P.S.R. ENGINEERING COLLEGE

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

M.E. –APPLIED ELECTRONICS

PG REGULATION-2016

CURRICULUM AND SYLLABI

[1st To 4th Semester]

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to

- **PO1: Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2**: **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- **PO3: Design / Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4: Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- **PO5: Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6: The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7**: **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
- **PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9: Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO:10 Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11: Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's

own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

- **PO12:Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

- **PSO1:** Design, simulate and analyze diverse problems in the field of telecommunication.
- **PSO2**: Able to design and analyze varied electronic circuits for applications.
- **PSO3**: Apply signal and image processing techniques to analyze a system for applications.
- **PSO4**: Construct, test and evaluate an embedded system and control systems with real time constraints.

P.S.R.ENGINEERING COLLEGE, SIVAKASI-626140
PG REGUALTION-2016
M.E. APPLIED ELECTRONICS
CURRICULUM
[I – IV SEMESTERS - FULL TIME]

Total Credits: 70

SEMESTER - I					
Sl	Code	Course Title	Category	L-T-P	C
1	162AE11	Linear Algebra and Optimization	FC	3-2-0	4
2	162AE12	Active Networks and Analysis	PC	3-0-0	3
3	162AE13	Digital System Design	PC	3-0-0	3
4	162AE14	Real Time Operating Systems	PC	3-0-0	3
5	162AE15	ARM Architecture and Programming	PC	3-0-0	3
6	-	Elective I*	PE	3-0-0	3
7	162AE16	System Design Lab	PC	0-0-4	2
8	162AE17	Technical Seminar	EEC	0-0-2	1
					No. of Credits: 22

SEMESTER - II					
Sl	Code	Course Title	Category	L-T-P	C
1	162AE21	Embedded System Design	PC	3-0-0	3
2	162AE22	ASIC and FPGA Design	PC	3-0-0	3
3	162AE23	Data Acquisition and Interfacing	PC	3-0-0	3
4	162AE24	Digital Control Engineering	PC	3-2-0	4
5	-	Elective II*	PE	3-0-0	3
6	-	Elective III*	PE	3-0-0	3
7	162AE27	Embedded System Lab	PC	0-0-4	2
					No. of Credits: 21

SEMESTER - III

Sl	Code	Course Title	Category	L-T-P	C
1	-	Elective IV*	PE	3-0-0	3
2	-	Elective V*	PE	3-0-0	3
3	-	Elective VI*/Directed Study	PE	3-0-0	3
4	162AE37	Project Work - Phase-I	EEC	0-0-12	6
					No. of Credits: 15

SEMESTER - IV

Sl	Code	Course Title	Category	L-T-P	C
1	162AE41	Project Work - Phase-II	EEC	0-0-24	12
					No. of Credits: 12

FC – Foundation Course, PC –Professional Core, PE - Program Elective, EEC- Employability Enhancement Course.

ELECTIVES

Sl	Code	Course Title	Category	L-T-P	C
1.	162AEE01	Software Defined Radio	PE	3-0-0	3
2.	162AEE02	Low power VLSI Design	PE	3-0-0	3
3.	162AEE05	Computational Intelligent Techniques	PE	3-0-0	3
4.	162AEE06	Electromagnetic Compatibility	PE	3-0-0	3
5.	162AEE08	Programmable System on Chip	PE	3-0-0	3
6.	162AEE09	Wireless and Mobile Networks	PE	3-0-0	3
7.	162AEE13	Multimedia Engineering	PE	3-0-0	3
8.	162AEE14	RF System Design	PE	3-0-0	3
9.	162AEE15	Cognitive Radio Technology	PE	3-0-0	3
10.	162AEE17	Data Analytics and Big Data	PE	3-0-0	3
11.	162AEE18	RFID Technology	PE	3-0-0	3
12.	162AEE20	Bio Medical Signal Analysis	PE	3-0-0	3
13.	162AEE22	Virtual Instrumentation Systems	PE	3-0-0	3
14.	162AEE23	Medical Imaging Processing	PE	3-0-0	3
15.	162AEE24	Industrial Internet of Things	PE	3-0-0	3
16.	162AEE26	Device Modeling	PE	3-0-0	3
17.	162AEE31	Cryptography and Data Security	PE	3-0-0	3
18.	162AEE33	VLSI Signal Processing	PE	3-0-0	3
19.	162AEE34	High Performance Communication Network	PE	3-0-0	3
20.	162AEE36	Cloud Computing	PE	3-0-0	3
21.	162AEE37	Data Warehousing and Data Mining	PE	3-0-0	3
22.	162AEE39	Mobile Robotics	PE	3-0-0	3
23.	162AEE38	Pattern Recognition	PE	3-0-0	3
24.	162AEE41	Social Network Analysis	PE	3-0-0	3
25.	162AEE45	Machine Learning Techniques	PE	3-0-0	3

162AE11	LINEAR ALGEBRA AND OPTIMIZATION	L-T-P	C
		3-2-0	4

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

AIM: To develop the mathematical skill in the area of Linear Algebra and Optimization.

Course Outcomes:

The Students will be able to
CO1: Utilize the concept of Matrix theory for electronics and communication applications.
CO2: Formulate Scientific Computing problems as Linear Algebra Operations.
CO3: Develop the ability the concept of tensors
CO4: Find optimal solution in the real life optimizing.
CO5: Find optimal solution in the non-linear programming.

MATRIX THEORY **12**

The Cholesky decomposition – Generalized Eigen vectors, Canonical basis – QR factorization–Least squares method – Singular value decomposition.

LINEAR ALGEBRA **12**

Basics –Vector spaces – Sub space – Inner Products –norms –Orthogonality– Gram –Schmidt Orthogonalisation.

MULTI LINEAR ALGEBRA **12**

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 **12**

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

NON – LINEAR PROGRAMMING **12**

Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn – Tucker conditions – Quadratic Programming.

Total Periods: 60

References:

1. Bronson, R.Matrix Operation, Schaum‟s outline series, McGrawHill, Newyork 1989.
2. Winston.W.L. “Operations Research”, Fourth Edition, Thomson – Brooks/Cole, 2003.
3. Taha H.A. “Operations Research : An introduction” Ninth Edition, Pearson Education, Asia, New Delhi 2012.
4. Higher Engineering Mathematics. Dr. B.S. Grewal, Khanna Publishers, New Delhi,Fourth Reprint 1999.
5. Andrews,L.C. and Philips.R.L. “Mathematical Techniques for engineering and scientists”, PrinticeHallof India,2006.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	1							3	3	1	3	3
CO2	3	3	2									2	2	2	2	2
CO3	2	2	3									3	2	1	2	2
CO4	2	2	2									3	2	2	2	3
CO5	2	2										1	2	2	2	2

162AE12 **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 Analyzefeedback 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

CO7: Determine 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

Text Book

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

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.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2						3		3	2		
CO2	3	3		3	3		2					2	2		3	
CO3	2	3	3	3	3		2	2				1	3	1		
CO4	2			3	2	2	3						3			3
CO5	1	2	3	3							2	3			2	
CO6	3	3	2					3				2			3	1
CO7	2	2						2	3	3		1		3	2	

162AE13	DIGITAL SYSTEM DESIGN	L-T-P	C
		3-0-0	3

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

AIM: To design and integrate the digital logic circuits for real time applications.

Course Outcomes:

The Students will be able to

CO1: Analyze the basic concepts of logic system design.
CO2: Analyze the synchronous sequential circuits design.
CO3: Categorize the asynchronous sequential circuits with their flow tables.
CO4: Implement the hazards free circuits.
CO5: Examine the applications of programmable logic devices

SEQUENTIAL LOGIC CIRCUITS **9**

Mealy machine, Moore machine, State table notation ,State diagrams, State table reduction, Incompletely specified sequential machines, State assignments, Design of synchronous and asynchronous sequential logic circuits working in fundamental and pulse mode.

SYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN **9**

Analysis of clocked synchronous sequential Networks (CSSN), Modeling of CSSN-State table assignment and reduction – Design of CSSN - ASM Chart- ASM Realization.

ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN **9**

Analysis of Asynchronous sequential Circuits (ASC)-Flow table reduction -Races in ASC-State assignment- Problem and the Transition table-Design of ASC-Static and Dynamic hazard.

PROGRAMMABLE LOGIC DEVICES **9**

Basic concepts of programming technologies, Programmable Logic Array(PLA),Programmable Array Logic(PAL),Designing a sequential circuit using PAL, Generic Array Logic, Erasable PLD,PLD computer Aided Design, FPGA.

MULTI -INPUT SYSTEM CONTROLLER DESIGN **9**

System Controllers and Design, Defining the purpose and role of the system, Defining the characteristic of the system, controlling system and the controlled system, Timing and Frequency Considerations, System Controller State Specification, Synchronizing two systems and choosing controller architecture controller.

Total Periods: 45

Text Books

1. Donald G.Givone, “Digital Principles and Design”, Tata McGraw Hill, 2002.
2. Yarbrough.M, “Digital Logic Applications and Design”, Thomson Learning, 2001.

References

1. Charles Roth Jr .H, “Digital System Design using VHDL”, Thomson Learning, 2nd Edition 2007.
2. Nripendra N Biswas, “Logic Design Theory”, Prentice Hall of India, 2001.
3. Charles H Roth Jr, “Fundamentals of Logic Design”, Thomson Learning, 2004.
4. William I.Fletcher,”An Engineering Approach to Digital Design”, Prentice Hall of India, 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1	2					3	1	2	2	1	1	
CO2	2	2	3	3	2	3			1	1	2	2	3	3		2
CO3	1	2	2	1	3				2	3	2	2	2	2	1	
CO4	2	1	1	3	2		2			3	2	1	3	2	1	
CO5	3	2	1	3	2	1			3	2	1	1	1	3		2

162AE14 **REAL TIME OPERATING SYSTEMS** **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 make the students with basics of real-time systems and to give the practical knowledge and skills necessary to design and develop embedded applications by means of real-time operating systems.

Course Outcomes:

The Students will be able to

CO1: Develop the fundamentals of real time communication

CO2: Evaluate different algorithms and techniques used for real time systems.

CO3: Realize the real time kernel for specific application

CO4: Generate a validation plan based on all the software requirements.

CO5: Design real time models, languages and operating systems.

CO6: Analyze real time examples.

OPERATING SYSTEM CONCEPTS **9**

Basic Principles - Operating System structures – System Calls – Files – Processes – Design and Implementation of processes – Communication between processes – Introduction to Distributed operating system – issues in distributed system: states, events, clocks-Distributed scheduling-Fault &recovery.

REAL-TIME OPERATING SYSTEMS **9**

Terminology -Real-Time System Design Issues -Example Real-Time Systems -Common Misconceptions-Real-Time Kernels- Preemptive-Priority Systems-Hybrid Systems-The Task-Control Block Model-Process Scheduling -Round-Robin Scheduling-Cyclic Executives-Fixed- Priority Scheduling–Rate-Monotonic Approach-Dynamic-Priority Scheduling: Earliest-Deadline–First Approach

INTERTASK COMMUNICATION , SYNCHRONIZATION AND MEMORY MANAGEMENT **9**

Buffering Data-Time-Relative Buffering-Ring Buffers-Mailboxes-Queues-Critical Regions-Semaphores-Other Synchronization Mechanisms-Deadlock-Priority Inversion-Process Stack Management-Run-Time Ring Buffer-Maximum Stack Size-Multiple-Stack Arrangements-Memory Management in the Task-Control- Block Model-Swapping-Overlays-Block or Page Management-Replacement Algorithms-Memory Locking- Real-Time Garbage Collection.

SOFTWARE REQUIREMENTS ENGINEERING **9**

Types of Requirements-Requirements Specification for Real-Time Systems-Formal Methods in Software Specification- Limitations of Formal Methods-Z-Finite State Machines-State charts-Petri Nets-Requirements Analysis with Petri Nets-Structured Analysis

CASE STUDY: POSIX AND SOFTWARE REQUIREMENTS ENGINEERING **9**

POSIX-Threads-POSIX Mutexes and Condition Variables-POSIX Semaphores-Using Semaphores and Shared Memory-POSIX Messages-Real-Time POSIX Signals- Asynchronous Input and Output-POSIX Memory Locking-Software Requirements Specification for Four-Way Traffic Intersection Traffic Light Controller System

Total Periods: 45

Text Books:

1.D.M.Dhamdhere, “Operating Systems, A Concept-Based Approch,TMH,2008

2. Phillip A. Laplante, “Real-Time Systems Design And Analysis", A John Wiley & Sons, Inc., Wiley-IEEE Press; 3rd Edition, 2004.

References:

1.Silberschatz,Galvin and Gagne, “Operating System Concepts”,6th Edition, John Wiley,2003

2. Herma K., “Real Time Systems – Design for distributed Embedded Applications”, Kluwer Academic, 1997.

3. C.M. Krishna, Kang, G.Shin, “Real Time Systems”, McGraw Hill, 1997.

4. Raymond J.A.Bhur, Donald L.Bailey, “An Introduction to Real Time Systems”, PHI 1999.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2		3							3		2	3			
CO2	2	3		2	2			3				3	2	2		3
CO3	2				3	2		3				2		3		
CO4	2				3			2								3
CO5	3		3		3	2		2				2	2			3
CO6	2		3									3				2

162AE15	ARM ARCHITECTURE AND PROGRAMMING	L-T-P	C
		3-0-0	3

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

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.

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

Text Book

1. Muhammad Ali Mazidi, "ARM Assembly Language programming & Architecture", 1st edition, 2016

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. LylaDas,"Embedded Systems", Pearson publication, 2012.

Course outcomes	Program outcomes (Pos)												Program Specific Outcomes (PSO s)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								3	2		2	2
CO2	3	3	3	2	3				3			3		2	2	2
CO3	3	3	3	2	2	2						3	1	2	3	2
CO4	3	3	3	3	2	2						3	3	2	2	2
CO5	3	3	3	2	2	1		2				3	2	2	3	2

162AE16 **SYSTEM DESIGN LAB** **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: Troubleshoot interactions between software and hardware.

CO5: 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 interface Real time Clock (RTC) via I2C bus using PIC Microcontroller,
4. Interface seven segment led display PIC Microcontroller
5. Read the key & display the key via ports using PIC Microcontroller Port programming
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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				2	1	2	1	1	3		
CO2	3	3	3	3	2				1		2	1		3		
CO3	3	2	3	2	3				2	1	3	2		3		
CO4	3	2	2	3	3				1	1	2	1		3		
CO5	3	2	3	2	3				2		3	2		3		

162AE17 **TECHNICAL SEMINAR** **L-T-P** **C**

0-0-2 **1**

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

AIM: The aim of the course is to make at least two technical presentations on current topics and Literature Review related to their specialization.

Course Outcomes:

The Students will be able to

CO1: Identify various real world problems.

CO2: Examine and enhance leadership skills.

CO3: Improve their communication skills, presentation skills and other soft skills

CO4: Demonstrate the ability to prepare appropriately to participate effectively in classdiscussion.

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

The students will make at least two technical presentations on current topics and Literature Review related to their specialization. The same will be assessed by a committee appointed by the college. The students are expected to submit a report at the end of the semester covering the various aspects of his/her presentation. A quiz covering the above will be held at the end of the semester.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				2	1	2	1	3	3	3	3
CO2	3	3	3	3	2				1		2	1	2	3	1	3
CO3	3	2	3	2	3				2	1	3	2	3	3	3	3
CO4	3	2	2	3	3				1	1	2	1	3	3	3	3
CO5	3	2	3	2	3				2		3	2	3	3	3	3

162AE21 **EMBEDDED SYSTEM DESIGN** **L-T-P C**
3-0-0 3

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

AIM: The aim of the course is to investigate embedded system design approaches from both the softwareand 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.

EMBEDDED DESIGN LIFE CYCLE **9**

Product specification – Hardware /Software Partitioning – Detailed hardware and software design – integration – Product Testing –Selection Processes –Microprocessor Vs Microcontroller –Performance tools – Bench Marking –RTOS Microcontroller –RTOS availability – Tool Chain availability – Other issues in selection Processes.

PARTITIONING DECISION 9

Hardware / Software duality – Coding Hardware – ASIC revolution – Managing the Risk - Co-Verification – execution environment – memory organization –System startup- Hardware manipulation –Object Placement memory mapped access –speed and code density.

INTERRUPT SERVICE ROUTINES **9**

Watch dog timers –Flash Memory basic toolset – Host based debugging – Remote debugging – ROM emulators – Logic analyzer –caches – Compiler optimization- Statistical profiling.

IN CIRCUIT EMULATORS **9**

BDM, JTAG, and Nexus- Bullet proof run control – Real time trace –Hardware break points – Overlay memory - Timing constraints – usage issues –Triggers.

TESTING & APPLICATION DESIGN **9**

BUG Tracking –Reduction of Risks & costs –performance – Unit testing –Regression testing - Choosing test cases – functional tests –coverage tests –Testing embedded software - performance testing -Maintenance. Case studies - Model train controller, IVRS, Alarm Clock, Digital Camera and Software modem.

Total Periods 45

Text Books

1. Arnold S.Berger, “Embedded System Design “, CMP books, USA 2002.
2. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, 3rd Edition Morgan Kaufmann Publisher, 2006.

References

1. SriramIyer, “Embedded Real time System Programming”, Tata McGraw-Hill, 2003.
2. Arkin, R.C., “Behavior-based Robotics”, The MIT Press, 1998.
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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3				2		1	2				3
CO2	2	3	2	2	2						1	1				3
CO3	3	3	3	2	2				2	2	3	2				3
CO4	3	3	2	2	3				1	1	2	1				3
CO5	2	3	3	3	2	2	1	2	1	2	3	2	1		1	3

162AE22 **ASIC AND FPGA DESIGN** **L-T-P C**
3-0- 0 3

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

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

Text Book

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.

References:

1. FarzadNekoogar, “From ASICs to SOCs: A Practical Approach”, Prentice Hall PTR, 2003.
2. Wayne Wolf, “FPGA-Based System Design”, Prentice Hall PTR, 2004.
3. 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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2						2	3		3		
CO2	2		2		2						2	2		2		
CO3	3	2	3	2	1						1	3		1		
CO4	3	2	2	2	2						2	3		1		
CO5	2		3		2						2	1		3		

162AE23 DATA ACQUISITION AND INTERFACING L-T-P C
3-0-0 3

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

AIM: To design and integrate the real time applications in Instrumentation and control systems.

Course Outcomes:

The Students will be able to

CO1: Categorize the data acquisition system and its software Considerations.
CO2: Categorize the sensors and interfacing and conversion techniques.
CO3: Analyze the I/O Techniques and buses in serial and asynchronous communications.
CO4: Implement the control system for the data acquisition system.
CO5: Apply the instrument interfaces for Industrial applications.

DATA ACQUISITION AND SAMPLING FUNDAMENTALS 9

The PC as a platform for data acquisition, Software considerations, Sensors and interfacing, Sampling, noise and filtering , Analog to Digital Conversion

SIGNAL CONDITIONING AND PARAMETER MEASUREMENTS 9

Amplification, Instrumentation Amplifiers, Filtering, Attenuation, Isolation, Linearization, Circuit Protection, Temperature Measurement, Strain Measurements, Vibration and Sound Measurements.

I/O TECHNIQUES AND BUSES 9

The interrupt system, Data transfer, Parallel buses, Serial communications- Introduction to asynchronous communication - Data acquisition via a serial link- Serial interface standards-Asynchronous serial I/O on the PC.

INTERPRETING AND USING ACQUIRED DATA 9

Scaling and linearization- Scaling of linear response curves - Linearization - Polynomial linearization- Interpolation between points in a look-up table - Interpolation vs. power-series polynomials- Interactive calibration programs, Basic control techniques- Terminology- An overview of control systems-Programmable logic controllers- Safety and reliability of control systems- Discontinuous control systems-Continuous control systems

DIGITAL AND PULSE-TRAIN CONDITIONING 9

Digital I/O Interfacing, Digital Inputs, Digital Isolation, Pulse Train Signal Conditioning, Frequency-to-Voltage Conversion

Total Periods 45

Text Books

1. Kevin James, “PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control”, Newness, 2000.
2. Gary Johnson, “Lab VIEW Graphical Programming”, Second edition, McGraw Hill, Newyork, 2006.

References

1.Data Acquisition Handbook, “A Reference for DAQ and Analog & Digital Signal Conditioning”, Third Edition.
2. Lisa K. wells and Jeffrey Travis, “Lab VIEW for everyone”, Prentice Hall, New Jersey, 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2			3	2		2		1	2	1	2		3
CO2	2	3	2			2	2				1	1	1	2		3
CO3	3	3	3			2	2		2	2	3	2		2		3
CO4	3	3	2			3	2		1	1	2	1				3
CO5	2	3	3			2	3	2	1	2	3	2	1	2	1	3

162AE24	DIGITAL CONTROL ENGINEERING	L-T-P	C
		3-2-0	4

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

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

Course Outcomes:

The Students will be able to

CO1: Analyze the basic Concepts of discrete time control system and Z Transform.
CO2: ApplyZ plane analysis of discrete time control systems.
CO3: Examine design of discrete time control systems.
CO4: Design about State Space Analysis.
CO5:Evaluate Controllability, Observability and Pole placement of the systems.
CO6: Design the Digital Filters for various control applications.

INTRODUCTION TO DISCRETE TIME CONTROL SYSTEMS AND Z TRANSFORM **12**

Introduction - Digital Control Systems-Quantizing and Quantization Error – Data Acquisition, Conversion and Distribution Systems - The z Transform – z Transforms of Elementary Functions - Important properties and theorems of z Transform- The Inverse z Transform - z Transform method for solving difference equations

Z PLANE ANALYSIS OF DISCRETE TIME CONTROL SYSTEMS **12**

Introduction-Impulse sampling and data hold-Reconstructing original signals from sampled signals-The Pulse transfer function - Realization of Digital Controllers and digital filters.

DESIGN OF DISCRETE TIME CONTROL SYSTEMS BY CONVENTIONAL METHODS **12**

Introduction-Mapping between the s plane and the z plane – Stability analysis of closed loop systems in the z plane-Transient and steady state response analysis - Design based on the Root locus method - Design based on the frequency response method - Analytical design Method.

STATE SPACE ANALYSIS **12**

Introduction- State Space Representations of Discrete Time Systems-Solving Discrete Time State space Equations- Liapunov Stability analysis.

POLE PLACEMENT AND OBSERVER DESIGN **12**

Introduction-Controllability- Observability-Useful Transformations in State Space Analysis and Design-Design via Pole placement-State Observers- Servo Systems.

Lecture: 45 Tutorial:15 Total Periods: 60

Text Book

1. Ogata K. “Discrete Time Control Systems”, Prentice Hall International, New Gercy, USA,2002.

References

1. Gopal M., “Digital Control and State Variable methods”, Tata McGraw Hill Publishing Company Ltd., New Delhi, India, 2003.
2. Kuo B.C., “Digital Control Systems”, Oxford University Press, Inc., 2003.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2									1	3	2		1
CO2	3	3	2	2								1	2	3		1
CO3	3	2	3	2								1	2	3		1
CO4	3	3	2									1	3	2	1	1
CO5	2	3	2	1								1	3	2	1	1
CO6	3	2	3	2								1	2	2	2	1

162AE27 **EMBEDDED SYSTEMS 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 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: Interface FPGA with supporting Boards

CO2: Design digital filters using digital signal processor.

CO3: Troubleshoot interactions between software and hardware

CO4:Design a simple application using Advanced processors like Arduino , Raspberry pi and ARM Boards

CO5: Create Final executable ROM image using flash controller

List of Experiments

1. Design and Implementation of traffic light controller using CPLD/FPGA
2. Design and configure a digital clock using Xilinx software
3. LED and LCD Interface using embedded microcontroller.
4. Filter design using digital signal processor.
5. Simple application design using ARM Processor – PWM and Buzzer
6. Interfacing Stepper motor with ARM Processor.
7. Sensor interfacing using Raspberry pi /Arduino Boards
8. Designing of wireless network using embedded systems
9. Design a simple line follower Robot using Robokits
10. Flash programming and verification

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3				2		1	2				3
CO2	2	3	2	2	2						1	1				3
CO3	3	3	3	2	2				2	2	3	2				3
CO4	3	3	2	2	3				1	1	2	1				3
CO5	2	3	3	3	2	2	1	2	1	2	3	2	1		1	3

162AE37 **PROJECT WORK (Phase-I)** **L-T-P** **C**

0-0-12 **6**

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

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: Decide plan and design with industry challenged problems to achieve the project's goals

CO2: Break work down into tasks and determine the appropriate hardware and software

CO3: Estimate cost and physical resources required, and make plans to obtain the necessary resources

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.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	3	1					2	3	3	3	3	3
CO2	3	3	3	3	2	2	2		3		2	2	3	3	3	3
CO3	3	2			2	2	1		3		1	3	2	2	2	2
CO4	3	2	2	1	1						2	3	3	3	3	3
CO5	1	1	1	1	1	1			3	2	3	1	3	2	3	3

162AE41 **PROJECT WORK (Phase-II)** **L-T-P** **C**

0-0-24 **12**

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

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

CO5: Present the work in a forum involving seminar, conference, project Expo and poster presentations.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				2					1		2	3	3	2	3
CO2	3	3	1										3	2	3	3
CO3	2	3	3		1			2	1	2			3	2	1	2
CO4	2	1	2	1								2	2	3	3	2
CO5						3	2	2				2	3	2	2	1

162AEE01 **SOFTWARE DEFINED RADIO** **L-T-P** **C**

3-0-0 **3**

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

AIM: To enrich the fundamental and state-of-the-art concepts in software-Defined radio.

Course Outcomes:

The Students will be able to

CO1: Make system-level decisions for software-defined radio technology and products.

CO2: Evaluate the software development methods for embedded wireless systems.

CO3: Categorize theanalog RF components.

CO4: Implement smart antenna algorithms.

CO5: Demonstrate the digital hardware architectures and understanding of development methods.

SOFTWARE RADIO **9**

The Need for Software Radios, Characteristics and Benefits of Software Radio – Design Principles of a Software Radio.

RADIO FREQUENCY IMPLEMENTATION ISSUES **9**

The Purpose of the RF Front-End. Dynamic Range-The Principal Challenge of Receiver Design-RF Receiver Front-End Topologies- Enhanced Flexibility of the RF Chain with Software Radios-Importance of the Components to Overall Performance- Transmitter Architectures - Noise and Distortion in the RF Chain. ADC and DAC Distortion.

DIGITAL GENERATION OF SIGNALS **9**

Introduction-Comparison of Direct Digital Synthesis with Analog Signal Synthesis-Approaches to Direct Digital Synthesis-Analysis of Spurious Signals-Spurious Components due to Periodic Jitter-Band pass Signal Generation –Performance of Direct Digital Synthesis Systems-Hybrid DDS-PLL Systems-Applications of direct Digital Synthesis-Generation of Random Sequences-ROM Compression Techniques.

RADIO FREQUENCY DESIGN **9**

Baseband Signal Processing, Radios with intelligence, ADC and DAC architectures- Smart antennas, Adaptive techniques, Phased array antennas, Applying SDR principles to antenna systems, Smart antenna architectures.

SDR PLATFORMS AND COGNITIVE RADIO **9**

Software communications architecture, Digital Hardware for SDR, Software methods for SDR, SDR platforms and their comparison, Cognitive Radio - Dynamic spectrum access - spectrum sensing-spectrum management –spectrum mobility-spectrum sharing .

Total Periods **45**

Text Books

1. Jeffrey H Reed, “Software Radio: A Modern Approach to Radio Engineering”, PEA Publication, 2002.
2. Walter Tuttle bee, “Software Defined Radio: Enabling Technologies”, Wiley Publications, 2002.

References

1. Paul Burns, “Software Defined Radio for 3G”, Bartech House, 2002.
2. Markus Dillinger, “Software Defined Radio: Architectures, Systems and Functions”, 2003.
3. Bard, Kovarik, “Software Defined Radio, The Software Communications Architecture”, Wiley 2007.
4. Peter Kenington, “RF and Baseband Techniques for Software Defined Radio”, Artech House Publishers, 2005.
5. Joseph Mitola III, “Cognitive Radio Architecture: The Engineering Foundations of Radio XML”, September 2006.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3										2	2	2	3
CO2	2	2	3	3												3
CO3	2	2		3									2		3	
CO4	2	2	3	3	3	3							2			
CO5	2	2				3	3						2			

162AEE02	LOW POWER VLSI DESIGN	L-T-P	C
		3-0-0	3

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

AIM The students know about the low power circuit design by using CMOS in VLSI technology.

Course Outcomes:

The Students will be to

CO1: Know the basics and advanced techniques in low power design which is a hot topic in today's market where the power plays major role.

CO2: Simplify the reduction in power dissipation,size, cost and etc.

CO3: Classify the sources of power in an IC.

CO4: Identify the power reduction techniques based on technology independent and technology dependent.

CO5: Power dissipation mechanism in various MOS logic style and determine suitable techniques to reduce the power dissipation

POWER DISSIPATION IN CMOS **9**

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices- Basic principle of low power design.

POWER OPTIMIZATION **9**

Logical level power optimization – Circuit level low power design – Circuit techniques for reducing power consumption in adders and multipliers.

DESIGN OF LOW POWER CMOS CIRCUITS **9**

Computer Arithmetic techniques for low power systems – Reducing power consumption in memories – Low power clock, Interconnect and layout design – Advanced techniques – Special techniques.

POWER ESTIMATION **9**

Power estimation techniques – Logic level power estimation – Simulation power analysis – Probabilistic power analysis.

SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER **9**

Synthesis for low power –Behavioral level transforms- Software design for low power.

Total Periods 45

Text Book

1 K.Roy and S.C. Prasad, "Low Power CMOS VLSI circuit design", Wiley, 2000.

References

1. DimitriosSoudris, ChirstianPignet, Costas Goutis, "Designing CMOS Circuits for LowPower, Kluwer, 2002.

2.J.B. Kuo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999.

3.S.Y. Kung, H.J. White House, T. Kailath, "VLSI and Modern Signal Processing", Prentice Hall, 1985.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3				2	1	2	1		3		
CO2	3	3	2	3	2				1		2	1		3		
CO3	3	2	3	2	3				2	1	3	2		3		
CO4	3	3	2	3	3				1	1	2	1		3		
CO5	3	2	3	2	3				2		3	2		3		

162AEE05 COMPUTATIONAL INTELLIGENT 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: Analyse the Fuzzy expert system

CO2: Analyze the components and building block hypothesis of Genetic algorithm.

CO3: Implement machine learning through Neural networks.

CO4: Model the Neuro Fuzzy system for clustering and classification.

CO5: Organize the machine learning through computational intelligence.

CO6: Apply computational intelligence techniques to classification, pattern recognition, control and Optimization problems.

FUZZY LOGIC **9**

Introduction to soft Computing – Fuzzy Sets – Basic Definition and Terminology –Set-theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning- Extension principle and Fuzzy Relations–Fuzzy Inference Systems – Mamdani Fuzzy Models-Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

GENETIC ALGORITHM **9**

Derivative-based Optimization – Descent Methods – The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithm based Optimization-Schema theory-Advanced Genetic Operators-Applications of Genetic Algorithm.

NEURAL NETWORKS **9**

Introduction -Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation MultilayerPerceptrons, Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

NEURO FUZZY MODELING **9**

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – learning Methods thatCross-fertilize ANFIS and RBFN – Coactive Neuro-Fuzzy Modeling – Framework – Neuron Functions forAdaptive Networks – Neuro Fuzzy Spectrum.

APPLICATIONS **9**

Image processing –Kinematics Problems – Automobile– Control system-Biomedical Applications-Soft Computing for Color Recipe Prediction.

Total Periods 45

Text Book

1. S. N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Limited, 2011.

References

1. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
2. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence PC Tools", AP professional, Boston 1996.
3. S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, Pearson Education 2004.

Course Outcomes	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO112	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2				2			2		2	1		2	
CO2	2	1			2					1		1	1	1	2	
CO3	2	2		1								1	1			
CO4	1		2	1								1	1			1
CO5	1	2										1				1
CO6	1	2							2	2		1	1			1

162AEE06 ELECTROMAGNETIC COMPATIBILITY L-T-P C
3-0-0 3

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

AIM: To lay good foundation on electromagnetic interference, control and compatibility in system design.

Course Outcomes:

The Students will be able to

CO1: ElaborateEMI concepts and different EMC standards

CO2: Conduct various emission measurements and interpret test reports

CO3: Examine different testing methods and evaluate the results

CO4: Design different types of filters and reduce the effect of radiation

CO5:Analyze Electromagnetic interference effects in PCBs

EMI/EMC CONCEPTS AND STANDARDS 9

Introduction and history of EMI, problems and effects of EMI, need for EMC, realization of EMC, EMC tests and measurement, elements of EMI , coupling mechanisms , EMI victims, types of EMC standards, civilian EMC standards, military EMC standards, introduction to EMC testing

EMISSION MEASUREMENTS 9

Basic and laboratory test setup, measurement instrumentation, EMI receiver, units of measurement,conducted emission limits, EUT configuration, discontinuous emission or clicks, measurement of clicks, low frequency conducted emissions, frequency range of measurement , limits, measurement site, disturbance power measurement , near field emission measurement , test reports

IMMUNITY AND SUSCEPTIBILITY TESTING 9

General test setup, electrical fast transients / burst (EFT/B),surge testing, conducted susceptibility – continuous wave (CW), electrostatic discharge test

Shileded enclosures, antennas and radiating systems, signal generators and amplifiers, measuring equipment ,ancillary equipment, severity levels and frequency ranges, rf electromagnetic field immunity test, magnetic field immunity test, evaluation of test results and test reports

FILTERING AND SHIELDING 9

Basic elements of filters and filter components, filter types, filter impedance, power line filter design, multistage power line filters, transient suppression in relays and motors, ferrite beads, filters for dc lines,filter installation, filter performance evaluation

Mechanism of radiation, shielding mechanisms, choice of shield material, shielding and equipment enclosures, penetrations and apertures, leakages at seams, shielding for connector openings, shielding of plastic enclosures, shields for cables

PCB DESIGN FOR EMC 9

Need for EMC design at PCB level, printed circuit board (PCB), board zoning, aspects of a good PCB design, common impedance coupling in PCBs, general considerations for a PCB, multilayer board and high speed PCB design, power and ground planes , plane and cavity resonance, cavity resonance between planes, fringing fields and their reduction, openings and discontinuities in ground plane, optimising anti-pad design, routing traces close to antipads, issues with a split plane, traces crossing and changing layers, connection of devices to planes ,placement of decoupling capacitors, advantages of multiple decaps, position of devices, layer stacking in boards, high density interconnect (HDI) technology, board segregation

Total Periods 45

Text Book

1. ChetanKathalay, “A Practical Approach to Electromagnetic Compatibility”, 1st Edition, EMC Publications, 2014.

References

1. Bemhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Ed, Artech house, Norwood, 1998.
2. C.R.Paul,”Introduction to Electromagnetic Compatibility”, John Wiley and Sons, 2nd Edition, 2006.

3. Don R. J.White Consultant Incorporate, “Handbook of EMI/EMC”, Vol I-V, 1988.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3			2		1						2	3	3		3
CO2	2	3	3		2	1							2	2		1
CO3	2	2	2		1								2	3		
CO4	2	3	3		1								3	2		
CO5	2	3	3		2								2	1		

162AEE08 **PROGRAMMABLE SYSTEM ON CHIP** **L-T-P** **C**

3-0-0 **3**

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

AIM: To make the students to design combinational and sequential logic networks.

Course Outcomes:

The Students will be able to

CO1: Analyze the various methods of logic gates.

CO 2: Optimize the power in combinational and sequential logic machines.

CO 3: Discuss about the various latches and flip-flops for sequential machines.

CO 4: Design the principles of FPGA and PLA.

CO 5: Examine the sub system design principles of shifters, adders and multipliers.

CO 6: Analyzethe various floor planning methods for system design.

LOGIC GATES **9**

Introduction. Combinational Logic Functions. Static Complementary Gates. Switch Logic. Alternative Gate Circuits. Low-Power Gates. Delay Through Resistive Interconnect. Delay Through Inductive Interconnect.

COMBINATIONAL LOGIC NETWORKS **9**

Introduction. Standard Cell-Based Layout. Simulation. Combinational Network Delay. Logic and interconnect Design. Power Optimization. Switch Logic Networks. Combinational Logic Testing

SEQUENTIAL MACHINES **9**

Introduction. Latches and Flip-Flops. Sequential Systems and Clocking Disciplines. Sequential System Design. Power Optimization. Design Validation. Sequential Testing.

SUBSYSTEM DESIGN **9**

Introduction. Subsystem Design Principles. Combinational Shifters. Adders. ALUs. Multipliers. High-Density Memory. Field Programmable Gate Arrays. Programmable Logic Arrays.

FLOOR-PLANNING **9**

Introduction, Floor-planning Methods – Block Placement & Channel Definition, Global Routing, switchbox Routing, Power Distribution, Clock Distributions, Floor-planning Tips, Design Validation. Off-Chip Connections – Packages, The I/O Architecture, PAD Design.

TOTAL: 45 PERIODS

References

1. Wayne Wolf, “Modern VLSI Design – IP based Design”, Prentice Hall, 4th Edition, 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	2				2		2	3		3		1
CO2	2	1	2		2							2		2		1
CO3	3	3	2	3	1				2			1		2		
CO4	3	2	1	3	2							1		2		
CO5	2		1		2				2		2	2		3		1
CO6	2	3	1	3							1	2		2		1

162AEE09 WIRELESS AND MOBILE NETWORKS L-T-P C
3-0-0 3

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

AIM: Enable the student to understand basics ofWireless networks, protocol stack and standards

Course Outcomes:

The Students will be able to

CO1: Design and implement cellular system.

CO2: Elaborate Wireless networks, protocol stack and standards.

CO3: Implement wireless network environment for any application using latest wireless protocols and standards

CO4: Examine latest 3G/4G and WiMAX networks and its architecture.

CO5: Know the difference 3G/4G and WiMAX networks

C06: Implement different type of applications for smart phones and mobile devices with latest network Strategies.

WIRELESS LAN **9**

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: Systemarchitecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM,BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol,security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX.

MOBILE NETWORK LAYER **9**

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: routing,Destination Sequence distance vector, Dynamic source routing.

MOBILE TRANSPORT LAYER **9**

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks**.**

WIRELESS WIDE AREA NETWORK **9**

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3GSGSN,3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packetaccess (HSDPA)- LTE network architecture and protocol.

4G NETWORKS **9**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation andcoding with time slot scheduler, Cognitive Radio

Total Periods: 45

Text Book

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.

References

1. Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier 2007.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	3		3	1						2		2	3	3
CO2	3	2	3		2		2				2	3	2	3	1	3
CO3	3	2	3		1	2					2	3	2	1	3	1
CO4	2		1	2	1	2						2			3	
CO5	3		2		1							3			3	
CO6	2	2	1	2							1	2		2		1

162AEE13 **MULTIMEDIA ENGINEERING** **L-T-P** **C**

3-0-0 **3**

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

AIM: To make the students to analyze the various Multimedia communication techniques across various networks.

Course Outcomes:

The Students will be able to

CO1: Applythe Broad Band Network Technology.
CO2: Apply above knowledge and skills to compression techniques
CO3: Explore the special features and representations of different data types.
CO4: Analyze the different Multimedia Communication Standards
CO5: Investigate Transport Protocol and Applications
CO6: Illustrate the multimedia communication across networks.

MULTIMEDIA NETWORKING **9**

Digital sound, video and graphics – Basic multimedia networking - Multimedia characteristics- Evolutionof Internet services model - Network requirements for audio/ video transform-Multimedia coding andcompression for text , image, audio and video.

BROAD BAND NETWORK TECHNOLOGY **9**

Broadband services - ATM and IP - IPV6 - High speed switching - Resource reservation – Buffer management - Traffic shaping – Caching - Scheduling and policing – Throughput - Delay and jitter performance. Storage and media services, voice and video over IP - MPEG-2 over AM/IP – indexing synchronization of requests - Recording and remote control.

RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS **9**

Multicast over shared media network - Multicast routing and addressing - Scalping multicast and NBMAnetworks - Reliable transport protocols - TCP adaptation algorithm – RTP - RTCP. MIME - Peer- to-Peercomputing - Shared application - Video conferencing - Centralized and distributed conference controlDistributed virtual reality - Light weight session philosophy.

MULTIMEDIA COMMUNICATION STANDARDS **9**

Objective of MPEG- 7 standard - Functionalities and systems of MPEG-7 - MPEG-21 Multimedia Framework Architecture - Content representation - Content Management and usage - Intellectual propertymanagement – Audio visual system- H322: Guaranteed QOS LAN systems- MPEG_4 video Transportacross internet.

MULTIMEDIA COMMUNICATION ACROSS NETWORKS **9**

Packet Audio/video in the network environment - Video transport across Generic networks- Layered video coding - Error Resilient video coding techniques - Scalable Rate control, Streaming video across Internet - Multimedia transport across ATM networks and IP network – Multimedia across wireless Networks.

Total Periods 45

References:

1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication Systems,PHI, 2003.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					3		3		2			2		3	
CO2	3				1	2		1							3	
CO3	2					2		1					2		3	
CO4	2	2	3										2		3	
CO5										3		2	2		3	
CO6							1			3		2			3	

162AEE14 **RF SYSTEMS DESIGN** **L-T-P C**

3-0-0 3

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

AIM: To obtain comprehensive knowledge in RF Systems Design and its applications.

Course Outcomes:

The Students will be able to

CO1: Learn the importance and issues in the design of RF

CO2: Design RF filter and RF amplifier

CO3:Categorize the RF components and apply microstripline matching networks

CO4: Design and analyze the characteristic of amplifiers

CO5: Classify the amplifier and apply biasing network

CO6: Study about the characteristics of oscillators, mixers, PLL, wireless synthesizers and detector circuits.

RF ISSUES **9**

Importance of RF design- Electromagnetic spectrum, RF behavior of passive components, chip components and circuit board considerations, scattering parameters, smith chart and applications.

RF FILTER DESIGN **9**

Overview, Basic resonator and filter configuration, special filter realizations, smith chart based filterdesign, coupled filter.

ACTIVE RF COMPONENTS AND APPLICATIONS **9**

RF diodes, BJT, RF FET'S, High electron mobility transistors, matching and biasing networks, impedancematching using discrete components, micro stripline matching networks, amplifier classesof operation and biasing networks.

RF AMPLIFIER DESIGNS **9**

Characteristics, amplifier power relations, stability considerations, constant gain circles, constant, VSWR circles, low noise circles broadband, high power and multistage amplifiers

OSCILLATORS, MIXERS & APPLICATIONS **9**

Basic oscillator model, High Frequency oscillator configuration, basic characteristic of mixers, wirelesssynthesizers, phase locked loops, detector and demodulator circuits.

Total Periods 45

Text Books

1. Reinhold Ludwig and Powel Bretchko, "RF Circuit Design – Theory and Applications", Pearson Education Asia, First Edition, 2001.

References

1. Joseph. J. Carr, "Secrets of RF Circuit Design", McGraw Hill Publishers, Third Edition,2000.
2. Mathew M. Radmanesh, "Radio Frequency & Microwave Electronics", Pearson Education Asia, Second Edition, 2002.
3. Ulrich L. Rohde and David P. NewKirk, "RF / Microwave Circuit Design", John Wiley & Sons USA 2000.
4. Roland E. Best, "Phase - Locked Loops: Design, simulation and applications", McGraw Hill Publishers, 5th edition, 2003.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				2	1	2	1	1	3		
CO2	3	3	3	3	2				1		2	1		3		
CO3	3	2	3	2	3				2	1	3	2		3		
CO4	3	2	2	3	3				1	1	2	1		3		
CO5	3	2	3	2	3				2		3	2		3		
CO6	3	3	1	3							1	2		1		2

162AEE15 **COGNITIVE RADIO TECHNOLOGY** **L-T-P** **C**

3-0-0 **3**

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

AIM: To explore the principle of Cognitive Radio and discuss the research challenges in Cognitive Radio Techniques

Course Outcomes:

The Students will be able to

CO1: Learn the principle of Cognitive Radio.

CO2: Demonstrate the working of SDR.

CO3: Model the rapid advances in Cognitive radio technologies.

CO4: Explore DDFS, CORDIC and its application.

CO5: Be aware of how signal processing concepts can be used for efficient FPGA based system design.

9

SOFTWARE DEFINED RADIO

Basic SDR – Software and Hardware Architecture of an SDR – Spectrum Management – Managing -unlicensed spectrum – Noise Aggregation

SDR AS PLATFORM FOR COGNITIVE RADIO **9**

Introduction – Hardware and Software architecture – SDR development process and Design –Application software – Component development – Waveform development – cognitive waveform development

COGNITIVE RADIO TECHNOLOGY **9**

Introduction – Radio flexibility and capability – Aware – Adaptive – Comparison of Radio capabilities and Properties – Available Technologies – IEEE 802 Cognitive Radio related activities – Application.

CR- TECHNICAL CHALLENGES **9**

Design Challenges associated with CR – Hardware requirements – Hidden primary user problem –detecting spread spectrum primary users –sensing duration and frequency – security.

SIGNAL SENSING **9**

Overview – Classification - Matched filter – waveform based sensing – cyclostationary based sensing – Energy detector based sensing – Radio Identifier – Cooperative sensing- other sensing methods.

Total Periods 45

Text Books

Kwang-Cheng Chen, RamjeePrasad "Cognitive Radio Networks" , Wiley, 2009.

References

1.Huseyin Arslan , "Cognitive Radio, Software Defined Radio and Adaptive wireless system, Springer 1st edition , 2007

2. Bruce A Fette "Cognitive Radio Technology", Academic Press, 2009.

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Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3												2	3		
CO2	2	2	3											3		
CO3	2	2	2	3	3	2								2	3	
CO4	2	2	2	3	3	2						3		3	3	
CO5	2	2	2	2	2	3						3			3	

162AEE17	DATA ANALYTICS AND BIG DATA	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

INTRODUCTION TO BIG DATA **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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2	1							3	2	2	2	2
CO2	3	3	3	3	2							2	3	3	2	2
CO3	3	2	3	3	2							2	3	3	2	2
CO4	3	2	2	2	2							2	3	2	2	2
CO5	3	2	2	3	2							2	3	2	2	2

162AEE18 **RFID TECHNOLOGY** **L-T-P** **C**
3-0-0 **3**

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

AIM: This course aims to provide an overview of RFID and various applications.

Course Outcomes:

The Students will be able to

CO1: Acquire knowledge about the RFID fundamentals and concept.
CO2: Examine the concept of RFID component of the system.
CO3: Acquire knowledge about the RFID system architecture
CO4: Analyze the RFID code and command structure.
CO5: Illustrate the technical concept of memory organization
CO6: Apply the RFID standardization in various applications.

RF TECHNOLOGY **9**

RF operating principle – Frequency divider –Coupling – Inductive coupling, Electromagnetic back scatter coupling, close coupling, Electrical coupling – Frequency ranges used in RF Coding- Digital Modulation – ASK,FSK and PSK.

RFID SYSTEM FUNDAMENTALS **9**

RFID systems – Component of an RFID System – Frequency, Range & Coupling – Transponder & Reader System – Equivalent Circuit – RFID Antennas: Antenna Parameters – Gain & directional effect, EIRP & ERP, Input impedance, Effective aperture and scatter aperture Effective length Antenna types – Dipole antennas, Yagi – Uda Antenna, Patch or micro strip antenna & slot antenna

RFID SYSTEM ARCHITECTURE **9**

Architecture of Transponder – HF interface, Address & Security logic, Memory architecture Microprocessors. Architecture of Reader - Components, Control Unit, Example – Reader IC U2270B, Connection of Antennas for inductive systems

RFID STANDARDIZATION AND MEMORY ORGANIZATION **9**

Animal Identification – ISO 11784 Code structure — ISO 11785 — Technical concept – Full/half duplex system - Sequential system – ISO 14223 — Advanced transponders – Air interface — Code and command structure - Read-only transponder - Writable transponder-Transponder with crypto logical function.

RFID APPLICATIONS **9**

Example Applications – Contact less Smart Cards, Public Transport, Ticketing, and Access control Transport Systems, Animal Identification. Electronic immobilization, Container Identification, Identification, Waste Disposal, Industrial Automation, Medical Applications.

Total Periods 45

Text Book

1.K.Finkenzeller, RFID Handbook: Fundamentals and Applications in contact less smart cards and identifications, John Wiley and sons Ltd, 2003.

References

1. Bill Glover and Himanshu Bhatt, RFID Essentials, Oreilly, 2006.
2. Patrick J.Sweeney II, RFID for Dummies, Wiley Publishing, Inc .
3. SandipLahiri, RFID Handbook, IBM, 2006.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	2							2	3	2	2	2
CO2	3	3	2	3	2							2	3	3	2	2
CO3	2	2	3	2	2							2	3	3	2	2
CO4	3	2	2	2	2							2	3	2	2	2
CO5	3	2	2	3	2							2	3	2	2	2
CO6	3	2	2	2	2							2	3	2	2	2

162AEE20	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

Text Book

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

References

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

2 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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2									1	3	2		
CO2	2	3	2	1								1	2	3		
CO3	3	3	2	2		1						1	3	3		1
CO4	3	2	3	2								1	3	2		1
CO5	2	3	2	1		1						1	2	2		1

162AEE22 VIRTUAL INSTRUMENTATION SYSTEMS L-T-P C
3-0-0 3

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

AIM: To design and integrate the real time applications in Instrumentation and control systems.

Course Outcomes:

The Students will be able to

CO1: Apply the Virtual Instrument software using Graphical User Interface

CO2: Apply theSCADAsoftware for real time systems.

CO3: Categorize the case structures and sequence structuresinvirtual instrument.

CO4: Implement the software and hardware installation.

CO5: Apply the instrument interfaces for office & Industrial applications.

CO6: Emphasis a computer to various instruments including real-time data acquisition and instrument control, instrument status, and acquisition speed.

CO7: Design and Analyze the Image acquisition and processing and Motion control using VI software.

VIRTUAL INSTRUMENTATION 9

Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.

PROGRAMMING TECHNIQUES 9

VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

DATA ACQUISITION BASICS 9

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

CHASSIS REQUIREMENTS 9

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Fire wire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

TOOLSETS, DISTRIBUTED I/O MODULES 9

Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

Total Periods 45

Text Books

1.Sumathi.SandP.Surekha, Labview based Advanced Instrumentation Systems, Springer 2007.

References

1.Gary Johnson, Lab VIEW Graphical Programming, Second edition, McGrawHill, Newyork, 2006.

2. Lisa K. wells & Jeffrey Travis, Lab VIEW for everyone, Prentice Hall, New Jersey, 2002.

3. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newness, 2000.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				2	1	2	1	1	3		
CO2	3	3	3	3	2				1		2	1		3		
CO3	3	2	3	2	3				2	1	3	2		3		
CO4	3	2	2	3	3				1	1	2	1		3		
CO5	3	2	3	2	3				2		3	2		3		
CO6	2	1	1	3							1	2		2		1
CO7	3	3	2	3							2	3		1		2

162AEE23 **MEDICAL IMAGING 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 and to apply image processing algorithms in practical applications.

INTRODUCTION **9**

Introduction to imaging modalities-Image quality X-rays in Diagnostic imaging-X-ray production, X-rayinteractions-X-ray spectra-X-ray dosimetry-X-ray detection-radiography-mammography-fluoroscopy. Computedtomography systems- Scanner design-reconstruction techniques-image quality artifacts-multislice imaging scannerperformance..

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-Classificationdeformablemodels-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

Text Books

1. Isaac Bankman, I. N. Bankman , “Handbook of Medical Imaging: Processing and Analysis”, Academic Press,2000.

References

1. AvinashC.Kak, Malcolm Slaney, “Principles of Computerized Tomographic Imaging”, Society of industrial and applied mathemetics,2001.
2. Albert Macowski, “Medical Imaging Systems”, Prentice Hall, New Jersy-1983.
3. 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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2										3	2		3	
CO2	1	3	2												3	
CO3										3		1	2		3	
CO4	2	3	2										2		3	
CO5		3	2										2		3	

162AEE24	INDUSTRIAL 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

Text Book

1.CharalamposDoukas, Building Internet of Things with the Arduino, Create Space, April 2002.

References

1. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
2. 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	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2									1	3	2		1
CO2	3	3	2	2								1	2	3		1
CO3	3	2	3	2								1	2	3		1
CO4	3	3	2									1	3	2	1	1
CO5	2	3	2	1								1	3	2	1	1
CO6	3	2	3	2								1	2	2	2	1

162AEE26 **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.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	2							1		2		
CO2	3	1	2	2	2							1		2		
CO3	3	3	2	3	1							2		3		
CO4	2	2	1	3	2							2		2		
CO5	2		1		2							1		2		
CO6	1	1	3	1								2		1		

162AEE31 CRYPTOGRAPHY AND DATA SECURITY L-T-P C
3-0-0 3

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

AIM: To obtain comprehensive knowledge in cryptography and data security.

Course Outcomes:

The Students will be able to
CO1: Analyze the basic concepts of network protocols.
CO2: Examine the process of cryptographic algorithms.
CO3: Elaborate various public key encryption.
CO4: Demonstrate the basic working principles of digital signature.
CO5: Express various data security techniques

CONCEPTS AND PROTOCOLS

Terminology – Steganography – Substitutional ciphers- Ceaser, Mono alphabetic, poly alphabetic, Hill , Vigenere , Playfair – Transposition ciphers- rail fence, One time pad Protocols-Key exchange, authentication, secret splitting, Secret sharing, Time stamping services, subliminal channel, Digital signature, proxy signature, group signature, bit commitment, Fair coin flips.

CRYPTOGRAPHIC ALGORITHMS

Algorithm types and modes- Over view of symmetric key cryptography- Data Encryption Standard (DES) - IDEA – RC4-RC5-Blow fish-AES

ASYMMETRIC / PUBLIC KEY ENCRYPTION

Number theory-Prime numbers-Fermat's and Euler's theorem – Testing for primality -The Chinese remainder theorem- Discrete logarithms, Public key crypto systems- requirements – applications – The RSA algorithm- Key management – Diffie Hellman key exchange- Elliptic curve cryptography.

HASH FUNCTIONS AND DIGITAL SIGNATURE

Message authentication- requirements – functions – codes – Hash functions, Hash algorithms- MD5 message digest algorithm – Secure Hash algorithm – HMAC, Digital signature- Digital Signature Standard – DSS Approach – Digital Signature algorithm

DATA SECURITY

Internet security protocols- basic concepts – Secure socket layer(SSL)- transport layer security(TLS) – Secure HTTP – Time Stamping protocol – Secure electronic transaction (SET)- SSL Versus SET- Email security – WAP Security- Security in GSM – Security in 3G - Bio metric authentication – Kerberos- Single sign on (SSO) approaches.

Total Periods 45

Text Books

1. Bruce Schneier, "Applied Cryptography", 2nd Edition, John Wiley & Sons

References

1.AtulKahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2009
2. William Stallings, "Cryptography and Network Security", 3rd Edition, Pearson Education, 2003
3. Douglas R Stinson, "Cryptography – Theory and Practice", CRC press

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3		3	3		2	1	2	1	2	1	2	1		3
CO2	3	3	2	3	2	1	2	1	1		2	1	1		2	2
CO3	3	2		2	3	2	3	1	2	1	3	2	2	1	2	2
CO4	3	3	2	3	3	2	2	2	1	1	2	1	1	1	2	2
CO5	3	2	2	2	3	1	3	3	2		3	2	2	1	2	3

162AEE33	VLSI SIGNAL PROCESSING	L-T-P	C
		3-0-0	3

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

AIM: To introduce the basic methodologies and techniques in VLSI architectures for digital signal processing and communication systems

Course Outcomes:

The Students will be able to

CO1: Outline the VLSI architecture theory and algorithms, addresses various architectures at the Implementation level.

CO2: Elaborate how to design high-speed, low-area, and low-power VLSI systems for a broad range of DSP applications

CO3: Interpret the basic approaches and methodologies for VLSI design of signal processing and communication systems

CO4: Illustrate the VLSI system design experience using hardware description language (HDL) and hands-on commercial EDA tools (Synopsys).

CO5: Match the real-life case studies of communication system integrated circuit (IC) design and implementations.

INTRODUCTION TO DSP SYSTEMS **9**

Introduction TO DSP Systems – Typical DSP algorithms: Iteration Bound – data flow graph representations,loop bound and iteration bound, Longest path Matrix algorithm: Pipelining and parallel processing – Pipeliningof FIR digital filters, parallel processing, pipelining & parallel processing for low power.

RETIMING, FOLDING AND UNFOLDING **9**

Retiming – definitions and properties Retiming techniques: Unfolding – an algorithm for Unfolding, properties of unfolding, sample period reduction and parallel processing application: Folding – Folding transformation –Register minimizing techniques.

FAST CONVOLUTION **9**

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets - Operation –Block Diagram of DSP starter kit – Application Programmes for processing real time signals – Generating andfinding the sum of series, Convolution of two sequences, Filter design.

BIT-LEVEL ARITHMETIC ARCHITECTURES AND SYSTOLICARCHITECTURE DESIGN **9**

BAIT-Level Arithmetic Architectures-parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x 4 bit Baugh-Wooley carry-save multiplication tabular form andimplementation, design of Lyon's bit-serial multipliers using Horner's rule, bit-serial FIR filter, CSD representation, CSD multiplication using Horner's rule for precision improvement, systolic array design methodology – FIR systolic Arrays – selection of scheduling vector-matrix multiplication and 2D systolic arraydesign-Systolic design for space representations containing Delays.

PROGRAMMEMING DIGITAL SIGNAL PROCESSORS **9**

Synchronous, Wave and asynchronous pipelining – synchronous pipelining and clocking styles, clock skew inedge-trigged single-phase clocking, two-phase clocking, wave pipelining, asynchronous pipelining bundled dataversus dual rail protocol: Programming Digital Signal Processors - general architecture with importantfeatures.

Total Periods 45

Text Book

1.Keshab K. Parhi, "VLSI Digital Signal Processing Systems Design and Implementation" Wiley - Inter science, 1999.

Reference

1.GaryYeap, "Practical Low Power Digital VLSI Design", Kluwer Academic Publishers, 1998.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	3	2	2							1		2		
CO2	3	1	2	2	2							1		2		
CO3	3	3	2	3	1							2		3		
CO4	2	2	1	3	2							2		2		
CO5	2		1		2							1		2		

162AEE34	HIGH PERFORMANCE COMMUNICATION NETWORK	L-T-P	C
		3-0-0	3

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

AIM: To know about the concept of packet switched network ,ISDN, ATM, and Bluetooth technology.

Course Outcomes:

The Students will be able to

CO1. Realize principles of high speed communication networking.

CO2. Analyze the performance of various networks, and to sharpen one's conceptual and intuitive understanding of the field.

CO3. Evaluate the architectures of ISDN, Frame Relay, and ATM.

CO4. Compare the various methods of providing connection -oriented services.

CO5. Create Skills in a balance between the description of existing networks and tools.

PACKET SWITCHED NETWORKS **9**

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS.

ISDN AND BROADBAND ISDN **9**

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 - Broadband ISDNarchitecture and Protocols.

ATM AND FRAME RELAY **9**

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management andControl, ATM switching and transmission.Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Framerelay via ATM.

ADVANCED NETWORK ARCHITECTURE **9**

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in theInternet, Resource Reservation Protocol (RSVP), Differentiated services.

BLUETOOTH TECHNOLOGY **9**

The Blue tooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio,The Link Manager, The Host controller interface; The Blue tooth module-Protocol stack Part I: Logical linkcontrol and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephonycontrol protocol.

Total Periods 45

Text Books

1.WilliamStallings,"ISDN and Broadband ISDN with Frame Relay and ATM", 4th edition, Pearsoneducation Asia, 2002.

References

1.LeonGracia, Widjaja, "Communication networks ", Tata McGraw-Hill, New Delhi, 2000.

2. Jennifer Bray and Charles F.Sturman,"Blue Tooth" Pearson education Asia, 2001.

3.SumitKasera, PankajSethi, "ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.

4. Rainer Handel, Manfred N.Huber, Stefan Schroder,"ATM Networks",3rd edition, Pearson education asia,2002.

6. Jean Walrand and Pravinvaraiya, "High Performance Communication networks", 2nd edition, Harcourt and Morgan Kauffman, London 2000.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	4	2	3	2	2							3	3		3	
CO2	3	2	3	3	3							2			3	
CO3	3	2	2	2	2							1			3	
CO4	2	3	2	3	3							3			3	
CO5	2	2	3	3	3							3	1		3	

162AEE36 **CLOUD COMPUTING** **L-T-P C**
3-0-0 3

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

AIM: To impart fundamental concepts in the area of cloud computing & its applications

Course Outcomes:

The Students will be able to
CO1: Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
CO2: Learn how to program and configure the cloud computing.
CO3: Configure various cloud enable technologies
CO4: Demonstrate the cloud computing mechanisms
CO5: Analyze the different types of cloud architectures and models
CO6: Identify the clouds in consumer perspective and cloud provider perspective

FUNDAMENTAL CLOUD COMPUTING **9**

Origins and Influences - Basic Concepts and Terminology - Goals and Benefits - Risks and Challenges - Fundamental Concepts and Models - Roles and Boundaries - Cloud Characteristics - Cloud Delivery Models - Cloud Deployment Models.

CLOUD-ENABLING TECHNOLOGY **9**

Broadband Networks and Internet Architecture- Data Center Technology- Virtualization Technology - Web Technology -Multitenant Technology -Service Technology -Case Study Example - Cloud Security Threats.

CLOUD COMPUTING MECHANISMS **9**

Cloud Infrastructure Mechanisms- Logical Network Perimeter Virtual Server - Cloud Storage Device Cloud Usage Monitor -Resource Replication Ready-Made Environment Cloud Management -Mechanisms Remote Administration System- Resource Management System -SLA Management System -Billing Management System.

CLOUD COMPUTING ARCHITECTURE **9**

Fundamental Cloud Architectures Workload Distribution Architecture- Resource Pooling Architecture- Dynamic Scalability Architecture- Elastic Resource Capacity Architecture- Service Load Balancing Architecture- Cloud Bursting Architecture- Elastic Disk Provisioning Architecture- Redundant Storage Architecture - Advanced Cloud Architectures- Hypervisor Clustering Architecture- Load Balanced Virtual Server Instances Architecture- Non-Disruptive Service Relocation Architecture- Case Study Example.

WORKING WITH CLOUDS **9**

Cloud Delivery Models: The Cloud Provider Perspective - The Cloud Consumer Perspective- Cost Metrics and Pricing Models- Business Cost Metrics -Cloud Usage Cost Metrics- Cost Management Considerations.

Total Periods 45

Text Books

1.ThomasErl, Zaigham Mahmood, Ricardo Puttini , “Cloud Computing: Concepts, Technology & Architecture” Prentice Hall/Pearson PTR , 2013.

References

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, “Cloud Computing – Insights into New Era Infrastructure”, Wiley Indian Edition, 2011.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3					3		3		2			2		3	
CO2	3				1	2		1							3	
CO3	2					2		1					2		3	
CO4	2	2	3										2		3	
CO5										3		2	2		3	
CO6							1			3		2			3	

162AEE37	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.

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

Text Books

1. J. Han, M. Kamber, “Data Mining: Concepts and Techniques”, Harcourt India / Morgan Kauffman, 2001.

References

1. Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education 2004.
2. Sam Anahory, Dennis Murry, “Data Warehousing in the real world”, Pearson Education 2003.
3. David Hand, Heikki Manila, PadhraicSymth, “Principles of Data Mining”, PHI 2004.
4. W.H.Inmon, “Building the Data Warehouse”, 3rd Edition, Wiley, 2003.
5. Alex Bezon, Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, MeGraw-Hill Edition, 2001.
6. Paulraj Ponniah, “Data Warehousing Fundamentals”, Wiley-Interscience Publication, 2003.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								2	2	3	3	
CO2	3	2	3	2								2		2	3	
CO3	3	3	3	2	2							2	1	3	3	
CO4	2	3	2	2	1							2			2	
CO5	3	3	3	2	3							3	1	1	3	

162AEE38 **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

STATISTICAL PATTEN 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

Text Books

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.

References

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
2. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2								2	2	3	3	
CO2	3	2	3	2								2		2	3	
CO3	3	3	3	2	2							2	1	3	3	
CO4	2	3	2	2	1							2			2	
CO5	3	3	3	2	3							3	1	1	3	
CO6	2	3	1	2						2		3	2	1	2	

162AEE39 **MOBILE ROBOTICS** **L-T-P** **C**

3-0-0 **3**

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

AIM: The aim of the course is to learn the concepts and basic algorithms needed to make a mobile robot function reliably and effectively

Course Outcomes:

The Students will be able to

CO1: Design a Robot for specific application

CO2: Design the distributed and centralized controls for robot

CO3: Fit the sensors for different environments

CO4: Make a robot for a specific application

CO5: Design swarm of robots for a task

LOCOMOTION AND KINEMATICS **9**

Legged Mobile robots- Wheel mobile robots- Ariel mobile robots-Kinematic Models and constraints- Mobile robot maneuverability-Mobile robot workspace- Motion control

PERCEPTION, NON VISUAL SENSORS AND ALGORITHMS **9**

Sensors for mobile robots-Fundamentals for computer vision- Feature extraction- Place recognition-Range data-contact sensors- inertial sensors- infrared- sonar, radar, Laser, satellite based positioning- Data fusion - biological sensing.

MOBILE ROBOT LOCALIZATION **9**

Noise aliasing- Belief Representation- probabilistic Map based localization- Autonomous Map building Landmark based Localization, globally unique localization, Position beacons and Route based localizations.

PLANNING AND NAVIGATION AND SYSTEM CONTROL **9**

Planning and reacting - Path planning- Obstacle avoidance - bug algorithm- Vector field histogram- bubble band technique - Curvature velocity technique - Dynamic window approach- Schlegel approach-Nearness diagram - gradient Method- Navigation Architectures- horizontal and vertical decomposition - Hybrid control architectures.

ROBOT APPLICATIONS **9**

Artificial intelligence in robotics - Line follower-wall follower - pick and place - Flying robots - Swarm robotics-Social Economic Application - Future of Mobile robotics.

Total Periods: 45

Text Books:

1. Illah Reza Nourbakhsh, Roland Siegwart, “Introduction to Autonomous Mobile Robots, MIT press, Cambridge, London, 2011.

References:

1. Gregory Dudek, Michael Jenkin, "Computational Principles of Mobile Robotics”, Cambridge university press, 2010.

2. Y Joseph L. Jones, Bruce A. Seiger, “Mobile Robots: Inspiration to Implementation”, AK peters Ltd., 2002.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	4	3	4	2	2							3		2		4
CO2	3	2	3	3	3							2		2		3
CO3	2	2	2	2	2							1		2		3
CO4	2	3	2	3	3							3		2		3
CO5	2	3	3	3	2							3		2		3

162AEE41	SOCIAL 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.

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

Text Books

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.

References

1. Guandong Xu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling”, IGI Global Snippet, 2009.
4.John G.Breslin, Alexander Passant and Stefan Decker,“The Social Semantic Web”,Springer, 2009.

Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	4	3	4	2	2							3	2		4	
CO2	3	2	3	3	3							2	2		3	
CO3	2	2	2	2	2							1			3	
CO4	2	3	2	3	3							3			3	
CO5	2	3	3	3	2							3	2		3	

162AEE45	MACHINE LEARNING TECHNIQUES	L-T-P	C
		3-0-0	3
Programme:	M.E.(Applied Electronics)	**Sem:** -	**Category:PE**
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

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 MarkovModels

–Tracking Methods

Total Periods 45

References

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   Learning Series)‖, Third Edition, MIT Press, 2014
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Edition, Wiley, 2014
3. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense
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5. Stephen Marsland, ―Machine Learning –An Algorithmic Perspective‖, Second Edition,
   Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
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Course Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2									2	1	3		
CO2	2	2	2	2								2		2	3	
CO3	2	3	2	2								1		3	1	
CO4	2	3	2	2	2							2	2		2	
CO5	2	3	2	2	3					2		2	1	2	3	