P.S.R.ENGINEERING COLLEGE

(An Autonomous Institution & Affiliated to Anna University, Chennai)

SIVAKASI - 626140

M.E. –APPLIED ELECTRONICS

PG REGULATION-2019

CURRICULUM AND SYLLABI

[1st To 4th Semester]

ACADEMIC COUNCIL

21.08.2020

P.S.R.ENGINEERING COLLEGE, SIVAKASI-626140
PG REGUALTION-2019
M.E. APPLIED ELECTRONICS
CURRICULUM
[I – IV SEMESTERS - FULL TIME]

Total Credits: 69

SEMESTER - I					
Sl	Code	-Course Title	Category	L-T-P	C
1	192AE11	Embedded System Design	PC	3-0-0	3
2	192AE12	ASIC and FPGA Design	PC	3-0-0	3
3	-	Elective I*	PE	3-0-0	3
4	-	Elective II*	PE	3-0-0	3
5	192SE13	Research Methodology and IPR	MC	3-0-0	3
6	-	Audit Course 1	MC	2-0-0	-
7	192AE17	Electronics System Design Laboratory	PC	0-0-4	2
8	192AE18	Embedded and IOT Laboratory	PC	0-0-4	2
					No. of Credits: 19

SEMESTER - II					
Sl	Code	Course Title	Category	L-T-P	C
1	192AE21	Machine Learning Techniques	PC	3-0-0	3
2	192AE22	Digital Image and Video Processing	PC	3-0-0	3
3	-	Elective III*	PE	3-0-0	3
4	-	Elective IV*	PE	3-0-0	3
5	-	Audit Course 2	MC	2-0-0	-
6	192AE27	Machine Learning Laboratory	PC	0-0-4	2
7	192AE28	Image and Video Analytics Laboratory	PC	0-0-4	2
8	192AE29	Mini Project	PROJ	0-0-4	2
					No. of Credits: 18

SEMESTER - III

Sl	Code	Course Title	Category	L-T-P	C
1	-	Elective V*	PE	3-0-0	3
2	-	Open Elective VI*	OE	3-0-0	3
4	192AE31	Project Phase – I	PROJ	0-0-12	10
					No. of Credits: 16

SEMESTER - IV

Sl	Code	Course Title	Category	L-T-P	C
1	192AE41	Project Phase – II	PROJ	0-0-24	16
					No. of Credits: 16

MC- Mandatory Course : PC –Professional Core; PE - Program Elective; PROJ - Project

PROGRAMME ELECTIVES

Sl. No.	Code	Course Title	Category	L-T-P	C
1.	192AEE01	Graph Theory and Optimization	PE	3-0-0	3
2.	192AEE02	Active Network analysis	PE	3-0-0	3
3.	192AEE03	Flexible Electronics	PE	3-0-0	3
4.	192AEE04	Reliability and Fault Analysis of Electronic Devices	PE	3-0-0	3
5.	192AEE05	Soft Computing Techniques	PE	3-0-0	3
6.	192AEE06	Sensors and Interface Electronics	PE	3-0-0	3
7.	192AEE07	Bio Medical Signal Analysis	PE	3-0-0	3
8.	192AEE08	Deep Learning Methods and Applications	PE	3-0-0	3
9.	192AEE09	ARM Architecture and Programming	PE	3-0-0	3
10.	192AEE10	Architecture of Internet of Things	PE	3-0-0	3
11.	192AEE11	Device Modeling	PE	3-0-0	3
12.	192AEE12	Data Warehousing and Data Mining	PE	3-0-0	3
13.	192AEE13	Big Data Computing	PE	3-0-0	3
14.	192AEE14	CAD for VLSI	PE	3-0-0	3
15.	192AEE15	VLSI Testing and Verification	PE	3-0-0	3
16.	192AEE16	Neuromorphic Engineering	PE	3-0-0	3
17.	192AEE17	Statistical Pattern Recognition	PE	3-0-0	3
18.	192AEE18	Smart Antennas	PE	3-0-0	3
19.	192AEE19	Social Media and Network Analysis	PE	3-0-0	3
20.	192AEE20	Biomedical Image Processing	PE	3-0-0	3
21.	192AEE21	Next Generation Networks	PE	3-0-0	3

OPEN ELECTIVES

Sl. No .	Code	Course Title	Category	L-T-P	C
1	192OEO1	Business Analytics	PE	3-0-0	3
2	192OEO2	Industrial Safety	PE	3-0-0	3
3	192OEO3	Operations Research	PE	3-0-0	3
4.	192OEO4	Design of Experiments	PE	3-0-0	3
5	192OEO5	Cost Management of Engineering Projects	PE	3-0-0	3
6.	192OEO6	Composite Materials	PE	3-0-0	3
7.	192OEO7	Waste to Energy	PE	3-0-0	3
8.	192OEO8	Nanomaterials and Nanotechnology	PE	3-0-0	3

AUDIT COURSES

Sl.No.	Code	Course Title	Category	L-T-P	C
1	192AC01	Constitution of India	MC	2-0-0	-
2	192AC02	Disaster Management	MC	2-0-0	-
3	192AC03	English for Research Paper Writing	MC	2-0-0	-
4	192AC04	Sanskrit for Technical Knowledge	MC	2-0-0	-
5	192AC05	Value Education	MC	2-0-0	-
6	192AC06	Pedagogy Studies	MC	2-0-0	-
7	192AC07	Stress Management by Yoga	MC	2-0-0	-
8	192AC08	Personality Development through Enlightenment Skills	MC	2-0-0	-

192AE11 **EMBEDDED SYSTEM DESIGN** **L-T-P C**
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: I** **Category:** PC

AIM: The aim of the course is to investigate embedded system design approaches from both the software and hardware perspectives.

Course Outcomes:

The Students will be able to

CO1: Illustrate the process and issues of embedded system life cycle.
CO2: Evaluate mapping of hardware and software design for Embedded Systems
CO3: Apply debugging techniques for testing of an embedded system.
CO4: Design an embedded prototype using In-circuit Emulator.
CO5: Choose testing environment for different embedded devices.
CO6: Analyze the practical issues for implementation of embedded systems

INTRODUCTION **9**

A Systems Engineering Approach to Embedded Systems Design- The Embedded Systems Model- An Overview of Programming Languages and Examples of Their Standards - Standards and Networking- Multiple Standards-Based Device Example: Digital Television (DTV)

EMBEDDED HARDWARE 9

Embedded Board and the von Neumann Model- Powering the Hardware- Semiconductors and the Active Building Blocks of Processors and Memory- ISA Architecture Models- Internal Processor Design- Processor Performance-Board Memory-Board I/O (Input/Output)

EMBEDDED OPERATING SYSTEMS **9**

Process- Multitasking and Process - Memory Management- I/O and File System Management - OS Standards -POSIX (Portable Operating System Interface- OS Performance Guidelines- OSes and Board Support Packages (BSPs).

DESIGN AND DEVELOPMENT. **9**

Creating an Embedded System Architecture - Solid Technical Foundation - Know the ABCs (Architecture Business Cycles) of Embedded Systems- Define the Architectural Patterns and Reference Models - Define the Architectural Structures- Document the Architecture - Analyze and Evaluate the Architecture

IMPLEMENTATION AND TESTING. **9**

Implementing the - The Main Software Utility Tool: Writing Code in an Editor or - Computer-Aided Design (CAD) and the Hardware- Translation Tools—Preprocessors, Interpreters, Compilers, and Linkers - Debugging Tools - System Boot-Up- Quality Assurance and Testing of the Design - Maintaining the Embedded System

Total Periods 45

References

1. Tammy Noergaard , "Embedded Systems Architecture :A Comprehensive Guide for Engineers and Programmers" Elsevier Publisher , 2nd Edition, 2012.
2. SriramIyer, "Embedded Real time System Programming", Tata McGraw-Hill, 2003.
3. Steve Heath, "Embedded Systems Design", Second Edition, Newness, 2003.
4. Frank Vahid, "Embedded System Design", Wiley, Student Edition, 2006.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3		1	2		1
CO2	2	3	2	2	3	1	2	2		2
CO3	3	3	3	2	2	1	1	2		1
CO4	3	3	2	2	3	1	2	2		
CO5	2	3	3	3	2		1	3		1
CO6	2	3	2	2	2	1	1	2		2

192AE12 **ASIC AND FPGA DESIGN** **L-T-P C**

3-0- 0 3

Programme: M.E.(Applied Electronics) **Sem:** I **Category:** PC

AIM To design and analyze the ASIC and FPGA using CMOS VLSI technology

Course Outcomes

The Students can be able to

CO1: Illustrate Semi custom IC Design and the principles of design logic cells, I/O cells and interconnect architecture,

CO2: Develop FPGA and ASIC design for the circuit and layout design point of view.

CO3: Design the next transistor and block level abstractions of FPGA and ASIC.

CO4: Analyze CAD design for VLSI and have gained sufficient theoretical knowledge for carrying out FPGA and ASIC designs.

CO5: Identify faults in the VLSI circuits

CO6: Solve the Routing problems in VLSI Circuits

INTRODUCTION TO ASICS, CMOS LOGIC AND ASIC LIBRARY DESIGN 9

Types of ASICs - Design flow - CMOS transistors CMOS Design rules - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort – Library cell design - Library architecture.

PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS 9

Anti fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE 9

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX – Design systems - Logic Synthesis - Half gate ASIC.

LOGIC SYNTHESIS, SIMULATION AND TESTING 9

Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

ASIC CONSTRUCTION, FLOOR & POWER PLANNING, PLACEMENT AND ROUTING 9

System partition - FPGA partitioning - partitioning methods - floor planning - placement – physical design flow global routing - detailed routing - special routing - circuit extraction – DRC, Power Planning, Clock Rate Synthesis, Static Timing Analysis.

Total Periods 45

References:

1. 1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.
2. FarzadNekoogar, “From ASICs to SOCs: A Practical Approach”, Prentice Hall PTR, 2003.
3. Wayne Wolf, “FPGA-Based System Design”, Prentice Hall PTR, 2004.
4. R. Rajsuman, “System-on-a-Chip: Design and Test”, Artech House Publishers, 2000.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2		2	2		
CO2	2		2		2		2	2		
CO3	3	2	3	2	1		2	1		
CO4	3	2	2	2	2		3	2		
CO5	2		3		2		2	3		
CO6	2		2				2	2		

192SE13 **RESEARCH METHODOLOGY AND IPR** **L-T-P C**

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: I** **Category:** MC

AIM: **To Initiate the learning for fundamental research and development activities.**

Course Outcomes:

The Students will be able to

CO1: Understand research problem formulation.

CO2: Analyze research related information

CO3: Follow research ethics

CO4: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D sector.

CO6: Create new and better products, and in turn brings about, economic growth and social benefits.

INTRODUCTION **9**

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

PROPOSAL PREPARATION **9**

Effective literature studies approaches, analysis Plagiarism , Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

INTELLECTUAL PROPERTY RIGHTS **9**

Nature of Intellectual Property: Patents, Designs, Trademarks 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.

PATENT RIGHTS **9**

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

NEW DEVELOPMENTS IN IPR **9**

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

Total Periods 45

References

1. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners" , 2nd Edition, Abe Books, 2005.
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
4. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1			2	3		2				2
CO2			3	2		1				2
CO3			2	1		2				2
CO4			3	2		2				3
CO5			3	1		1				2
CO6			2	3		2				1

192AE17	ELECTRONIC SYSTEM DESIGN LABORATORY	L-T-P	C
		0-0-4	2

Programme: M.E.(Applied Electronics) **Sem:** I **Category:** PC

AIM: The aim of the course is to design of practical hands-on experience with Matlab DSP processors , embedded microcontrollers Keil and Xilinx software

Course Outcomes:

The Students will be able to

CO1: Model the Sequential and ALU system using VHDL

CO2: Apply the fundamentals of embedded programming concepts to Microcontroller.

CO3: Obtain the response of PID controller and Compensator with different transfer function

CO4: Analyze FFT and Quantization Effect of signals.

CO5: Estimate the spectrum of various signals

CO6: Design a simple application using RTOS

List of Experiments

1. Modeling of Sequential Digital system using VHDL
2. Design and Implementation of ALU and MAC unit using FPGA.
3. Design and Implementation of traffic light controller and digital clock using CPLD/FPGA
4. Design and interface Real time Clock (RTC) via I2C bus , Seven segment LED Display
5. Read the key & display the key via ports using PIC Microcontroller
6. Design of Adaptive and Non adaptive Digital Control System using Matlab
7. Spectrum estimation using signal processing toolbox
8. Analysis of single sided and two sided FFT signals using Labview.
9. Evaluation of Quantization effect of the signal and reconstruction using Labview.
10. Testing RTOS Environment and system programming using KEIL tools.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2	2	1	3		2
CO2	2	2	2	1	2	1	2	3		1`
CO3	3	2	3	2	1	2	2	2		2
CO4	3	1	2	2	2	1	3	3		2
CO5	2	2	3	1	2	2	2	3		2
CO6	2	1	2	1	1	2	2	3		2

192AE18 **EMBEDDED & IOT LABORATORY** **L-T-P C**
0-0-4 2

Programme: M.E.(Applied Electronics) **Sem**: I **Category: PC**

AIM: The aim of the course is to design of practical hands-on experience with embedded microcontrollers and IOT Technologies

Course Outcomes:

The Students will be able to

CO1: Design a simple application using Advanced processors like Arduino , Raspberry pi and ARM Boards

CO2 Create Final executable ROM image using flash controller

CO3: Troubleshoot interactions between software and hardware

CO4: Design a simple robot using IOT

CO5: Develop home automation model using IOT

CO6: Configure the Gateway and web server with IOT

List of Experiments

1. LED and LCD Interface using embedded microcontroller.
2. Simple application design using ARM Processor – Motor and Buzzer
3. Sensor interfacing using Raspberry pi /Arduino Boards
4. Design of wireless network using embedded systems
5. Design a simple Robot using Robokits
6. Observing (sensed and measured) data remotely
7. Controlling or actuating devices remotely
8. Data Communication through social media
9. Sending out alerts by objects without human intervention
10. Developing an elementary home automation model and Creating a virtual device & configuring Gateway

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2	2	2	1	2		1
CO2	2	2	2	1	2	1	2	2		1
CO3	3	2	3	2	1	2	2	2		1
CO4	2	1	2	2	2	1	3	2		2
CO5	2	2	3	1	2	2	2	1		1
CO6	3	1	2	1	1	2	2	2		2

192AE21 **MACHINE LEARNING TECHNIQUES** **L-T-P C**

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: II Category: PC**

AIM: To introduce students to the basic concepts and techniques of Machine Learning. And study the various probability based learning techniques..

Course Outcomes:

The Students will be able to

CO1: Distinguish between, supervised, unsupervised and semi-supervised learning

CO2: Apply the appropriate machine learning strategy for any given problem

CO3: Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem

CO4: Design systems that uses the appropriate graph models of machine learning

CO5: Modify existing machine learning algorithms to improve classification efficiency

CO6: Classify the various models

INTRODUCTION **9**

Learning –Types of Machine Learning –Supervised Learning –The Brain and the Neuron –Design a Learning System –Perspectives and Issues in Machine Learning –Concept Learning Task –Concept Learning as Search –Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants –Perceptron –Linear Separability –Linear Regression

LINEAR MODELS **9**

Multi-layer Perceptron –Going Forwards –Going Backwards: Back Propagation Error–Multi-layer Perceptron in Practice –Examples of using the MLP –Overview –Deriving Back-Propagation –Radial Basis Functions and Splines –Concepts –RBF Network –Curse of Dimensionality –Interpolations and Basis Functions –Support Vector Machines.

TREE AND PROBABILISTIC MODELS **9**

Learning with Trees –Decision Trees–Constructing Decision Trees –Classification and Regression Trees – Ensemble Learning –Boosting –Bagging –Different ways to Combine Classifiers –Probability and Learning – Data into Probabilities –Basic Statistics –Gaussian Mixture Models –Nearest Neighbor Methods – Unsupervised Learning –K means Algorithms –Vector Quantization –Self Organizing Feature Map

DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS **9**

Dimensionality Reduction –Linear Discriminant Analysis –Principal Component Analysis –Factor Analysis –Independent Component Analysis –Locally Linear Embedding –Isomap –Least Squares Optimization –Evolutionary Learning –Genetic algorithms –Genetic Offspring: -Genetic Operators – Using Genetic Algorithms –Reinforcement Learning –Overview –Getting Lost Example –Markov Decision Process

GRAPHICAL MODELS **9**

Markov Chain Monte Carlo Methods –Sampling –Proposal Distribution–Markov Chain Monte Carlo –Graphical Models –Bayesian Networks –Markov Random Fields –Hidden Markov Models –Tracking Methods

Total Periods 45

References

1. Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)‖, Third Edition, MIT Press, 2014
2. Jason Bell, ―Machine learning –Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014
3. Stephen Marsland, ―Machine Learning –An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2			2		3	
CO2	2	2	2				2		3	
CO3	3	2	3	2			2		3	
CO4	3	2	2	2			3		2	
CO5	3	2	3				2		3	
CO6	3	2	2				2		3	

192AE22 **DIGITAL IMAGE AND VIDEO PROCESSING** **L-T-P C**
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: II** **Category:** PC

AIM: To learn the concept of MRI, ultrasound imaging, segmentation techniques and 3D visualization.

Course Outcomes:

The Students will be able to

CO1: Learn different techniques for image enhancement, video and image recovery
CO2: Analyze the image and video restoration
CO3: Apply various transforms to images and videos
CO4: Understand techniques for image and video segmentation
CO5: Study techniques for image and video compression and object recognition
CO6: Recognize the object using object tacking techniques

DIGITAL IMAGE AND VIDEO FUNDAMENTALS **9**

Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms , Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

IMAGE AND VIDEO ENHANCEMENT AND RESTORATION **9**

Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

IMAGE AND VIDEO SEGMENTATION **9**

Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

IMAGE AND VIDEO COMPRESSION **9**

Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

OBJECT RECOGNITION **9**

Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

Total Periods 45

References

1. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
2. J. W. Woods, "Multidimensional Signal, Image and Video Processing and Coding",2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods," Digital Image Processing", 3rd Edition, Prentice Hall, 2008.
4. A. M. Tekalp, "Digital Video Processing", 2nd Edition, Prentice Hall, 2015.

ourse Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	2			2		3	
CO2	2	2	2	2			2		3	
CO3	1	1	3	2			2		3	
CO4	1	2	2	2			3		2	
CO5	2	2	3	1			2		3	
CO6	3	1	2	1			2		3	

192AE27	MACHINE LEARNING LAB	L-T-P	C
		0-0-4	2

Programme: M.E.(Applied Electronics) **Sem**: II **Category:** PC

AIM: The aim of the course is to introduce students to learn state-of-the-art methods and modern programming tools for machine learning.

Course Outcomes:

The Students will be able to

CO1: Understand the fundamental concepts and methods of machine learning, statistical pattern recognition and its applications

CO2 : Analyze and evaluate simple algorithms for pattern classification

CO3: Design simple algorithms for pattern classification, code them with Python programming language and test them with benchmark data sets.

CO4: Perform image and video enhancement and segmentation

CO5 : Detect an object in an image/video using machine learning

CO6 : Classify supervised and unsupervised learning

List of Experiments

1. Implement maximum likelihood algorithm
2. Implement Bayes classifier
3. Implement linear regression
4. Design a classifier using perceptron rule
5. Design a classifier using feedforward back-propagation and delta rule algorithms
6. Implement deep learning algorithm
7. Implement linear discriminant algorithm
8. Design a two class classifier using SVM
9. Design a multiclass classifier using SVM
10. Perform unsupervised learning

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	2	1	2	2		3	
CO2	2	2	2	2	2	2	2		3	
CO3	1	1	3	2	2	3	2		3	
CO4	1	2	2	2	2	2	3		2	
CO5	2	2	3	1	1	2	2		3	
CO6	3	1	2	1	1	3	2		3	

192AE28 IMAGE AND VIDEO ANALYTICS LAB L-T-P C
0-0-4 2

Programme: M.E.(Applied Electronics) **Sem: II Category: PC**

AIM: The aim of the course is to acquire practical aspects of fundamental notions in image and video processing, as well as covers most popular tools used, such as edge detection, motion estimation, segmentation, and compression.

Course Outcomes:

The Students will be able to

CO1: Identify an appropriate sampling resolution, given the 2-D spectrum of a continuous image.
CO2: Select an appropriate format for various video applications
CO3: Perform histogram equalization and histogram specification on an image.
CO4: Implement an edge detection algorithm.
CO5 Select appropriate features for image segmentation.
CO6: Examine the color image processing.

List of Experiments

1. Image formation and perception, image representation
2. Image filtering: space- and frequency- domain filtering, linear and non-linear filters
3. Morphological image processing
4. Image geometric transformations, image registration
5. Edge detection, image segmentation, active contours, level set methods
6. Object recognition, template matching, classification
7. Clustering techniques and applications.
8. Object detection and tracking: background modeling, kernel-based tracking, particle filters
9. Computation of 3D scene from 2D
10. Coloring and color image processing.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	2	2		3	
CO2	2	2	2	2	2	2	2		3	
CO3	1	1	3	2	2	3	2		3	
CO4	3	2	2	2	3	2	3		2	
CO5	2	2	3	1	2	2	2		3	
CO6	3	2	2	1	2	3	2		3	

192AE29 **MINI PROJECT** **L-T-P C**
0-0-4 2

Programme: M.E.(Applied Electronics) **Sem:** - **Category:** EEC

AIM:

Course Outcomes:

The Students will be able to

CO1: Get an opportunity to work in actual industrial environment if they opt for internship.
CO2: Solve a live problem using software/analytical/computational tools.
CO3: Learn to write technical reports.
CO4: Develop skills to present and defend their work in front of technically qualified audience.
CO5: Publish the work into reputed Journals and Conferences
CO6: Demonstrate the design methodology for the project

Syllabus Contents:

The students are required to search / gather the material / information on a specific a topic Comprehend it and present / discuss in the class. They can take up small problems in the field of design engineering as mini project. It can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects, material characterization, studying a software tool for the solution of an engineering problem etc.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO 2	PSO3	PSO4
CO1	3	3	3	2	2	2		2		3
CO2	2	2	3	2	2	2		2		3
CO3	2	2	2	2	2	3		3		3
CO4	3	2	2	2	3	2		2		3
CO5	2	2	3	1	2	2		2		3
CO6	2	2	2	3	2	3		2		3

192AE31 **PROJECT PHASE -I** **L-T-P** **C**

0-0-12 **10**

Programme: M.E.(Applied Electronics) **Sem:** **III** **Category:** **PC**

AIM: The aim of the course is to solve the identified problem based on electronics and provide solution to Engineering community

Course Outcomes:

The Students will be able to

CO1: synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.

CO2: Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.

CO3: Ability to present the findings of their technical solution in a written report.

CO4: Presenting the work in International/ National conference or reputed journals.

CO4: Improve their communication skills, presentation skills and other soft skills

CO5: Gain the knowledge about various magazine, newsletters and journals related to their field.

CO6: Demonstrate the design methodology for the project

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

- Relevance to social needs of society
- Relevance to value addition to existing facilities in the institute
- Relevance to industry need
- Problems of national importance
- Research and development in various domain

The student should complete the following:

- Literature survey Problem Definition
- Motivation for study and Objectives
- Preliminary design / feasibility / modular approaches
- Implementation and Verification
- Report and presentation

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	2	3			3
CO2	2	2	3	2	2	2	3			3
CO3	2	2	2	2	2	3	3			3
CO4	3	2	2	2	3	2	2			3
CO5	2	2	3	1	2	2	2			3
CO6	2	2	2	3	2	3	2			3

192AE41 **PROJECT PHASE-II** **L-T-P** **C**

0-0-24 **16**

Programme: M.E.(Applied Electronics) **Sem:** **IV** **Category:** **PC**

AIM: The aim of the course is to identify the technical knowledge of student's through quality of research project undertaken by the students.

Course Outcomes:

The Students will be able to

CO1 : Demonstrate a sound technical knowledge of their selected project topic.

CO2: Undertake problem identification, formulation and solution.

CO3: perform a literature search to review current knowledge and developments in the chosen project

CO4: Undertake detailed technical work in the chosen area using one or more of theoretical studies and modeling.

CO5: Prepare an interim report describing the work undertaken and results.

CO6: Present the work in a forum involving seminar, conference, project Expo and poster presentations

.

Syllabus Contents:

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them. It may be based on:

- Experimental verification / Proof of concept.
- Design, fabrication and testing of proposed research work.
- The viva-voce examination will be based on the above report and work

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2	2	3			3
CO2	2	2	3	2	2	2	3			3
CO3	2	2	2	2	2	3	3			3
CO4	3	2	2	2	3	2	2			3
CO5	2	2	3	1	2	2	2			3
CO6	2	2	2	3	2	3	2			3

PROGRAMME ELECTIVES

192AEE01 GRAPH THEORY AND OPTIMIZATION TECHNIQUES L-T-P C
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **PE**

AIM: To develop the mathematical skill in the area of Game Theory and Optimization.

Course Outcomes:

The Students will be able to

CO1: Understand and apply the fundamental concepts in graph theory.

CO2: Learn the model problems using graphs and to solve these problems algorithmically.

CO3: Expose the concepts of modeling and optimization for solving real world Problems.

CO4: Study a systematic procedure for determining the optimal combination of decisions of dynamic programming.

CO5: Solve complex Engineering problems with linear programming

CO5: Learn the mathematical foundations of the genetic algorithm and ant colony optimization in the field of engineering.

BASIC CONCEPTS IN GRAPH THEORY **9**

Undirected graph — Degree of a vertex - Degree sequence - Sub graphs - Vertex induced sub graphs - Complement of a graph - Self complementary graphs – Walk – Path – Connectivity – Eccentricity – Radius –Diameter - Vertex and edge cuts - Vertex partition - Independent set - Clique. Digraph — Orientation – Strongly connected digraphs – Weekly connected digraphs - Unilaterally connected digraphs - Directed acyclic graph. Adjacency matrix - Incidence matrix of graphs. Trees - Spanning trees - Matrix tree theorem.

GRAPH ALGORITHMS **9**

Search algorithms — Depth first search and breadth first search - Spanning tree algorithm — Kruskal's and Prim's shortest path algorithm — Dijkstra's and Floyd-Marshall. Matching — Perfect matching, Bipartite matching. Flow networks — Augmenting path algorithm - Min-cut and max-cut algorithms.

NONTRADITIONAL OPTIMIZATION ALGORITHMS **9**

Summation convention – Contra variant and covariant vectors – contraction of tensors – inner product – quotient law – metric tensor – Christoffel symbols – covariant differentiation – gradient, divergence and curl.

LINEAR PROGRAMMING **9**

Formulation – Graphical solution – Simplex method – Two phase method –Transportation and Assignment Problems.

NON – LINEAR PROGRAMMING **9**

Integer programming problem - Pure and mixed integer – Gomory’s cutting plane algorithm. Dynamic programming problem - Principle of optimality - Backward and forward induction methods - Calculus method of solution - Tabular method of solution - Shortest path network problems - Applications in production.

Total Periods: 45

References:

1. Jonathan L Gross and Jay Yellen, ‘Graph Theory and its Applications’, Chapman & Hall, New York,2005.
2. Hamdy A Taha, ‘Operations Research. An Introduction’, Pearson Education, New Delhi, 2014.
3. West D B, ‘Introduction To Graph Theory’, Pearson Education, New Delhi, 2007.
4. Kanti Swarup, P.K.Gupta, Man Mohan ‘ Operations Research’,Twelfth Edition, Sultan Chand & Sons ,New Delhi, 2004.
5. Kalyan moy Deb, ‘Optimization for Engineering Design, Algorithms and Examples’, Prentice Hall, NewDelhi, 2010.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	1		2	1		
CO2	3	3	2				2	2		
CO3	2	2	3				1	1		
CO4	2	2	2				2	1		
CO5	2	2	1				1	2		
CO6	2	2	1				2	2		

162AEE02 **ACTIVE NETWORK AND ANALYSIS** **L-T-P C**
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: I** **Category:** PC

AIM: To familiarize the student with the analysis and design of networks and feedback amplifiers.

Course Outcomes:

The Students will be able to

CO1: Analyze the characteristics of networks.

CO2: Utilize two port networks and their parameters for network characterization.

CO3: Design and Analyze feedback amplifiers

CO4: Analyze the different feedback configurations and circuit implementations.

CO5: Design a feedback network to meet desired closed loop gain, input impedance and output impedance.

CO6: Formulate the signal flow graph for feedback theory and d etermine the stability of feedback amplifiers.

CHARACTERIZATIONS OF NETWORKS **9**

Linearity and nonlinearity, Time invariance and variance, passivity and activity, causality and non causality, Matrix characterizations of n-port networks, Equivalent frequency domain conditions of passivity, Discrete frequency concepts of passivity and activity.

ACTIVE TWO PORT NETWORKS **9**

Two port parameters, Power gain, Sensitivity, Passivity and activity, The U-function, potential instability and absolute stability, Optimum terminations of absolute stable two port networks.

THEORY OF FEEDBACK AMPLIFIERS -I **9**

Ideal feedback model, Feedback amplifier configuration, General feedback theory, The network functions and feedback.

THEORY OF FEEDBACK AMPLIFIERS -II **9**

Sensitivity function and feedback, The return functions and two port networks, Extension to feed back concepts, The relative sensitivity function and feedback, Signal flow graph formulation of feedback theory.

STABILITY OF FEEDBACK AMPLIFIERS **9**

The single loop feedback amplifiers, The Routh criterion, The Hurwitz criterion and the lienard -chipart criterion, The Nyquist criterion, Applications of Nyquist criterion to single loop feedback amplifiers, The root locus method, Root sensitivity ,Bode formulas, Bode's design theory.

Total Periods: 45

References

1. Franklin F. Kuo, "Network Analysis and Synthesis", John Wiley and sons International Editions, Singapore, 2nd Edition, 2005.

2. Wai- Kai Chen, "Passive and Active filters: Theory and implementations", B. John Wiley & Sons, NewYork, 1986..

3. Wai- Kai Chen, "Advanced series in Electrical and Computer Engineering", World Scientific, Vol.2, March 1991.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2		3	2		
CO2	3	3		3	3		2	1		
CO3	2	3	3	3	3		3	1		
CO4	2	1	1	3	2		3	3		
CO5	1	2	3	3			1	2		
CO6	3	3	2				1	1		

192AEE03 **FLEXIBLE ELECTRONICS** **L-T-P C**
3-0-0 3

Programme: M.E (Applied Electronics) **Sem: -** **Category: PE**

AIM: To provide an overview of wearable and nearable electronics

Course Outcomes:

The Students will be able to
CO1: Classify the wearable electronics technology.
CO2: Categorize the wearable electronics materials
CO3: Apply the methods of wearable sheet type and manufacturing
CO4: Acquire the knowledge about the display circuits
CO5:Apply the various wearable electronics applications
CO6: Analyze the wearable electronics fabrication process.

OVERVIEW WEARABLE ELECTRONIICS TECHNOLOGY **9**

History of Flexible Electronics - Materials for Flexible Electronics - Degrees of Flexibility – Substrates Backplane Electronic – Front plane Technologies – Encapsulation - Fabrication Technology for Flexible Electronics - Fabrication on Sheets by Batch Processing - Fabrication on Web by Roll-to-Roll Processing - Additive Printing.

WEARABLE ELECTRONICS MATERIALS **9**

Introduction of Materials Considerations for Flexible Electronics - Overview - Inorganic Semiconductors and Dielectrics - Organic Semiconductors and Dielectrics – Conductors- materials issue Issues of organic photovoltaicbasic operation -photocurrent - dark current.

WEARABLE SHEET TYPE **9**

Introduction - Sheet-type Image Scanners - Methods - Device Structure and Manufacturing Process Electronic Performance of Organic Photodiodes Organic Transistors Photo sensor Cells Issues Related to Device Processes: Pixel Stability and Resolution A Hierarchal Approach for Slow Organic Circuits The Double-Wordline and Double-Bitline Structure - A New Dynamic Second-Wordline Decoder Higher Speed Operation with Lower Power Consumption - Sheet Type Braille Displays - Manufacturing Process Electronic Performance of Braille Cells .

FLEXIBLE DISPLAY AND CIRCUITS **9**

Introduction - Enabling Technologies for Flexible Backplanes and Flexible Substrate Technologies TFT Technologies for Flexible Backplanes Display Media for Flexible Displays (LCD, reflective-EP, OLED) Barrier Layers - Important Organic TFT Parameters for Electronic Systems Field-Effect Mobility - Threshold Voltage - Leakage Currents - Liquid Crystal and Electrophoretic Displays Active Matrix OLED .

APPLICATION OF WEARABLE NEARABLE **9**

Photovoltaic cells – Solar cells - Photo sensor Cells - lithography - LED –LCD - OLED- Active Matrix OLED.

Total Periods 45

References

1. Mario Caironi and Yong-Young Noh, “Large Area and Flexible Electronics“, Wiley, 2015.
2. GuozhenShen, “Flexible Electronics from materials to devices”, World Scientific,2015.
3. Alberto Salleo and William S. Wong, “Flexible Electronics Materials and Applications”, Springer, 2009.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3		1	2		
CO2	2	3	2	2	3		2	2		
CO3	3	3	3	2	2		1	2		
CO4	3	3	2	2	3		2	2		
CO5	2	3	3	3	2		1	3		
CO6	2	3	2	2	2		1	2		

192AEE04 **RELIABILITY AND FAULT ANALYSIS OF ELECTRONIC DEVICES** **L-T-P C**

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: -** **Category:**

AIM:

Course Outcomes:

The Students will be able to

CO1: Classify difference types of fault modes
CO2: Formulate mathematical model for fault for diagnosis
CO3: Identify the root causes of faults
CO4: Determine the issues in the Electronic device packages
CO5 : Interpret various fault analysis techniques
CO6: Analysis the degradation performance of PV modules

INTRODUCTION **9**

Background and Introduction: Definitions of reliability, failure modes, mechanisms, cost of warranty returns, motivation for improving product reliability in the era of Planned Obsolescence

MATHEMATICAL METHODS FOR RELIABILITY **9**

Failure rates, Normal distribution function, Six Sigma, Exponential, Weibull and Lognormal distributions for reliability modeling. Manufacturing yields. Accelerated testing: Types of accelerated tests, Designing accelerated tests for typical stressors experienced in field, Acceleration factors, Arrhenius, Eyring and modified Coffin-Manson models

SEMICONDUCTOR DEVICE PACKAGING **9**

Materials and processes used for semiconductor device packaging, stresses induced because of packaging. Physics of failure based models for : Mass transport-induced failures (electromiration and stress voiding), Electronic charge-induced failures (Dielectric breakdown, Hot carrier effects, Electrical over-stress and Electrostatic discharge), Environmental damage (moisture ingress, corrosion, radiation damage), Degradation of interconnects (solder creep and fatigue).

FAILURE ANALYSIS TECHNIQUES **9**

Non-destructive techniques – I-V trace, Infrared, X-ray and Electroluminescence imagining, Destructive techniques- chemical / thermal / mechanical decapsulation of electronic devices for die-level failure analysis, materials analysis techniques – FTIR, EDX

SPECIAL TOPICS **9**

Design for reliability, degradation in photovoltaic (PV) modules, systems reliability.

Total Periods 45

References

1. M. Ohring, Reliability and Failure of Electronic Materials and Devices, First Edition, Academic Press, 1998.
2. J.W. McPherson, Reliability Physics and Engineering, Second Edition, Springer, 2013.
3. J.Ross, Microelectronic Failure Analysis, Sixth Edition, ASTM International, 2011.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2			1	2		
CO2	3	3	2	2			2	2		
CO3	1	2	1	2			1	2		
CO4	3	2	2	2			2	2		
CO5	1	2	3	3			1	3		
CO6	2	3	1	2			1	2		

192AEE05 **SOFT COMPUTING TECHNIQUES** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: -** **Category:** **PE**

AIM: To analyze, model and apply the Intelligent computing to real time applications.

Course Outcomes:

The Students will be able to

CO1: Analyze the Fuzzy expert system

CO2: Analyze the components and building blocks of Fuzzy rules and modeling

CO3: Implement Neural networks in Artificial Intelligence

CO4: Design of genetic algorithms for Engineering applications

CO6: Interpret Multilevel Optimization Techniques

CO5: Apply computational intelligence techniques to classification, pattern recognition, Biomedical Engg.

INTRODUCTION TO SOFT COMPUTING **9**

Introduction of soft computing - soft computing vs. hard computing - various types of soft computing techniques - Fuzzy Computing - Fuzzy Sets-Basic Definition and Terminology Set-theoretic Operations - Member Function Formulation and Parameterization. Neural Computing - Genetic Algorithms-Associative Memory – Classification – Clustering - Probabilistic reasoning.

FUZZY LOGIC **9**

Fuzzy Rules - Fuzzy Relations - Fuzzy If-Then Rules - Fuzzy Reasoning - Fuzzy Inference Systems - Mamdani Fuzzy Models - Sugeno Fuzzy Models - Tsukamoto Fuzzy Models - Input Space Partitioning and Fuzzy Modeling.

NEURAL NETWORKS **9**

Supervised Learning Neural Networks - Perceptrons - Adaline - Backpropagation Mutilayer Perceptrons - Radial Basis Function Networks. Unsupervised Learning Neural Networks - Competitive Learning Networks - Kohonen Self- Organizing Networks - Learning Vector Quantization - Hebbian Learning. Case study: Applications of ANN in research

GENETIC ALGORITHM **9**

History of Genetic Algorithms (GA) - Working Principle - Various Encoding methods - Fitness function - GA Operators – Reproduction – Crossover – Mutation - Convergence of GA - Bit wise operation in GA - Multi-level Optimization

HYBRID SYSTEMS **9**

Fuzzy-Neural Systems, Neuro-Genetic Systems, Fuzzy-Genetic Systems, GA based Weight Determination, Fuzzy BP Architecture, Learning in Fuzzy BP. Soft Computing Applications-Case study- Image processing – Kinematics Problems – Automobile– Control system-Biomedical Applications.

Total Periods 45

References

1. S. Rajasekaran and G.A.V.Pai, .Neural Networks, Fuzzy Logic and Genetic Algorithms., PHI, 2003.
2. S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
4. J.S.R.Jang "Neuro-Fuzzy and Soft Computing" PHI 2003.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	2		1	2		
CO2	3	3	3	2	1		2	2		
CO3	2	2	3	2	2		1	2		
CO4	3	2	2	2	3		2	2		
CO5	2	2	3	3	2		1	3		
CO6	3	3	2	3	2		1	2		

192AEE06 **SENSORS AND INTERFACE ELECTRONICS** **L-T-P C**

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: To understand the basic laws and phenomena on which operation of sensors and actuators in industrial environment.

Course Outcomes:

The Students will be able to

CO1: Explain fundamental physical and technical base of sensors and actuators,

CO2: Describe basic laws and phenomena that define behaviour of sensors and actuators,

CO3: Analyze various premises, approaches, procedures and results related to sensors and actuators

CO4: Design a self generating sensors

CO5: Create analytical design and development solutions for sensors and actuators,

CO6: Conduct experiments and measurements in laboratory and on real components, sensors and actuators for the development of application.

INTRODUCTION TO MEASUREMENT SYSTEMS 9

Introduction to measurement systems: general concepts and terminology, measurement systems, sensor classification, general input-output configuration, methods of correction, performance characteristics: static characteristics of measurement systems, accuracy, precision, sensitivity, other characteristics: linearity, resolution, systematic errors, random errors, dynamic characteristics of measurement systems: zero-order, first-order, and second-order measurement systems and response.

RESISTIVE AND REACTIVE SENSORS 9

Resistive sensors: potentiometers, strain gages, resistive temperature detectors, magneto resistors, light-dependent resistors, Signal conditioning for resistive sensors: Wheatstone bridge, sensor bridge calibration and compensation, Instrumentation amplifiers, sources of interference and interference reduction, Reactance variation and electromagnetic sensors, capacitive sensors, differential, inductive sensors, linear variable differential transformers (LVDT), magneto elastic sensors, hall effect sensors, Signal conditioning for reactance-based sensors & application to the LVDT.

SELF-GENERATING SENSORS 9

Self-generating sensors: thermoelectric sensors, piezoelectric sensors, pyroelectric sensors, photovoltaic sensors, electrochemical sensors, Signal conditioning for self-generating sensors: chopper and low-drift amplifiers, offset and drifts amplifiers, electrometer amplifiers, charge amplifiers, noise in amplifiers.

ACTUATORS DRIVE CHARACTERISTICS AND APPLICATIONS 9

Relays, Solenoid drive, Stepper Motors, Voice-Coil actuators, Servo Motors, DC motors and motor control, 4-to-20 mA Drive, Hydraulic actuators, variable transformers: synchros, resolvers, Inductosyn, resolver-to-digital and digital-to-resolver converters.

DIGITAL SENSORS AND SEMICONDUCTOR DEVICE SENSORS 9

Digital sensors: position encoders, variable frequency sensors – quartz digital thermometer, vibrating wire strain gages, vibrating cylinder sensors, saw sensors, digital flow meters, Sensors based on semiconductor junctions: thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, sensors based on MOSFET transistors, CCD imaging sensors , ultrasonic sensors, fiber-optic sensors.

Total Periods 45

References

1. Andrzej M. Pawlak Sensors and Actuators in Mechatronics Design and Applications, 2006.

3. Kevin James, PC Interfacing and Data acquisition, Elsevier, 2011.

4. Ramon Pallás Areny, John G. Webster, "Sensors and Signal conditioning", 2nd edition, John Wiley and Sons, 2000.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	2	3		1	3		
CO2	3	3	1	2	2		2	3		
CO3	2	1	3	2	2		1	2		
CO4	3	1	2	2	3		2	2		
CO5	3	3	2	3	2		2	3		
CO6	2	3	2	3	1		2	2		

192AEE07 **BIO MEDICAL SIGNAL ANALYSIS** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To know the concept about bio signal waves, Time series analysis and to discuss about removal of artifacts and special topics on bio signal processing.

Course Outcomes:

The Students will be able to

CO1: Categorize knowledge about Bio signal wave shapes and its Complexity

CO2: Estimate Time series analysis and Spectral Estimation

CO3: Apply the removal of artifacts in Bio Signals

CO4: Elaborate the Bio signal Pattern Classification

CO5. Build Chaos theory on bio signals

BIO SIGNAL WAVE SHAPES AND WAVEFORM COMPLEXITY **9**

Introduction to Biomedical signals-overview and characteristics of ECG, ENG, EMG, ERPs, EGG, PCG, Carotid pulse, EOG, VMG, VAG, and Oto acoustic emission signals-Bio signal acquisition-conversion and analysis. Morphological analysis of ECG-Envelope extraction and analysis of PCG-Correlation and Cross spectral analysis of EEG Channels.

TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION **9**

Time series analysis-linear prediction models-Time variant systems-Adaptive segmentation - Spectral Estimation-Blackman Tuckey method-Periodogram and model based estimation

9

REMOVAL OF ARTIFACTS

Noise sources in biomedical signals-Review of optimal filtering-adaptive filters-LMS&RLS Adaptive filters-Removal of Artifacts in ECG-Maternal-Fetal ECG-Muscle contraction interference-use of adaptive filters for segmentation in ECG and PCG Signals.

BIO SIGNAL PATTERN CLASSIFICATION AND DIAGNOSTIC DECISION **9**

Pattern classification as applied to Bio signals-supervised pattern classification- unsupervised pattern classification-Probabilistic models and statistical training and test steps-Neural networks-measures of diagnostic accuracy and cost-Reliability of classifiers and decisions.

SPECIAL TOPICS ON BIO SIGNAL PROCESSING **9**

Application of wavelet transform-TFR representation-ECG Characterization-wavelet networks-data compression of ECG and EEG signals-Application of chaos theory on Bio signals.

Total Periods 45

References

1 Rangaraj. M.Rangayyan, “Biomedical Signal Analysis-A Case Study Approach”, IEEE Press-John Wiley & Sons Inc, New York, 2002.

2 Arnon-Cohen, “Bio-Medical Signal Processing”, Vol I&II, CRC Press. 1995.

3 W.J.Tompkins, “Biomedical Digital signal processing”. Prentice hall, New Jersey, 1993.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	3	1		2		2	
CO2	3	3	1	2	2		2		3	
CO3	2	3	3	2	2		2		2	
CO4	3	2	3	2	2		2		1	
CO5	3	1	2	1	2		2		3	
CO6	3	1	2	1	1		2		2	

192AEE08 **DEEP LEARNING METHODS AND APPLICATIONS** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To provide strong foundation in Deep Learning for student-researchers who are deeply interested in Machine Learning/Artificial Intelligence.

Course Outcomes:

The Students will be able to

CO1: Understand the fundamentals of Deep Learning.

CO2: Gain the knowledge of the different modalities of Deep learning currently used.

CO3: Acquire Knowledge about State-of the art models and Other Important Works in recent years.

CO4: Learn the skills to develop Deep Learning based AI Systems

CO5: Design different Deep neural network models

CO6: Apply CNN & RNN algorithms into images and videos

INTRODUCTION **9**

History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks

9

FEEDFORWARD NEURAL NETWORKS

FeedForward Neural Networks, Backpropagation Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis Principal Component Analysis and its interpretations, Singular Value Decomposition

AUTOENCODERS **9**

Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders. Encoder Decoder Models, Attention Mechanism, Attention over images.

REGULARIZATION **9**

Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization Learning Vectorial Representations Of Words

CNN &RNN MODELS **9**

Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks. Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs

Total Periods 45

References

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville “Deep Learning” , The MIT Press , 2016.
2. Adam Gibson and Josh Patterson “Deep Learning: A Practitioners Approach”O-Reilly Press, 2017
3. Francois Chollet “ Deep Learning with Python” O-Reilly Press, 2016.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3		3		3	
CO2	3	2	2	2			3		2	
CO3	2	2	2	2			2		2	
CO4	3	3	2	2	1		2		2	
CO5	2	3	2	3	2		3		3	
CO6	2	3	2	1	1		2		3	

192AEE09 ARM ARCHITECTURE AND PROGRAMMING L-T-P C

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: This course will provide an opportunity to the students to become familiar with ARM microprocessor architecture, instruction set and programming.

Course Outcomes:

The Students will be able to

CO1: Analyze the advance microprocessor family set.

CO2: Illustrate the architecture of ARM processor.

CO3: Apply the instruction set of ARM processor to various applications.

CO4: Apply the hybrid (assembly & C) program for ARM microprocessor.

CO5: Outline input/output devices like Keyboard, LED, LCD, sensors with ARM7TDMI.

CO6: Design memory for Embedded products using ARM

INTRODUCTION 9

Need of advance microprocessors, Difference between RISC and CISC, RISC Design philosophy, ARM Design Philosophy, History of ARM microprocessor, ARM processor family, Development of ARM architecture.

THE ARM ARCHITECTURE AND PROGRAMMERS MODEL 9

The Acorn RISC Machine, ARM Core data flow model, Architectural inheritance, The ARM7TDMI programmer's model: General purpose registers, CPSR, SPSR, ARM memory map, data format, load and store architecture, Core extensions, Architecture revisions, ARM development tools.

ARM INSTRUCTION SET 9

Data processing instructions, Arithmetic and logical instructions, Rotate and barrel shifter, Branch instructions, Load and store instructions, Software interrupt instructions, Program status register instructions, Conditional execution, Multiple register load and store instructions, Stack instructions, Thumb instruction set, advantage of thumb instructions, Assembler rules and directives, Assembly language programs for shifting of data, swapping register contents, moving values between integer and floating point registers.

C PROGRAMMING FOR ARM 9

Overview of C compiler and optimization, Basic C data types, C Looping structures, Register allocations, function calls, pointer aliasing, structure arrangement, bit fields, unaligned data and Endianness, Division, floating point, Inline functions and inline assembly, Portability issues. C programs for General purpose I/O, general purpose timer, PWM Modulator, UART, I2C Interface, SPI Interface, ADC, DAC.

MEMORY MANAGEMENT UNITS 9

Moving from memory protection unit (MPU) to memory management unit (MMU), Working of virtual memory, Multitasking, Memory organization in virtual memory system, Page tables, Translation look aside buffer, Caches and write buffer, Fast context switch extension, Advanced Microprocessor Bus Architecture (AMBA) Bus System, User peripherals, Exception handling in ARM, ARM optimization techniques.

Total Periods: 45

References:

1. William Hohl, ChristppherHinds , "Arm Assembly Language, Fundamentals and Techniques", 2nd edition, 2014.
2. Andrew N. Sloss , "Arm System Developer's Guide, Designing and Optimizing Software", 1st Edition 2004.
3. Steve Furber , "Arm System-on-chip Architecture", 2nd Edition, 2000.
4. Muhammad Ali Mazidi, "ARM Assembly Language programming & Architecture", 1st edition, 2016

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	2	3		2	2		
CO2	3	3	1	2	2		2	3		
CO3	3	2	3	2	2		3	1		
CO4	3	1	2	2	3		2	2		
CO5	3	3	3	2	2		3	3		
CO6	2	2	2	2	3		2	2		

192AEE10 ARCHITECTURE OF INTERNET OF THINGS L-T-P C
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: -** **Category:** PE

AIM: The aim of the course is to make the students design and implement IOT in real time applications.

Course Outcomes:

The Students will be able to
CO1: Identify the components of IOT
CO2: Design a portable IOT using appropriate boards
CO3: Program the sensors and controller as part of IOT
CO4: Apply the schemes for the applications of IOT in real time scenarios.
CO5: Determine the real time performance of real time packet based Networks.
CO6: Analyze trade-offs in interconnected wireless embedded sensor networks.

INTRODUCTION 9

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security –privacy. Components in internet of things: Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

PROGRAMMING THE MICROCONTROLLER FOR IOT 9

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/ Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using wifi / ethernet

RESOURCE MANAGEMENT IN THE INTERNET OF THINGS 9

Clustering – software Agents – Data Synchronization – Clustering Principles in an Internet of Things Architecture – The Role of Context – Design Guidelines –Software Agents for object – Data Synchronization – Types of Network Architectures – fundamental concepts of Agility and Autonomy – Enabling Autonomy and agility by the Internet of Things

BUSINESS MODELS FOR THE INTERNET OF THINGS 9

The Meaning of DiY in the Network Society – Sensor actuator Technologies and Middleware as as Basis for DiY Service Creation Framework –Device Integration –Middleware Technologies Needed for DiY Internet of Things Semantic Interoperability as a Requirement for DiY creation –Ontology – value Creation in the Internet of Things – Application of Ontology Engineering in the Internet of Things –Semantic Web Ontology – the Interne of Things in Context of Eurudice – Buisness Impact

FROM THE INTERNET OF THINGS TO THE WEB OF THINGS 9

Resource-oriented Architecture and Best Practices-Designing REST ful Smart Things –Web –enabling Constrained Devices – The Future Web of Things –Set up Cloud environment - Send data from microcontroller to cloud – Case Studies – Open Source e- Health sensor platform –Be Close Elderly monitoring – other recent projects

Total Periods 45

References

1. Charalampos Doukas, Building Internet of Things with the Arduino, Create Space, April 2002.
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011.
3. CunoPfister, "Getting Started with the Internet of Things", O'Reilly, 2011.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3		1	2		1
CO2	2	3	2	2	3	1	2	2		2
CO3	3	3	3	2	2	1	1	2		1
CO4	3	3	2	2	3	1	2	2		
CO5	2	3	3	3	2		1	3		1
CO6	2	3	2	2	2	1	1	2		2

192AEE11 **DEVICE MODELING** **L-T-P**
3-0-0

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To creates models for the behavior of the electrical devices based on fundamental physics.

Course Outcomes:

The Students will be able to

CO1: Demonstrate the Basic operation and advanced MOSFET modeling.
CO2: Apply the high frequency behavior of MOS transistor and A.C small signal modeling.
CO3: Analyze the concept of noise modeling and calculation of distortion in analog CMOS circuits.
CO4: Describe the MOSFET Modeling and its applications.
CO5: Classify the types of other MOSFET modeling.
CO6: Design an influence of process variation and it's applications

MOSFET DEVICE PHYSICS 9

MOSFET capacitor, Basic operation, Basic modeling, Advanced MOSFET modeling, RF modeling of MOS transistors, Equivalent circuit representation of MOS transistor, High frequency behavior of MOS transistor and A.C small signal modeling, model parameter extraction, modeling parasitic BJT, Resistors,Capacitors, Inductors.

NOISE MODELING 9

Noise sources in MOSFET, Flicker noise modeling, Thermal noise modeling, model for accurate distortion analysis, nonlinearities in CMOS devices and modeling, calculation of distortion in analog CMOS circuits.

BSIM4 MOSFET MODELING 9

Gate dielectric model, Enhanced model for effective DC and AC channel length and width, Threshold voltage model, Channel charge model, mobility model, Source/drain resistance model, I-V model, gate tunneling current model, substrate current models, Capacitance models, High speed model, RF model, noise model, junction diode models, Layout-dependent parasitic model.

OTHER MOSFET MODELS 9

The EKV model, model features, long channel drain current model, modeling second order effects of the drain current, modeling of charge storage effects, Nonquasi- static modeling, noise model temperature effects, MOS model , MOSAI model).

MODELLING OF PROCESS VARIATION AND QUALITY ASSURANCE 9

Influence of process variation, modeling of device mismatch for Analog/RFApplications, Benchmark circuits for quality assurance, Automation of the tests.

Total Periods 45

References

1. TrondYtterdal, Yuhua Cheng and Tor A. FjeldlyWayne Wolf, "Device Modeling for Analog and RF CMOS Circuit Design", John Wiley & Sons Ltd,2003.
2. Tar Fjeldly, Trond Ytterdal and Michael S. Shur " Introduction to Device Modeling and Circuit Simulation" Wiley-Blackwell, 1997.
3. Giuseppe Massabrio and Paolo Antognetti "Semiconductor Device Modeling with Spice" Tata McHill, 2010.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	2			2		
CO2	3	1	2	2	2			2		
CO3	3	3	2	3	1			3		
CO4	2	2	1	3	2			2		
CO5	2		1		2			2		
CO6	1	1	3	1				1		

192AEE12 DATA WAREHOUSING AND DATA MINING L-T-P C
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: To familiar the fundamental concepts different types of data and its processing algorithms

The Students will be able to

CO1: Demonstrate the basic working principles of data warehousing.
CO2: Examine the concepts of data mining techniques.
CO3: Design the architecture to process the data.
CO4: Categorize the data processing based on their prediction techniques.
CO5: Analyze the data using recent technology.
CO6: Classify various data set for both supervised and unsupervised data's.

INTRODUCTION AND DATA WAREHOUSING 9

Introduction, Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Implementation, Further Development, Data Warehousing to Data Mining

DATA PREPROCESSING, LANGUAGE, ARCHITECTURES, CONCEPT DESCRIPTION 9

Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces, Architectures, Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.

ASSOCIATION RULES& DATABASES 9

Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi- Level Association Rules from Transaction Databases

CLASSIFICATION AND CLUSTERING 9

Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Cluster Analysis, Types of data, Categorization of methods, Partitioning methods, Outlier Analysis.

RECENT TRENDS IN DATA MINING 9

Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining.

Total Periods 45

References

1. J. Han, M. Kamber, "Data Mining: Concepts and Techniques", Harcourt India / Morgan Kauffman, 2001.
2.Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education 2004.
3. Sam Anahory, Dennis Murry, "Data Warehousing in the real world", Pearson Education 2003.
4. David Hand, Heikki Manila, PadhraicSymth, "Principles of Data Mining", PHI 2004.

.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	3			3	1		
CO2	2	2	3	3			2	2		
CO3	3	2	1	1			3	1		
CO4	3	3	2	2			2	2		
CO5	2	2	1	1			1	2		
CO6	2	1	2	2			2	1		

192AEE13	BIG DATA COMPUTING	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To highlight and explore the need for big data.

Course Outcomes:

CO1: Identify the various sources of Big Data
C02: Design new algorithms for collecting Big Data from various sources
CO3: Design algorithms for pre-processing Big Data other than the traditional approaches
CO4: Examine methodologies to extract data from structured and un-structured data for analytics
CO5: Develop big data application in HADOOP environment
CO6: Apply data privacy concepts in real time bigdata applications

INTRODUCTION TO BIG DATA ACQUISITION **9**

Big data framework -Fundamental concepts of Big Data management and analytics -Current challenges and trendsin Big Data Acquisition.

DATA COLLECTION AND TRANSMISSION **9**

Big data collection-Strategies-Types of Data Sources-Structured Vs Unstructured data-ELT vs ETL -storage infrastructure requirements -Collection methods-Log files-Sensors-Methods for acquiring network data (Libcap-based and zero-copy packet capture technology) -Specialized network monitoring softwares (Wireshark, martsniff and Winnetcap)-Mobile equipment's-Transmission methods- Issues

DATA PREPROCESSING **9**

Data pre-processing overview-Sampling-Missing Values -Outlier Detection and Treatment -Standardizing Data-Categorization -Weights of Evidence Coding -Variable Selection and Segmentation.

DATA ANALYTICS **9**

Predictive Analytics (Regression, Decision Tree, Neural Networks) -Descriptive Analytics (Association Rules, Sequence Rules), Survival Analysis (Survival Analysis Measurements, Kaplan Meir Analysis, Parametric Survival Analysis) -Social Network Analytics (Social Network Learning-Relational Neighbor Classification)

BIG DATA PRIVACY AND APPLICATIONS **9**

Data Masking –Privately Identified Information (PII) -Privacy preservation in Big Data-Popular Big Data Techniques and tools-Map Reduce paradigm and the Hadoop system-Applications-Social Media Analytics- Recommender Systems-Fraud Detection.

Total Periods 45

Reference Books

1. Bart Baesens," Analytics in a Big Data World:The Essential Guide to Data Science and its Applications",John Wiley & Sons, 2014.
2.Min Chen, Shiwen Mao, Yin Zhang, Victor CM Leung ,Big Data: Related Technologies, Challenges and Future Prospects, Springer, 2014.
3.MichaelMinelli,MicheleChambers,AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends",John Wiley& Sons, 2013.
4.Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3			3	1		
CO2	2	2	2	3			2	2		
CO3	3	1	1	4			3	1		
CO4	3	3	2	2			2	2		
CO5	2	3	2	3			1	3		
CO6	3	3	2	2			3	3		

192AEE14 **CAD FOR VLSI CIRCUITS** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To gain the knowledge on Simulation and Synthesis in VLSI Design Automation

Course Outcomes:

The Students will be able to

CO1.Design advanced electronics systems

CO2.Evaluate and analyze the systems in VLSI design environments.

CO3.Apply advanced technical knowledge in multiple contexts

CO4.Conduct an organized and systematic study on significant research topic within the field of VLSI and its allied field

CO5: Model the hardware architecture and synthesis using CAD tools

VLSI DESIGN METHODOLOGIES **9**

Introduction to VLSI Design methodologies -Review of Data structures and algorithms -Review of VLSI Design automation tools -Algorithmic Graph Theory and Computational Complexity -Tractable and Intractable problems -general purpose methods for combinatorial optimization.

DESIGN RULES **9**

Layout Compaction -Design rules -problem formulation -algorithms for constraint graph compaction -placement and partitioning –Circuit representation –Placement algorithms -partitioning.

FLOOR PLANNING **9**

Floor planning concepts -shape functions and floorplan sizing -Types of local routing problems -Area routing -channel routing -global routing -algorithms for global routing.

SIMULATION **9**

imulation -Gate-level modeling and simulation -Switch-level modeling and simulation -Combinational Logic Synthesis -Binary Decision Diagrams -Two Level Logic Synthesis.

MODELLING AND SYNTHESIS **9**

High level Synthesis -Hardware models -Internal representation -Allocation -assignment and scheduling -Simple scheduling algorithm –Assignment problem–High level transformations.

Total Periods 45

References

1. S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, 2002.

2. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwer Academic Publishers, 2002.

3.Erik Brunvand " Digital VLSI Chip Design with Cadence and Synopsys CAD Tools" Pearson; 1st edition, 2009

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2			1	2		
CO2	3	1	2	3			3	1		
CO3	2	3	2	3			2	3		
CO4	2	3	2	1			1	3		
CO5	1	2	2	1			3	2		
CO6	2	2	3	1			2	3		

192AEE15 **VLSI TESTING AND VERIFICATION** **L-T-P C**

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: -** **Category:**

AIM: To discuss different aspects of VLSI testing and formal verification of designs.

Course Outcomes:

The Students will be able to

CO1: Analyze the use of Multilevel and Heuristic Minimization

CO2: Design Binary Decision Diagram for VLSI circuits

CO3: Apply various testing tools in VLSI circuits

CO4: Understand the various faults in VLSI Circuits.

CO5: Generate various test pattern vector for VLSI circuits

CO6: Use advanced testing tools

INTRODUCTION **9**

Introduction to Digital VLSI Design Flow- High Level Design Representation- Transformations for High Level Synthesis- Scheduling, Allocation and Binding- Introduction to HLS: Scheduling, Allocation and Binding Problem- -Scheduling Algorithms - Binding and Allocation Algorithms- Logic Optimization and Synthesis- Two level Boolean Logic Synthesis - Heuristic Minimization of Two-Level Circuits- Finite State Machine Synthesis- Multilevel Implementation

VERIFICATION **9**

Binary Decision Diagram- Binary Decision Diagram: Introduction and construction- Ordered Binary Decision Diagram- Operations on Ordered Binary Decision Diagram- Ordered Binary Decision Diagram for Sequential Circuits- Temporal Logic- Introduction and Basic Operations on Temporal Logic- Syntax and Semantics of CLT- Equivalence between CTL Formulas- Model Checking- Verification Techniques - Model Checking Algorithm- Symbolic Model Checking

TESTING **9**

Introduction to Digital Testing- Introduction to Digital VLSI Testing- Functional and Structural Testing -Fault Equivalence.

FAULT ANALYSIS & PATTERN GENERATION **9**

Fault Simulation and Testability Measures- Fault Simulation- Testability Measures (SCOAP) - Combinational Circuit Test Pattern Generation- Introduction to Automatic Test Pattern Generation (ATPG) and ATPG Algebras-Algorithm

ADVANCED TESTING **9**

Sequential Circuit Testing and Scan Chains- ATPG for Synchronous Sequential Circuits- Scan Chain based Sequential Circuit Testing- Built in Self test (BIST)- Built in Self Test- Memory Testing

Total Periods 45

References

1. D. D. Gajski, N. D. Dutt, A.C.-H. Wu and S.Y.-L. Lin, High-Level Synthesis: Introduction to Chip and System Design, Springer, 1st edition, 1992.
2. S. Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Prentice Hall, 2nd edition, 2003.
3. M. Huth and M. Ryan, Logic in Computer Science modeling and reasoning about systems, Cambridge University Press, 2nd Edition, 2004.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	2			1	3		
CO2	3	1	3	2			3	1		
CO3	2	3	2	1			2	3		
CO4	1	2	2	3			3	2		
CO5	3	2	3	1			3	2		
CO6	2	3	1	2			2	1		

192AEE16 **NEUROMORPHIC ENGINEERING** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: I** **Category: PE**

AIM: The basic information about design of VLSI circuits with the neural network applications

Course Outcomes:

The Students will be able to

CO1: develop power efficient hardware technologies to process real-world noisy data, using techniques employed by the brain.

CO2: discuss the fundamental concepts and current trends in designing neuromorphic devices, circuits, and systems

CO3: Emphasis on neuromorphic engineering in MOS transistors in CMOS technology, static circuits, dynamic circuits, systems with PSOC.

CO4: Demonstrate Analog and Digital neuromorphic systems

CO5: Design spiking neural large systems

CO6: Apply digital neuromorphic systems into VLSI circuits

INTRODUCTION **9**

Introduction to Neuromorphic Engineering; Signalling and operation of Biological neurons, neuron models, signal encoding and statistics; Synapses and plasticity rules, biological neural circuits; Neuromorphic design principles;,

ANALOG AND DIGITAL ELECTRONIC NEURON DESIGN **9**

FETs - device physics and sub-threshold circuits; Analog and digital electronic neuron design; Non-volatile memristive semiconductor devices;

SPIKING NEURAL NETWORKS **9**

Electronic synapse design; Interconnection Networks; Interconnection schemes for large non-spiking and spiking neural networks

NEUROMORPHIC VLSI **9**

Analysis of design, architecture and performance characteristics of demonstrated chips employing Analog neuromorphic VLSI

DIGITAL NEUROMORPHIC VLSI **9**

Digital neuromorphic VLSI, Electronic synapses and other neuromorphic systems.

Total Periods: 45

References:

1. Shih-Chii Liu, Jörg Kramer, Giacomo Indiveri, Tobias Delbrück, Rodney Douglas, Analog VLSI: circuits and principles, MIT press, 2002.
2. Carver Mead, Analog VLSI and neural systems, Addison-Wesley, 1989.
3. Eric Kandel, James Schwartz, Thomas Jessell, Steven Siegelbaum, A.J. Hudspeth, Principles of neural science, McGraw Hill 2012.
4. Dale Purves, Neuroscience, Sinauer, 2008.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	3			2	3		
CO2	3	2	1	3			3	2		
CO3	2	3	2	1			3	1		
CO4	1	2	3	3			3	3		
CO5	3	2	1	2			2	1		
CO6	2	2	3	3			3	1		

192AEE17 STATISTICAL PATTERN RECOGNITION L-T-P C
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: students should be able to understand and apply existing models and (learning) algorithms for statistical pattern recognition, such as Gaussian models, mixture models, EM, neural networks and the well known backprop algorithm, and to motivate, formulate and derive their own ones.

Course Outcomes:

CO1: Analyze the Probability, statistics, and random processes as applied to statistical pattern recognition
CO2: Analyze classification problems probabilistically and estimate classifier performance
CO3: Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density models and hidden Markov models,
CO4: summarize the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models.
CO5:Gain knowledge about nonparametric techniques
CO6: Familiarity with unsupervised learning and clustering methods.

INTRODUCTION 9

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test

PARAMETERS OF PATTERN RECOGNITION 9

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions

LIKLIHOOD AND BAYESIAN PARAMETER ESTIMATION METHODS 9

Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

NONPARAMETRIC TECHNIQUES 9

Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification

UNSUPERVISED LEARNING & CLUSTERING 9

Criterion functions for clustering, Clustering Techniques: Iterative square - error partition clustering – K means, agglomerative hierarchical clustering, Cluster validation.

Total Periods 45

References

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.
4. Andrew R. Webb, "Statistical Pattern Recognition, Second Edition ,John Wiley & Sons, Ltd,2002.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3			3		3	
CO2	3	2	1	2			2		1	
CO3	2	3	3	2			3		2	
CO4	2	2	1	2			2		3	
CO5	2	3	3	1			2		1	
CO6	2	3	1	2			1		2	

192AEE18	SMART ANTENNAS	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem:** - **Category:** PE

Prerequisites:

AIM: To know about the concept of Smart Antennas and to develop adaptive algorithms for smart antennas

Course Outcomes:

The Students will be able to

CO1. Realize principles of Smart Antennas

CO2. Analyze and apply DOA concepts to design Smart antennas

CO3. Analyze the spatial channel model

CO4.Create the application specific smart antennas

CO5. Evaluate the performance of the multi user smart antennas

CO6: Apply simulation tools for smart antenna design

INTRODUCTION **9**

Spatial processing- Adaptive antennas- Beam forming networks, Switched Beam systems, Spatial Processing Receivers, Adaptive Antenna Systems, Transmission Beamforming, Digital radio receiver techniques and software radios.

MULTI-USER SPATIAL PROCESSING TECHNIQUES **9**

Multi-user spatial Processing, Dynamic re-sectoring- Range and capacity extension Range and Capacity analysis using smart antennas. Spatio – temporal channel models. Wireless Multipath Channel Models, Environment, and Signal Parameters, Spatio-Temporal Channel Models for Smart Antenna design, Spatial Channel Measurements, Application of Spatial Channel Models, Environment and signal parameters. Geometrically based single bounce elliptical model.

DOA ESTIMATION **9**

DOA estimation – conventional and subspace methods. ML estimation techniques. Estimation of the number of sources using Eigen decomposition. DOA Estimation under Coherent Signal Conditions, The Integrated Approach to DOA Estimation, Direction finding and true ranging PL systems. Elliptic and hyperbolic PL systems. TDOA estimation techniques, Introduction to AOA estimation.

ADAPTIVE ALGORITHMS FOR MULTITARGET DECISIONS **9**

Impact of Multipath on Optimal spatial filtering – adaptive algorithms for CDMA, In-door positioning. Performance of Under loaded and Overloaded Adaptive Arrays, Multitarget decision–directed algorithm. Multitarget Decision-Directed Algorithm (MT-DD), Least Squares De-spread Re-spread Multi target Array (LS-DRMTA), Least Squares De-spread Re-spread Multi target Constant Modulus Algorithm

SIMULATION AND MEASUREMENT **9**

Introduction to Simulation tools for smart antenna design- ADS, CST Microwave Studio, and ANSYS. Antenna measurement and instrumentation –Gain, Impedance and antenna factor measurement; Introduction to Vector Network Analyzer, Antenna test range Design.

Total Periods: 45

References:

1.T.S.Rappaport, J.C.Liberti, “Smart Antennas for Wireless Communication”, Springer, First Edition, 2008.

2.R.Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Springer, Second Edition, 2008.

3.Bronzel, “Smart Antennas”, John Wiley and Sons, First Edition, 2004.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	3			2	3		
CO2	3	2	1	2			3	2		
CO3	1	2	2	3			2	1		
CO4	2	2	1	3			1	2		
CO5	1	2	3	1			2	2		
CO6	2	1	3	2			3	1		

192AEE19 SOCIAL MEDIA AND NETWORK ANALYSIS L-T-P C
3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: The aim of the course is to understand the concept of semantic web and related modeling and applications.

Course Outcomes:

The Students will be able to

CO1: Explore semantic web related applications.

CO2: Represent knowledge using ontology.

CO3:Predict human behavior in social web and related communities

CO4:Identify Multi-Relational characterization of dynamic social network communities

CO5: Visualize social networks.

CO6: Identify social networks in collaborative and co-citation networks.

INTRODUCTION 9

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web -Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 9

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi- Relational characterization of dynamic social network communities.

PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 9

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and counter measures.

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 9

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

Total Periods 45

References

1. Peter Mika, “Social Networks and the Semantic Web”, First Edition, Springer 2007.

2. BorkoFurht, “Handbook of Social Network Technologies and Applications”, 1st Edition, Springer, 2010.

3.GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition Springer, 2011

4.. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling”, IGI Global Snippet, 2009.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	3	1	2			1	2		
CO2	3	1	1	2			3	2		
CO3	2	3	3	1			2	3		
CO4	1	2	3	1			3	1		
CO5	3	2	1	2			2	2		
CO6	2	2	1	3			2	1		

192AEE20 BIOMEDICAL IMAGE PROCESSING L-T-P C

3-0-0 3

Programme: M.E.(Applied Electronics) **Sem: - Category: PE**

AIM: To learn the concept of MRI, ultrasound imaging, segmentation techniques and 3D visualization.

Course Outcomes:

The Students will be able to

CO1: Bring out the procedure for medical image acquisitions.

CO2: Examine the basic principles of the major medical imaging techniques

CO3: Demonstrate different types of Radio diagnostic techniques.

CO4: Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.

CO5: Analyze the constraints in image processing when dealing with 3D data sets

CO6: Apply image processing algorithms in practical applications.

INTRODUCTION **9**

Introduction to imaging modalities-Image quality X-rays in Diagnostic imaging-X-ray production, X-ray interactions-X-ray spectra-X-ray dosimetry-X-ray detection-radiography-mammography-fluoroscopy. Computed tomography systems- Scanner design-reconstruction techniques-image quality artifacts-multi slice imaging scanner performance..

MAGNETIC RESONANCE IMAGING **9**

Basic principles of nuclear magnetic resonance-Image creation- Slice selection, Frequency encoding, Phase Encoding, pulse sequence, Image characteristics and artifacts, Hardware and software components

ULTRASOUND IMAGING **9**

The wave equation-Impedance, Power and reflection-Acoustic properties of Biological tissues-Transducers, beam patterns and resolution-Diagnostic imaging modes –Doppler principles.

SEGMENTATION **9**

Image preprocessing-Thresholding-Edge based techniques-Region based segmentation-Classification deformable models-Image Registration-Geometrical Transformations-Point based methods-Surface based Methods-Intensity based methods.

3D VISUALIZATION **9**

Pre processing-Scene-based visualization-object based visualization-Manipulation. Medical Applications and Systems– Diagnostics-Therapeutics- Interventions.

Total Periods 45

References

1. Isaac Bankman, I. N. Bankman , “Handbook of Medical Imaging: Processing and Analysis”, Academic Press,2000.
2. Avinash C.Kak, Malcolm Slaney, “Principles of Computerized Tomographic Imaging”, Society of industrial and applied mathemetics,2001.
3. Albert Macowski, “Medical Imaging Systems”, Prentice Hall, New Jersy-1983.
4. AtamP.Dhawan, ‘Medical Image Analysis’, Wiley Interscience Publication, NJ, USA 2003.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	2			2		2	
CO2	3	1	3	2			3		2	
CO3	2	2	3	1			2		3	
CO4	2	2	2	3			1		3	
CO5	2	2	1	2			3		2	
CO6	2	2	1	2			2		3	

192AEE21 **NEXT GENERATION NETWORKS** **L-T-P** **C**

3-0-0 **3**

Programme: M.E.(Applied Electronics) **Sem: -** **Category: PE**

AIM: To best practices about how to design, deploy, and troubleshoot next generation networks.

Course Outcomes:

The Students will be able to

CO1: Classify the technical, economic and service advantages of next generation networks.

CO2: Analyze the role of IP Multimedia Sub-system (IMS), network attachment and admission control functions.

CO3: Compare the various methods of providing connection-oriented services over a NGN with reference to MPLS, MPLS-TE.

CO4: Illustrate the multicast, optical networks and layer 2, 3 services

CO5: Investigate the various NGN virtual network services with reference to VPNs.

CO6: Analyze the NGN management and the adaptive self healing networks.

INTRODUCTION **9**

Evolution of public mobile services - motivations for IP based services, Wireless IP network architecture – 3GPP packet data network architecture. Introduction to next generation networks - Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next Generation Society, future Trends.

IMS AND CONVERGENT MANAGEMENT **9**

IMS Architecture - IMS services, QoS Control and Authentication, Network and Service management for NGN, IMS advantages, Next Generation OSS Architecture – standards important to oss architecture, Information framework, OSS interaction with IMS, NGN OSS function/ information view reference model, DMTF CIM.

MPLS AND VPN **9**

Technology overview –MPLS &QoS, MPLS services and components – layer 2 VPN, layer 2 internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN.

MULTICAST **9**

MPLS Multicast VPN overview – Applications, examples, IPv6 and MPLS – Technology overview, Future of MPLS –Integrating IP and optical networks, Future layer 3 services, future layer 2 services.

NGN MANAGEMENT **9**

Network Management and Provisioning – Configuration, Accounting, performance, security, case study for MPLS, Future enhancements – Adaptive self healing networks.

Total Periods **45**

References

1. Thomas Plavyk, “Next generation Telecommunication Networks, Services and Management”, Wiley & IEEE Press Publications, 2012.
2. Neill Wilkinson, “Next Generation Network Services”, John Wiley Publications, 2002.
3. Robert Wood, “MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization", CISCO Press, 2006.
4. Ina Minie, Julian Lucek, “MPLS enabled Applications – Emerging developments and new technologies”, 3rd edition, Wiley, 2011.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	2			1	3		
CO2	3	2	1	3			3	2		
CO3	1	2	3	1			1	2		
CO4	2	1	3	2			2	3		
CO5	3	2	1	1			3	1		
CO6	2	1	3	3			2	2		

OPEN ELECTIVES

192OE01	BUSINESS ANALYTICS	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem: - Category: OE**

AIM: To Familiarize Z-Transform and designthe discrete time nonlinear control systems.

Course Outcomes:

The Students will be able to

CO1: Understand the role of business analytics within an organization.

CO2: Analyse data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

CO3: To become familiar with processes needed to develop, report, and analyze business data.

CO4: Use decision-making tools/Operations research techniques.

CO5: Mange business process using analytical and management tools.

CO6: Analyse and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

INTRODUCTION **9**

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.

TRENDINESS AND REGRESSION ANALYSIS **9**

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.

BUSINESS ANALYTICS PROCESS **9**

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.

FORECASTING TECHNIQUES **9**

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.

DECISION ANALYSIS: **9**

Formulating Decision Problems, Decisio n Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Lecture: 45 Tutorial:0 Total Periods: 45

References

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey "Business analytics Principles, Concepts, and Applications", Pearson FT Press, 2014.

2. James Evans "Business Analytics", persons Education, 2017.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	3			1	2		
CO2	1	3	1	2			3	1		
CO3	2	3	3	1			2	1		
CO4	2	2	3	3			1	3		
CO5	1	2	3	1			3	2		
CO6	2	1	3	3			2	3		

192OE02	INDUSTRIAL SAFETY	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **OE**

AIM: To understand about fire and explosion, preventive methods, relief and its sizing methods

Course Outcomes:

Co1: Analyse 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.4
CO4:Understand the relief and its sizing methods
CO5: Understand the methods of hazard identification and preventive measure
CO6: Follow safety and preventive maintenance of Industrial Engineering

INDUSTRIAL SAFETY

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.

FUNDAMENTALS OF MAINTENANCE ENGINEERING

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.

WEAR AND CORROSION AND THEIR PREVENTION

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.

FAULT TRACING

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.

PERIODIC AND PREVENTIVE MAINTENANCE

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.

Lecture:45 Tutorial:0 Total Periods:45

References

1. Higgins & Morrow "Maintenance Engineering Handbook,", THI, 6th Edition, 2002.
2. H. P. Garg, "Maintenance Engineering", S. Chand and Company, 2010.
3. Audels "Pump-hydraulic Compressors" , Mcgrew Hill Publication,2016.
4. Winterkorn, Hans "Foundation Engineering Handboo" , Chapman & Hall London,1975..

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	2			2	3		
CO2	1	3	1	2			1	3		
CO3	2	3	3	1			1	2		
CO4	2	2	1	3			3	1		
CO5	1	2	3	3			3	2		
CO6	3	1	1	3			2	1		

192OE03	OPERATIONS RESEARCH	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **OE**

AIM: To identify and develop operational research models from the verbal description of the real system.

Course Outcomes:

At the end of the course**,** the student should be able to

CO1: Apply the dynamic programming to solve problems of discreet and continuous variables.
CO2: Apply the concept of non-linear programming
CO3: Carry out sensitivity analysis
CO4: Model the real world problem and simulate it.
CO5: Schedule the tasks as per given time period
CO6: Understand the dynamic programming and game theory techniques

INTRODUCTION

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

LINEAR PROGRAMMING

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

NONLINEAR PROGRAMMING

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PER

SCHEDULING AND SEQUENCING

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

DYNAMIC PROGRAMMING

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

Lecture: 45 Tutorial:0 Total Periods: 45

References

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
3. Pannerselvam, Operations Research: Prentice Hall of India 2010
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1			1	3		
CO2	3	2	1	3			3	2		
CO3	2	3	3	1			2	3		
CO4	1	2	3	1			1	2		
CO5	1	3	3	2			2	2		
CO6	2	1	3	2			2	1		

192OE04	DESIGN OF EXPERIMENTS	L	T	P	C
		3	0	0	3

Programme: M.E. Computer Science and Engineering **Sem:** - **Category:** OE

Aim: To design the experiments and analyze data collected from experiments

Course Outcomes: The Students will be able to

CO1: Familiarize the Fundamentals of design of experiments
CO2: Practice the various tools used in DOE
CO3: Conduct experiments based on factorial design
CO4: Impart the concepts of Taguchi technique
CO5: Apply for product/process optimization

FUNDAMENTALS OF DESIGN OF EXPERIMENTS **9**

Basic principles of design of experiment – randomization – replication – interactions - simple comparative experiments - applications of experimental design - barriers in DOE - practical methodology

ANALYTICAL TOOLS OF DOE **9**

Main effects plot - Interactions plots - Cube plots - Pareto plot of factor effects - Normal Probability Plot of factor effects - Response surface plots and regression models - Model building – Analysis of variance

FACTORIAL DESIGNS **9**

Single factor experiments - Latin square designs and extensions –Introduction to factorial designs, two levels, 2^k factorial designs - Fractional factorial designs , two-level, three-level and mixed-level factorials

TAGUCHI APPROACH **9**

Overview of Taguchi approach - common experiments and methods of analysis. Orthogonal array-properties - Degrees of freedom-confidence level and interval – case study exercises.

PARAMETER OPTIMIZATION **9**

Regression models - parameter optimization – single and multi objective optimization - Response surface methodology – grey relational analysis – complex proportional assessment of alternatives (COPRAS) - case study exercises

TOTAL : 45 PERIODS

REFERENCE BOOKS

1. Douglas C. Montgomery, "Designand Analysis of Experiments", 5th edition., Wiley. 2001
2. Jiju Antony, " Design of Experiments for Engineers and Scientists", 2nd Edition, Elsevier, Londan, 2014.
3. Lennart Eriksson, " Design of Experiments: Principles and Applications", Umetrics Academy, Sweedan, 2008
4. Oehlert, GaryW. "First Course in Design and Analysis of Experiments", Freeman Publishers, New York, 2000
5. Ranjit K Roy, Design of Experiments using the Taguchi Approach, John Wiley & sons, Inc., 2001

192OE05	COST MANAGEMENT OF ENGINEERING PROJECTS	L-T-P	C
		3-0-0	3

Programme:	M.E.(Applied Electronics)	Sem:	Category:	OE

AIM: To develop the knowledge and skills required to administer and manage projects effectively in a specific discipline of engineering

Course Outcomes:

CO1: Demonstrate an understanding of, and apply, the fundamentals of project planning and project management.
Co2: Prepare and evaluate cost estimates, tender documentation and contract documentation.
CO3: Administer and supervise contracts in accordance with the relevant Standards and/or Codes of Practice
CO4: Critically evaluate professional practice principles and their application to an engineering environment.
CO5: Contract law and Documentation, schedules of Quantities, costing and Tendering, time cost/quality balance, contract types, engineering company structures
CO6: Apply the concepts into Engineering projects

INTRODUCTION

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

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.

PROFIT PLANNING & TARGET COSTING

Cost Behavior 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.

TOTAL QUALITY MANAGEMENT

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

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

Lecture:45 Tutorial:0 Total Periods:45

References

1. Charles T. Horngren "Cost Accounting A Managerial Emphasis" , Prentice Hall of India, New Delhi,2012
2. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting,1998.
3. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher,2012.
4. N.D. Vohra, Quantitative Techniques in Management, 5th Edition, Tata McGraw Hill Book Co. Ltd,2017.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	2			2	2		
CO2	3	3	1	2			1	3		
CO3	2	2	3	1			3	2		
CO4	2	1	3	2			1	2		
CO5	3	2	1	2			3	1		
CO6	2	2	1	3			2	1		

192OE06	COMPOSITE MATERIALS	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **OE**

AIM:

Course Outcomes:

CO1: Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.

CO2: Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.

CO3: Analyse the elastic properties and simulate the mechanical performance of composite laminates; and understand and predict the failure behaviour of fibre-reinforced composites

CO4: Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project

CO5: Critique and synthesise literature

CO6: Apply the knowledge gained from the course in the design and application of fibre-reinforced composites.

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.

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.

COMPOSITES

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.

PREPARATION OF MOULDING

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

STRENGTH DESIGN

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.

Lecture: 45 Tutorial:0 Total Periods:45

TEXT BOOKS:

1. R.W.Cahn , “Material Science and Technology “ Composites – VCH, West Germany,1994.
2. WD Callister, Jr., Adapted by R.Balasubramaniam, “Materials Science and Engineering, An introduction. “ John Wiley & Sons, NY, Indian edition, 2007.
3.– Deborah D.L. Chung “ Composite Materials Science and Applications” Springer London, 2012.
4. Danial Gay, Suong V. Hoa, and Stephen W.Tasi “Composite Materials Design and Applications” , 2014.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	2			1	2		
CO2	3	3	1	2			3	2		
CO3	2	3	2	1			2	3		
CO4	2	1	3	1			2	1		
CO5	1	2	3	2			2	2		
CO6	2	1	3	2			3	1		

.

192OE07	WASTE TO ENERGY	L-T-P	C
		3-0-0	3

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **OE**

AIM: To deal with the production of energy from different types of wastes through thermal, biological and chemical routes.

Course Outcomes:

CO1: Describe the nature and principle of different biomass energy extraction systems and know how to choose the suitable biomass fuels for different bio-energy applications;
CO2: Distinguish the desirable features of these biomass energy sources and their advantages over traditional fuels such as coal and oil
CO3: Identify their limited scope in terms of suitable sites, dependence on the elements, capital costs, and cost effectiveness compared with traditional sources.
CO4: Get acquainted with the environmental impacts of energy technologies.
CO5: Acquire scientific and technological understanding on the energy resources
CO6 : Identify the issues associated with energy crisis

INTRODUCTION

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

BIOMASS PYROLYSIS:

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

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.

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.

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.

Lecture: 45 Tutorial:0 Total Periods: 45

References

1. Desai, Ashok V., "Non Conventional Energy", Wiley Eastern Ltd., 1990.
2. Khandelwal, K. C. and Mahdi, S. S., " Biogas Technology - A Practical Hand Book" Vol. I &II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Challal, D. S., "Food, Feed and Fuel from Biomass" IBH Publishing Co. Pvt. Ltd., 1991.
4. , C. Y. WereKo-Brobby and E. B. Hagan, "Biomass Conversion and Technology" John Wiley &Sons, 1996.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2	1	3	1			2	3		
CO2	3	3	1	2			2	1		
CO3	2	3	2	1			2	3		
CO4	1	2	1	3			3	1		
CO5	3	1	2	3			3	2		
CO6	2	1	3	1			2	2		

192OE08	NANOMATERIALS AND NANOTECHNOLOGY	L-T-P	C
		3-0-0	3

Programme: **M.E ENGINEERING DESIGN** **Category: OE**

Prerequisites: Nil

Aim: To understand the basics of nano materials and its technology

Course Outcomes:

The Students will be able to

CO1. Acquire the knowledge of the representatives of Nano particles and Characteristic techniques of nano materials.

CO2. Familiar with new trends in engineering, namely nanotechnology and nanofabrication and with their applications in modern industries.

CO3. Get the knowledge in the field of nanotechnology and nano materials.

CO4: Practice the nano electronics

CO5: Familiarize nano heat transfer

ZERO – DIMENSIONAL NANOSTRUCTURES **9**

Nanoparticles through homogenous nucleation, nanoparticles through the heterogeneous nucleation, kineticallyconfined synthesis of nanoparticles, epitaxial core – shell nanoparticles. One Dimensional Nanostructure-Nanowires And Nanorods: Spontaneous growth, template based synthesis, electro spinning, and lithography.

TWO-DIMENSIONAL NANOSTRUCTURES-THIN FILMS **9**

Fundamentals of film growth, vacuum science, physical vapor deposition (PVD), Chemical VaporDeposition(CVD), Atomic Layer Deposition (ALD), Electrochemical Deposition, Sol-Gel films.

NANOSTRUCTURES FABRICAITON **9**

Lithography, nano manipulation and nanolithography, soft lithography, assembly of nanoparticels andnanowires, other methods of micro fabrication, Scanning Electron Microscope. Nanomechanics: A high speed review of motion: Displacement, velocity, acceleration and force, nano mechanical oscillation, feeling faint forces.

NANO ELECTRONICS: ELECTRON ENERGY BANDS, ELECTRONS IN SOLIDS **9**

Conductors, insulation and semi conductors, fermi energy, the density of states for solids, quantumconfinement, tunneling, single electron phenomenon, molecular electronics. Nanophotonics: Photonics properties of nanomaterials, near-field light, optical tweezers, photonic crystals.

NANO SCALE HEAT TRANSFER **9**

Nanoscale heat, conduction, convection, radiation. Nanoscale Fluid Mechanics: Fluids at the nanoscale: major concepts, flow fluids flow at the nanoscale, applications of nanofludics

TOTAL : 45 PERIODS

REFERENCE BOOKS

1. Ben Rogers, Pennathur and Adams, Nanotechnology: Understanding Small System, CRC Press, 2008.
2. Bhushan, Bharat (Ed.) Handbook of Nanotechnology, Springer 2006.
3. Guozhong Cao, Nanostructures and Nanomaterials, Imperial College Press, 2006.
4. Lundstrom, Mark, Guo, Jing, Nanoscale transistors, Device physics, modeling and simulation,Springer,2006.
5. Yury Gogotsi, Nanomaterials Handbook, Drexel University, Philadelphia, Pennsylvania, USA, 2006.

AUDIT COURSES

192AC05	CONSTITUTION OF INDIA	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

COURSE OUTCOMES:

Students will be able to:

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument

CO3: Inform the conceptualization of social reforms leading to revolution in India.

CO4: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

CO5: Discuss the passage of the Hindu Code Bill of 1956.

CO6: Understand the role of Election commission

HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History ,Drafting Committee, (Composition & Working)

PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

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.

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

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: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role.Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

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.

Lecture: 24 Tutorial:0 Total Periods:24

References

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.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						2				3
CO2						2				3
CO3						3				2
CO4						3				2
CO5						3				2
CO6						3				1

192AC02	DISASTER MANAGEMENT	L-T-P C 2-0-0 0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To through knowledge, experience and research build capacities that will reduce disaster risks and contribute to better and more targeted public health based relief following disasters.

Course Objectives:

Students will be able to:

CO1: learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO2: critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO3: develop an understanding of standards of humanitarian response and

CO4: Develop practical relevance in specific types of disasters and conflict situations.

CO5: critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

CO6: Explain more about disaster mitigation.

INTRODUCTION

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

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, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And
Conflicts.

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.

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.

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.

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.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies " New Royal book Company, 2014.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi, 2001.

3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep &Deep Publication Pvt. Ltd., New Delhi,2009.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						3				2
CO2						3				2
CO3						2				2
CO4						3				3
CO5						1				2
CO6						2				1

192AC03	ENGLISH FOR RESEARCH PAPER WRITING	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To learn the skills required for Research paper writing

Course Objectives:

Students will be able to:

CO1: Understand that how to improve your writing skills and level of readability

CO2: Learn about what to write in each section

CO3: Understand the skills needed when writing a Title

CO4: Ensure the good quality of paper at very first-time submission

CO5: Examine the writing skills

CO6: Verity the manuscript for first time submission.

INTRODUCTION

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Conciseand Removing Redundancy, Avoiding Ambiguity and Vagueness.

CLARIFICATION

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

LTERATURE SURVEY

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

ESSENTIAL SKILLS

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.

VERIFICATION

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions. Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Goldbort R “Writing for Science”, Yale University Press ,2006.
2. Day R , “How to Write and Publish a Scientific Paper” , Cambridge University Press, 2006.
3. Highman N “Handbook of Writing for the Mathematical Sciences” , SIAM. Highman’s book ,1998.
4. Adrian Wallwork , “English for Writing Research Papers”, Springer New York Dordrecht Heidelberg London, 2011.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						2				2
CO2						3				1
CO3						3				2
CO4						1				3
CO5						2				3
CO6						3				3

192AC04	SANSKRIT FOR TECHNICAL KNOWLEDGE	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To Learn Sanskrit through Technical Education

Course Outcomes:

CO1: Understanding basic Sanskrit language
CO2 Get a working knowledge in illustrious Sanskrit, the scientific language in the world
CO3: Learn of Sanskrit to improve brain functioning
CO4: Develop the logic in mathematics, science & other subjects enhancing the memory power..
CO5: Ancient Sanskrit literature about science & technology can be understood
CO6: Being a logical language will help to develop logic in students

UNIT 1

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

UNIT 2

Order, Introduction of roots, Technical information about Sanskrit Literature

UNIT 3

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

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Dr.Vishwas "Abhyaspustakam" Samskrita-Bharti Publication, New Delhi,2012.
2. Prathama Deeksha-Vempati Kutumbshastri "Teach Yourself Sanskrit", Rashtriya Sanskrit Sansthanam, New Delhi Publication,2012.
3. Suresh Soni "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi,2009.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						3				2
CO2						3				2
CO3						3				2
CO4						2				3
CO5						2				3
CO6						1				3

192AC05	VALUE EDUCATION	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To Understand value of education and self- development

Course Outcomes:

Students will be able to

CO1: Knowledge of self-development

CO2: Learn the importance of Human values

CO3: Develop the overall personality

CO4: Identify moral and ethics of value Education

CO5: Avoid fault thinking

CO6: Know about the role of human values and equality

MORALS AND ETHICS

Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation. Standards and principles, Value judgments.

CULTIVATION OF VALUES

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.

PERSONALITY AND BEHAVIOR DEVELOPMENT

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.

SCIENCE OF REINCARNATION-

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 -Honesty, Studying effectively

Lecture: 24 Tutorial:0 Total Periods:24

Reference

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi,1998.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						2				1
CO2						3				2
CO3						1				3
CO4						3				3
CO5						2				3
CO6						1				3

192AC06	PEDAGOGY STUDIES	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers

Course Outcomes:

Students will be able to

CO1: Create a connection between teaching and learning, between professors and students
CO2: Take much of the guessing out of the student's attempt to learn
CO3: Enable them to truly master the content of the course
CO4: Analyze different teaching approaches from teaching students to memorize.
CO5: describe the measurable skills, abilities, knowledge or values
CO6: Demonstrate as a result of a completing a course

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.

THEMATIC OVERVIEW

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

PEDAGOGICAL PRACTICES

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.

PROFESSIONAL DEVELOPMENT

Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

RESEARCH GAPS AND FUTURE DIRECTIONS

Research design, Contexts**,** Pedagogy**,** Teacher education**,** Curriculum and assessment**,** Dissemination and research impact.

Lecture: 24 Tutorial:0 Total Periods:24

References

1. Ackers J, Hardman F "Classroom interaction in Kenyan primary schools", Compare, 31 (2): 245-261, 2001.
2. Agrawal M "curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361-379,2004.
3. Akyeampong K , Teacher training in Ghana - does it count? Multi-site teacher education research" ,2003.project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J " Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?" International Journal Educational Development, 33 (3): 272–282,2013.

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						2				3
CO2						3				1
CO3						3				2
CO4						3				1
CO5						2				2
CO6						2				3

192AC07 **STRESS MANAGEMENT BY YOGA** **L-T-P** **C**

2-0-0 **0**

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To achieve overall health of body and mind

Course Objectives: To Develop healthy mind in a healthy body thus improving social health also Improve efficiency

Course Outcomes:

Students will be able to:

CO1: Develop healthy mind in a healthy body thus improving social health
CO2: Classify Yoga Ashtanga
CO3: Learn Do`s and Don't's in life
CO4: Differentiate between Yam and Niyam
CO5: Regularize of breathing techniques
CO6: Implement various yog poses and their benefits for mind and body

UNIT 1

Definitions of Eight parts of yog. (Ashtanga)

UNIT 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

UNIT 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

Lecture: 24 Tutorial: 0 Total Periods:24

References

1. Janardan Swami Yogabhyasi Mandal "Yogic Asanas for Group Tarining-Part-I" , Nagpur , 2014.
2. "Rajayoga or conquering the Internal Nature" Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						3				3
CO2						3				3
CO3						2				2
CO4						2				1
CO5						2				3
CO6						1				3

192AC08	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L-T-P	C
		2-0-0	0

Programme: M.E.(Applied Electronics) **Sem:** **Category:** **AC**

AIM: To become a person with stable mind, pleasing personality and determination

Course Outcomes:

Students will be able to

CO1: Study of Shrimad-Bhagwad-Geeta

CO2: Develop personality and achieve the highest goal in life.

CO3: Lead the nation and mankind to peace and prosperity.

CO4: Study of Neetishatakam for developing versatile personality

CO5: Learn Do`s and Don't's in life

CO6: Approach day to day work and duties

UNIT 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)

UNIT 2

Approach to day to day work and duties, Shrimad Bhagwad Geeta : 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.

UNIT 3

Statements of basic knowledge, Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model, Shrimad Bhagwad Geeta:Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39,Chapter18 – Verses 37,38,63

Lecture: 24 Tutorial:0 Total Periods:24

References

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

Course Outcomes	Program Outcomes (POs)						Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1						2				2
CO2						3				3
CO3						3				2
CO4						2				3
CO5						2				3
CO6						3				2