POWERING THE YOUTH
EMPOWERING THE NATION

SRI SHAKTHI
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE, New Delhi ▪ Affiliated to Anna University, Chennai
Chinniyampalayam, Coimbatore - 62.

NATIONAL BOARD OF ACCREDITATION For CSE,MECH,EEE, IT

ACCREDITED WITH GRADE A NAAC

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULAM AND SYLLABI

M.E EMBEDDED SYSTEM TECHNOLOGIES

REGULATION – 2021

SRI SHAKTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, COIMBATORE
(AUTONOMOUS)
M.E EMBEDDED SYSTEM TECHNOLOGIES
REGULATIONS – 2021

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1	:	To provide the students with fundamental knowledge, methodologies and use of cutting edge technologies.
PEO2	:	To provide the students with an awareness of, and skill in life ling learning and self education.
PEO3	:	To cultivate team work, technical writing and oral communication skills.
PEO4	:	To provide students with an appreciation of engineering impact on society and the professional responsibilities of engineers.

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

PO1	a	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	b	**Problem analysis**: Identify, formulate, review research literature, and modelling complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	c	**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	d	**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	e	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modellingcomplex engineering activities with an understanding of the limitations.
PO6	f	**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	g	**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	h	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9	i	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	j	**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	k	**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	l	**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.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO1	:	To gain a promising knowledge on basic engineering science with hands on training that would enhance the students in designing the technical concepts and furnish the knowledge on real time applications in Electrical and electronics engineering
PSO2	:	To enrich the student's competence with analysis, synthesis and development capabilities using latest methodologies in the Electrical and Electronics Engineering field.
PSO3	:	Ability to adapt in multidisciplinary environment and expertise the student's skills in advanced technologies and creating engineering solutions for technical and non-technical aspects.
PSO4	:	Graduates will be talented to innovate, creative applications and to provide solutions for complex problems related to society

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
1	√				√	√	√				√	√
2		√	√						√			
3				√			√					√
4		√							√		√	

MAPPING OF PROGRAM SPECIFIC OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAMME SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	√				√	√	√				√	√
2		√	√						√			
3				√			√					√
4		√							√		√	

SRI SHAKTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, COIMBATORE
(AUTONOMOUS)
M.E EMBEDDED SYSTEM TECHNOLOGIES
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table

COURSE OUTCOMES		PROGRAMME OUTCOMES											
Sem	Course Name	A	B	C	D	E	F	G	H	I	J	K	L
I	Applied Mathematics for Electrical Engineers	√				√	√	√				√	√
	Microcontrollers for Embedded System Design		√	√						√			
	Advanced Digital System Design				√			√					√
	Advanced Digital Signal Processing		√							√		√	
	Embedded computing system design	√				√	√	√				√	√
	System on chip		√	√						√			
	Audit Course I	√					√						
	Embedded System Project I				√			√					√
II	Real time operating systems		√	√						√			
	Embedded System Design Using ARM				√			√					√
	Design of Embedded Control		√							√		√	

	Systems												
	Research Methodology	√				√	√	√				√	√
	Professional Elective I		√	√						√			
	Professional Elective II				√			√					√
	Audit Course II	√					√						
	Embedded System Project II		√							√		√	
III	Professional Elective III	√				√	√	√				√	√
	Professional Elective IV		√	√						√			
	Professional Elective V				√			√					√
	Technical Seminar		√							√		√	
	Dissertation Phase I	√				√	√	√				√	√
IV	Dissertation Phase II		√	√						√			

SRI SHAKTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, COIMBATORE
(AUTONOMOUS)
M.E EMBEDDED SYSTEM TECHNOLOGIES
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

CURRICULUM

SEMESTER I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	21MS103	Applied Mathematics for Electrical Engineers	BS	4	3	1	0	4
2	21ET101	Microcontrollers for Embedded System Design	PC	2	2	0	0	2
3	21ET102	Advanced Digital System Design	PC	2	2	0	0	2
4	21ET103	Advanced Digital Signal Processing	PC	2	2	0	0	2
5	21ET104	Embedded computing system design	PC	2	2	0	0	2
6	21ET105	System on chip	PC	2	2	0	0	2
7		**Audit Course I**	HS	2	2	0	0	0
LABORATORY								

8	21ET112	Microcontrollers for Embedded System Design Laboratory	PC	2	0	0	2	1
9	21ET113	Advanced Digital System Design Laboratory	PC	2	0	0	2	1
10	21ET114	Embedded computing system design Laboratory	PC	2	0	0	2	1
11	21ET115	System on chip Laboratory	PC	2	0	0	2	1
12	21ET111	Embedded System Project I	EEC	6	0	0	6	3
TOTAL				30	15	1	14	21

SEMESTER II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	21ET201	Real time operating systems	PC	3	3	0	0	3
2	21ET202	Embedded System Design Using ARM	PC	3	3	0	0	3
3	21ET203	Design of Embedded Control Systems	PC	3	3	0	0	3
4	21CC201	Research Methodology	ES	3	3	0	0	3
5		**Professional Elective I**	PE	3	3	0	0	3
6		**Professional Elective II**	PE	3	3	0	0	3
7		**Audit Course II**	HS	2	2	0	0	0
LABORATORY								
8	21ET212	Real time operating systems Laboratory	PC	2	0	0	2	1
9	21ET213	Embedded System Design Using ARM Laboratory	PC	2	0	0	2	1
10	21ET214	Design of Embedded Control Systems Laboratory	PC	2	0	0	2	1
11	21ET211	Embedded System Project II	EEC	6	0	0	6	3
TOTAL				32	20	0	12	24

SEMESTER III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1		**Professional Elective III**	PE	3	3	0	0	3
2		**Professional Elective IV**	PE	3	3	0	0	3
3		**Professional Elective V**	PE	3	3	0	0	3
4	21ET312	Technical Seminar	SC	2	0	0	2	1
LABORATORY								
5	21ET311	Dissertation Phase I	EEC	12	0	0	12	6
TOTAL				23	9	0	14	16

SEMESTER IV

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
LABORATORY								
1	21ET411	Dissertation Phase II	EEC	12	0	0	12	6

TOTAL NO OF CREDITS: 73

S.No	SUBJECT AREA	I	II	III	IV	CREDITS TOTAL	Percentage
1	**HS**	0	0	0	0	0	0
2	**BS**	4	0	0	0	4	5.47
3	**ES**	0	3	0	0	3	4.10
4	**PC**	15	11	0	0	26	35.61
5	**PE**	0	6	9	0	15	20.54
6	**OE**	0	0	0	0	0	0
7	**EEC**	3	3	6	12	24	32.87
8	**SC**	0	0	1	0	1	1.36
Total		**21**	**24**	**16**	**12**	**73**	**100**

PROFESSIONAL ELECTIVE- I (PE)

S.No.	Course code	Course Title	Category	Contact Periods	L	T	P	C
1	21PET01	IoT Architecture and Protocols	PE	4	3	0	0	3
2	21PET02	Industrial robotics	PE	4	3	0	0	3
3	21PET03	Distributed embedded systems	PE	4	3	0	0	3
4	21PET04	Embedded System Programming	PE	4	3	0	0	3
5	**21PET05**	**Electric vehicle and power management**	PE	4	3	0	0	3
PROFESSIONAL ELECTIVE- II (PE)								
6	21PET06	Advanced Digital image processing	PE	4	3	0	0	3
7	21PET07	FPGA system design	PE	4	3	0	0	3
8	21PET08	Computer architecture	PE	4	3	0	0	3
9	21PET09	Pervasive computing	PE	4	3	0	0	3
10	**21PET10**	**MEMS Technology**	PE	4	3	0	0	3
PROFESSIONAL ELECTIVE- III (PE)								
11	**21PET11**	**Soft computing for Embedded system design**	PE	3	0	0	3	0
12	21PET12	Embedded Networking	PE	3	0	0	3	0
13	21PET13	RISC Processor Architecture and Programming	PE	3	0	0	3	0
14	21PET14	Cryptography and Network Security	PE	3	0	0	3	0
15	21PET15	Embedded Product Development	PE	3	0	0	3	0
PROFESSIONAL ELECTIVE- IV (PE)								

16	21PET16	Intelligent Controllers for Electric Vehicle applications	PE	3	0	0	3	0
17	**21PET17**	**Wireless sensor networks**	PE	3	0	0	3	0
18	21PET18	Smart Grid	PE	3	0	0	3	0
19	21PET19	Automotive Embedded System	PE	3	0	0	3	0
20	21PET20	Digital Instrumentation	PE	3	0	0	3	0
PROFESSIONAL ELECTIVE- V (PE)								
21	21PET21	Wireless communication for embedded system	PE	3	0	0	3	0
22	21PET22	Electric Vehicles and Power Management	PE	3	0	0	3	0
23	21PET23	Soft Computing and Optimization Techniques	PE	3	0	0	3	0
24	21PET24	Wireless and Mobile Communication	PE	3	0	0	3	0
25	**21PET25**	**Nanoscale Devices**	PE	3	0	0	3	0

AUDIT COURSES

S.No.	Course code	Course Title	Category	Contact Periods	L	T	P	C
1	21AC101	English for Research Paper Writing	HS	2	2	0	0	0
2	21AC201	Disaster Management	HS	2	2	0	0	0
3	21AC301	Stress Management by Yoga	HS	2	0	0	2	0
4	21AC401	Value Education	HS	2	2	0	0	0

21MS103	APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES

- The main objective of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable for the students of electrical engineering.
- This course also will help the students to identify, formulate, abstract, and solve problems in electrical engineering using mathematical tools from a variety of mathematical areas, including Matrix Theory, Calculus of variations, Probability, Linear programming and Fourier series.

UNIT I MATRIX THEORY 9+3

The Cholesky decomposition – Generalized Eigenvectors – QR factorization – Least squares method – Singular value decomposition.

UNIT II CALCULUS OF VARIATIONS 9+3

Variation and its properties – Euler's equation – Functionals dependent on first and higher order derivatives – Functionals dependent on functions of several independent variables – Variational problems with moving boundaries

UNIT III PROBABILITY AND RANDOM VARIABLES 9+3

Probability – Axioms of probability – Conditional probability – Baye's theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Uniform, Exponential and Normal distributions

(Problems only).

UNIT IV LINEAR PROGRAMMING 9+3

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

UNIT V FOURIER SERIES 9+3

Fourier trigonometric series (concepts only): Periodic function as power signals – Convergence of series – Even and odd function: Cosine and sine series – Non periodic function: Extension to other intervals – Power signals: Exponential Fourier series – Parseval's theorem and power spectrum – Eigenvalue problems and orthogonal functions.

Total:60 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1 Apply various methods in matrix theory to solve system of linear equations.

CO2 Maximizing and minimizing the functional that occur in electrical engineering discipline.

CO3 Estimate the probability and moments, standard distributions of discrete and continuous random variables for the given Engineering problems.

CO4 Develop a linear programming model from problem description, and apply thesimple method for solving linear programming problems.

CO5 Solve the problem using the Fourier series analysis concept.

CO6 Apply various methods in to solve Theorems and Functions.

TEXT BOOKS

1. Andrews L.C. and Phillips R.L., "Mathematical Techniques for Engineers and Scientists", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.
2. Bronson, R. "Matrix Operation", Schaum's outline series, 2ndEdition, McGraw Hill, 2011.

REFERENCE BOOKS

1. Elsgolc, L. D. "Calculus of Variations", Dover Publications, New York, 2007.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8thEdition, 2015
3. O'Neil, P.V., "Advanced Engineering Mathematics", Thomson Asia Pvt. Ltd., Singapore,2003.6.Taha, H.A., "Operations Research, An Introduction",9thEdition, Pearson education, New Delhi,2016.

4 Taha, H.A., "Operations Research, An Introduction", 9th Edition, Pearson education,New Delhi, 2016.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													**CO/PSO Mapping**			
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	**PO 2**	**PO3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO2**	**PSO3**	**PSO 4**
CO1	3	3	3	2	2	0	0	0	0	0	1	2	3	1	1	1
CO2	3	3	3	2	1	0	0	0	0	0	1	2	3	3	3	3
CO3	3	3	3	1	2	0	0	0	0	0	2	2	3	2	2	1
CO4	2	1	1	2	1	0	0	0	0	0	2	3	3	3	3	2
CO5	3	1	3	2	2	0	0	0	0	0	2	2	3	2	3	3
CO6	3	3	3	2	2	0	0	0	0	0	1	3	2	3	3	3

21ET101	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To study the architecture of 8051- and 8-bit PIC Microcontrollers
- To understand the concepts of Memory and Peripheral Interfacing with microcontrollers
- To learn assembly language programming for microcontrollers
- To learn about software design tools used for programming microcontrollers

UNIT I REVIEW OF 8051 ARCHITECTURE 6

Architecture – memory organization – addressing modes – instruction set –Timers - Interrupts -I/O ports, Interfacing I/O Devices – Serial Communication- Assembly language programming – Arithmetic Instructions – Logical Instructions –Single bit Instructions – Timer Counter Programming – Serial Communication Programming- Interrupt Programming

UNIT II 8 BIT PIC MICROCONTROLLER 6

Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly& C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming

UNIT III PERIPHERALS OF PIC MICROCONTROLLER 6

Timers – Interrupts, I/O ports- A/D converter-UART- I2C bus –SPI- CCP modules -Flash and EEPROM memories-ADC, DAC and Sensor Interfacing.

UNIT IV DEVELOPMENT TOOLS 6

Host and Target Machines- Linker/Locators for Embedded Software, Debugging Techniques- MPLAB overview: Using MPLAB, Toolbars, Select Development Mode and Device Type, Project, Text Editor-Assembler, MPLAB Operations – Emulators.

UNIT V SYSTEM DESIGN – CASE STUDY 6

Interfacing LCD Display – Keypad Interfacing – Servo motor Control – Controlling DC/ AC appliances – Measurement of frequency – Standalone Data Acquisition System- Interfacing Wireless Communication modules - RF, Zigbee and GSM modules with microcontrollers.

Total:30 Hours

COURSE OUTCOMES

CO1 :At the end of the course students should be able to

CO2: Understand the the architecture of 8051- and 8-bit PIC Microcontrollers.
CO3:Understandthe concepts of Memory and Peripheral Interfacing with microcontrollers
CO4:Learn about the assembly language programming for microcontrollers
CO5: Learn about software design tools used for programming microcontrollers.
CO6: To develop applications using microcontroller for regular usage.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO2	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	2
CO3	3	3	2	2	2	0	0	0	0	0	3	2	3	2	3	3
CO4	1	3	1	1	1	0	0	0	0	0	3	1	2	3	2	2
CO5	3	1	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO6	3	3	2	2	2	0	0	0	0	0	3	2	2	2	2	3

TEXT BOOKS

1. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey 'PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008
2. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 'The 8051 Microcontroller and Embedded Systems' Prentice Hall, 2005.

REFERENCE BOOKS

1. John Iovine, 'PIC Microcontroller Project Book', McGraw Hill 2000
2. MykePredko, "Programming and customizing the 8051 microcontrollers", Tata McGraw Hill 2001.
3. Scott Mackenzie and Raphael C.W. Phan, "The Micro controller", Pearson, Fourth edition 2012.

21ET102	ADVANCED DIGITAL SYSTEM DESIGN	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To understand the concepts of Asynchronous Sequential Circuit Design.
- To study the concepts of Fault Diagnosis and Testability Algorithms.
- To understand the concepts of System Design Using VHDL and Programmable Devices

UNIT I SEQUENTIAL CIRCUIT DESIGN 6

Analysis of Synchronous Sequential Networks (SSN) Modeling of SSN – State Stable Assignment and Reduction – Design of SSN – Design of Iterative Circuits – ASM Chart–ASM Realization.

UNIT II ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN 6

Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC– State Assignment–Problem and the Transition Table–Design of ASC – Static and Dynamic Hazards – Essential Hazards.

UNIT III FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS 6

30Fault Table Method – Path Sensitization Method – Boolean Difference Method – Kohavi Algorithm – Tolerance Techniques – The Compact Algorithm – Practical PLA's – Fault in PLA– Test Generation – Masking Cycle –DFT Schemes – Built –in Self-Test

UNIT IV SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES 6

EPROM to Realize a Sequential Circuit – Programmable Logic Devices – Designing a Synchronous Sequential Circuit using a GAL – EPROM – Realization State machine using PLD– FPGA–Xilinx FPGA–Xilinx2000-Xilinx3000.

UNIT V SYSTEM DESIGN USING VHDL 6

VHDL Description of Combinational Circuits – Arrays – VHDL Operators – Compilation and Simulation of VHDL Code–Modeling using VHDL–– Flip Flops – Registers – Counters– Sequential Machine – Combinational Logic Circuits –Design of a Simple Microprocessor.

Total:30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the concepts of Asynchronous Sequential Circuit Design.
CO2: Comprehend the concepts of Fault Diagnosis and Testability Algorithms.
CO3:Recognize the concepts of System Design Using VHDL and Programmable Devices
CO4: To Understand the Concepts of Realization State machine using PLD.
CO5: To Analyze the VHDL Description Circuits.
CO6: To Understand the Concepts of Design of a Simple Microprocessor.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	O4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	2	3	0	0	0	2	0	1	1	2	1	2	3
CO2	2	2	2	2	3	0	0	0	2	0	2	1	2	1	2	3
CO3	1	3	2	2	3	0	0	0	2	0	3	1	2	1	2	3
CO4	2	2	3	1	2	0	0	0	2	0	2	1	2	1	2	3
CO5	2	2	2	2	3	0	0	0	1	0	3	2	1	2	3	1
CO6	2	2	2	2	3	0	0	0	2	0	2	1	2	1	2	3

TEXT BOOKS

1.M. Morris Mano, Michael D.Ciletti, “Digital System Design”Pearson Education, 2008

2.Charles H. Roth Jr., “Digital System Design using VHDL” Thomson Learning, 1998.

REFERENCE BOOKS

1. Charles H. Roth Jr., Fundamentals of Logic design Thomson Learning, 2004.
2. Donald G.Givone, Digital principles and Design, TataMcGrawHill, 2002.
3. John M.Yarbrough, Digital Logic appns .and Design,Thomson Learning, 2001.
4. Stephen Brown and ZvonkVranesic, Fundamentals of Digital Logic with VHDL Design, TataMcGrawHill, 2002.

21ET103	ADVANCED DIGITAL SIGNAL PROCESSING	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To necessitate students, understand the basic principles of random signal processing, spectral estimation methods, adaptive filter algorithms and their applications
- To facilitate the student to comprehend the different signal detection and estimation methods used in communication system

UNIT I MULTIRATE SIGNAL PROCESSING 6

Introduction-Sampling and Signal Reconstruction-Sampling rate conversion – Decimation by an integer factor – interpolation by an integer factor –Sampling rate conversion by a rational factor – poly-phase FIR structures – FIR structures with time varying coefficients - Sampling rate conversion by a rational factor- Multistage design of decimator and interpolator.

UNIT II DISCRETE RANDOM SIGNAL PROCESSING 6

Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem, special types of random process – Signal modeling-Least Squares method, Pade approximation, Prony's method, iterative Prefiltering, Finite Data records.

UNIT III ADAPTIVE FILTERS 6

FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Windrow Hof LMS Adaptive algorithm - Adaptive channel equalization – Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters

UNIT IV DSP ALGORITHM IMPLEMENTATION 6

Computation of the discrete Fourier transform- Number representation – Arithmetic operations – handling of overflow – Tunable digital filters – function approximation.

UNIT V POWER SPECTRUM ESTIMATION 6

Estimation of spectra from Finite Duration Observations signals- Nonparametric methods for power spectrum Estimation- parametric method for power spectrum Estimation- Estimation of spectral form-Finite duration observation of signals- Non-parametric methods for power spectrum estimation – Walsh methods – Blackman and torchy method

Total:30 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2:Articulate and apply the concepts of special random processes in practical applications
CO3:Choose appropriate spectrum estimation techniques for a given random process
CO4:Apply optimum filters appropriately for a given communication application
CO5:Apply appropriate adaptive algorithm for processing non-stationary signals

CO6:Apply and analyze wavelet transforms for signal and image processing-based applications

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	0	0	0	0	0	0	2	2	3	3	2	2
CO2	3	1	2	3	0	0	0	0	0	0	2	2	3	3	2	2
CO3	2	3	1	2	0	0	0	0	0	0	2	2	3	3	2	2
CO4	3	3	1	2	0	0	0	0	0	0	1	3	3	3	2	2
CO5	3	3	1	2	0	0	0	0	0	0	1	3	1	2	1	3
CO6	3	3	1	2	0	0	0	0	0	0	1	3	1	2	1	3

TEXT BOOKS

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G.Proakis, DimitrisG.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. Glenn Zelniker, Fred J. Taylor, Advanced Digital Signal Processing – Theory and Applications

REFERENCE BOOKS

1. John G.Proakiset.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
2. DimitrisG.Manolakiset.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.
3. Ifeachor.E.C.,Jarvis.B.W., "Digital Signal Processing: A Practical Approach", 2nd edition, Prentice Hall, 2002.

21ET104	EMBEDDED COMPUTING SYSTEM DESIGN	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To study the overview of Embedded System Architecture
- To focus on distributed Embedded Architecture and its accessing protocols
- To understand about the design methodologies in hardware and software design

UNIT I EMBEDDED SYSTEMS OVERVIEW 6

Embedded systems overview-design challenge-optimizing metrics - processor technology – IC technology - design technology-automation-synthesis-verification: hardware/software co - simulation-trade-offs.

UNIT II PROCESSING ELEMENTS 6

Custom single purpose processor design-RT level custom single purpose processor design optimizing custom single purpose processors-General purpose processor's software: architecture, operation, programmer's view and development environment – ASIPs - selecting a microprocessor - general purpose processor design.

UNIT III MEMORY 6

Introduction-memory write ability and storage Permanence-common memory types-composing memory-memory hierarchy and caches-advanced RAM.

UNIT IV INTERFACING AND PROTOCOL 6

Introduction-communication basics-microprocessor interfacing: I/O addressing, interrupts, DMA Arbitration- multilevel bus architectures-advanced communication principles-serial protocols parallel protocols-wireless protocols.

UNIT V APPLICATIONS FOR EMBEDDED SYSTEM 6

Standard single purpose processor's peripherals: timers, counters, watchdog timers, UART, PWM, LCD controllers, keypad controllers, stepper motor controllers, ADC and RTC. Digital camera-washing machine-cell phones-home security systems-finger print identifiers-cruise control-printers-Automated teller machine.

Total:30 Hours

COURSE OUTCOMES

CO1: Acquire knowledge of Embedded Systems.
CO2: To construct embedded system hardware.
CO3: To develop software programs to control embedded system.
CO4: To generate product specification for embedded system.
CO5: To Understand the Concept of communication basics.
CO6::Apply and analyze the technical and general communication.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO2	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	2
CO3	3	3	2	2	2	0	0	0	0	0	3	2	3	2	3	3
CO4	1	3	1	1	1	0	0	0	0	0	3	1	2	3	2	2
CO5	3	1	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO6	3	3	2	2	2	0	0	0	0	0	3	2	2	2	2	3

TEXT BOOKS

1. Frank Vahid and Tony Givargis, Embedded system design: A unified hardware/Software introduction, Third edition, John Wiley & sons, 2010
2. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2008.

REFERENCE BOOKS

1. Jonathan.W.Valvano, Embedded Microcomputer systems: Real Time Interfacing, Third edition, cengage learning,2012
2. Santanuchattopadhyay, Embedded system Design, PHI Learning Pvt. Ltd., 2010
3. Steave Heath, Embedded system Design, Second edition, 2003
4. Daniel D. Gajski, Samar. Abdi, Andreas. Gerstlauer Embedded system design: Modeling, synthesis and verification", Springer, 2009

21ET105	SYSTEM ON CHIP	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To understand the concepts of System on Chip Design methodology for Logic and Analog Cores.
- To understand the concepts of System on Chip Design Validation.
- To understand the concepts of SOC Testing

UNIT I INTRODUCTION 6

System trade-offs and evolution of ASIC Technology- System on chip concepts and methodology – SoC design issues -SoC challenges and components.

UNIT II DESIGN METHODOLOGICAL 6

SoC Design Flow – On-chip buses –Design process for hard cores –Soft and firm cores – Designing with hard cores, soft cores- Core and SoC design examples.

UNIT III METHODOLOGY FOR MEMORY 6

Embedded memories –Simulation modes Specification of analog circuits – A to D converter – Phase-located loops –High I/O.

UNIT IV DESIGN ENDORSEMENT 6

Core level validation –Test benches –SoC design validation – Co simulation –hardware/ Software co-verification. Case Study: Validation and test of systems on chip.

UNIT V TESTING FOR SOC 6

SoC Test Issues – Testing of digital logic cores –Cores with boundary scan –Test methodology for design reuse– Testing of microprocessor cores – Built in self-method –testing of embedded memories Designing BIST techniques for SOC testing- soft core models for different logic circuits

Case Study: Integrating BIST techniques for on-line SoC testing.

Total:30 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2:Understand all important components of a System-on-Chip and an embedded system, i.e. digital hardware, analog hardware and embedded software

CO3:Understand the major architectures and trade-offs concerning performance, cost and power consumption of single chip and embedded explain the role of protocols in networking.

CO4:Know the major design flows for digital hardware, analog hardware and embedded software

CO5:Analysis the Concept of Embedded Memories.

CO6: Learn and design the SoC Tests.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

TEXT BOOKS

1. RochitRajsunah, System-on-a-chip: Design and Test, Artech House, 2007.
2. PrakashRaslinkar, Peter Paterson &Leena Singh, System-on-a-chip verification: Methodology andTechniques, Kluwer Academic Publishers, 2000.

REFERENCE BOOKS

1. M.Keating, D.Flynn, R.Aitken, A, GibbonsShi, Low Power Methodology Manual for System-on-ChipDesign Series: Integrated Circuits and Systems, Springer, 2007.
2. L.Balado, E. Lupon, Validation and test of systems on chip, IEEE conference on ASIC/SOC,1999.
3. A.Manzone, P.Bernardi, M.Grosso, M. Rebaudengo, E. Sanchez, M.SReorda, Centro Ricerche Fiat, Integrating BIST techniques for on-line SoC testing, IEEE Symposium on On-line testing 2005.
4. Wang, Charles E Strout and NurATouba, System on Chip Test Architectures: Nanometer Design for Testability, Morgan Kaufmann, 2007.

21ET112	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	2	1

Objectives

- To study the architecture of 8051- and 8-bit PIC Microcontrollers
- To understand the concepts of Memory and Peripheral Interfacing with microcontrollers
- To learn assembly language programming for microcontrollers
- To learn about software design tools used for programming microcontrollers

List of Programs

1.Basic experiments on 8051 microcontrollers

2.-Keypad interfacing with 8051 microcontrollers.

3.-Interfacing of Servo motor control with 8051

4.-ADC interfacing with 8051

5.-Experimentwith Zigbee

6-DAC interfacing with 8051

7.-Interfacing with GSM module

8.-Interfacing EPROM and interrupt.

9.-Smart Wireless Relay Control and Power Monitoring System using Zigbee Technology

10.-Zigbee based DC motor Control from PC 1.0

11.-ADC interfacing with Zigbee

12.-DAC interfacing with Zigbee

TOTAL: 30 PERIODS

Outcomes

At the end of the course, learners will be able to:

- Understand the the architecture of 8051- and 8-bit PIC Microcontrollers.
- Understandthe concepts of Memory and Peripheral Interfacing with microcontrollers
- Learn about the assembly language programming for microcontrollers
- Learn about software design tools used for programming microcontrollers.
- To develop applications using microcontroller for regular usage. Microcontrollers.
- Apply the concepts of the8051 Microcontrollers.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

21ET113	ADVANCED DIGITAL SYSTEM AND SIGNAL PROCESSING LABORATORY	L	T	P	C
		0	0	2	1

Objectives

- To understand the concepts of Asynchronous Sequential Circuit Design.
- To study the concepts of Fault Diagnosis and Testability Algorithms.
- To understand the concepts of System Design Using VHDL and Programmable Devices.
- To necessitate students, understand the basic principles of random signal processing, spectral estimation methods, adaptive filter algorithms and their applications
- To facilitate the student to comprehend the different signal detection and estimation methods used in communication system

List of Programs

1. FPGA Kit
2. Xilinx simulation with Verilog
3. Programming in VHDL
4. Design an Adder (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implementby Xilinx/Altera FPGA
5. Design a Multiplier (4 Bit Min) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
6. Generation of elementary Discrete-Time sequences (MATLAB)
7. Linear and Circular convolutions (MATLAB)
8. Auto correlation and Cross Correlation (MATLAB)
9. Frequency Analysis using DFT (MATLAB)
10. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation (MATLAB)

TOTAL: 30 Hours

Course Outcomes

At the end of the course, learners will be able to:

- Articulate and apply the concepts of special random processes in practical applications
- Choose appropriate spectrum estimation techniques for a given random process
- Apply optimum filters appropriately for a given communication application
- Apply appropriate adaptive algorithm for processing non-stationary signals
- Apply and analyse wavelet transforms for signal and image processing-based applications
- Gain the knowledge about the digital filters in MATLAB Simulink.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

21ET114	EMBEDDED COMPUTING SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	2	1

Objectives

- To necessitate students, understand the basic principles of random signal processing, spectral estimation methods, adaptive filter algorithms and their applications
- To facilitate the student to comprehend the different signal detection and estimation methods used in communication system

List of Programs

1. PIC for Embedded System Design
2. PIC to interface stepper motor controllers
3. PIC to implement ADC
4. PIC and Microcontroller for Keyboard display
5. Interfacing EPROM and interrupt.
6. Smart carZigbeeArduino Nano Projects
7. Vehicle Emission and Control System using ZigbeeArduino
8. Remote Monitoring and Controlling System Based on ZigBee Networks
9. Automatic speed and torque monitoring in induction motors using Zigbee and SMS

10. Low-Power Wireless Liquid Monitoring System Using Ultrasonic Sensors
11. ZIGBEE based Wireless Monitoring and Controlling of Automation System using PLC & SCADA
12. ZigBee Based Industrial Automation Profile for Power Monitoring Systems

TOTAL: 30 Hours

Outcomes

At the end of the course, learners will be able to:

- Construct embedded system hardware
- Develop software programs to control embedded system
- Generate product specification for embedded system

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													**CO/PSO Mapping**			
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

21ET201	REAL TIME OPERATING SYSTEMS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the aspects of Real Time Embedded concepts
- To learn the Essentials of Open Source RTOS and their usage
- To select the proper technique to design a Real-Time System
- To understand VxWorks RTOS and real time application programming with it
- To build the device driver and kernel internal for Embedded OS and RTOS earn and apply the knowledge of Memory systems

UNIT I EMBEDDED OPERATING SYSTEM 6

Linux internals: Process Management, File Management, Memory Management, I/O Management. Overview of POSIX APIs, Threads – Creation, Cancellation, POSIX Threads Inter Process Communication – Semaphore, Pipes, FIFO, Shared Memory Kernel: Structure, Kernel Module Programming Schedulers and types of scheduling. Interfacing: Serial, Parallel Interrupt Handling Linux Device Drivers: Character, USB, Block& Network.

UNIT II RTOS 6

Basics of RTOS: Real-time concepts, Hard Real time and Soft Real-time, Differences between General Purpose OS & RTOS, Basic architecture of an RTOS, Scheduling Systems, Inter-process communication, Performance Matric in scheduling models, Interrupt management in RTOS environment, Memory management, File systems, I/O Systems, Advantage and disadvantage of RTOS. POSIX standards, RTOS Issues – Selecting a Real-Time Operating System, RTOS comparative study.

UNIT III KERNEL BASICS 6

Function: Basics - User-defined Functions - Inter Function Communication - Standard Functions – Recursion- Recursive Functions - Storage Classes: Auto – Register – Static – Extern - Scope Rules - Type Qualifiers -Pre-processor Commands - Command line Arguments.Converting a normal Linux kernel to real time kernel, Xenomai basics. Real Time Operating Systems: Event based, process based and graph-based models, Petrinet models. Real time languages, real time kernel, OS tasks, task states, task scheduling, interrupt processing, clocking, communication and Synchronization. Control blocks, memory requirements and control, kernel services, basic design using RTOS.

UNIT IV VXWORKS / FREE RTOS 6

VxWorks/ Free RTOS Scheduling and Task Management – Realtime scheduling, Task Creation, Intertask Communication, Pipes, Semaphore, Message Queue, Signals, Sockets, Interrupts I/O Systems – General Architecture, Device Driver Studies, Driver Module explanation, Implementation of Device Driver for a peripheral.

UNIT V CASE STUDY 6

Software Development and Tools: Simulators, debuggers, cross compilers, in circuit emulators for the microcontrollers. Interface Issues Related to Embedded Systems: A/D, D/A converters, FPGA, ASIC,

diagnostic port. Cross compilers, debugging Techniques, Creation of binaries & porting stages for Embedded Development board (Beagle Bone Black, Rpi or similar), Porting an Embedded OS/ RTOS to a target board (). Testing a real-time application on the board.

Total:30 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2: Understand the aspects of Real Time Embedded concepts.
CO3: Identification of Open Source RTOS and their usage.
CO4:Design a Real-Time System with applications
CO5: To learn about VxWorks RTOS and real time application programming.
CO6: To develop applications using Memory, Embedded OS and RTOS.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO2	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO3	1	3	0	3	1	1	1	0	0	0	2	1	2	2	2	2
CO4	3	2	0	1	2	3	1	0	0	0	1	1	2	1	3	1
CO5	3	3	0	2	2	1	2	0	0	0	1	1	2	1	3	1
CO6	3	3	0	2	2	1	1	0	0	0	1	1	2	1	3	1

TEXT BOOKS

1. VenkateswaranSreekrishnan," Essential Linux Device Drivers", Ist Kindle edition, Prentice Hall, 2008
2. Jerry Cooperstein , "Writing Linux Device Drivers: A Guide with Exercises", J. Cooperstein publishers ,2009
3. Qing Li and CarolynYao,"3Real Time Concepts for Embedded Systems – Qing Li, Elsevier ISBN:1578201241 CMP Books © 2003

REFERENCE BOOKS

1. Raj Kamal," Embedded Systems Architecture Programming and Design", Tata McGraw Hill, 2011
2. KVK Prasad," Embedded/Real Time Systems Concepts, Design and Programming Black Book", Wiley India 2003
3. Seppo J. Ovaska Phillip A. Laplante," Real-Time Systems Design and Analysis: Tools for the Practitioner", 4ed Paperback – 17 May 2013
4. Ward, Paul T & Mellor, Stephen, "Structured Development for Real - Time Systems v1, v2, V3: Implementation Modeling Techniques" Prentice hall, 2015

21ET202	EMBEDDED SYSTEM DESIGN USING ARM	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the advanced controllers used for embedded system design
- To study about current technologies, integration methods and hardware and software design concepts associated with processor in Embedded Systems.
- To study about a simple low power microcontroller and their applications
- To get detail knowledge regarding testing and hardware software co- design issues pertaining to design of an Embedded System using low power microcontrollers

UNIT I ARM EMBEDDED SYSTEMS 6

Embedded System- The RISC Design Philosophy - ARM Design Philosophy - Embedded System Hardware - Embedded System Software - Core Extensions - Architecture Revisions.

UNIT II ARM PROCESSOR FUNDAMENTALS 6

Registers of ARM processor, Current Program Status Register (CPSR), Pipeline concept of ARM families, Exceptions, Interrupts and Interrupt Vector Table, ARM Processor Families.

UNIT III ARM INSTRUCTION SET AND EMBEDDED C 6

Data Processing Instructions – Arithmetic Instructions, Logic Instructions, Compare Instructions, Multiply Instructions - Branch Instructions – Load/Store Instructions – Types of Load/Store Instructions - Addressing modes of Single and Multiple Register Load/Store Instructions, Swap Instructions, Program Status Register Instruction - Software Interrupt Instruction - Loading Constants - ARM 5vE Extensions - Conditional Execution.

UNIT IV ARM CORE BASED MICROCONTROLLER - LPC2148 6

Architecture of ARM CORE based Microcontroller - Memory Mapping -General Purpose Input Output Ports (GPIO) -Timers/counter -Analog to Digital Converter (ADC) – Digital to Analog Converter (DAC) - Interrupts Concepts – Pulse Width Modulation (PWM).

UNIT V SERIAL COMMUNICATIONS AND NETWORK – LPC2148 6

Universal Synchronous Asynchronous Receiver and Transmitter (USART), Serial Peripheral Interface (SPI), Inter Integrate Circuit (I2C), Controller Area Network (CAN).

Total:30 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2:Analysis the different types of advanced controllers

CO3: Analysis current technologies, integration methods and hardware and software design concepts associated with processor.

CO4: Analysis low power microcontrollers and their applications.

CO5: Be exposed to the fundamentals of ARM Core based Controller.

CO6: Able to understand the Communications and network.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	0	0	0	0	2	2	3	2	3	2	2
CO2	2	3	2	3	2	0	0	0	0	2	2	3	1	2	2	3
CO3	1	2	1	3	2	0	0	0	0	2	2	3	2	2	1	2
CO4	2	3	2	2	1	0	0	0	0	2	2	3	2	2	1	3
CO5	2	3	2	3	2	0	0	0	0	1	1	2	1	3	2	2
CO6	2	3	2	3	2	0	0	0	0	2	2	3	1	2	1	2

TEXT BOOKS

1. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM Developer‟s Guide.
2. User Manual of ARM Controllers LPC2148, CORTEX M-3.
3. Steve Furber “ARM System on Chip Architecture”, 2nd Edition, Addison Wesley, 2000

REFERENCE BOOKS

1. Muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi, Janice Mazidi, “ARM Assembly Language: Programming and Architecture” 2013.
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002
3. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.
4. Arnold S Burger, “Embedded System Design”, CMP Books, 2002
5. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, TMH Publications,Second Edition, 2008.

21ET303	DESIGN OF EMBEDDED CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To expose the students to the fundamentals of Embedded System Blocks
- To teach the fundamental RTOS
- To discuss the Applications development using interfacing

UNIT I EMBEDDED SYSTEM ORGANIZATION 6

Embedded computing – characteristics of embedded computing applications – embedded system design challenges; Build process of Real time Embedded system – Selection of processor; Memory; I/O devices-Rs-485, MODEM, Bus Communication system using I2C, CAN, USB buses, 8 bit –ISA, EISA bus.

UNIT II REAL-TIME OPERATING SYSTEM 6

Introduction to RTOS; RTOS- Inter Process communication, Interrupt driven Input and Output - Nonmaskable interrupt, Software interrupt; Thread – Single, Multithread concept; Multitasking Semaphores.

UNIT III INTERFACE WITH COMMUNICATION PROTOCOL 6

Design methodologies and tools – design flows – designing hardware and software Interface – system integration; SPI, High speed data acquisition and interface-SPI read/write protocol, RTC interfacing and programming.

UNIT IV SOFTWARE FOR EMBEDDED CONTROL 6

Software abstraction using Mealy-Moore FSM controller, Layered software development, Basic concepts of developing device driver – SCI – Software - interfacing & porting using standard C & C++; Functional and performance Debugging with benchmarking Real-time system software – Survey on basics of contemporary RTOS – VXWorks, UC/OS-II.

UNIT V CASE STUDIES WITH EMBEDDED CONTROLLER 6

Programmable interface with A/D & D/A interface; Digital voltmeter, control- Robot system; - PWM motor speed controller, serial communication interface, Applications of Embedded System.

Total:30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Compare types and Functionalities in commercial software tools.
CO2: Develop the Applications using interfacing.
CO3: Program for the process communication.
CO4: To able to analyze the design Methodologies.
CO5: Analyze the basic the Embedded Control.
CO6: Acquire the knowledge of Embedded Controllers.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	3	1	2	2	1	2	0	2	0	1	2	3	3	1	1
CO2	3	3	1	2	2	1	2	0	2	0	1	2	2	1	2	2
CO3	2	3	1	3	2	1	2	0	2	0	1	1	3	3	1	2
CO4	3	1	1	2	1	2	1	0	1	0	3	2	3	3	1	2
CO5	3	3	1	2	2	1	2	0	2	0	1	2	3	3	1	2
CO6	3	3	1	2	2	1	2	0	2	0	1	2	3	3	1	2

TEXT BOOKS

1. Raj Kamal, “Embedded Systems- Architecture, Programming and Design” Tata McGraw Hill, 2006.
2. Steven F. Barrett, Daniel J. Pack, “Embedded Systems – Design and Applications with the 68HC 12 and HCS12”, Pearson Education, 2008.
3. MichealKhevi, “The M68HC11 Microcontroller application in control, Instrumentation & Communication”, PH NewJersy, 1997.
4. Raj Kamal, “Embedded Systems- Architecture, Programming and Design” Tata McGraw Hill, 2006.

REFERENCE BOOKS

1. Chattopadhyay, “Embedded System Design”,PHI Learning, 2011.
2. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, “PIC Microcontroller and Embedded Systems- Using Assembly and C for PIC18”, Pearson Education,2008.
3. Steven F.Barrett,DanielJ.Pack, ”Embedded Systems-Design & Application with the 68HC12 & HCS12”, Pearson Education,2008.
4. Daniel W. Lewis, “Fundamentals of Embedded Software”, Prentice Hall India, 2004.

21CC201	RESEARCH METHODOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Ability to critically evaluate current research and propose possible alternate methods for further work.
- Ability to develop hypothesis / Problem Statement and methodology for research.
- Ability to comprehend and deal with complex research issues in order to communicate their scientific results clearly for peer review.

UNIT I INTRODUCTION TO RESEARCH METHODOLOGY 9

Meaning of Research, Types of Research, Research Process, Problem definition, Objectives of Research, Research Questions, Research design, Approaches to Research, Quantitative vs. Qualitative Approach, Understanding Theory, Building and Validating Theoretical Models, Exploratory vs. Confirmatory Research, Experimental vs Theoretical Research, Importance of reasoning in research.

UNIT II LITERATURE REVIEW 9

Problem Formulation, Understanding Modeling & Simulation, Conducting Literature Review, Referencing, Information Sources, Information Retrieval, Role of libraries in Information Retrieval, Tools for identifying literatures, Indexing and abstracting services, Citation indexes.

UNIT III DATA COLLECTION AND SAMPLING DESIGN 9

Experimental Research: Cause effect relationship, Development of Hypothesis, Measurement Systems Analysis, Error Propagation, Validity of experiments, Statistical Design of Experiments, Field Experiments, Data/Variable Types & Classification, Data collection, Numerical and Graphical Data Analysis: Sampling, Observation, Surveys, Inferential Statistics, and Interpretation of Results.

UNIT IV RESEARCH REPORTS 9

Preparation of Dissertation and Research Papers, Tables and illustrations, Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript. References, Citation and listing system of documents.

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR) AND PATENTS 9

Intellectual property rights (IPR) - patents-copyrights-Trademarks-Industrial design geographical indication. Ethics of Research- Scientific Misconduct- Forms of Scientific Misconduct. Plagiarism, Unscientific practices in thesis work, Ethics in science.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:To learn about the following: literature study, case study, structured surveys, interviews, focus groups, participatory approaches, narrative analysis, cost-benefit analysis, scenario methodology and technology foresight.

CO2:To understand the concepts of current research and alternate research work
CO3:Identification of problem statements and different solutions for the further research
CO4:To learn the methodologies to be implemented in current research
CO5: Ability to deal with complex research issues and communicating their scientific results.
CO6: To understand the concepts of Intellectual property rights.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4
CO1	0	0	0	0	0	2	2	3	3	3	3	1	0	0	3	3
CO2	0	0	0	0	0	2	2	3	3	3	3	3	0	0	3	3
CO3	0	0	0	0	0	3	1	2	2	2	1	1	0	0	3	3
CO4	0	0	0	0	0	1	1	3	3	1	3	2	0	0	2	1
CO5	0	0	0	0	0	3	3	2	3	3	2	3	0	0	3	3
CO6	0	0	0	0	0	3	2	3	3	3	3	3	0	0	3	3

TEXT BOOKS

1. C.R. Kothari, Research Methodology Methods and Techniques, 2nd Revised edition, New Age

REFERENCE BOOKS

1. Deepak Chawla, NeenaSodhi “Research Methodology concepts and cases “2nd edition, Vikas Publishing house pvt ltd.
2. Michael Quinn Patton “Qualitative Research & Evaluation Methods” 3rd edition, Sage Publications.
3. Paul D. Leedy, Jeanne Ellis Ormrod “Practical Research: Planning and Design”, Prentice Hall.

21ET212	REAL TIME OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

Objectives

- To understand the aspects of Real Time Embedded concepts
- To learn the Essentials of Open Source RTOS and their usage
- To select the proper technique to design a Real-Time System
- To understand VxWorks RTOS and real time application programming with it
- To build the device driver and kernel internal for Embedded OS and RTOS earn and apply the knowledge of Memory systems

List of Programs

1. Simulation of digital controllers using MATLAB/LabVIEW
2. GPIO programming with ARM Controller
3. Interfacing Wireless modules
4. Sensor Interfacing and I/O device control
5. Internet of Things (IOT) implementation
6. To Implement Priority Scheduling based application
7. Webcam Interface, Image Acquisition and processing
8. Inter process communication using mailbox and message queues
9. Resource management with semaphores
10. Smart Substations and smart Grid solutions

TOTAL: 30 Hours

Course Outcomes

- Understand the aspects of Real Time Embedded concepts.
- Ale to Analyze the Open Source RTOS and their usage.
- To Design a Real-Time System with applications
- To learn about VxWorks RTOS and real time application programming.
- To develop applications using Memory, Embedded OS and RTOS.
- To gain the Concepts of smart Grid solutions

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

21ET213	DESIGN OF EMBEDDED CONTROL SYSTEMS LABORATORY	L	T	P	C
		0	0	2	1

Objectives

- To expose the students to the fundamentals of Embedded System Blocks
- To teach the fundamental RTOS
- To discuss the Applications development using interfacing

List of Programs

1. Implement Priority Scheduling based application
2. Implement Multitasking using RTOS (Toggling LEDs and at different ports)
3. Inter process communication using mailbox and message queues
4. Arduino Uno interfacing
5. Writing Multithreaded S/W
6. Manipulating Kernel Objects
7. Developing an Application using Inter Process Communication
8. Implementation of Offline Scheduling
9. Implementation of Online Scheduling

10. Implementation a semaphore for task switching
11. Implementation of thread synchronization
12. Multi task handling using polled loop and interrupt methods

TOTAL: 30 Hours

COURSE OUTCOMES:

1. Compare types and Functionalities in commercial software tools.
2. Develop the Applications using interfacing.
3. Program for the process communication.
4. Develop the Ardunio Interfacing
5. To gain the Implementation a semaphore for task switching
6. 6.To analyze the Implementation of Online Scheduling

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													**CO/PSO Mapping**			
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

21PET01	IOT ARCHITECTURE AND PROTOCOLS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To Study about Internet of Things technologies and its role in real time applications
- To familiarize the accessories and communication techniques for IOT.
- To study about wireless technologies for IOT.
- To familiarize the different platforms and Attributes for IOT

UNIT I INTRODUCTION TO INTERNET OF THINGS 9

Overview, Technology drivers , Business drivers, Typical IoT applications , Trends and implications

UNIT II IOT ARCHITECTURE: 9

Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture **,**IoT standards, Cloud computing for IoT,Bluetooth, Bluetooth Low Energy, beacons.

UNIT III PROTOCOLS AND WIRELESS TECHNOLOGY FOR IOT 9

Protocols :NFC, RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe Wired vs. Wireless communication,GSM, CDMA, LTE, GPRS, small cell.

Wireless technologies for IoT: WiFi (IEEE 802.11), Bluetooth/Bluetooth Smart, ZigBee/ZigBee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems.

UNIT IV DATA ANALYSTICS FOR IOT 9

Services/Attributes: Big-Data Analytics and Visualization,Dependability,Security,Maintainability.

Data analytics for IoT: A framework for data-driven decision making , Descriptive, Predictive and Prescriptive Analytics , Business Intelligence and Artificial Intelligence Importance of impact and open innovation in data-driven decision making.

UNIT V CASE STUDIES 9

Home Automation, smart cities, Smart Grid, Electric vehicle charging, Environment, Agriculture, Productivity Applications

Total:45 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2:Understand the concepts of IOT and its present developments

CO3: Study about different IOT technologies.

CO4: Acquire knowledge about different platforms and Infrastructure for IOT.

CO5: Learn the art of implementing IOT for smart applications and control.

CO6: Paraphrase the importance of IOT.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO2	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO3	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO4	2	1	0	1	2	2	2	0	0	0	2	3	3	1	2	1
CO5	3	3	0	2	2	1	1	0	0	0	1	3	1	1	1	1
CO6	3	3	0	2	2	1	1	0	0	0	1	3	1	2	1	1

TEXT BOOKS

1. ArshdeepBahga and VijaiMadisetti : A Hands-on Approach “Internet of Things”,Universities Press 2015.
2. Oliver Hersent , David Boswarthick and Omar Elloumi “ The Internet of Things”, Wiley,2016.

REFERENCE BOOKS

1. Samuel Greengard, “ The Internet of Things”, The MIT press, 2015
2. Adrian McEwen and Hakim Cassimally“Designing the Internet of Things “Wiley,2014.
3. Jean- Philippe Vasseur, Adam Dunkels, “Interconnecting Smart Objects with IP: The Next Internet” Morgan Kuffmann Publishers, 2010
4. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley and sons, 2014
5. Lingyang Song/DusitNiyato/ Zhu Han/ EkramHossain,” Wireless Device-to-Device
6. Communications and Networks, CAMBRIDGE UNIVERSITY PRESS,2015
7. OvidiuVermesan and Peter Friess (Editors), “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers Series in Communication, 2013.
8. Vijay Madisetti ,ArshdeepBahga, “Internet of Things (A Hands on-Approach)”, 2014

21PET02	INDUSTRIAL ROBOTICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce robot terminologies and robotic sensors To educate direct and inverse kinematic relations
- To educate on formulation of manipulator Jacobians and introduce path planning techniques
- To educate on robot dynamics
- To introduce robot control techniques.

THEORY COMPONENT CONTENTS

UNIT I INTRODUCTION AND TERMINOLOGIES 9

Definition-Classification-History- Robots components-Degrees of freedom-Robot joints-coordinates-Reference frames-workspace-Robot languages-actuators-sensors-Position, velocity and acceleration sensors-Torque sensors-tactile and touch sensors-proximity and range sensors- vision system-social issues.

UNIT II KINEMATICS 9

Mechanism-matrix representation-homogenous transformation-DH representation-Inverse kinematics solution and programming-degeneracy and dexterity

UNIT III DIFFERENTIAL MOTION AND PATH PLANNING 9

Jacobian-differential motion of frames-Interpretation-calculation of Jacobian-Inverse Jacobian- Robot Path planning

UNIT IV DYNAMIC MODELLING 9

Lagrangian mechanics- Two-DOF manipulator- Lagrange-Euler formulation – Newton- Euler formulation – Inverse dynamics

UNIT V ROBOT CONTROL SYSTEM 9

Linear control schemes- joint actuators- decentralized PID control- computed torque control – force control- hybrid position force control- Impedance/ Torque control.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- Ability to understand the components and basic terminology of Robotics
- Ability to model the motion of Robots and analyze the workspace and trajectory panning of robots.
- Abiilty to formulate models for the control of mobile robots in various industrial
- Design the differential motion of frames
- Abilityto understand about the Dynamic modeeling.
- Ability to acquire knowledge onLinear control schemes.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	1
CO4	3	3	1	2	3	0	0	0	0	0	1	3	1	1	3	1
CO5	1	3	1	2	3	0	0	0	0	0	1	3	2	3	3	2
CO6	3	2	2	2	3	0	0	0	0	0	1	3	2	3	3	2

TEXT BOOKS

1. R.K. Mittal and I J Nagrath, " Robotics and Control", Tata MacGraw Hill, Fourth edition.
2. Saeed B. Niku ,"Introduction to Robotics ", Pearson Education, 2002.

REFERENCE BOOKS

1. R.D. Klafter, TA Chmielewski and Michael Negin, "Robotic Engineering, An Integrated approach",Prentice Hall of India, 2003.
2. Fu, Gonzalez and Lee Mcgrahill ,"Robotics ", international edition.

21PET03	DISTRIBUTED EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To have a knowledge of the Hardware Infrastructure
- To have a knowledge the concept of Internet
- To have a knowledge of the using of JAVA in Distributed Embedded Computing
- To have a knowledge of embedded computing architectures

UNIT I THE HARDWARE INFRASTRUCTURE 9

Broad Band Transmission facilities – Open Interconnection standards – Local Area Networks –Wide Area Networks – Network management – Network Security – Cluster computers.

UNIT II INTERNET CONCEPTS 9

Capabilities and limitations of the internet – Interfacing Internet server applications to corporate databases HTML and XML Web page design and the use of active components.

UNIT III DISTRIBUTED COMPUTING USING JAVA 9

IO streaming – Object serialization – Networking – Threading – RMI – multicasting – distributed databases – embedded java concepts – case studies.

UNIT IV EMBEDDED AGENT 9

Introduction to the embedded agents – Embedded agent design criteria – Behaviour based, Functionality based embedded agents – Agent co-ordination mechanisms and benchmarks embedded-agent. Case study: Mobile robots.

UNIT V EMBEDDED COMPUTING ARCHITECTURE 9

Synthesis of the information technologies of distributed embedded systems – Analog/digital co-design – optimizing functional distribution in complex system design – validation and fast prototyping of multiprocessor system-on-chip – a new dynamic scheduling algorithm for real-time multiprocessor systems.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Understand the concept of distributed computing infrastructure
CO2:Concept of Internet and programing language
CO3:Design of computer hardware architecture.
CO4:Ability to design the Embedded agent design criteria
CO5:Ability to Analyze the Synthesis of the information technologies.
CO6:To Understand the Concepts of dynamic scheduling algorithm for Systems.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	0	0	0	0	2	2	3	2	3	2	2
CO2	2	3	2	3	2	0	0	0	0	2	2	3	1	2	2	3
CO3	1	2	1	3	2	0	0	0	0	2	2	3	2	2	1	2
CO4	2	3	2	2	1	0	0	0	0	2	2	3	2	2	1	3
CO5	2	3	2	3	2	0	0	0	0	1	1	2	1	3	2	2
CO6	2	3	2	3	2	0	0	0	0	2	2	3	1	2	1	2

TEXT BOOKS

1. "Architecture and Design of Distributed Embedded Systems", edited by Bernd KleinjohannClab, Universitat Paderborn, Germany, Kluwer Academic Publishers, Boston, April 2001, 248 pp.
2. SapeMullender, "Distributed Systems", Addison-Wesley, 1993

REFERENCE BOOKS

1. Dietel & Dietel, "JAVA how to program", Prentice Hall 1999. ACC.NO: B112846.
2. George Coulouris and Jean Dollimore, "Distributed Systems – concepts and design",Addison – Wesley 1988

21PET04	EMBEDDED SYSTEM PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To impart the knowledge of the Embedded Programming
- To Impart the knowledge in the Application with Data Structures

UNIT I INTRODUCTION 9

Introduction – Issues in Real Time Computing – Structure of a Real Time System – Task classes – Performance Measures for Real Time Systems – Estimating Program Run Times – Task Assignment and Scheduling – Classical uniprocessor scheduling algorithms – Uniprocessor scheduling of IRIS tasks – Task assignment – Mode changes and Fault Tolerant Scheduling.

UNIT II EMBEDDED OS FUNDAMENTALS 9

Introduction: Operating System Fundamentals, General and Unix OS architecture Embedded Linux. Booting Process in Linux GNU Tools: gcc, Conditional Compilation, Preprocessor directives, Command line arguments, Make files

UNIT III EMBEDDED C PROGRAMMING 9

Review of data types –scalar types-Primitive types-Enumerated types-sub ranges Structure typescharacter strings –arrays- Functions introduction to Embedded C- Introduction, Data types Bit manipulation, Interfacing C with Assembly. Embedded programming issues - Re-entrancy, Portability, Optimizing and testing embedded C programs

UNIT IV EMBEDDED APPLICATIONS USING DATA STRUCTURES 9

Linear data structures– Stacks and Queues Implementation of stacks and Queues- Linked List - Implementation of linked list, Sorting, Searching, Insertion and Deletion, Nonlinear structures.

UNIT V EMBEDDED JAVA 9

Introduction to Object Oriented Concepts. Core Java/Java Core- Java buzzwords, Overview of Java programming, Data types, variables and arrays, Operators, Control statements. Embedded Java – Understanding J2ME,Connected Device configuration, Connected Limited device configuration, Profiles, Anatomy of MIDP applications, Advantages of MIDP

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- Understanding on the various programming concepts used in the field of Embedded.
- Ability to understand of C and Java Programming
- Learn about fundamental of OS
- Understand the Concepts of Embedded programming.
- To introduce the Embedded Applications.
- To give an Introduction to Object Oriented Concepts.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO2	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	2
CO3	3	3	2	2	2	0	0	0	0	0	3	2	3	2	3	3
CO4	1	3	1	1	1	0	0	0	0	0	3	1	2	3	2	2
CO5	3	1	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO6	3	3	2	2	2	0	0	0	0	0	3	2	2	2	2	3

TEXT BOOKS

1. Embedded / Real-Time systems: Concepts, Design and Programming - The Ultimate Reference, Prasad K.V.K.K, Dreamtech Press, New Delhi.
2. C Programming Language, Kernighan, Brian W, Ritchie, Dennis M, PHI publications.
3. The Complete reference Java2, 5th Edition, Herbert Schildt, TMH.

REFERENCE BOOKS

1. GNU/Linux application programming, Jones, M Tim, Dreamtech press, New Delhi
2. Beginning J2ME-From Novice to Professional-3rd Edition , Sing Li and Jonathan Knudsen,Dreamtech Press, New Delhi.

21PET06	DIGITAL IMAGE PROCESSING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To impart knowledge on the fundamentals of image processing and image transforms.
- To studythe techniques involved in image enhancement.
- To learn the low and high-level features for image analysis.
- To understand the fundamentals and significance of image compression.
- To design and implement embedded image processing applications.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING AND IMAGE TRANSFORMS 6

Elements of visual perception, brightness, contrast, hue, saturation, Mach band effect, 2D image transforms-DFT, DCT, KLT, SVD, Walsh -Hadamard -Wavelet Transforms and Inverse Wavelet Transforms.

UNIT II IMAGE ENHANCEMENT 6

Spatial domain; Gray-level transformations – histogram processing – spatial filtering, smoothing and sharpening. Frequency domain: filtering in frequency domain – smoothing and sharpening filters – Homomorphic filtering. Image enhancement for remote sensing images and medical images.

UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS 6

Detection of discontinuities – edge operators – edge linking and boundary detection, thresholding – feature analysis and extraction – region-based segmentation – morphological watersheds – shape skeletonization, phase congruency. Number plate detection using segmentation algorithm.

UNIT IV IMAGE COMPRESSION 6

Image compression: fundamentals – models – elements of information theory – error free compression – lossy compression – compression standards. Applications of image compression techniques in video and image transmission. Need for data compression, Huffman, Run-length Encoding – Vector quantization, JPEG standard, JPEG 2000, MPEG Standards.

UNIT V EMBEDDED IMAGE PROCESSING 6

Introduction to embedded image processing. ASIC vs FPGA - memory requirement, powerconsumption, parallelism. Design issues in VLSI implementation of Image processing algorithms - interfacing. Hardware implementation of image processing algorithms: Segmentation and compression

Total:30 Hours

COURSE OUTCOMES

CO1:At the end of the course students should be able to

CO2:Comprehend the fundamentals of image processing and image transforms

CO3:Study the techniques involved in image enhancement, segmentation and compression and their real-time

CO4: Implementation of image processing applications using software and hardware.

CO5: Be exposed to design the Detection of discontinuities.

CO6:Obtain the knowledge about the Embedded Image Processing

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	2	1	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	2	1	3	1	3	3	3	3	3	3
CO3	1	2	3	3	3	2	2	1	3	1	2	1	3	3	3	2
CO4	3	3	2	3	1	2	1	1	1	1	2	1	2	1	3	2
CO5	3	3	2	1	2	2	1	2	2	2	2	1	2	2	1	2
CO6	3	3	2	1	2	2	1	1	2	2	2	1	2	2	1	2

TEXT BOOKS

1. Rafael C. Gonzalez and Richard E. Woods, “Digital Image processing”, 2nd edition, Pearson education, 2003
2. Anil K. Jain, “Fundamentals of digital image processing”, Pearson education, 2003

REFERENCE BOOKS

1. Milan Sonka, ValclavHalavac and Roger Boyle, “Image processing, analysis and machine vision”, 2nd Edition, Thomson learning, 2001
2. Mark Nixon and Alberto Aguado,“Feature extraction & Image processing for computer
3. vision”,3rd Edition, Academic press, 2012
4. Donald G. Bailey, “Design for Embedded Image processing on FPGAs” John Wiley and Sons,2011..
5. John G.Proakis, DimitrisG.Manolakis, “Digital Signal Processing: Principles, Algorithms and Applications”, PHI.

21PET17	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To enable the student to understand the role of sensors and the networking of sensed data for different applications.
- To expose the students to the sensor node essentials and the architectural details, the medium access and routing issues and the energy constrained operational scenario.
- To enable the student to understand the challenges in synchronization and localization of sensor nodes, topology management for effective and sustained communication, data management and security aspects.

PRE-REQUISITES :

THEORY COMPONENT CONTENTS

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 9

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks- case study, Enabling Technologies for Wireless Sensor Networks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts. Physical Layer and Transceiver Design Considerations

UNIT III MAC AND ROUTING 9

MAC Protocols for Wireless Sensor Networks, IEEE 802.15.4, Zigbee, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V DATA MANAGEMENT and SECIRUTY 9

Data management in WSN, Storage and indexing in sensor networks, Query processing in sensor, Data aggregation, Directed diffusion, Tiny aggregation, greedy aggregation, security in WSN.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- The student would be able to appreciate the need for designing energy efficient sensor nodes.
- The student would be able to understand the protocols for prolonging network lifetime.
- The student would be able to demonstrate an understanding of the different implementation challenges and the solution approaches.
- Able to Understand the Concepts of MAC Protocols.
- To Understand the Concepts of Routing
- Able to understand the Concepts of Topology Control and data Management.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO2	3	3	2	2	2	0	0	0	0	0	3	2	3	3	3	2
CO3	3	3	2	2	2	0	0	0	0	0	3	2	3	2	3	3
CO4	1	3	1	1	1	0	0	0	0	0	3	1	2	3	2	2
CO5	3	1	2	2	2	0	0	0	0	0	3	2	3	3	3	3
CO6	3	3	2	2	2	0	0	0	0	0	3	2	2	2	2	3

TEXT BOOKS

1. Ian F. Akyildiz, Mehmet Can Vuran, " Wireless Sensor Networks" John Wiley, 2010.
2. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.

REFERENCE BOOKS

1. Wayne Tomasi, "Introduction To Data Communication And Networking", Pearson Education, 2007.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
4. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-s Technology, Protocols, And Applications", John Wiley, 2007.

21PET07	FPGA SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To acquire knowledge on Hardware Description Languages, Programmable logic devices and FPGAs.
- To design the FPGA based systems, Combinational and sequential networks,
- To expose theFPGA architecture and Large FPGA Systems.

PRE-REQUISITES : Advanced Digital System Design

THEORY COMPONENT CONTENTS

UNIT I VERILOG HDL FEATURES AND MODELLING 9

Overview of Digital design with Verilog HDL - Hierarchical Modeling Concepts -Lexical Conventions - Data types - Modules and Ports -Gate Level Modeling: Gate Types - Gate Delays - Data flow Modeling: Continuous Assignments - Expressions - Operator Types - BehavioralModeling: Structures ProceduresProcedural Assignments - Conditional Statements - Multiway Branching - Loops - Tasks and FunctionsSwitch level Modeling -Design of combinational, sequential digital circuits using Verilog HDL.

UNIT II COMPLEX PROGRAMMABLE LOGIC DEVICES AND FGPAs 9

Programmable Logic to ASICs - PROMS, PLAs, PALs, MGA ASICs, CPLDs and FPGAs - CPLDs - CPLD Architectures - Function Blocks - I/O Blocks - Clock Drivers - Interconnects - CPLD Technology and Programmable Elements - Embedded devices. FPGAs - FPGA Architectures - Configurable Logic Blocks - Configurable I/O Blocks - Programmable interconnects - Clock Circuitry - SRAM vsAntifuse Programming - Emulating and prototyping ASICs. Comparison of CPLDs and FPGAs.

UNIT III FPGA BASED SYSTEMS AND FABRICS 9

Introduction - Basic Concepts- Digital Design and FPGAs - Role of FPGAs - FPGA Types - FPGA Based System Design- Registers and RAM. Introduction to FPGA Fabrics - FPGA Architectures - SRAM Based FPGAs - Permanently Programmed FPGAs-Chip I/O - Circuit Design of FPGA Fabrics - Architecture of FPGA Fabrics.

UNIT IV COMBINATIONAL AND SEQUENTIAL LOGIC NETWORKS DESIGN 9

Logic design Process - Modeling with HDLs - Combinational Network Delay-Power and Energy Optimization - Arithmetic Logic - Logic implementation for FPGAs - Physical Design for FPGAs - Sequential Machine Design Process - Sequential Design styles - Rules for Clocking - Performance analysis - Power Optimization.

UNIT V FPGA ARCHITECTURE DESIGN AND LARGE SCALE SYSTEMS 9

Behavioral Design - Data path controller Architectures - Scheduling and Allocation - Power - Pipelining - Design Methodologies - Design Example - Digital Signal Processor. Introduction to Large scale systems - Busses - Platform FPGAs - Multi FPGA systems, Novel Architectures

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- The student can able to design digital circuit using
- The student would be able to understand the HDL the architectures of Programmable logic devices and FPGAs.
- The student would be able design of FPGA based systems.
- Able to Understand the Concept of digital networks.

- Analyze the Knowledge about the architectures and Large FPGA systems.
- To Understand the Concept of Large Scale Systems.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO2	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO3	3	3	0	3	1	1	1	0	0	0	1	2	3	3	2	2
CO4	2	1	0	1	2	2	2	0	0	0	2	3	3	1	2	1
CO5	3	3	0	2	2	1	1	0	0	0	1	3	1	1	1	1
CO6	3	3	0	2	2	1	1	0	0	0	1	3	1	2	1	1

TEXT BOOKS

1. Wayne Wolf, "FPGA- based System Design", Pearson Education, International Edition, 2004
2. Samir Palnitkar, "Verilog HDL", 2nd Edition, Pearson Education, 2004.

REFERENCE BOOKS

1. Charles H.RothJr "Digital Systems Design using VHDL", Cengage Learning, 2013.
2. Michael D. Ciletti, Advanced Digital Design with the Verilog HDL, 2nd Edition, Prentice Hall, 2002.
3. Bob Zeidman, "Designing with FPGAs and CPLDs, Elsevier, CMP Books, 2002.
4. Ion Grout, "Digital Systems Design with FPGAs and CPLDs", Elsevier, 2008

21PET08	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To teach the architecture of personal computer
- To teach the interface PC with memory
- To teach the instruction Queue and pipeline concepts of PC
- To teach the computer network for real time control application

UNIT I INTRODUCTION TO COMPUTER DESIGN **9**

Review of fundamentals of CPU, Memory and IO – Performance evaluation – Instruction set principles – Design issues – Example Architectures - instruction level parallelismPipelining and handling hazards – Dynamic Scheduling – Dynamic hardware prediction –Multiple issue – Hardware based speculation – Limitations of ILP – Case studies.

UNIT II INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES **9**

Compiler techniques for exposing ILP – Static branch prediction – VLIW & EPIC – Advanced compiler support – Hardware support for exposing parallelism - Hardware Versus software speculation mechanisms.

UNIT III MEMORY AND I/O **9**

Cache Memory - Cache performance, Reducing cache miss penalty and miss rate, Reducing hit time – Main memory and performance – Memory technology - Types of storage devices – Buses – RAID – Reliability, availability and dependability – I/O performance measures – Designing an I/O system

UNIT IV INTERCONNECTION NETWORKS AND CLUSTERS **9**

Simple network - interconnection network media, connecting more than two computers - network topology - practical issues for commercial interconnecting networks – examples - crosscutting issues for interconnecting networks – clusters - designing a cluster fallacies and pitfalls.

UNIT V MULTIPROCESSORS AND THREAD LEVEL PARALLELISM **9**

Symmetric and distributed shared memory architectures – Performance issues – Synchronization – Models of memory consistency – Multi-threading.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Design the architecture of personal computer with memory and I/O peripherals.
CO2: Analyze the multiprocessor design and Multithreading
CO3: Analyze the computer network communications.
CO4: Understand about memory and i/o
CO5: Understand about interconnection networks and clusters
CO6: Understand about multiprocessors and thread level parallelism

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	1	0	0	0	0	0	0	1	1	2	1	1	2
CO2	3	2	2	1	0	0	0	0	0	0	1	1	2	1	1	2
CO3	2	3	1	1	0	0	0	0	0	0	2	3	2	2	2	2
CO4	2	3	3	2	0	0	0	0	0	0	3	3	1	2	3	2
CO5	3	2	1	1	0	0	0	0	0	0	1	1	2	1	1	1
CO6	3	2	2	1	0	0	0	0	0	0	1	1	2	1	1	2

TEXT BOOKS

1. A.Kai Hwang, "Advanced Computer architecture", Mcgraw - Hill, Inc 1987
2. Kai Hwang and Faye A.Briggs, "Computer Architecture and Parallel Processing", McGraw-Hill 1989.

REFERENCE BOOKS

1. John L.Hennessey and David A.Patterson, "Computer Architecture: A Quantitative Approach", Third Edition, Morgan Kaufmann, 2003.
2. D.Sia, T.Fountain and P.Kacsuk, "Advanced computer Architectures: A Design Space Approach", Addion Wesley, 2000.

21PET09	PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Design and deploy wireless sensor networks for specific applications
- Have understood the basic concepts of ubiquitous computing
- Design and develop a pervasive computing device for a specific need.
- Develop a framework for pervasive computing.

UNIT I Introduction to Ubiquitous Computing 9

Concept of Distributed Computing, Mobile Computing, Pervasive Computing, Wearable Computing, Modeling the Key Ubiquitous/Pervasive Computing Properties, Mobile Adaptive Computing , Mobility Management and Caching.

UNIT II Pervasive Computing Devices 9

Smart Environment: CPI and CCI Smart Devices: Application and Requirements, Device Technology and Connectivity, Human Computer Interaction.

UNIT III Human Computer Interaction 9

Explicit HCI, Implicit HCI, User Interface and Interaction for four hand-held widely used devices, Hidden UI via basic smart devices, Hidden UI via wearable and Implanted devices, Human centered design, user models.

UNIT IV Middleware for Pervasive Computing 9

Adaptive middleware, Context aware middleware, Mobile middleware, Service Discovery, Mobile Agents.

UNIT V Security in Pervasive Computing 9

Security and Privacy in Pervasive Networks, Experimental Comparison of Collaborative Defense Strategies for Network Security.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

CO1:To Design Mobile Computing.
CO2:Analyze the Pervasive Computing Devices
CO3:Analyze the Adaptive middleware.
CO4:Ability to acquire knowledge on Mobile Agents
CO5:To Understand the Concept of Human Computer Interaction.
CO6:Ability to Understand the Concept of Defense Strategies for Network Security

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair												CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	2	1	3	2	3	3	3	3	3	3

CO2	1	2	1	1	2	2	1	1	3	2	3	3	3	3	3	3
CO3	3	3	1	1	2	2	1	2	1	3	2	3	3	3	3	3
CO4	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2
CO5	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2
CO6	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2

TEXT BOOKS

1. StefenPoslad: Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley, London, 2009, Indian reprint, 2014.
2. Guruduth S. Banavar, Norman H. Cohen, ChandraNarayanaswami: Pervasive Computing: An ApplicationBased Approach, Wiley Interscience, 2012.

REFERENCE BOOKS

1. Mohammad S. Obaidat, Mieso Denko, Isaac Woungang (Editors): Pervasive Computing and Networking, Wiley, 2012.

21PET11	SOFT COMPUTING FOR EMBEDDED SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Understand the fundamental concepts of soft computing, artificial neural networks
- To understand the concepts of optimization techniques
- Familiarize with recent advancements in Artificial neural networks and optimization techniques

PRE-REQUISITES :

THEORY COMPONENT CONTENTS

UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9

Introduction to soft computing: soft computing vs. hard computing – various types of soft computing techniques, from conventional AI to computational intelligence, applications of soft computing. Fundamentals of neural network: biological neuron, artificial neuron, activation function, single layer perceptron – limitations. Multi-layer perceptron – back propagation algorithm.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Radial basis function networks – reinforcement learning. Hopfield / recurrent network – configuration – stability constraints, associative memory and characteristics, limitations and applications. Hopfield vs. Boltzmann machine. Advances in neural networks – convolution neural networks. Familiarization of Neural network toolbox.

UNIT III FUZZY LOGIC AND NEURO FUZZY SYSTEMS 9

Fundamentals of fuzzy set theory: fuzzy sets, operations on fuzzy sets, scalar cardinality, union and intersection, complement, equilibrium points, aggregation, projection, composition. Fuzzy membership functions. Fundamentals of neuro-fuzzy systems – ANFIS. Familiarization of ANFIS Toolbox.

UNIT IV INTRODUCTION TO OPTIMIZATION TECHNIQUES 9

Classification of optimization problems – classical optimization techniques. Linear programming – simplex algorithm. Non-linear programming – steepest descent method, augmented Lagrange multiplier method – equality constrained problems.

UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9

Simple hill climbing algorithm, Steepest ascent hill climbing – algorithm and features. Simulated annealing – algorithm and features. Genetic algorithm: working principle, fitness function. Familiarization with Optimization Toolbox.

Total:45 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- Comprehend the fundamentals of artificial neural network, fuzzy systems and optimization techniques
- Understand the significance of various optimization algorithms to engineering problems
- Be capable of choosing appropriate optimization techniques for engineering applications.
- Ability to analyze the fuzzy set theory.
- To Understand the Concepts of optimization problems.
- To Understand the Concepts of Familiarization with Optimization Toolbox.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	2	1	3	2	3	3	3	3	3	3
CO2	1	2	1	1	2	2	1	1	3	2	3	3	3	3	3	3
CO3	3	3	1	1	2	2	1	2	1	3	2	3	3	3	3	3
CO4	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2
CO5	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2
CO6	3	3	1	1	2	2	1	1	1	2	2	2	2	2	2	2

TEXT BOOKS

1. Laurene V. Fausett, “Fundamentals of neural networks, architecture, algorithms and applications, Pearson Education, 2008.
2. Simon Haykin, “Neural Networks – A comprehensive foundation”, Pearson Education, 2005.

REFERENCE BOOKS

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and soft computing”, Prentice Hall of India, 2003.
2. David E. Goldberg, “Genetic algorithms in search, optimization and machine learning”,
3. Pearson Education, 2009.
4. Singiresu S. Rao, “Engineering Optimization – Theory and Practice”, 4th edition, John Wiley & Sons, 2009.
5. Thomas Weise, “Global Optimization algorithms – Theory and applications”, self-published,2009

21PET12	EMBEDDED NETWORKING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To teach the communication protocols of Embedded system
- To teach the network topology of communication systems
- To teach the wireless network of Embedded system

PRE-REQUISITES: Computer Networks

THEORY COMPONENT CONTENTS

UNIT I Embedded Communication Protocols 6

Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT II USB and CAN Bus 6

USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors –PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN.

UNIT III Ethernet Basics 6

Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT IV Embedded Ethernet 6

Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure.

UNIT V Wireless Embedded Networking 6

Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing – Data Centric routing.

Total:30 Hours

COURSE OUTCOMES

At the end of the course students should be able to

- Describe the programmer's model of ARM processor and create and test assembly level programming.
- Analyze various types of coprocessors and design suitable co-processor interface to ARM processor.
- Identify the architectural support of ARM for operating system
- Analyze the function of memory Management unit of ARM.
- To understand the Concept of Ethernet Basics.
- Ability to Understand the Embedded Networking.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair		CO/PSO Mapping
COs	**PROGRAMME OUTCOMES (POs)**	**PSOs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2	3	2	0	0	0	0	2	2	3	2	3	2	2
CO2	2	3	2	3	2	0	0	0	0	2	2	3	1	2	2	3
CO3	1	2	1	3	2	0	0	0	0	2	2	3	2	2	1	2
CO4	2	3	2	2	1	0	0	0	0	2	2	3	2	2	1	3
CO5	2	3	2	3	2	0	0	0	0	1	1	2	1	3	2	2
CO6	2	3	2	3	2	0	0	0	0	2	2	3	1	2	1	2

TEXT BOOKS

1 Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002

2 Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan Axelson, Penram Publications, 1996.

REFERENCE BOOKS

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series - Dogan Ibrahim, Elsevier 2008.

2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.

3. Networking Wireless Sensors – BhaskarKrishnamachari, Cambridge press 2005.

21PET13	RISC PROCESSOR ARCHITECTURE AND PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To teach the architecture of general AVR processor
- To teach the architecture and programming of 8/16 bit RISC processor
- To teach the implementation of DSP in ARM processor
- To discuss on memory management, application development in RISC processor
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

UNIT I AVR MICROCONTROLLER ARCHITECTURE 6

Architecture – memory organization – addressing modes – I/O Memory – EEPROM – I/O Ports – SRAM –Timer –UART – Interrupt Structure- Serial Communication with PC – ADC/DAC Interfacing.

UNIT II ARM ARCHITECTURE AND PROGRAMMING 6

Arcon RISC Machine – Architectural Inheritance – Core & Architectures -- The ARM Programmer's model -Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors. Instruction set – Thumb instruction set – Instruction cycle timings.

UNIT III ARM APPLICATION DEVELOPMENT 6

Introduction to RT implementation with ARM – Exception Handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Free RTOS Embedded Operating Systems concepts –example on ARM core like ARM9 processor.

UNIT IV MEMORY PROTECTION AND MANAGEMENT 6

Protected Regions-Initializing MPU, Cache and Write Buffer-MPU to MMU-Virtual Memory-Page Tables-TLB-Domain and Memory Access Permission-Fast Context Switch Extension.

UNIT V DESIGN WITH ARM MICROCONTROLLERS 6

Assembler Rules and Directives- Simple ASM/C programs- Hamming Code- Division-Negation-Simple Loops –Look up table- Block copy- subroutines-application.

Total:30 Hours

- **COURSE OUTCOMES**
- At the end of the course students should be able to
- Describe RISC processor Architectures
- Analyze various types of coprocessors and design suitable co-processor interface to RISCprocessor.
- Analyze the function of memory Management unit with RISC processor.
- Able to learn design ARM Applications
- Gain knowledge to Protected Regions.
- Apply the techniques of Assembler Rules and Directives

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

TEXT BOOKS

1. Andrew N. Sloss, Dominic Symes, Chris Wright, ARM Developer‟s Guide.
2. Steve Furber, ‘ARM system on chip architecture’, Addision Wesley
3. Developer’s Guide Designing and Optimizing System Software’, Elsevier 2007.

REFERENCE BOOKS

1. Muhammad Ali Mazidi, SarmadNaimi, SepehrNaimi, Janice Mazidi, “ARM Assembly Language: Programming and Architecture” 2013.
2. ARM Architecture Reference Manual, LPC213x User Manual
3. www.Nuvoton .com/websites on Advanced ARM Cortex Processors
4. Arnold S Burger, “Embedded System Design”, CMP Books, 2002
5. Trevor Martin, ‘The Insider's Guide To The Philips ARM7-Based Microcontrollers.

21PET10	MEMS TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To have knowledge in the basic of MEMS fabrication
- To have knowledge about sensors in MEMS

THEORY COMPONENT CONTENTS

UNIT I MICRO-FABRICATION, MATERIALS AND ELECTRO MECHANICAL CONCEPTS **9**

Overview of micro fabrication – Silicon and other material based fabrication processes –
Concepts: Conductivity of semiconductors-Crystal planes and orientation-stress and strainflexural beam bending analysis-torsional deflections-Intrinsic stress- resonant frequency and quality factor.

UNIT II ELECTROSTATIC SENSORS AND ACTUATION **9**

Principle, material, design and fabrication of parallel plate capacitors as electrostatic sensors and actuators-Applications

UNIT III THERMAL SENSING AND ACTUATION **9**

Principle, material, design and fabrication of thermal couples, thermal bimorph sensors, thermal resistor sensors-Applications.

UNIT IV PIEZOELECTRIC SENSING AND ACTUATION **9**

Piezoelectric effect-cantilever Piezo electric actuator model-properties of piezoelectric materialsApplications.

UNIT V CASE STUDIES **9**

Piezoresistive sensors, Magnetic actuation, Micro fluidics applications, Medical applications, Optical MEMS.

Total:45 Hours

COURSE OUTCOMES

1. At the end of the course students should be able to
2. Understanding on the types of sensors and actuators.
3. Design the sensor for various application
4. Students will have knowledge in basic of MEMS and the Sensors used for the application development
5. Gain knowledge about the fabrication of thermal couples
6. To Know the concepts of Medical applications

TEXT BOOKS

1. Chang Liu, “Foundations of MEMS”, Pearson International Edition, 2006. ACC.NO: B127890.
2. Marc Madou , “Fundamentals of microfabrication”,CRC Press, 1997. ACC.NO: B130141.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

REFERENCE BOOKS

1. Boston , “Micromachined Transducers Sourcebook”,WCB McGraw Hill, 1998.
2. M.H.Bao “Micromechanical transducers :Pressure sensors, accelerometers and gyroscopes”, Elsevier, Newyork, 2000.

21PET14	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To expose the students to the fundamentals of data security.
- To teach the fundamentals of mathematical aspects in creating Encryption keys
- To teach the fundamentals of Security in data& wireless communication.
- To teach the fundamentals of Secured system operation.
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

UNIT I SYMMETRIC CIPHERS **9**

Overview – classical Encryption Techniques – Block Ciphers and the Data Encryption standard – Introduction to Finite Fields – Advanced Encryption standard – Contemporary Symmetric Ciphers – Confidentiality using Symmetric Encryption.

UNIT II PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS **9**

Introduction to Number Theory – Public-Key Cryptography and RSA – Key Management Diffie-Hellman Key Exchange – Elliptic Curve Cryptography – Message Authentication and Hash Functions – Hash Algorithms – Digital Signatures and Authentication Protocols.

UNIT III NETWORK SECURITY PRACTICE **9**

Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security architecture – Authentication Header – Encapsulating Security Payload – Key Management.

UNIT IV SYSTEM SECURITY **9**

Intruders – Intrusion Detection – Password Management – Malicious Software – Firewalls – Firewall Design Principles – Trusted Systems.

UNIT V WIRELESS SECURITY **9**

Introduction to Wireless LAN Security Standards – Wireless LAN Security Factors and Issues.

Total:45 Hours

COURSE OUTCOMES

CO1 : At the end of the course students should be able to

Comprehend the fundamentals of image processing

Study the techniques involved in image enhancement, segmentation and compression and their real-time

Implementation the image processing applications using software and hardware.

Understand theIntrusion Detection.

Able to Understand theWireless LAN Security Standards.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													CO/PSO Mapping			
COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

TEXT BOOKS

1.William Stallings, “Cryptography And Network Security – Principles AndPractices”, Pearson Education, 3rd Edition, 2003.
2.AtulKahate, “Cryptography and Network Security”, Tata McGraw Hill, 2003.

REFERENCE BOOKS

1. Bruce Schneier, “Applied Cryptography”, John Wiley and Sons Inc, 2001
2. Stewart S. Miller, “Wi-Fi Security”, McGraw Hill, 2003
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security In Computing”, 3rd Edition,
4. Pearson Education, 2003.
5. Mai, “Modern Cryptography: Theory and Practice”, First Edition, Pearson
6. Education, 2003.

21AC101 **ENGLISHFORRESEARCH PAPERWRITING LTPC**

2 0 0 0

Courseobjectives:

- U nderstand that how to improve your writing skills and level of read ability Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

Unit I	Planning and Preparation,Word Order,Breaking up long sentences, StructuringParagraphs and Sentences,Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	5
Unit II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising,Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	6
Unit III	Review of the Literature, Methods,Results,Discussion,Conclusions,The Final Check.	4
Unit IV	Key skills are needed when writing a Title, key skills are needed when Writing an Abstract, key skills are needed when writing an Introduction,skills needed when writing a Review of the Literature,	6
Unit V	skills are needed when writing the Methods, skills needed when writing the Results,skills are needed when writing the Discussion,skills are needed when writing the Conclusions	5
Unit VI	Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission	4

Course Outcomes

- Listen and comprehend technical and non-technical spoken experts critically and functionally using BECmodules.
- Write different forms of writing effectively and apparently and create advance level of writing inEnglish.
- Read different genres of text, analyzing and interpreting it by guessing the meaning from the context and employ it for new ideas, to learn andpresent.
- Speak fluently using the proper vocabulary, modulation, articulation andpronunciation.
- Familiarize the soft skills needed for the employability
- Gaining the functional understanding of thelanguage

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair	**CO/PSO Mapping**

COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO2	3	3	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO3	1	2	1	2	2	0	0	0	2	0	1	2	3	2	1	2
CO4	3	3	3	2	2	0	0	0	3	0	3	3	1	2	1	2
CO5	3	3	1	1	2	0	0	0	2	0	1	2	3	3	3	1
CO6	3	3	1	2	1	0	0	0	2	0	1	2	3	2	1	2

Text Book

T1: Adrian Wall work, English for Writing Research Papers, Springer NewYork Dordrecht Heidelberg London, 2011

ReferenceBooks

R1: Goldbort R(2006) Writing for Science, Yale University Press(available on Google Books)
R2: DayR (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
R3: HighmanN(1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's

\

21AC201	DISASTERMANAGEMENT	L	T	P	C
		2	0	0	0

COURSEOBJECTIVES

- To provide students an exposure to disasters, their significance and types.
- Toensurethatstudentsbegintounderstandtherelationshipbetweenvulnerability,disasters,disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction(DRR).
- To enhance awareness of institutional processes in the country and
- Ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

PRE-REQUISITES:

- Nil

UNITI INTRODUCTION TO DISASTERS 5

Definition:Disaster,Hazard,Vulnerability,Resilience,Risks–Disasters:Typesofdisasters – Earthquake, Landslide, Flood, Drought, Fire etc – Classification, Causes, Impacts including social, economic, political, environmental and health-Global trends in disasters:urban disasters,complex emergencies,Climate change-Dos and Don'ts during various types of Disasters.

UNITII APPROACHES TO DISASTER RISK REDUCTION(DRR) 6

Disaster cycle – Phases, prevention, mitigation and preparedness community based DRR,Structural-non structural measures, Roles and responsibilities of-Government &NGO's-Institutional Processes and Framework at State and Central Level-State Disaster Management Authority (SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNITIII INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 6

FactorsaffectingVulnerabilities,impactofDevelopmentprojectssuchasdams,embankments,changesinLand-useetc.-ClimateChangeAdaptation-IPCCandScenariosinthecontextof India–Relevanceofindigenousknowledge,appropriatetechnologyandlocalresources.

UNITIV DISASTER RISK MANAGEMENT IN INDIA 7

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food,Sanitation, Shelter, Health, Waste Management, Disaster Management Act and Policy – RoleofGISandInformationTechnologyComponentsinPreparedness,RiskAssessment,Response And Recovery Phases of Disaster –Disaster Damage Assessment.

UNITV DISASTER MANAGEMENT:APPLICATIONS AND CASE STUDIES AND FIELD WORKS 6

Natural disasters- CaseStudies, Earthquake, Landslide, Drought,Floods:Fluvial and Pluvial Flooding - Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works for disaster management.

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair		CO/PSO Mapping
COs	**PROGRAMME OUTCOMES (POs)**	**PSOs**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3	PSO4
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

REFERNCEBOOKS

R1. SinghalJ.P."DisasterManagement",LaxmiPublications,2010.

R2. Tushar Bhattacharya,"Disaster Science and Management",McGraw Hill India EducationPvt. Ltd.,2012.

R3. Gupta AnilK, SreejaS.Nair. Environmental Knowledge for Management,NIDM,NewDelhi,2011.

R4. KapurAnu Vulnerable India:AGeographical Study of Disasters, IIAS and Sage Publishers,NewDelhi,2010.

21AC301 STRESS MANAGEMENTBY YOGA **L T P C**
2 0 0 0

Course objectives:

- To enable the student to have good health
- To practice mental hygiene
- To possess emotional stability
- To Integrate moral values
- To attain higher level of consciousness
- To Understand the Concepts of Natural disasters

UNIT 1:

Shathakarma-Kapalbhati(11-30strokes)Asanas-Trikonasana,Ardha-Kati Chakrasana,Tadasana,Vrikshasana,PadmasanaSimhasana,Paschimottanasana, Uttanpadasana,Salabhasana, ShavasanaPranayama – BhastrikaConcentration– Onownbreath (2min)ohmchanting and shanti path Shatha karma – Introduction of trataka and practice of concentric on nose tip.

UNIT 2:

Asanas – Garudasana, EK – Pad Pranamasana kati chakrasana, Urdhava Hastottanasana, Natrajasana , Parvatasana, Kukkutasana, Pawanmuktasana, Bhujangasana, Shavasana Pranayama–Bhramari Concentration –On own breath(3min) ohmchanting and shantipath

UNIT 3:

Shatha karma – Introduction of Nauli Asanas – Pada Hastasana, Urdhv Pranamasana, Konasana, Vajrasana, Supta Vajrasana, Shashankasana, Gomukhasana, Janusirasana, Naukasana, Halasana, Chakrasana, Shavasana, Surya Namaskar Pranayama – Anuloma-Viloma(Nadishodhan) Concentration – On own breath (So-ham) Ohm Chanting and shanti path.

UNIT 4:

Shatha karma – Jala Neti (if facility Available) Asanas – Trikonasana ,Tadasana, Natrajasana, Kato Chakarasana, Baddhapadmasana, Ushtrasana, Paschimottanasana, Bakasana, Kurmasana, Ardha Marsyendrasana, Makrasana, Dhanurasana, Shavasana, Surya Namaskar Pranayama – Ujjayi and Suryabhedan Concentration – In between eyebrows,Ohm Chanting and shanti path

UNIT 5:

Shatha karma – Trataka Asanas – Trikonasana, Vrikshasana, Parivrat Trikonasana, Padmasana, Yogmudra, Matsyasana, Mandukasana, Vristitapada Bhoonamanasana, Pawanmuktasana, Vipritkarni, Shavasana, Yoganidra Pranayama – Bhramari, Sheetkari Concentration – on 'Dot' or 'Ohm', Ohm Chanting and shanti path

Course Outcomes

- To gain the good health
- To apply the practice mental hygiene
- To Analyze the possess emotional stability
- Ability to Integrate moral values
- To attain higher level of consciousness

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													**CO/PSO Mapping**			
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2

CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

Text Book

T1 : Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur

Reference Books

R2 : Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

21AC401 **VALUE EDUCATION** **L T P C**
2 0 0 0

Course objectives:

- Understand value of education and self-development
- Imbibe good values in students
- Let should know about the importance of character

UNIT I

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

UNIT II

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity. Power of faith, National Unity, Patriotism.Love for nature, Discipline

UNIT III

Personality and Behavior Development, Soul and Scientific, attitude, positive thinking, integrity and discipline, Punctuality, Love and Kindness, avoid fault Thinking, Free from anger,

UNIT IV

Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self- destructive habits, Association and Cooperation, doing best for saving nature

UNIT V

Character and Competence, Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying Effectively

Course Outcomes

1. Understand the Concept of Values and self-development
2. Able to Understand the Importance of cultivation of values
3. To understand the Concepts of Behaviour Development
4. Ability to understand the saving nature
5. Ability to understand the Self-management.
6. To gain the Knowledge about the Honesty, Studying Effectively

CO/PO MAPPING (S/M/W indicates strength of correlation) 3-Strong, 2-Moderate, 1-Fair													**CO/PSO Mapping**			
COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO2	3	3	1	3	2	0	0	0	0	0	2	2	3	3	2	2
CO3	1	2	1	2	1	0	0	0	0	0	2	1	3	3	2	2
CO4	3	3	3	2	1	0	0	0	0	0	3	1	2	2	1	1
CO5	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1
CO6	3	3	1	2	1	0	0	0	0	0	3	1	2	2	1	1

Text Book

T1:
Chakroborty,S.K.“ValuesandEthicsfororganizationsTheoryandpractice”,OxfordUniversityPres
,New Delhi

References

R1 :John Haggai “Lead On” & “How to win over worry” – World Book Publisher – 1986
R2.PrasanthamJ.P.“Therapeutic Counselling”– Asian Trading Corporation 1994
R3.Fr.JoeCurieS.J.“Bare foot Counsellor”–a TC Publication –1998
R4. Atkinson D.J. & Field D.H. “New Dictionary of Christian Ethics and Pastoral Theology” –Intervarsity Press, USA– 1995
R5.DavidClydeJones“BiblicalChristianEthics”–Baker Books–1994