Microprocessor and Microcontrollers.
CEO2 To familiarize with the 8051 architecture.
CEO3 To provide an in-depth understanding of Addressing Modes, Instructions & Programming.
CEO4 To interface various peripheral devices with 8086/8088.

Course Outcomes: At the end of the course the student will be able to

CO1 Differentiate between microprocessor and microcontroller.
CO2 Outline the architectural features of 8051 microcontroller.
CO3 Compare the various microprocessors and its architecture.
CO4 Summarize the interfacing rules of different peripherals with 8086 microprocessor.

Introduction : Historical background, Microprocessor based personal computer systems, RISC processor, Micro controllers, comparison of 8048, 8049, 8051 and 8052, Architecture of 8051.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare the different types of Oscilloscopes.
LO2 Discuss the Logic state analysers and their applications.

Introduction and comparison of 8086, 8088, 80186 / 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processors, Addressing modes, Memory and Architecture. 8086 / 8088 Hardware specifications – Memory interface – I/O Interface – Interrupts – DMA – The Arithmetic Coprocessor Bus Interface - 8086 / 8088 Addressing Modes – Instructions – Programming.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare the different types of Oscilloscopes.
LO2 Discuss the Logic state analysers and their applications.

References :

1. The Intel Microprocessors 8086 / 8088, 80186, 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processor Architecture, Programming and Interface by Barray B. Berry, 4th Edition, PHI.
2. Microprocessors Principles and Applications by Gilmore, 2nd Edition, TMH.
3. Microprocessors and Interfacing Programming and Applications by Douglas V. Hall, Mc Graw Hill.
4. Microprocessors / Microcomputers Architecture, Software and Systems by A.J. Khambata, John Wiely & Sons.
5. Advanced Microprocessors by Daniel Tabak, Mc Graw Hill, 1995.

Elective-I
DSP PROCESSORS & ARCHITECTURES

Credits: 3

Subject Code: MTEI – 1.3 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the architecture, addressing modes of DSP processors.
CEO2 To interface the serial converters to a DSP device
CEO3 To give an exposure to the various fixed point & a floating point DSP architectures and to develop applications using these processors.
CEO4 To know different basic DSP algorithms.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the concepts of DSP and numeric representations.
CO2 Illustrate the architectural features of DSP devices.
CO3 Determine various addressing modes and instructions of DSP processor.
CO4 Analyze the concepts of basic DSP algorithms.
CO5 Analyze the interfacing serial converters to a DSP device.

UNIT I
INTRODUCTION TO DIGITAL SIGNAL PROCESING
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.
Learning outcomes: At the end of this unit the student will be able to
LO1 Realize the basic DSP algorithms.
LO2 Understand the Analysis and Design tools for DSP Systems using MATLAB.

UNIT II
COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Learning outcomes: At the end of this unit the student will be able to
LO1 Realize the computational accuracy in DSP.
LO2 Analyze different Sources of error in DSP implementations.

UNIT III

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES AND EXECUTION

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing, Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the architectures for programmable DSP devices.

LO2 Discuss the features for interfacing, interrupts and other basics.

UNIT IV

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the Data Addressing modes of TMS320C54XX DSPs.

LO2 Discuss the TMS320C54XX instructions and Programming, On-Chip Peripherals and Interrupts.

UNIT V

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS AND FFT ALGORITHMS

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

Learning outcomes: At the end of this unit the student will be able to

LO1 Implement the digital filters on the TMS320C54XX processor.

LO2 Execute an 8-Point FFT implementation on the TMS320C54XX.

UNIT VI

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the Memory interfacing.

LO2 Interface different I/O Peripherals to programmable DSPs.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M.Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

Elective-I
WIRELESS COMMUNICATION AND NETWORKS

Credits: 3

Subject Code: MTEI – 1.3 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the functioning and evolution of different wireless communication systems and standards.
CEO2 To know the multiple access techniques for Wireless Communication.
CEO3 To provide an in-depth understanding of routing, switching and protocols of various wireless communication networks.
CEO4 To learn the concepts of mobile IP and wireless application protocol for different data networks.

Course Outcomes: At the end of the course the student will be able to

CO1 Discuss the cellular system design and technical challenges.
CO2 Classify the different multiple access techniques and protocols for wireless communication.
CO3 Understand the concepts of routing and switching.
CO4 Categorize the different Wireless Data Services.
CO5 Realize the concepts of Mobile and Wireless Application Protocols.
CO6 Differentiate the various Blue Tooth and Mobile Data Networks.

UNIT -I

WIRELESS COMMUNICATION AND SYSTEM FUNDAMENTALS: Introduction to Wireless Communication Systems, Examples of Wireless Communications, Comparisons of Common Wireless Communication Systems, Trends in Cellular Radio and Personal Communications, Cellular Concepts, Frequency Reuse, Handoff Strategies, Interference and System Capacity, Trucking and Grade Of Service, Improving Coverage & Capacity In Cellular Systems.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare various Wireless Communication Systems.
LO2 Differentiate the trends in Cellular Radio and Personal Communications.

UNIT-II

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION: FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid Techniques) SDMA Technique (As Applicable to Wireless Communications), Packet Radio Access Protocols, CSMA Protocols, Reservation Protocols, Capture Effect in Packet Radio, Capacity of Cellular Systems.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare various Multiple access techniques.

LO2 Discuss the Packet Radio protocols and its effects.

UNIT-III

WIRELESS NETWORKING: Introduction, Differences Between Wireless and Fixed Telephone Networks, Traffic Routing in Wireless Networks, Circuit Switching, Packet Switching, The X.25 protocol**.**

Learning outcomes: At the end of this unit the student will be able to

LO1 Differentiate between Wireless and Fixed Telephone Networks.

LO2 Compare the Circuit Switching and Packet Switching.

UNIT-IV

Wireless Data Services, Cellular Digital Packet Data (CDPD), Advanced Radio Data Information Systems (ARDIS), RAM Mobile Data (RMD), Common Channel Signaling (CCS), Broad Band ISDN and ATM, Signaling System .No.7 (SS7), Network Services Part (NSP), SS7 User Part, Signaling Traffic in SS7, SS7 Services, Performance of SS7.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare various Wireless Data Services.

LO2 Describe the Broad Band ISDN, ATM and Signaling System.

UNIT-V

MOBILE IP AND WIRELESS APPLICATION PROTOCOL: Mobile IP Operation of Mobile IP, Co-located Address, Registration, Tunneling, WAP Architecture, Overview, WML Scripts, WAP Service, WAP Session protocol, Wireless Transaction, Wireless Datagram, Infrared LAN's, Spread Spectrum LAN's, Narrowband Microwave LAN's, IEEE 802 Protocol Architecture, IEEE 802 Architecture and Services, 802. 11 Medium Access Controls, 802.11 Physical Layers.

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the operation of Mobile IP.

LO2 Differentiate the various wireless application protocols.

UNIT-VI

BLUE TOOTH AND MOBILE DATA NETWORKS: Overview, Radio Specification, Baseband Specification, Links Manager Specification, Logical Link Control and Adaptation Protocol, Introduction to WLL Technology, Introduction, and Data Oriented CDPD Network, GPRS and Higher Data Rates, Short Messaging Service in GSM, Mobile Application Protocol.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the concepts of blue tooth data networks.

LO2 Discuss the mobile data networks.

TEXT BOOKS:

1. Wireless communication and Networking -William Stallings, PHI, 2003
2. Wireless Communications, Principles, Practice - Theodore, S. Rappaport, PHI, 2nd Edition,

2002.

REFERENCES:

1. Wireless Digital Communications-Karnilo feher,PHI, 1999.
2. Principles of Wireless Networks - Kavehpahlaven and P.Krishna Murthy, Pearson Education, 2002

Elective-II
EMI/EMC

Credits: 3

Subject Code: MTEI – 1.4 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To familiarize with the fundamentals that are essential for electronics industry in the field of EMI / EMC.
CEO2 To understand the EMI from apparatus, circuits and open area test sites.
CEO3 To understand the various techniques for electromagnetic compatibility.
CEO4 To acquire broad knowledge of various radiated and conducted EMI measurement techniques.
CEO5 To know the grounding, shielding, cabling and filtering effects.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the Electromagnetic environment and Natural & Nuclear sources of EMI.
CO2 Identifying of EMI from hotspots like apparatus, circuits and open area test sites.
CO3 Differentiate various radiated and conducted EMI measurement techniques.
CO4 Classify the various techniques like Grounding, Shielding and filtering.
CO5 Summarize the EMC design constraints, components and standards.

I. Introduction, Natural and Nuclear sources of EMI / EMC :
Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the overview of EMI / EMC.
LO2 Differentiate the Natural and Nuclear sources of EMI.

II. EMI from apparatus, circuits and open area test sites :
Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive intermodulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

Learning outcomes: At the end of this unit the student will be able to

LO1 Analyze the EMI from apparatus and circuits.

LO2 Discuss the Open area test sites and measurements.

III. Radiated and conducted interference measurements and ESD :

Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements. ESD, Electrical fast transients / bursts, electrical surges.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Radiated interference measurements.

LO2 Outline the conducted interference measurements.

IV. Grounding, shielding, bonding and EMI filters:

Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design.

Learning outcomes: At the end of this unit the student will be able to

LO1 Classify the Principles and types of grounding, shielding and bonding.

LO2 Analyze the characteristics and design of EMI filters.

V. Cables, connectors, components and EMC standards :

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the EMC cables and connectors.

LO2 Discuss the National and International EMC standards.

Text Books:

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
2. Electromagnetic Interference and Compatibility IMPACT series, IIT – Delhi, Modules 1– 9.

Reference:

1. Introduction to Electromagnetic Compatibility, Ny, John Wiley, 1992, by C.R. Pal.

Elective-II
BIO MEDICAL INSTRUMENTATION

Credits: 3

Subject Code: MTEI – 1.4 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the sources of Bioelectric potentials and Electrodes.
CEO2 To analyze the cardiovascular & Respiratory systems and its related measurements.
CEO3 To understand the various techniques for electromagnetic compatibility.
CEO4 To acquire knowledge of electronics in clinical laboratory and therapeutic area.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the origin of biopotentials and role of its electrodes.
CO2 Elucidate the cardiovascular system and its measurements.
CO3 Develop a thorough understanding on principles of Patient Care Monitory and Measurements in Respiratory System.
CO4 Outline the concepts of Bio telemetry and Instrumentation for the clinical laboratory.
CO5 Summarize the application of Electronics in diagnostics and therapeutic area.

Chapter – I: Sources of Bioelectric potentials and Electrodes

Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials

Electrode theory, Bio Potential Electrodes, Biochemical Transducers

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Sources of Bioelectric potentials.

LO2 Discuss the Bio Potential Electrodes and Biochemical Transducers.

Chapter – II: The Cardiovascular System and Cardiovascular Measurements,

The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds

Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds,

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Heart and Cardiovascular System.

LO2 Outline the Characteristics and Measurement of Blood Flow.

Chapter – III: Patient Care & Monitory and Measurements in Respiratory System

The elements of Intensive Care Monitory, Diagnosis, Calibration and repairability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators

The Physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the Patient Care & Monitory System and its Measurements.

LO2 Discuss the functioning and Measurements in Respiratory System.

Chapter – IV: Bio telemetry and Instrumentation for the clinical laboratory Introduction to biotelemetry, physiological parameters adaptable to biotelemetry, the components of biotelemetry system, implantable units, applications of telemetry in patient care

The blood, tests on blood cells, chemical test, automation of chemical tests

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the components of biotelemetry system and implantable units.

LO2 Differentiate the applications of telemetry in patient care.

Chapter – V: X – ray and radioisotope instrumentation and electrical safety of medical equipment.

Generation of Ionizing radiation, instrumentation for diagnostic X – rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy.

Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the instrumentation for the medical use of radioisotopes and radiation therapy.

LO2 Discuss the Physiological effects of electrical shock Hazards from electrical equipment.

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer – Pearson education.

Elective-II
ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

Credits: 3

Subject Code: MTEI – 1.4 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To familiarize with basic principles of AI towards problem solving, knowledge representation, and learning.
CEO2 To introduce the field of artificial neural networks and Fuzzy Systems.
CEO3 To understand the different Neural Dynamics.
CEO4 To acquire knowledge on Synaptic Dynamics.

Course Outcomes: At the end of the course the student will be able to

CO1 Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
CO2 Elucidate the concepts of Neural Networks and Fuzzy Systems.
CO3 Classify the different Activation signals and models.
CO4 Summarize the application of Learning algorithms.

Artificial Intelligence as Representation and Search

Introduction to AI, Roots and Scope of AI, Definition, Turing Test, Application Areas of AI, Predicate Calculus , Structures and Strategies for State Space Search , Heuristic Search , Control and Implementation of State Space Search

Representation and Inference

Knowledge Representation , Strong Methods for Problem Solving , Reasoning in Uncertain , Situations, Machine Learning : Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning , Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the Structures and Strategies for State Space Search.

LO2 Discuss the key concepts of Knowledge Representation and learning.

Neural Networks and Fuzzy Systems

Neural and Fuzzy machine intelligence, fuzziness as multivalence, the dynamical-systems approach to machine intelligence, intelligent behaviour as adaptive model-free estimation.

Learning outcomes: At the end of this unit the student will be able to

LO1 Analyze the dynamical-systems approach to machine intelligence.

LO2 Elucidate the intelligent behaviour as adaptive model-free estimation.

Neural Dynamics

I. Activations and signals : Neurous as functions, signal monotonicity, biological activations and signals, neuron fields, neuronal dynamical systems, common signal functions, pulse-coded signal functions, Neuronal dynamics II : Activation Models : neuronal dynamical systems, additive neuronal dynamics, additive neuronal feedback, additive bivalent models, BAM Connection matrices, additive dynamic and the noise-saturation dilemma, general neuronal activations : Cohen-grossberg and multiplicative models

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the different activation signals.

LO2 Discuss the various activation models.

Synaptic Dynamics

I. Unsupervised Learning : Learning as encoding, change, and quantization, four unsupervised learning laws, probability spaces and random processes, stochastic unsupervised learning and stochastic equilibrium, signal hebbian learning, competitive learning, differential hebbian learning, differential competitive learning. Synaptic Dynamics II : Supervised learning : Supervised function estimation, supervised learning as operant conditioning, supervised learning as stochastic pattern learning with known class memberships, supervised learning as stochastic approximation, the back propagation algorithm.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the concepts of Unsupervised Learning.

LO2 Compare the Supervised Learning with Unsupervised Learning.

Text Books:

1. "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", George F. Luger, 4th Edition, Pearson Education , 2003.
2. Neural Networks & Fuzzy Systems, Bark Kosko, PHI Published in 1994.

Reference Books:

1. "Artificial Intelligence", Knight, Tata McGraw Hill
2. "Artificial Intelligence 'a Modern Approach" Russell & Norvig, second edition , Pearson Education , 2003.
3. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum, PHI
4. Neural Network Design, Hagan, Demuth and Beale, Vikas Publishing House.

RESEARCH METHODOLOGY AND IPR

Credits: 2

Subject Code: MTEI – 1.5 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To identify an appropriate research problem in their interesting domain.
CEO2 To understand the ethical issues and functions of the literature review of a research.
CEO3 To develop a theoretical and conceptual framework in writing a report.
CEO4 To acquire knowledge on IPR.

Course Outcomes: At the end of the course the student will be able to

CO1 Formulate a research problem for a specific domain.
CO2 Analyze the available literature for given research problem with ethics.
CO3 Develop technical writing and presentation skills.
CO4 Comprehend concepts related to patents, trademark and copyright.

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the sources and characteristics of a research problem.
LO2 Discuss the various approaches of investigation of solutions for research problem.

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics,

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the Approaches of Effective literature studies.
LO2 Discuss the Plagiarism analysis and Research ethics.

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Learning outcomes: At the end of this unit the student will be able to

LO1 Understand how to write a report.
LO2 Analyze how to format and present a report.

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the Process of Patenting and Development.

LO2 Discuss the Procedure for grants of patents.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the Scope of Patent Rights.

LO2 Discuss the Patent information and databases.

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Learning outcomes: At the end of this unit the student will be able to

LO1 Define the New Developments in IPR.

LO2 Describe the Traditional knowledge Case Studies,.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science
2. & engineering students’”
3. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
4. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
5. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
6. Mayall , “Industrial Design”, McGraw Hill, 1992.
7. Niebel , “Product Design”, McGraw Hill, 1974.
8. Asimov, “Introduction to Design”, Prentice Hall, 1962.
9. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New
10. Technological Age”, 2016.
11. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

AUDIT COURSE 1&2

Credits: 0

Subject Code: MTEI – 1.6 **Exam Marks:** 70

Semester-I **Sessional:** 30

ENGLISH FOR RESEARCH PAPER WRITING

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand how to improve the writing skills and level of readability
CEO2 To learn about what to write in each section.
CEO3 To develop the skills needed when writing a title.
CEO4 To ensure the good quality of paper at very first time submission.

Course Outcomes: At the end of the course the student will be able to

CO1 Demonstrate writing meaningful sentences and coherent paragraphs.
CO2 Show conciseness, clarity and avoid redundancy in writing.
CO3 Summarize, evaluate literature, and write methodology, results and conclusion.
CO4 Apply correct style of referencing and use punctuation appropriately.

1. Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.
2. Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.
3. Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.
4. Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.
5. Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions
6. Useful phrases, how to ensure paper is as good as it could possibly be the first- time Submission.

REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.

Highman’sbook .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

DISASTER MANAGEMENT

Course Educational Objectives: The main objectives of this course are given below

CEO1 To provide basic conceptual understanding of disasters and its relationships with Development.
CEO2 To understand Medical and Psycho-Social Response to Disasters.
CEO3 To prevent and control Public Health consequences of Disasters.
CEO4 To build skills to respond to disasters.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand foundations of hazards, disasters and associated natural/social phenomena.
CO2 Methods of community involvement as an essential part of successful DRR.
CO3 Humanitarian Assistance before and after disaster.
CO4 Technological innovations in Disaster Risk Reduction.

1 **Introduction:** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

2 **Repercussions Of Disasters And Hazards**: Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

3 **Disaster Prone Areas In India :**Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics

4 **Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

5 **Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

6 **Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends

In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

REFERENCES:

1. R. Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “’New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies” ,Deep &Deep Publication Pvt. Ltd., New Delhi.

SANSKRIT FOR TECHNICAL KNOWLEDGE:

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the Divine and unique origin of Sanskrit language.
CEO2 To Extent and extant of Sanskrit language in general.
CEO3 To Acquaintance with the various dimensions of works of Sanskrit literature.
CEO4 To encourage integration of learning across academic disciplines.

Course Outcomes: At the end of the course the student will be able to

CO1 Read and understand Sanskrit texts.
CO2 Increase the knowledge and understanding of Sanskrit grammar.
CO3 Familiarity of the history of Sanskrit literature.
CO4 Understand the Sanskrit culture and religious background.

1 Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

2 Order

Introduction of roots

Technical information about Sanskrit Literature

3 Technical concepts of Engineering-Electrical, Mechanical,Architecture, Mathematics

REFERNCES:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

VALUE EDUCATION

Course Educational Objectives: The main objectives of this course are given below

CEO1 To teach and inculcate the importance of value based living.
CEO2 To give students a deeper understanding about the purpose of life.
CEO3 To learn the essential qualities to become a good leader.
CEO4 To learn and practice social values and responsibilities.

Course Outcomes: At the end of the course the student will be able to

CO1 Emerge as responsible citizens with clear conviction to practice values and ethics in life.
CO2 Understand and start applying the essential steps to become good leaders.
CO3 Become value based professionals.
CO4 Contribute in building a healthy nation.

1 Values and self-development –Social values and individual attitudes.

Work ethics, Indian vision of humanism.

Moral and non- moral valuation. Standards and principles.

Value judgements

2 Importance of cultivation of values.

Sense of duty. Devotion, Self-reliance. Confidence, Concentration.

Truthfulness, Cleanliness.

Honesty, Humanity. Power of faith, National Unity.

Patriotism. Love for nature, Discipline

3 Personality and Behavior Development - Soul and Scientific attitude.

Positive Thinking. Integrity and discipline.

Punctuality, Love and Kindness.

Avoid fault Thinking.

Free from anger, Dignity of labour.

Universal brotherhood and religious tolerance.

True friendship.

Happiness Vs suffering, love for truth.

Aware of self-destructive habits.

Association and Cooperation.

Doing best for saving nature

4 Character and Competence –Holy books vs Blind faith.

Self-management and Good health.

Science of reincarnation.

Equality, Nonviolence, Humility, Role of Women.

All religions and same message.

Mind your Mind, Self-control.

REFERNCES:

1 Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

CONSTITUTION OF INDIA

Course Educational Objectives: The main objectives of this course are given below

CEO1 To Enable the student to understand the importance of constitution.
CEO2 To realize the structure of executive, legislature and judiciary.
CEO3 To know philosophy of fundamental rights and duties.
CEO4 To understand the central and state relation, financial and administrative..

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the emergence and evolution of Indian Constitution.
CO2 Analyze Panchayati Raj institutions as a medium of decentralization.
CO3 Understand and Evaluate the Indian Political scenario amidst the emerging challenges.
CO4 Understand and analyze federalism in the Indian context.

1 History of Making of the Indian Constitution:

History

Drafting Committee, (Composition & Working)

2 Philosophy of the Indian Constitution:

Preamble

Salient Features

3 Contours of Constitutional Rights & Duties:

Fundamental Rights

Right to Equality

Right to Freedom

Right against Exploitation

Right to Freedom of Religion

Cultural and Educational Rights

Right to Constitutional Remedies

Directive Principles of State Policy

Fundamental Duties.

4 Organs of Governance:

Parliament

Composition

Qualifications and Disqualifications

Powers and Functions

Executive

President

Governor

Council of Ministers

Judiciary, Appointment and Transfer of Judges, Qualifications

Powers and Functions

5 Local Administration:

District's Administration head: Role and Importance,

Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Pachayati raj: Introduction, PRI: ZilaPachayat.

Elected officials and their roles, CEO ZilaPachayat: Position and role.

Block level: Organizational Hierarchy (Different departments),

Village level: Role of Elected and Appointed officials,

Importance of grass root democracy

6 Election Commission:

Election Commission: Role and Functioning.

Chief Election Commissioner and Election Commissioners.

State Election Commission: Role and Functioning.

Institute and Bodies for the welfare of SC/ST/OBC and women.

REFERNCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.

2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

PEDAGOGY STUDIES

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the Theories of learning, Curriculum, Teacher education.
CEO2 To realize the Pedagogical practices.
CEO3 To create Evidence on the effectiveness of pedagogical practices.
CEO4 To have the Professional development..

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the Conceptual framework and terminology.
CO2 Analyze the Pedagogical practices in a classroom.
CO3 Understand Strength and nature of the body of evidence for effective pedagogical practices.
CO4 Outline the Barriers to learning.

1 **Introduction and Methodology:**

Aims and rationale, Policy background, Conceptual framework and terminology

Theories of learning, Curriculum, Teacher education.

Conceptual framework, Research questions**.**

Overview of methodology and Searching.

2 Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

3 Evidence on the effectiveness of pedagogical practices

Methodology for the in depth stage: quality assessment of included studies.

How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Theory of change.

Strength and nature of the body of evidence for effective pedagogical practices.

Pedagogic theory and pedagogical approaches.

Teachers' attitudes and beliefs and Pedagogic strategies.

4 Professional development: alignment with classroom practices and follow support

Peer support.

Support from the head teacher and the community.

Curriculum and assessment.

Barriers to learning: limited resources and large class sizes.

5 Research gaps and future directions

Research design

Contexts

Pedagogy

Teacher education

Curriculum and assessment

Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, ‘learning to read’ campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

STRESS MANAGEMENT BY YOGA

Course Educational Objectives: The main objectives of this course are given below

CEO1 To discuss the definition of stress and apply critical thinking to identify its causes and treatments.
CEO2 To identify common stressors inherent in today's global marketplace.
CEO3 To act as a center of excellence in Yoga.
CEO4 To develop, promote and propagate the philosophy, science and art of Yoga.

Course Outcomes: At the end of the course the student will be able to

CO1 Identify and understand the signs and symptoms of stress.
CO2 Apply stress management techniques.
CO3 Develop an understanding of the impact of stress on physiological, emotional and cognitive processes.
CO4 Therapy and Yoga to meet the aspirations of modern age.

1 Definitions of Eight parts of yog. (Ashtanga) 8

2 Yam and Niyam.

Do`s and Don't's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

3 Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii)Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata.

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Educational Objectives: The main objectives of this course are given below

CEO1 To cause a basic awareness about the significance of soft skills.
CEO2 To learn to achieve the highest goal happily.
CEO3 To become a person with stable mind, pleasing personality and determination
CEO4 To awaken wisdom in students.

Course Outcomes: At the end of the course the student will be able to

CO1 Develop the personality and achieve the highest goal in life.
CO2 Lead the nation and mankind to peace and prosperity.
CO3 Help in developing versatile personality.
CO4 Creates a positive approach for the beginning of a day.

1 Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom)

Verses- 29,31,32 (pride & heroism)

Verses- 26,28,63,65 (virtue)

Verses- 52,53,59 (dont's)

Verses- 71,73,75,78 (do's)

2 Approach to day to day work and duties.

Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48,

Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35,

Chapter 18-Verses 45, 46, 48.

3 Statements of basic knowledge.

Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad BhagwadGeeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39

Chapter18 – Verses 37,38,63

REFERENCES

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

INSTRUMENTATION LAB-I

Credits: 2

Subject Code: MTEI – 1.7 **Exam Marks:** 70

Sessional: 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the different ADCs and DACs.
CEO2 To implement basic linear and nonlinear circuits.
CEO3 To know the working of filters.
CEO4 To analyze the rectifiers and regulators.

Course Outcomes: At the end of the course the student will be able to

CO1 Make use of various methods for designing ADCs and DACs.
CO2 Execute various linear and nonlinear circuits.
CO3 To understand the concepts of transformers.
CO4 Implement different rectifiers and calculate its ripple factors.
CO5 Realize the principles and functioning of the filters.

1. Binary weighted Resistor Method.
2. R-2R Ladder D/A Convertor.
3. DAC Settling Time Measurements.
4. Counter Ramp Method ADC.
5. Full Scale Adjustment of ADC.
6. Conversion Time of ADC.
7. Resolution of ADC.
8. Frequency Counter Trainer.
9. Attenuator Circuit.
10. Wave Shaping Circuits.
11. Frequency Divider Circuit.
12. Frequency Counter and Display Driver Circuit.
13. Study of Transformer.
14. Two Diode Full Wave Rectifier.
15. Bridge Rectifier.
16. Calculation of Ripple Factor.
17. Working of Filters.
18. Zener Diode Regulator.
19. Bleeder Resistor.

SIGNAL PROCESSING LAB

Credits: 2

Subject Code: MTEI – 1.8 **Exam Marks: 100**

Semester-I

Course Educational Objectives: The main objectives of this course are given below

CEO1 To make familiar with practical implementation of the digital signal processing.
CEO2 To develop DSP algorithms for convolution, correlation and DFT.
CEO3 To design digital filters.
CEO4 To have hands on experience in MATLAB and DSP processor.

Course Outcomes: At the end of the course the student will be able to

CO1 Generation and Implementation of discrete time signals and systems.
CO2 Compute N-point DFT for a given sequence using FFT.
CO3 Design and simulate FIR and IIR filters with different techniques.
CO4 Analyze the interpolation and decimation process.
CO5 Obtain the Impulse response of first & second order systems.

Using MATLAB

1. Generation of Basic signals Using MATLAB.
2. To Find DFT/IDFT of a given signal.
3. Implementation of FFT for a given sequence.
4. Implementation of LP FIR & HP FIR filter for a given sequence.
5. Implementation of LP IIR & HP IIR filter for a given sequence.
6. Implementation of interpolation and decimation process.
7. Impulse response of first & second order systems.

Using DSP Processor

1. Computation of N-point DFT for a given sequence.
2. Implementation of FFT for a given sequence.
3. Implementation of LP FIR & HP FIR filter for a given sequence.
4. Implementation of LP IIR & HP IIR filter for a given sequence.
5. Implementation of interpolation and decimation process.
6. Impulse response of first & second order systems.

TRANSDUCERS AND SIGNAL CONDITIONERS

Credits: 3

Subject Code: MTEI – 2.1 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the necessity and advantages of transducer.
CEO2 To learn the operation and applications of various transducer.
CEO3 To design and construct different transducers.
CEO4 To measure several parameters using transducers.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the concepts of bilateral electro mechanical transducers.
CO2 Illustrate the operation and applications of capacitive and inductive transducer.
CO3 Analyze the design principles of transducers.
CO4 Make use of transducers for measuring several parameters.

Unframed theory of bilateral electro mechanical transducers, sensitivity and linearity analysis, static and dynamic responses, transfer function analysis of various transducers and their associated circuits, electrodynamic variable, variable inductance, variable capacitance, piezoelectric and force – balance transducers.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the static and dynamic responses, transfer function analysis of various transducers.
LO2 Compare the various transducers.

Design and construction of the above types of transducers:

Uses of the above transducers in measurement of displacement, velocity and acceleration. Thermo couples, Quartz thermometers, transducers for pressure and flow measurements. Ionization ganges, load cell and force – balanced transducers. Doppler shift flow meter, thermal transport flow meter. Magnetic flow meter.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the design principles of different transducers.
LO2 Compare the various flow meters.

Text Books:

1. H.K.P. Neubert Instrument Transducers Oxford University Press : (Second edition)
2. E.O. Doebelin ‘Measurement Systems’ Mc Graw Hill.

DATA ACQUISITION SYSTEM

Credits: 3

Subject Code: MTEI – 2.2 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the concept of data acquisition systems.
CEO2 To learn the operation and principles of DACs.
CEO3 To classify the different ADCs.
CEO4 To study the static and dynamic analysis of data acquisition systems.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the Principles and design of data acquisition systems.
CO2 Differentiate the various DACs.
CO3 Analyze the different methods of ADCs.
CO4 Outline the static and dynamic error analysis of data acquisition systems.

Data Acquisition system: Introduction, Principles and design.

Digital to Analog converters (DACs) : Parallel R-2R, Weighted resistor, inverted ladder and serial (ADCs).

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the design principles of data acquisition systems.
LO2 Compare the various DACs.

Analog to Digital Converters (ADCs) : Paralleled feedback, Successive approximation, Ramp comparison, Dual slope integration, Voltage to frequency, Voltage to time, Logarithmic types of ADCs, Accuracy analysis, Dynamic and static error analysis of the above, Typical study of monolithic DACs and ADCs.

Learning outcomes: At the end of this unit the student will be able to

LO1 Categorize the ADCs techniques.
LO2 Analyze the accuracy of various DAQs.

Text Books

1. H. Schmid ‘ELECTRONIC ANALOG-DIGITAL CONVERSION’ McGraw Hill
2. D.G. Hoeschele ‘A to D and D to A conversion techniques’ Wiley
3. B.S. Sopnde Data Converters – Tata McGraw Hill
4. Analog Devices – Handbook.

References

1. E.R. Hanateck, User’s Handbook of D/A and A/D converters – Wiley.
2. Datel / Intersil – Data acquisition systems.

Elective-III
GPS and APPLICATIONS

Credits: 3

Subject Code: MTEI – 2.3 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To describe the fundamental concepts of the Global Positioning System.
CEO2 To know how to evaluate GPS derived coordinates and data.
CEO3 To Calculate GPS satellite orbit positions and velocities.
CEO4 To learn error sources for GPS user position calculations.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the Principles and architecture of Global Positioning System.
CO2 Understand the GPS signaling structure.
CO3 Define and calculate GPS coordinates
CO4 Analyze the GPS orbits and satellite position determination.
CO5 Classify the various GPS error sources

Unit I

Overview of GPS :

Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the basic concepts of GPS.

LO2 Realize the GAGAN architecture.

Unit II GPS Signals

Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the GPS signaling structure.

LO2 Compare the GPS and GALILEO satellite construction.

Unit III

GPS coordinate frames, Time references : Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the GPS coordinate frames.

LO2 Discuss the GPS Time references.

Unit IV

GPS orbits and satellite position determination : GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.

Learning outcomes: At the end of this unit the student will be able to

LO1 Determine the GPS orbits and satellite position.

LO2 Describe receiver independent exchange format.

Unit V

GPS Errors :

GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

Learning outcomes: At the end of this unit the student will be able to

LO1 Differentiate various GPS error sources.

LO2 Estimate the error using dual frequency GPS receiver.

Textbook:

1. G S RAO, **Global Navigation Satellite Systems,** McGraw-Hill Publications, New Delhi, 2010

Reference Books:

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001).
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).

Elective-III
REMOTE SENSING AND IMAGE SENSORS

Credits: 3

Subject Code: MTEI – 2.3 **Exam Marks:** 70

Semester-I **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To describe the fundamental concepts of the Remote sensing.
CEO2 To know about different types of satellite and sensors.
CEO3 To learn the Microwave Remote Sensing.
CEO4 To study the basics of Thermal Imaging system.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the Principles and characteristics of Remote sensing.
CO2 Understand the concepts of satellite & sensor parameters and characteristics of different platforms.
CO3 Analyze the characteristics of Thermal Imaging system and its effects.
CO4 Realize the Meteorological satellites and its orbits.

Unit-I Basics of Remote Sensing

- Principles of Remote sensing, History of Remote sensing, Remote sensing in India,
- Electromagnetic Radiation and Electromagnetic Spectrum, EMR quantities: Nomenclature and Units
- Thermal Emission of Radiation, Radiation Principles (Plank's Law, Stephen Boltezman law), Interaction of EMR with the Earth Surface (Wien's displacement law, Kirchoffs Law)
- Spectral signature, Reflectance characteristics of Earths cover types, Remote sensing systems.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Electromagnetic Radiation and its Spectrum.

LO2 Compare the various Remote sensing systems.

Unit – II Platforms and sensors

Platforms, Remote sensing sensors, resolutions Across track and along the track scanning, Optical sensors,

- Thermal scanners
- Microwave sensing radar
- satellite missions
- Landsat series, SPOT series, IRS satellite series, IKNOS,

Learning outcomes: At the end of this unit the student will be able to

LO1 Differentiate various Platforms and sensors.

LO2 Discuss the Landsat series, SPOT series, IRS satellite series, IKNOS.

Unit-III Microwave Remote Sensing

- Airborne and Space borne radar systems basic instrumentation.
- System parameters - Wave length, Polarization, Resolutions, Radar geometry.
- Target parameters - Back scattering, Point target, Volume scattering, Penetration, Reflection, Bragg resonance, Cross swath variation. Speckie radiometric calibration.
- Radar - Grametry - Introduction, Mosaicing Stereoscope.
- Application : Geology, Forestry, Land use, Soils etc. Future trends and Research

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare Airborne and Space borne radar systems.

LO2 Outline the applications of Microwave Remote Sensing.

Unit-IV Thermal Imaging system

- Thermal Imaging System: Introduction - IR region of the Electromagnetic spectrum, Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature. Thermal conductivity. Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity.
- IR - radiometers, Airborne and Satellite TTR scanner system
- Characteristics of IR images
  i) Scanner distortion, ii) image irregularities, iii) Film density and recorded iv)Temperature ranges
- Effects of weather on images
  i) Clouds, ii) Surface winds, iii) Penetration of smoke plumes
- Interpretation of thermal imagery
- Advantages of Thermal imagery

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Characteristics of IR images.

LO2 Discuss the Interpretation and Advantages of thermal imagery.

Unit-V

- Meteorological satellites
- Meteorological satellite characteristics and their orbits, TIROS, NIMBUS, NOAA, TIROS N, SEASAT, GOES, METEOSAT, INSAT
- Measurement of Earth and Atmospheric energy and Radiation budget parameters from satellites

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Meteorological satellite characteristics and their orbits.

LO2 Measure the Earth and Atmospheric energy and Radiation budget parameters from satellites.

Text books

1. Imaging Radar for Resource Survey: Remote Sensing Applications, 3, W Travelt, Chapman & Hall
2. Remote Sensing: The quantitative approach, P.H. Swain and S.M. Davis, McGraw Hill
3. Floyd, F. Sabins, Jr: Remote Sensing Principles and Interpretation, Freeman and Co. San Franscisco, 1978
4. Applied Remote Sensing C.P.L.O., Longman Scientific and Technical Publishers.
5. Introduction to Environmental Remote Sensing, E.C. Barrett & L.F Curtis, Chapman and Hall, London
6. Fundamentals of remote sensing, George Joseph, Universities Press

Elective-IV
NANO TECHNOLOGY AND APPLICATIONS

Credits: 3

Subject Code: MTEI – 2.4 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the principles and Background of nanotechnology.
CEO2 To learn the basic Electronic Nanomaterial Properties.
CEO3 To classify the different Carbon Nano Structures.
CEO4 To Diagnose the Personal Health and Medical Applications.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the Principles of nanotechnology.
CO2 Classify the basic Electronic Nanomaterial Properties.
CO3 Realize the Carbon Nano Structures.
CO4 Outline the applications of Medical Diagnosis.

Unit 1 : Introduction to Nanotechnology

Essence of Nanotechnology, Nano in daily life, Brief account of nano applications, Properties of nano materials, Metal nano clusters, Semiconductor nano particles.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Essence of Nanotechnology.

LO2 Discuss the Semiconductor nano particles.

Unit 2 : Nano Materials

Nano composites, Nanofying electronics, Sensing the environment, Mechanising the micro world, Energy and cleaner environment with nano technology.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the Nanofying electronics.

LO2 Discuss the Energy and cleaner environment with nano technology.

Unit 3 : Carbon Nano Structures

Introduction, Carbon molecules, Carbon clusters, Carbon nanotubes, Applications of carbon nanotubes.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Carbon clusters and nanotubes.

LO2 Discuss the Applications of carbon nanotubes.

Unit 4 : Diagnosing Personal Health and Medical Applications

Lab on a chip, Super X-ray vision, Mapping the genes, Understanding how pharmaceutical company develops drugs, Delivering a new drug the Nanotech way, Cooking cancer with nano cells, Biomimetics.

Learning outcomes: At the end of this unit the student will be able to

LO1 Understand how a pharmaceutical company develops drugs.

LO2 Cooking cancer with nano cells and Biomimetics.

Unit 5 : Biological Materials

Introduction, Biological building blocks, Nucleic acids, Biological nanostructures.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Biological Materials.

LO2 Discuss the Biological nanostructures.

Textbooks

1. Nanotechnology by Richard Booker, Earl Boysen, Wiley Publishing Inc., 2006.
2. Introduction to Nanotechnology by Charles P. Poole Jr., Frank J. Owens, John Wiley & Sons Publications, 2003.

Elective-IV

MICROCONTROLLERS AND EMBEDDED SYSTEMS

Credits: 3

Subject Code: MTEI – 2.4 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the concept of Embedded Systems.
CEO2 To integrate hardware and software for processor applications.
CEO3 To have knowledge about the basic working of a microcontrollers.
CEO4 To study the state machine and concurrent process models.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the overview of Embedded Systems and technologies.
CO2 Outline the basic software and hardware of various microcontrollers.
CO3 Differentiate the various memories access techniques.
CO4 Analyze the different microcontroller applications.
CO5 Realize the FSMs and concurrent process models.

UNIT-1

INTRODUCTION: Embedded Systems overview, Design Challenge, Processor Technology, IC Technology, Design Technology, Trade-offs.

Learning outcomes: At the end of this unit the student will be able to

LO1 Explain the overview of embedded system.

LO2 Differentiate the Processor and IC Technology.

UNIT-II

CUSTOM SINGLE-PURPOSE PROCESSORS (HARDWARE): Introduction, Combinational logic, Sequential logic, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing Custom Single-Purpose Processors.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the RT-Level Custom Single-Purpose Processor Design.

LO2 Optimize the Single-Purpose Processor Design.

UNIT-III

GENERAL PURPOSE PROCESSORS (SOFTWARE): Introduction, Basic Architecture, Operation, Programmer's view, Development Environment, Application-Specific Instruction-set Processors, Selecting a Microprocessor.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the architecture of general purpose processors.

LO2 Analyze the Application-Specific Instruction-set Processors.

UNIT-IV

MEMORY: Introduction, Memory types, Memory Hierarchy and Cache, Advanced Memory Interfacing: Communication Basics, Memory Access, I/O addressing, Interrupts, DMA, Arbitration, Multilevel Architecture, Protocols.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the concept of Memory Interfacing.

LO2 Analyze the I/O addressing, Interrupts and DMA.

UNIT-V

MICROCONTROLLERS: Review of 8051 Microcontroller Architecture &Programming**.** Peripherals: Timers, Counters and Watchdog Timers, UART, Pulse width Modulators, LCD Controllers, Stepper Motor Controllers, Analog to Digital Converters, Real-Time Clocks. Digital Camera Introduction, Specifications, Design.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the 8051 Microcontroller Architecture &Programming.

LO2 Analyze its applications.

UNIT-VI

STATE MACHINE AND CONCURRENT PROCESS MODELS: Introduction, Models Vs Languages, Text Vs Graphics, Textual Languages Vs Graphical Languages, An Example, A Basic State Machine Model, FSM with Data Path Model, FSMD Using State Machines, Concurrent Process Model, Communication among Processes.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the design of FSMs.

LO2 Realize the Concurrent Process Model.

Text Books:

1. Embedded System Design: A Unified Hardware/Software Introduction By Frank vahid / Tony Givargis John wiley & sons
2. The 8051 Microcontroller & Embedded Systems By Muhammad Ali Mazidi & Janice Gillispie Mazidi PHI

References:

1. Embedded Systems Architecture, Programming and Design By Raj Kamal TMH
2. Embedded Software Priner By Simon.
3. The 8051 Microcontroller: Architecture, Programming & Applications. By Kenneth J.Ayala Penram International. 2nd edn.

Elective-IV

DIGITAL IMAGE PROCESSING

Credits: 3

Subject Code: MTEI – 2.4 **Exam Marks:** 70

Semester-II **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To familiarize with basic concepts of digital image processing and different image transforms

CEO2 To learn various image processing techniques like image enhancement, restoration, segmentation and compression

CEO3 To understand color fundamentals and different color models

CEO4 To understand wavelets and morphological image processing.

Course Outcomes: At the end of the course the student will be able to

CO1 Illustrate the fundamental concepts of Digital Image Processing and different image transforms.

CO2 Analyze the effect of spatial and frequency domain filtering of images.

CO3 Evaluate the methodologies for image restoration and reconstruction.

CO4 Compare the different color image processing techniques.

CO5 Elucidate the mathematical modelling of image Multi-resolution processing and apply different image compression techniques.

CO6 Categorize different image segmentation techniques and morphological image operations.

1. Digital Image Fundamentals

   An image model – sampling & quantization – basic relation between pixels : imaging geomentry.

2. Image Transforms

   Properties of 2-D fourier transforms, FFT algorithm and other separable image transforms, Walsh transforms, Hadamard, Cosine, Haar, Slant Transforms, RL Transforms and their properties.

   Learning outcomes: At the end of this unit the student will be able to

   LO1 Understand the origins of digital image processing

   LO2 Analyze the mathematical tools used in digital image processing.

3. Image Enhancement & Restoration

   Spatial domain methods, Frequency domain methods, Histogram Modification technique,

Neighbourhood averaging, Median filtering, Low pass filtering, Averaging of Multiple Images, Image sharpening by differenctiation, High pass Filtering, Degradation model for Continuous functions, Discrete Formulation, Diagonalization of Circulant and Block – Circulant Matrices, Effects of Diagonalization, Constrained and unconstrained Restorations Inverse filtering, Wiener Filter, Constrained least Square Restoration.

Learning outcomes: At the end of this unit the student will be able to

LO1 Classify the different Spatial and frequency domain filtering techniques.

LO2 Describe the different image restoration techniques.

4. Image Encoding

Objective an subjective Fidelity Criteria, the encoding process, the Mapping, the Quantizer and the Coder, Contour Encoding, Run length Encoding, Image Encoding relative to a Fidelity Criterion, Differential Pulse Code Modulation, Transform Encoding.

5. Image Compression

Fundamentals, Image compression models, error free compression, lossy compression, image compression standards.

6. Image Segmentation

The detection of Discontinuities, Point Line and Edge Detections, Gradient Operators, Combined Detection, Thresholding.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the image encoding.

LO2 Discuss the different image compression Segmentation techniques.

7. Image Representation

Representation Schemes, Chain Codes, Polygon Approximation, Boundary Descriptors, Simple Descriptors, Shape Numbers, Fourier Descriptors.

8. Image Construction from Projections

Radon Transforms, Convolution/filterback Projection.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the image representation schemes .

LO2 Construct the images from projections.

Textbooks

1. Gonzalez RC & Woods RE, Digital Image Processing, Addison Wesley Publishing Company.
2. Jain AK, Fundamentals of Digital Image Processing, PHI
3. Rosefeld & Kak AC, Digital Picture Processing Academic Press Inc.

INSTRUMENTATION LAB-II

Credits:2

Subject Code: MTEI – 2.6 **Exam Marks:10**0
Semester-II
List of Experiments:

1. Positive Regulated Power Supply.
2. Negative Regulated Power Supply.
3. Adjustable Power Supply.
4. Line Regulation of Power Supply.
5. Load Regulation of Power Supply.
6. Function Generator Circuit.
7. Triangular Wave Generator.
8. Sine Wave Generator.
9. Square Wave Generator.
10. Duty Cycle of Square Wave.
11. TTL Wave Generator.
12. Switched Faults.
13. LED Demonstration Bridge.
14. Multimeter Voltage Measurement.
15. Resistance Measurement.
16. Continuity Tests.
17. Measurement of Frequency Using Gate Time Circuit.
18. Gate Time Circuit.
19. Sensitivity of Frequency Counter Trainer.

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the different Power Supplies.
CEO2 To implement the generator circuits.
CEO3 To know the various measuring instruments.
CEO4 To analyze the switching faults.

Course Outcomes: At the end of the course the student will be able to

CO1 Make use of various methods for designing Power Supplies.
CO2 Execute various linear and nonlinear circuits.
CO3 To understand the concepts of switching faults.
CO4 Implement different generator circuits.
CO5 Realize the principles and functioning of various measuring instruments.

MICROPROCESSOR LAB

Credits:2

Subject Code: MTEI – 2.7 **Exam Marks:10**0

Semester-II

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the basics of programming of 8086 microprocessor.
CEO2 To study 8086 microprocessor-based ALP using arithmetic, logical and shift operations.
CEO3 To implement conversions of numbers using 8086 microprocessor.
CEO4 To interface 8086 with I/O and other devices.
CEO5 To execute encryption of the text with ciphers.

Course Outcomes: At the end of the course the student will be able to

CO1 Build basic assembly language programs based on arithmetic operations using 8086 microprocessor.
CO2 Develop basic assembly language programs based on arithmetic, logical, shift and string operations using MASM32 assembler.
CO3 Execution of base conversions using 8086 microprocessor.
CO4 Implement the encryption of the text with ciphers.
CO5 Generation of waveforms using 8086 microprocessor.

List of Experiments:

1. Write an 8086 assembly language program to generate Fibonacci series.
2. Write an 8086 assembly language program to multiply two matrices.
3. Write an 8086 assembly language program to find the factorial of a given number.
4. Write an 8086 assembly language program to reverse the digits.
5. Given two positive integers n and m, write the assembly language program to find the greatest common divisor(GCD) of the number.
6. Given two positive integers n and m, write the assembly language program to find the least common multiple(LCM) of the two numbers.
7. Write an 8086 assembly language program to generate the table of a given number.
8. Write an 8086 assembly language program to generate prime numbers less than 31.
9. Write an 8086 assembly language program to count number of vowels in a given string.
10. Write an assembly language program to convert decimal number to any base.
11. Write an 8086 assembly language program to encrypt the given text using simple substitution cipher.
12. Write an 8086 assembly language program to encrypt the given text using multiple substitution cipher.
13. Write an 8086 assembly language program to multiply 2 digit BCD number X,2 digit BCD number

and store the result in BCD form.

14. Write an 8086 assembly language program to multiply 4 digit BCD number X,2 digit BCD number and store the result in BCD form.
15. Write an 8086 assembly language program to compute arithmetic mean of given set of numbers.
16. Write an assembly language program to compute the RMS value of given set of numbers.
17. Generate a square wave using 1 ms time delay.
18. Write an 8086 assembly language program to interface a four road junction traffic light controller.
19. Write an assembly language program to generate a sine wave.
20. Write an 8086 assembly language program for a decimal counter and display the count using two seven segment displays.

Elective-V
LINEAR AND DIGITAL SYSTEMS DESIGN

Credits: 3

Subject Code: MTEI – 3.1 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know the design Principles of operational amplifiers.
CEO2 To learn the various applications of operational amplifiers.
CEO3 To acquire the basic knowledge of digital logic levels.
CEO4 To implement the analysis and design of various digital electronic circuits.

Course Outcomes: At the end of the course the student will be able to

CO1 Elucidate the Principles and design of operational amplifiers.
CO2 Differentiate the various applications of operational amplifiers.
CO3 Analyze the design of digital circuits.
CO4 Detect and correct the errors in digital circuits.

Principles and applications of operational amplifiers as summers, Integrators controlled current voltage sources, Function generators, Logarithmic amplifiers, Anti logarithmic amplifiers, Instrumentation amplifiers, Sample and hold circuits, Comparators, Multivibrators, Window discriminators, Analog multipliers, Modulator circuits, Four quadrant multipliers, Squaring and square rooting, phase sensitive detector circuits, analog switches, multiplexers, Phase locked loops, broad band amplifiers, Precision rectifiers, IC voltage regulators, switched mode regulators and active filter circuits, 555, 566 * 8038 ICs and their applications, Line drivers, Receivers for MODEMS, Isolation amplifiers.

Learning outcomes: At the end of this unit the student will be able to

LO1 Explain the generators and amplifiers.

LO2 Differentiate the filter circuits and ICs.

Review of combinational logic design : Logic design with MSI and LSI; Multiplexers and Demultiplexers; Arithmetic units; Carry look-ahead adders; Decimal and BCD adders / subtractors; Tabular design; Read only memory methods; programmable logic array methods. Analysis and synthesis of sequential circuits : Algorithmic state machine (ASM) methods; Map entered variable and synthesis of random logic. Fault detection and error correction in combinational and sequential circuits ; two level multi level multi level fault detection methods. Test generation; redundance techniques. Introduction to computer aided design of digital circuits.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the Analysis and synthesis of digital circuits.

LO2 Describe the Fault detection and error correction in digital circuits.

Text Book

1. A.B. Grebene ‘Analog IC design’ – Van Nostrand
2. G.B. Clayton ‘Applications of Linear ICs’ – Max Millan (India)
3. Toetze & Schenk ‘Advanced electronic Circuits’ John Wiley
4. S.C. Lee ‘Digital system design’ – Prentice Hall, May 2003 (Prescribed)

References

1. W.N. Carr ‘ MOS / LST Design and applications’ McGraw Hill
2. M.A. Bruer and A.D. Fridman ‘Diagnosis and reliable design of digital systems’ Computer science press, 1976.
3. ZVI Kohavi ‘Switching and Finite automata theory TMH 1976
4. Frederick J. Hill, Gerald R. Peterson ‘Computer Aided Logical Design with emphasis on VLSI – 1933 (John Wiley)

Elective-V
OPTICAL FIBERS AND APPLICATIONS

Credits: 3

Subject Code: MTEI – 3.1 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
CEO2 To know the various optical sources and detectors.
CEO3 To learn the fiber optical receivers and noise performance in photo detector.
CEO4 To study the FOC design and applications.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the optical fiber communication link, structure and its propagation.
CO2 Describe the principles of optical sources and power launching-coupling methods.
CO3 Compare the characteristics of fiber optic receivers.
CO4 Analyze the System Design and Fiber Optical Applications.

1. Optic Fiber Waveguides

Step – Index Fiber, Graded – Index Fiber, Attenuation, Modes in Step-Index Fibers, Modes in Graded – Index Fibers, Pulse Distortion and Information Rate in Optic Fibers, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables,

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the modes of optical fibers.

LO2 Describe the Construction of Optic Fibers.

2. Light Sources and Detectors

Light-Emitting Diodes, Light-Emitting – Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser-Diode Operating Characteristics, Distributed – Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical-Cavity Surface-Emitting Laser Diodes

Principles of Photodetection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode,

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the Light Sources and Detectors.

LO2 Describe the Principles of Photodetection.

3. Couplers and Connectors

Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Wavelength-Division Multiplexing, Fiber Bragg Gratings, Other Components : Attenuator, Circulator and Polarization Controller

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the optical Couplers and Connectors.

LO2 Describe the Wavelength-Division Multiplexing.

4. Modulation, Noise and Detection

Light-Emitting-Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, and Jitter, Additional Noise Contributors, receiver Circuit Design

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the optical modulation circuits.

LO2 Describe the optical receiver Circuit Design.

5. System Design and Fiber Optical Applications

Analog System Design, Digital System Design, Applications of Fiber Optics

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the optical system design.

LO2 Describe the Applications of Fiber Optics.

Text Book:

1. Fiber Optic Communications, Joseph. C. Palais, Pearson Education, Asia, 2002

References:

1. Fiber Optic Systems, John Powers, Irwin Publications, 1997
2. Optical Fiber Communication, Howes M.J., Morgen, D.V John Wiely

Elective-V

APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASIC)

Credits: 3

Subject Code: MTEI – 3.1 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the entry-level industrial standard ASICs.
CEO2 To give an understanding of issues and tools related to ASIC.
CEO3 To know the basics of System on Chip and Platform based design.
CEO4 To study the Dynamic Warp Processors.

Course Outcomes: At the end of the course the student will be able to

CO1 Differentiate the type of ASICs.
CO2 Develop the programmable ASIC logic cells.
CO3 Analyze the Low-level Design languages and tools.
CO4 Outline the CMOS System Core Studies.

1. Introduction to ASICs – Types of ASICs, Design flow, Economics of ASICs, ASIC cell libraries, CMOS Logic, CMOS design rules, Logic cells, I/O cells, cell compilers.
   Learning outcomes: At the end of this unit the student will be able to
   LO1 Classify the different types of ASICs.
   LO2 Describe the CMOS Design Rules.

2. ASIC Library Design – Transistors as resistors, Transistor parasitic capacitance, Logical effort, Cell design, Programmable ASICs, Programmable ASIC logic cells, Programmable ASIC I/O cells, Programmable ASIC interconnect, Programmable ASIC design software.
   Learning outcomes: At the end of this unit the student will be able to
   LO1 Analyze the ASIC Library design.
   LO2 Discuss the Programmable ASIC interconnect and Design Software.

3. Low-level design entry, Schematic entry, low-level design languages, PLA tools, EDIF, An overview of VHDL and verilog, Logic synthesis, Simulation. ASIC construction, Floor planning and placement.
   Learning outcomes: At the end of this unit the student will be able to
   LO1 Outline the overview of VHDL and verilog.
   LO2 Understand the concepts of Floor planning and placement.

4. CMOS System Core Studies
   Dynamic Warp Processors: Introduction, The problem, the algorithm, a functional overview, detailed functional specification, structural floor plan, physical design, fabrication, Hierarchical layout and design of single chip 32 bit CPU : Introduction, Design methodology, Technology updatability and layout verification.
   Learning outcomes: At the end of this unit the student will be able to

   LO1 Describe the CMOS system core studies.

   LO2 Analyze the various layouts of CMOS system.

5. Practical Realities and Ground Rules
   Further thoughts on floor plans/layout, floor plan layout of the four bit processors, input/output (I/O) pads, "Real estate", further thoughts on system delays, ground rules for successful design, scaling of MOS circuits.
   Learning outcomes: At the end of this unit the student will be able to

   LO1 Realize the practical realities and ground rules.

   LO2 Analyze the Scaling of MOS Circuits.

Textbook:

1. Application Specific Integrated Circuits by J.S. Smith, Addison Wesley, 1997.

Reference Books:

1. Basic VLSI Design : Systems and Circuits, Doublas A. Puckness & Kamran Eshraghian, Prentice Hall of India Private Ltd., New Delhi, 1989.
2. Principles of CMOS VLSI Design : A system perspective, N. Westle & K. Eshraghian, Addition – Wesley Pub. Co. 1985.
3. Introduction to VLSI System, C. Mead & L. Canway, Addison Wesley Pub Co. 1990.
4. The Design & Analysis of VLSI Circuits, L.A. Glassey & D.W. Dobbephl, Addison Wesley Pub Co. 1985.
5. Introduction to NMOS & VLSI System Design, A. Mukharjee, Prentice Hall, 1986.
6. VLSI Design Techniques for analog and digital circuits, R.L. Geiger, P.E. Allen & N.R. Streder, McGraw Hill Int. 1990.
7. Digital Integrated Circuits, A Design Perspective, Jan A. Rabey, Prentice Hall of India Pvt. Ltd., 1997.
8. Application specific integrated circuits, J.S. Smith, Addison Wesley, 1997.

Core Elective: VLSI

Credits: 3

Subject Code: MTEI – 3.1 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn basic CMOS Circuits.
CEO2 To understand the concepts of designing VLSI Subsystems.
CEO3 To Understand the basic steps of layout and fabrication.
CEO4 To learn techniques of chip design using programmable devices.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the fabrication process of IC technology.
CO2 Analyze the design rules and layout diagram.
CO3 Implement the digital circuit design.
CO4 Outline the design principles of subsystem.

1. Digital Systems and VLSI : why design integrated circuits? – integrated circuits manufacturing – CMOS Technology – Integrated Circuit Design Techniques.

2. Transistors and Layout : Introduction – Fabrication processes – transistors – wires and vias – design rules – layout design and tools.

   Learning outcomes: At the end of this unit the student will be able to

   LO1 Realize the digital IC fabrication.

   LO2 Analyze the layout rules.

3. Logic Gates : Introduction – combinational logic functions – static complementary gates – switch logic – low power gates – delay through resistive interconnect-delay through inductive interconnect.

4. Combinatinal Logic Networks : Introduction – standard cell – based layout – simulation – combinational network delay – logic and interconnect design – power optimization – switch logic networks – combinational logic testing.

5. Sequential Machines : Introduction – latches and flip-flops – sequential systems and clocking disciplines – sequential system design – power optimization – design validation – sequential testing.

   Learning outcomes: At the end of this unit the student will be able to

   LO1 Realize the basic logic gates.

LO2 Analyze the Combinatinal Logic Networks.
LO3 Realize the sequential system design.

6. Subsystem Design : Introduction – subsystem design principles – combinational shifters – address – high density memory – field – programmable gate arrays – programmable logic arrays – floorplanning methods – off-chip connections.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the subsystem design principles.

LO2 Discuss the floor-planning methods & off-chip connections.

Text books:

1. Modern VLSI Design, System – on – Chip by Wayne Wolf, Pearson Education, 3rd Edition.

References:

1. Introduction to VLSI Systems by C. Mead and L. Conway, Addison Wesley, 1980.
2. Introduction to VLSI Design by Eugene D. Fabrecius, McGraw Hill, 1990.
3. Basic VLSI Design by D.A. Pucknell & K. Eshragian, PHI, 3rd Edition.

OPEN ELECTIVE

BUSINESS ANALYTICS

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To investigate data to establish new relationships and patterns.
CEO2 To realize the correlation between different variables.
CEO3 To know the possibility of default and generate customer records.
CEO4 To interpret data use the tools such as Excel and open source software.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand and critically apply the concepts and methods of business analytics.
CO2 Identify, model and solve decision problems in different settings.
CO3 Execute appropriate courses of action for a given managerial situation.
CO4 Develop feasible solutions to decision making problems.
CO5 Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities that serve.

Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Learning outcomes: At the end of this unit the student will be able to
LO1 Understand the Overview of Business analytics.
LO2 Describe the Statistical Tools.

Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Learning outcomes: At the end of this unit the student will be able to
LO1 Discuss the regression analysis.
LO2 Describe the Data and models for Business analytics.

Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Learning outcomes: At the end of this unit the student will be able to

LO1 Realize the organization structure.

LO2 Compare the Descriptive and predictive analytics.

Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Learning outcomes: At the end of this unit the student will be able to

LO1 Classify the different Forecasting Techniques.

LO2 Select Appropriate Forecasting Models.

Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, the Value of Information, Utility and Decision Making.

Learning outcomes: At the end of this unit the student will be able to

LO1 Understand the Decision Analysis .

LO2 know the value of Information, Utility and Decision Making.

Unit 6: Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the Recent Trends in Embedded and collaborative business intelligence.

LO2 Describe the Recent Trends in Data Storytelling and journalism.

Reference:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

OPEN ELECTIVE

INDUSTRIAL SAFETY

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To know about Industrial safety programs and toxicology.
CEO2 To learn the Industrial laws , regulations and source models.
CEO3 To understand about fire and explosion, preventive and relief methods.
CEO4 To acquire the knowledge on industrial hazards and its risks.

Course Outcomes: At the end of the course the student will be able to

CO1 Analyze the effect of release of toxic substances.
CO2 Understand the industrial laws, regulations and source models.
CO3 Apply the methods of prevention of fire and explosions.
CO4 Understand the relief and its sizing methods.
CO5 Identify the industrial hazards and the preventive measures to be taken.

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Learning outcomes: At the end of this unit the student will be able to
LO1 Understand the concepts of Industrial safety.
LO2 Describe the various safety equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Learning outcomes: At the end of this unit the student will be able to
LO1 Define the Types of maintenance.
LO2 Discuss the Types and applications of tools used for maintenance.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity

lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Learning outcomes: At the end of this unit the student will be able to

LO1 Differentiate the types of wear and lubricants.

LO2 Define the principle and factors affecting the corrosion.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic,automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Learning outcomes: At the end of this unit the student will be able to

LO1 Explain the significance of Fault tracing.

LO2 Discuss the Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the Steps for periodic and preventive maintenance.

LO2 Realize the significance and advantages of preventive maintenance.

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.

2. Maintenance Engineering, H. P. Garg, S. Chand and Company.

3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.

4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OPEN ELECTIVE

OPERATIONS RESEARCH

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand and analyze managerial problems in industry so that they are able to use resources more effectively.
CEO2 To formulate mathematical models for quantitative analysis of managerial problems.
CEO3 To learn the various Operations Research approaches in industry.
CEO4 To utilize the computer tools in solving real problems.

Course Outcomes: At the end of the course the student will be able to

CO1 Understand the application of OR and frame a LP Problem with solution – graphical and through solver add in excel (software).
CO2 Build and solve Transportation and Assignment problems using appropriate method.
CO3 Design and solve simple models of CPM.
CO4 Develop critical thinking and objective analysis of decision problems.
CO5 Enables to take best course of action for the purpose of achieving objectives by applying game theory and sequencing model.

Unit 1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

Learning outcomes: At the end of this unit the student will be able to
LO1 Illustrate the different Optimization Techniques.

LO2 Describe the Sensitivity Analysis and Inventory Control Models.

Unit 2: Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

Learning outcomes: At the end of this unit the student will be able to
LO1 Define the Formulation of a LPP.

LO2 Realize the parametric programming.

Unit 3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

Learning outcomes: At the end of this unit the student will be able to

LO1 Discuss the Nonlinear programming problem.

LO2 Realize the max flow problem - CPM/PERT.

Unit 4: Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Learning outcomes: At the end of this unit the student will be able to

LO1 Define the concepts of Scheduling and sequencing.

LO2 Compare the deterministic and Probabilistic inventory control models.

Unit 5: Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

Learning outcomes: At the end of this unit the student will be able to

LO1 Illustrate the Steps for Dynamic Programming.

LO2 Discuss the Elementary Graph Theory and Game Theory Simulation.

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008

2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009

5. Pannerselvam, Operations Research: Prentice Hall of India 2010 6. Harvey M Wagner,

Principles of Operations Research: Prentice Hall of India 2010

OPEN ELECTIVE

COST MANAGEMENT OF ENGINEERING PROJECTS

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the optimization techniques used in designing the digital filters.
CEO2 To know the sampling rate requirement in the DSP applications.
CEO3 To know the significance of linear prediction.
CEO4 To implement DSP algorithms for various applications.
CEO5 To acquire the knowledge on Signal Processing Hardware.

Course Outcomes: At the end of the course the student will be able to

CO1 Make use of optimization methods for designing advanced digital filters.
CO2 Understand the concepts of Multirate DSP and filter banks.
CO3 Classify the different optimum linear filters.
CO4 Evaluate the DFT using various DSP algorithms.
CO5 Realize the DSP architecture for different operations.
CO6 Understand the signal Processing concepts in various applications.

Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making. Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behaviour and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi

2. Charles T. Horngren and George Foster, Advanced Management Accounting

3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.

OPEN ELECTIVE

COMPOSITE MATERIALS

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To learn the behavior of constituents in the composite materials.
CEO2 To enlighten the different types of reinforcement.
CEO3 To develop an understanding of the different manufacturing methods available for composite material.
CEO4 To provide knowledge and analysis skills in applying basic laws in mechanics.

Course Outcomes: At the end of the course the student will be able to

CO1 Outline the mechanical behavior of layered composites compared to isotropic materials.
CO2 Apply constitutive equations of composite materials and understand the behavior at micro and macro levels.
CO3 Relate the stress and strain in composites materials.
CO4 Identify, describe and evaluate the properties of fiber reinforcements.
CO5 Understand and predict the failure behavior of fiber-reinforced composites.
CO6 Analyze the elastic properties and simulate the mechanical performance of composite laminates.

UNIT–I:

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Learning outcomes: At the end of this unit the student will be able to
LO1 Illustrate the Classification and characteristics of Composite materials.
LO2 Discuss the Functional requirements of reinforcement and matrix.

UNIT – II:

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Learning outcomes: At the end of this unit the student will be able to
LO1 Classify the properties and applications of different fibers.

LO2 Discuss the Mechanical Behavior of composites.

UNIT – III:

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Learning outcomes: At the end of this unit the student will be able to
LO1 Describe the Manufacturing of Ceramic Matrix Composites.

LO2 Discuss its Properties and applications.

UNIT–IV:

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Learning outcomes: At the end of this unit the student will be able to
LO1 Outline the Preparation of Moulding compounds.

LO2 Discuss its Properties and applications.

UNIT – V:

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Learning outcomes: At the end of this unit the student will be able to
LO1 Explain different criteria's.

LO2 Discuss the strength design using caplet plots.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.

2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

OPEN ELECTIVE

WASTE TO ENERGY

Credits: 3

Subject Code: MTEI – 3.2 **Exam Marks:** 70

Semester-III **Sessional:** 30

Course Educational Objectives: The main objectives of this course are given below

CEO1 To understand the concept of Waste to Energy.
CEO2 To link legal, technical and management principles for production of energy form waste.
CEO3 To learn about the best available technologies for waste to energy.
CEO4 To analyze various case studies for understanding success and failures.

Course Outcomes: At the end of the course the student will be able to

CO1 Apply the knowledge about the operations of Waste to Energy Plants.
CO2 Analyze the various aspects of Waste to Energy Management Systems.
CO3 Carry out Techno-economic feasibility for Waste to Energy Plants.
CO4 Analyze the planning and operations of Waste to Energy plants.

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

Learning outcomes: At the end of this unit the student will be able to
LO1 Define the Classification of waste as fuel.
LO2 List the Conversion devices.

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Learning outcomes: At the end of this unit the student will be able to
LO1 Define the types of Biomass Pyrolysis.
LO2 Discuss the Manufacture of pyrolytic oils and gases.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating

– Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Learning outcomes: At the end of this unit the student will be able to

LO1 Compare the various Biomass Gasifiers.

LO2 Discuss its Design, construction and operation.

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Learning outcomes: At the end of this unit the student will be able to

LO1 Describe the Biomass Combustion.

LO2 Discuss the operation of biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Learning outcomes: At the end of this unit the student will be able to

LO1 Outline the Properties of biogas.

LO2 Types of biogas Plants – Applications.

References:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.

2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.