SYLLABUS

(With effect from 2013-2014)
Out Come Based Education

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2013–14)
ಫಲಿತಾಂಶ ಆಧಾರಿತ ಶಿಕ್ಷಣ

VII and VIII Semester

Bachelor Degree
in
Electronics and Communication Engineering

P.E.S. College of Engineering

Mandya - 571 401, Karnataka
(An Autonomous Institution Affiliated to VTU, Belagavi)
Grant -in- Aid Institution
(Government of Karnataka)
Accredited by NBA, New Delhi
Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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Preface

PES College of Engineering, Mandya, started in the year 1962, has become autonomous in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running eight undergraduate and eight Postgraduate programs. It consists of six M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE), has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of 2013-14.Industry Interactions have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Mini Project is included in all undergraduate programs.

Sri.B.Dinesh Prabhu
Deputy Dean (Academic)
Associate Professor,
Dept. of Automobile Engg.

Dr. P S Puttaswamy
Dean (Academic)
Professor
Dept. of Electrical & Electronics Engg.

P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401

(An Autonomous Institution Under VTU. Belgaum)

Vision

"An institution of high repute, imparting quality education to develop innovative and Humane engineers"

Mission

"Committed to develop students potential through high quality teaching- learning processes and state of the art infrastructure"

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

About the Department

In the department, the B.E degree was started in 1972 and the M.Tech degree in 2006 , the Ph.D and M.Sc (by research) programmes in 2004. Currently the strength of teaching faculty is 20 and that of non teaching staff is 14. The present intake of B.E course is 120 and that of M.Tech course is 49. The teacher - student ratio is 1:16. The department has a research centre under VTU, with 4 research guides and 17 research students. During the last five years, the department has published 15 technical papers in international journals and 10 technical papers in national journals. So far, the department has organized one international and one national conference.

Vision

Developing high quality engineers with sound technical knowledge, skills and ethics in order to meet the global technological and societal demands in the area of Electronics and Communication engineering.

Mission

- Developing high quality graduates and post-graduates of Electronics and communication Engineering with modern technical knowledge, professional skills and attitudes in order to meet industry and society demands.
- Developing graduates with an ability to work productively in a team with professional ethics and social responsibility.
- Developing highly employable graduates and post graduates who can meet industrial requirements and bring innovations.
- Moulding the students with foundation knowledge and skills to enable them to take up post-graduate programmes and research programmes at the premier institutes.
- Providing students with an excellent academic ambience to instil leadership qualities, character moulding and life-long learning necessary for a successful professional career.

Department of Electronics and Communication Engineering

(A) Programme Educational Objectives (PEOs)

The Bachelor of Engineering Programme in Electronics and Communication Engineering [B.E. (E&C)] during four years term aims to

I. Provide the students with strong fundamental and advanced knowledge in mathematics, science and engineering with respect to Electronics and Communication Engineering discipline with an emphasis to solve engineering problems

II. Prepare the students through well - designed curriculum to excel in bachelor degree programme in E&C Engg. in order to engage in teaching or industrial or any technical profession and to pursue higher studies

III. Train students with intensive and extensive engineering knowledge and skill so as to understand, analyze, design and create novel products and solutions in the field of electronics and communication engineering.

IV. Inculcate in students the professional and ethical attitude, effective communication skills, team spirit, multidisciplinary approach and ability to relate engineering issues to broader social context.

V. Provide students with an excellent academic environment to promote leadership qualities, character moulding and lifelong learning as required for a successful professional career.

(B) Programme Outcomes (POs):

The BACHELOR OF ENGINEERING Programme in Electronics and Communication Engineering [B.E. (E&C)] must demonstrate that its graduates have

a) An ability to apply knowledge of mathematics, science and engineering to develop both analog and digital electronic and communication circuits and systems including software and hardware entities.

b) An ability to design and construct analog and digital electronic circuits, and to conduct experiments on them to analyze and interpret data.

c) An ability to design simulate and fabricate electronic and communication systems, Components, devices as well as to design and simulate the analog and digital processes of physical world.

d) An ability to function effectively as an individual and as a member of engineering teams of electrical, computer, information, automobile, mechanical and other disciplines.

e) An ability to identify, formulate and solve the problems of both analog and digital electronic and communication circuits and systems including software and hardware entities.

f) An understanding of professional and ethical responsibility at local, national and international levels.

g) An ability to effectively communicate orally and in writing on social and technical occasions in local and global scenarios.

h) The broad education to understand the impact of engineering solutions in a global and societal context.

i) An ability to engage in independent and lifelong learning in the broad context of technological change.

j) A knowledge of contemporary issues at local , national and international levels.

k) An ability to use the techniques, skills and modern engineering hardware and soft ware tools which are necessary for engineering practice.

These programme outcomes (POs) are achieved through an array of courses. To ensure the achievement of POs, the course learning outcomes (CLOs) are so formulated that they address the POs.

P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401
(An Autonomous Institution Under VTU. Belgaum)
Department of Electronics & Communication Engineering.

VII Semester B.E. . (E&C) **Scheme Of Teaching and Examination 2013-14**

Sl No	Course Code	Course Title	Teaching Dept.	Hrs/Week Pattern L:T:P:H	Total Credit	Examination Marks			Exam Duration in hours
						CIE	SEE	Total	
1	P13EC71	GSM Communication and Networks (HC)	E&C	4:0:0:4	4	50	50	100	3
2.	P13EC72	Low Power VLSI Design (HC)	E&C	4:0:0:4	4	50	50	100	3
3.	P13EC73	Advanced Microcontrollers(HC)	E&C	4:0:0:4	4	50	50	100	3
4.	P13EC74	Embedded and Real Time Systems(HC)	E&C	4:0:0:4	4	50	50	100	3
5.	P13EC75	Elective-2 Group-B (PS) *	E&C	4:0:0:4	4	50	50	100	3
6.	P13EC76	Elective-3 Group-C (OS) **	E&C	2:2:0:3	3	50	50	100	3
7.	P13ECL77	Computer Communication Networks and VLSI Laboratory	E&C	0:1:2:3	1.5	50	50	100	3
8.	P13ECL78	Embedded and Real Time Systems Laboratory	E&C	0:1:2:3	1.5	50	50	100	3
9.	P13EC79	Industrial Visit	E&C	--	Mandatory	--	--	--	--
Total					26	400	400	800	

Industrial Visit Shall be arranged during vacation after examination of 7th Semester and a visit report shall be submitted to be department. **HC:** Hard Core (4 Credits) – 4 courses), OS: Other subject (3 credits) -1 course. PS: Professional subject (4 credits) - course One hour Lecture = Two Hours Tutorial / Practical+ 1 credit

*** List of Electives-2 (Group-B)** **** List of Electives-3 (Group -C)**

Sl. No	Course Code	Elective -2 Course Title	Sl.No	Course Code	Elective -3 Course Title
1.	P13EC751	Artificial Neural Networks	1.	P13EC761	Speech Processing
2.	P13EC752	Medical Imaging Systems	2.	P13EC762	Biomedical Signal Processing
3.	P13EC753	Operating System	3.	P13EC763	Multimedia Communications
4.	P13EC754	Internet Engineering	4.	P13EC764	Synthesis and Optimization of VLSI Circuits

VIII Semester B.E. . (E&C) Scheme of Teaching and Examination 2013-14

Sl No	Course Code	Course Title	Teaching Dept.	Hours/week L:T:P	Total Credit	Total Hours/Week	Examination Marks			Exam Duration in hours
							CIE	SEE	Total	
1.	P13EC81	Satellite Communication(SC)	E&C	2:1:0:3	3	4	50	50	100	3
2.	P13EC82	Operations Research (SC)	E&C	2:1:0:3	3	4	50	50	100	3
3.	P13EC83	Elective-4, Group-D (OS) *	E&C	2:1:0:3	3	4	50	50	100	3
4.	P13EC84	Elective-5, Group-E (OS) **	E&C	2:1:0:3	3	4	50	50	100	3
5.	P13EC85	Project Work	E&C	-	10	6	100	100	200	3
6.	P13EC86	Seminar	E&C	0:0:2:2	2	3	50	-	50	-
Total					24	25	350	300	650	-

*** List of Electives-4 (Group-D)** **** List of Electives-5 (Group-E)**

Sl. No	Course Code	Elective Course Title Electives-4 (Group-D)	Sl. No.	Course Code	Elective Course Title Electives-5 (Group-E)
1.	P13EC831	SOC Communications Architecture	1.	P13EC841	Biometrics
2.	P13EC832	ADHOC Wireless Networks	2.	P13EC842	Data Compression
3.	P13EC833	ASIC Design	3.	P13EC843	Wireless Sensor Networks
4.	P13EC834	Error Control Coding	4.	P13EC844	Real Time Systems

Evaluation Scheme							
Scheme	**Weightage**	**Marks**	**Event Break Up**				
CIE	50%	50	**Test I**	**Test II**	**Quiz I**	**Quiz II**	**Assignment**
			35	35	5	5	10
SEE	50%	100	**Questions to Set: 10**		**Questions to Answer: 5**		

Course Title: GSM Communication and Networks			
Course Code: P13EC71	**Semester: 7th**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: Hrs.; Exam: Hrs.		**Weightage: CIE: 50%; SEE: 50%**	

Prerequisites:

1. Analog Communication Theory - P13EC42
2. Digital Communication Theory - P13EC53

Course Learning Objectives (CLOs):

This Course aims to;

1. Describe the fundamental concepts of GSM Technology which is used in wireless mobile communication
2. Explain the GSM architecture and interfaces with BSS, MSC, VLR, HLR, EIR and other networks
3. Outline the concepts of Radio link measurements as applicable to MS and BS.
4. List the different logical channels and their usage
5. Classify the different messages and services available in GSM technology.
6. Discuss the different aspects of privacy and security in GSM system.
7. Design the GSM wireless networks for given specifications.

Relevance of the Course:

1. Satellite communication - P13EC81

Course Content

UNIT-I

Access Technologies: Introduction, Narrowband channelized systems**,** Narrow band digital channelized systems, Spectral Efficiency, spectral efficiency of modulation, multiple access spectral efficiency, Wideband systems, comparisons of FDMA, TDMA and DS–CDMA.

Cellular Communications Fundamentals : Introduction, cellular systems, Geometry of Hexagonal cell, co–channel interference ratio, cellular system design in worst case with an Omni directional antenna, co channel interference reduction with use of directional antennas, directional antennas in 7– cell reuse pattern, Three sector case, Six sector case, Cell splitting.

Text:3.1 to 3.5,4.1 to 4.8 **10 Hrs**

UNIT-II

GSM Architecture and Interfaces: Introduction, GSM frequency bands, GSM PLMN, Objectives of a GSM PLMN, GSM PLMN Services, GSM Subsystems, GSM Subsystems entities, GSM interfaces, The radio interface (MS to BSC), Abis interface (BTS to BSC), A interface (BSC to MSC), Interfaces between other GSM entities, Mapping of GSM layers onto OSI layers, North American PCS–1900.

Radio Link Features in GSM Systems:Introduction,Radio link measurements, Radio link features of GSM, Dynamic power control, Discontinuous transmission (DTX), SFH, Future techniques to reduce interference in GSM, Channel borrowing, smart antenna.

Text: 5.1 to 5.9, 6.1 to 6.4 **10 Hrs**

UNIT-III

GSM Logical Channels and Frame Structure: Introduction, GSM logical channels, allowed logical channel combinations, TCH multi frame for TCH/H, CCH multi frame, GSM frame structure, GSM bursts, Normal burst, Synchronization burst, Frequency correction channel burst, Access burst, Data Encryption in GSM, Mobility management, Location registration and Mobile identification.

Messages, Services and Call flows in GSM: Introduction, GSM–PLMNservices, bearer services, Tele–Services, supplementary services, GSM service quality requirements, MSC performance,GSM messages, MS–BS interface, BS to MSC messages on the A interface, MSC to VLR and HLR, GSM call setup by an MS, Mobile–Terminated call, Call release, Handover.
Text: 7.1 to 7.7, 9.1 to 9.4 **10 Hrs**

UNIT-IV

Data Services in GSM: Introduction, Data interworking, GSM data services, Interconnection for switched data, Group 3 fax, Packet data on the signaling channel, User–to–user signaling, SMS, GSM GPRS.
Privacy and Security in GSM: Introduction, Wireless security requirements, Privacy of communications, Authentication requirements, System lifetime requirements, Physical requirements, SIM cards, Security algorithms for GSM, Token–based authentication, Token–based registration, Token–based challenge.
Text: 10.1 to 10.5, 11.1 to 11.5 **11 Hrs**

UNIT-V

Planning and Design of a GSM Wireless Network: Introduction, Tele traffic models, Call model, Mobilitymodel, Topology model, Mobility in cellular / PCS networks, Application of a fluid flow model, Planning of a wireless network, Radio design for a cellular / PCS network, Radio link design, Coverage planning, Design of a wireless system, Service requirements, Constraints for hardware implementation, Propagation path loss, System requirements, Spectral efficiency of a wireless system, Receiver sensitivity and link budget, Selection of modulation scheme, Design of TDMA frame, Relationship between delay spread and symbol rate.
Management of GSM Networks: Introduction, Traditional approaches to NM, TMN, TMN Layers, TMN Nodes, TMN Interfaces, TMN Management Services, Management Requirements for Wireless Networks, Management of Radio Resources, Personal Mobility Management, Terminal Mobility, Service Mobility Management, Platform Centered Management, SNMP, OSI System Management, NM Interfaces and Functionality, NMS Functionality, OMC Functionality,Management of GSM Network**,** TMN Applications, GSM Information Model, GSM Containment Tree, Future work items.
Low Mobility Adjunct to GSM: Introduction, DECT, A Typical Implementation of DECT, Supplementary Services, Data Capabilities, Capacity and Spectrum Analysis.
Text: 14.1 to 14.11, 15.1 to 15.7, 16.1 to 16.2.4 **11 Hrs**

Text Books:

"Principles and Applications of GSM", Vijay K. Garg and Joseph E.Wilkes,Pearson education / PHI, 1999.

Reference Books:

1. "Mobile Communication Engineering", William C. Y. Lee, 2nd edition, MGH.
2. "3–G Wireless Networks", Clint Smith, Daniel Collin, 2nd edition, TMH.
3. "Wireless Communication and Networks: 3G and beyond", ItiSahaMisra, 2nd edition, 2013, MGH.
4. "Wireless Tele–Communication Systems and Networks", Gary J Mullet, 2nd edition, 2012, New Age.
5. "Wireless Communication", UpenaDalal, 2009, Oxford.

6. "Convergence Technologies for 3–G Networks", Jeffrey and others, Willey student Edition.
7. "Mobility Management", Somashekar – Rudrakshi– MGH.
8. "Wireless communication", Andreas F Molisch, 2nd edition, Willey Student Edition.
9. "ADHOC Wireless Networks: Architecture and Protocols", C. Shivaramamurthy and B. S. Manoj, Pearson Pub.
10. "Introduction to Wireless and Mobile Systems", Dharam-PrakashAgarwal and Zeng, 3rd Edition, Cenage Learning pub.

Course Outcomes

After learning all the units of the course, the student is able to;

01 Describe the access technologies – FDMA, TDMA and their advantages.– L1 (Unit – I)
02 Discuss the different GSM interfaces present between different functional entities – L2 (Unit – II)
03 Apply the concepts of data encryption in GSM. – L3 (Unit – III)
04 Discuss the issues of wireless security requirements such as privacy, authentication, system lifetime and physical requirements. – L2 (Unit – IV)
05 Plan the wireless GSM network. – L5 (Unit – V)
06 Discuss the SNMP and OSI systems management under platform–centered management. – L2 (Unit – V)

Model Question Paper	Marks	CO's	Levels
Unit-1			
1 a. Discuss the two basic digital strategies of spectrum resource allocation – FDMA and TDMA.	6M	I	L2
b. Compare TDMA, FDMA and DS-CDMA systems.	6M	I	L4
c. Briefly discuss about wideband systems.	8M	I	L2
2a. Discuss how a cell structure is implemented in cellular systems.	10M	I	L2
b. Explain Co-channel interference ratio and describe how it affects the communication?	10M	I	L2
Unit-2			
3 a. Sketch a typical GSM PLMN diagram and mention the general objectives of the network with respect to the sources provided to a subscriber.	10M	II	L3
b. Explain the functional elements in a GSM reference model with a neat diagram.	10M	II	L2
	8M	II	L2
4 a.How power control is achieved in GSM using dynamic measurement with necessary diagram?Describe.	12M	II	L2
b.Draw the baseband frequency hopping implementation diagram and explain.			
Unit-3			
5. a. List all the logical channels of GSM communication and specify their combinations for the use in traffic time slots and control time slots.	8M	III	L1
b. Sketch the GSM frame structure starting from time slot to hyper frame.	6M	III	L3
c.Describe the paging procedure followed between MS and BSS.	6M	III	L2
	10M	III	L1
6. a. List atleast five different services offered separately under the category of bearer services, tele-services and supplementary services.			
b. Explain the sequential steps of procedure that follow in call release which is initiated by a mobile user.	10M	III	L2
Unit-4			
7a. Sketch and explain the architecture of PCS network architecture for data interworking.	6M	IV	L3
b. with a neat diagram explain protocol stack for GPRS.	10M	IV	L2
c. Sketch the architecture of SMS and protocol stack.	4M	IV	L3
8 a.Discuss the information contents stored on the SIM card.	10M	IV	L2
b.Explain with a figure, the steps of call flows for token based challenge in authentication procedure.	10M	IV	L2
Unit-5			
9 a. List the important issues that must be considered to determine the size of GSM- network, cell size, frequency plan and traffic plan, while planning a wireless network and discuss them.	6M	V	L1
b. Highlight the significance of spectral efficiency of a wireless network for voice and non-voice transmissions.	7M	V	L4

c. What do you mean by receiver sensitivity? Derive the expression for receiver sensitivity and maximum allowable path loss between a mobile station and a base station.	7M	V	L2
10 a. Sketch the simplified TMN physical architecture indicating all the nodes and interfaces.	5M	V	L3
b. List several service components of performance management, fault management and configuration management.	6M	V	L1
c. Sketch the diagram of NM architecture and interfaces and describe the NMS functionality.	9M	V	L3

Course Title: Low Power VlSI Design			
Course Code: P13EC72	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period-Lecture: 52Hrs.; Exam:3 Hrs.		**Weightage: CIE: 50%; SEE: 50%**	

Prerequisites:

1. Digital CMOS VLSI Design-P13EC52
2. Digital Design Using Verilog HDL-P13EC65

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge of low power VLSI design.
2. Explain the various sources of power dissipation in MOSFET.
3. Discuss the design, physics and limitations of low–power MOSFET.
4. Describe the synthesis for low–power using Algorithm level transforms and Logic Level optimization for low–power.
5. Explain the circuit level synthesis.
6. Explain the design and testing of low–voltage CMOS circuits.
7. Describe the various techniques of low–energy computing using energy recovery.
8. Explain the sources of software powerdissipation.

Relevance of the Course:

Help to pursue in-depth Low power issues of VLSI design in post graduate studies

Course Content

UNIT-I,

Low Power CMOS VLSI Design: Introduction, Sources of power dissipation, designing for low power.

Physics of power dissipationin CMOS FET Devices: Physics of power dissipation in MOSFET devices – MIS Structure,Long channel MOSFET, Sub–micron MOSFET, Gate induced Drain leakage, Power dissipation in CMOS – Short circuit dissipation, Dynamic dissipation, Load capacitance, Low power design limits – Principles of low power design, Hierarchy of limits, fundamental limits, Material limits, Device limits, Circuit limits,System limits.

Text: 1.1 to 1.3, 2.2 and 2.3 and 2.4 **11 Hrs**

UNIT-II,

Synthesis for Low Power: Behavioral Level Transforms – Algorithm level transforms for low Power, Power–constrained Least – squares optimization for adaptive and non–adaptive filters,Circuit activity driven architectural transformations, Architectural driven voltage scaling, Power optimization using operation reduction, Power optimization using operation substitution, Pre–computation – Based optimization for Low Power, Logic Level optimization for low power – FSM and Combinational logic synthesis, Technology Mapping.

Text: 4.1 and 4.2 **10 Hrs**

UNIT – III

Circuit Level – Circuit level transforms, CMOS Gates, Transistor Sizing.

Design and Test of Low–Voltage CMOS Circuits: Introduction, Circuit Design style, Leakage current in Deep sub–micron transistors, Deep Sub micrometer device design issues, Key to minimizing short channel effect.

Text: 4.3 and 5.1 to 5.5 **10 Hrs**

UNIT – IV

Low voltage circuit design techniques–Reverse V_{gs}, Steeper sub threshold swing, multiple threshold voltage, testing deep sub micrometer IC's with elevated intrinsic leakage, multiple supply voltages.

Low–Energy Computing Using Energy Recovery Techniques: Energy dissipation in transistor channel using an RC model, Energy recovery circuit design, Designs with partially reversible logic, Supply clock generation.

Text: 5.6 to 5.8 and 7.1 to 7.4 **11 Hrs**

UNIT – V

Software Design for Low Power: Introduction, Sources of software power dissipation, Software power estimation, Software power optimization.

Text: Chapter 8 (8.1 to 8.4) **10 Hrs**

Text Books and Reference Books

TEXT BOOK:

"Low–Power CMOS VLSI Circuit Design", Kaushik Roy and Sharat C Prasad, Wiley Student Edition, 2009.

REFERENCE BOOKS:

1. "Practical Low Power Digital VLSI Design", Gary K. Yeap,Kluwer Academic Publisher, 2002.
2. "Low Power Design Methodologies", PedramRabaey,Kluwer Academic Publishers, 1997.

Course Outcomes

After learning all the units of the course, the student is able to;

01 Explain the various sources of power dissipation in MOSFET. – L2 (Unit – I)
02 Explain the Architectural driven voltage scaling and Power optimization using operation reduction. – L2 (Unit – II)
03 Discuss the deep Sub micrometer device design issues. – L1 (Unit – III)
04 Explain the low–voltage design techniques. – L2 (Unit – IV)
05 Design the partially reversible logic circuits. – L3 (Unit – IV)
06 Discuss the sources of software power dissipation, estimation and optimization. – L1 (Unit – V)

		Model Question Paper	Marks	CO's	Levels
		Unit I			
1.	a)	Explain the sources of power dissipation in CMOS circuit.	8	I	L2
	b)	Derive the expression for surface space charge region and hence the threshold voltage.	12		L2
2.	a)	Explain the load capacitance, overlap capacitance and diffusion capacitance.	10		L2
	b)	List the low power design limits and explain any two.	10		L4
		Unit II			
3.	a)	Write the signal flow graph for direct and transposed direct form realizations of even length FIR system.	6	II	L3
	b)	Distinguish between parallel and pipelined implementation of data path with an adder and a comparator.	8		L4
	c)	Analyze the pre computation with wing Shannon's expansion with relevant diagram.	6		L4
4.	a)	Write the state diagram and state assignment for a state machine that produces on output '1' whenever a sequence of five 1's appear else it outputs a '0'.	8		L3
	b)	For the function F={f_1,f_2} such that f_1 = ab +bcd +ae and f_2 = a +bc + dh + eh, p(a)= p(b)= p(c)= p(d)= p(e)= p(f)=0.5, D(a)=-0.1, D(b)=0.6, D(c)=3.6, D(d)= 21.6, D(e)=129.6, D(h)=3.6. Sketch optimized circuit with (i) area alone, (ii) power alone.	12		L3
		Unit III			
5.	a)	Discuss the transistor sizing and transmitter reordering with respect to circuit level optimization.	12	III	L2
	b)	Analyze the power consumption of CMOS gates for the functiony $= \overline{(x_1 + x_2)x_3}$.	4		L4
	c)	Construct the schematic of CPL NAND/ AND and CPL XOR/XNOR.	4		L3
6.	a)	Briefly discuss the domino logic of NAND gate and differential current switch logic (percentage high).	10 6		L2 L4
	b)	Analyze the surface potentials of short and long –channel devices at V_c =0 v and V_D> 0 v.	4		L4
	c)	Distinguish the difference between single gate and dual- gate SOI MOSFET			
		Unit IV			
7.	a)	Outline the schematic of MTCMOS NAND2 gate.	4	IV	L2
	b)	Discuss the principle of SSI CMOS along with V-I curve.	8		L2
	c)	Explain the working of DCVS voltage level converter.	8		L2
8.	a)	Derive an expression for energy dissipation in transistor channel using RC model.	8	V	L2
	b)	Analyze the designs with partially reversible logic with necessary example.	6		L4
	c)	Discuss the generation of two non-overlapping clock signals	6		L2

		using adiabatic power technique.			
		Unit V			
9.	a)	Analyze the various levels of estimation of software power.	12	VI	L4
	b)	Explain the source of software power dissipation.	8		L2
	a)	With an example show the efficient use of computational resources in parallel processor application.	8		L3
10.	b)	Analyze the performance of different edge types for memory and register allocation constraints	12		L4

Course Title: Advanced Microcontrollers			
Course Code: P13EC73	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52Hrs.; Exam: 3 Hrs.	**Weightage: CIE: 50%;**		**SEE: 50 %**

Prerequisites:

1. Microprocessor and Microcontroller-P13EC44

Course Learning Objectives (CLOs):

This Course aims to

1. Provide the knowledge about basic concepts of Microcontrollers.
2. Describe the architecture of MSP 430 and ARM controllers.
3. Outline the instructions and programming of the above controllers.
4. Emphasize the basic communication interfaces.
5. Describe the concepts of real time programming on the above.
6. Apply the interfacing knowledge with various devices under microcontrollers.
7. Provide the knowledge of memory devices and interface standards.
8. Outline the concepts of exceptions and interrupt handling.

Course Content

UNIT – I

The Texas MSP 430: The outside view–pin out, the inside view–functional block diagram, memory, central processing unit, memory–mapped input and output, clock generator. **Exception:** Interrupts and resets where to find further information.

Central processing unit, addressing modes, constant generator and emulated instruction, instruction set, examples, reflections on the CPU and instruction set, resets, clock system.

Text1: 2.1 to 2.8 and 5.1 to 5.8 **10 Hrs**

UNIT – II

Functions and subroutines, what happens when a subroutines Is called?, storage for local variables, passing parameters to a subroutine and returning a result, mixing C and assembly language, interrupt service routine, issues associated with interrupts, low power modes of operations

Digital input and output: parallel ports, digital inputs, switch de–bounce, digital outputs, interface between 3V and 5V systems, driving heavier loads, liquid crystal displays, driving LCD from an MSP430–4xx, simple applications of LCD.

Text1: 6.1 to 6.10 and 7.1 to 7.9 **11 Hrs**

UNIT – III

ARM Embedded Systems: The RISC Design Philosophy, the ARM Design Philosophy Embedded System Hardware, Embedded System Software.

ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families.

Introduction to the ARM Instruction Set, Data Processing Instructions, Branch Instructions, Load–Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution.

Text 2: 1.1 to 1.4, 2.1 to 2.7 and 3.1 to 3.8 **10 Hrs**

UNIT – IV

Introduction to the Thumb Instruction Set: Thumb Register Usage, ARM–Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single–Register

Load–Store Instructions, Multiple–Register Load–Store Instructions, Stack Instructions, Software Interrupt Instruction.

Efficient C Programming: Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Structure Arrangement, Bit–fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues .

Text2:4.1 to 4.8 and 5.1 to 5.13 **11 Hrs**

UNIT – V

Exception and Interrupt Handling, Exception Handling, Interrupts, Interrupt Handling Schemes.

Firmware: Firmware and Boot loader, **Example:** Sandstone.

Embedded Operating Systems: Fundamental Components, **Example:** Simple Little Operating System.

Text2: 9.1 to 9.3.2, 10.1 to 10.2 and 11.1 to 11.2 **10 Hrs**

TEXT BOOKS:

1. "MSP 430 Microcontroller Basics", John H. Devies, Elsevier Publications, 2008
2. "ARM System Developer's Guide", Designing and Optimizing System Software Andrew N. Sloss, Dominic Symes, Chris Wright, Elsevier, 2004

REFERENCE BOOKS:

1. "Advanced Microprocessor", Daniel Tabak, 2nd Edition, TMH.
2. "Architecture programming and application of advanced microprocessors", Amar K Gangoli, Narosa publications.
3. "Advanced Microprocessors and Peripherals", K. M. Bhurchandi and A. K. Ray, 3rd Edition, MGH.

Course Outcomes

After learning all the units of the course, the student is able to

1. Describe the pin outs, memory organization and architecture of Texas MSP 430. – L2 (Unit – I)
2. Analyze the embedded system development process using MSP 430. – L3 (Unit – II)
3. Describe the architecture of ARM controllers. – L2 (Unit – III)
4. Explain the arm controller instruction set & programming concepts. – L2 (Unit – III)
5. Interpret the thumb instruction set in ARM controllers. – L3 (Unit – IV)
6. Summarize the C programming interrupt handling in ARM controllers. – L2 (Unit – V)

Model Question Paper	Marks	CO's	Levels
UNIT-I			
1) (a) Describe the architecture of MSP430 microcontroller with a block diagram.	**10**	**L1**	
(b) Explain the addressing mode used for the following instructions and the contents of the destination operand after the instruction execution (Given R4=104, R5=134 Assume suitable data in the concerned memory locations) (i)MOV.B 3(R5), R4 (ii) ADD.W R4,R5 (iii)AND @(R4), R5	**06**	**L2**	**CO1**
(c) Discuss the pin out diagram of MSP430 in brief**.**	**04**	**L6**	
OR			
2) (a) Explain about two levels of reset in MSP430.	**06**	**L2**	
(b) Discuss basic clock module of MSP430.	**08**	**L6**	
(c) Describe Program counter and Stack pointer of MSP430in brief.	**06**	**L1**	
UNIT-II			
3) (a) Explain the different issues associated with interrupts of MSP430	**05**	**L2**	
(b) Discuss the various simple applications of the LCD.	**10**	**L6**	
(c) Describe the different low-power modes of operation in MSP430.	**05**	**L1**	
OR			
4) (a) Explain the three different classes of LCD in MSP430.	**06**	**L2**	**CO2**
(b) Discuss the LCD two way multiplexing method with relevant waveforms.	**07**	**L6**	
(c) List and explain the various digital inputs and outputs in MSP430.	**07**	**L1,L2**	
UNIT-III			
5) (a) List the features of instruction set used in embedded systems.	**06**	**L1**	
(b) Explain pipelining mechanism in RISC processor to execute instruction.	**06**	**L2**	
(c) Discuss software interrupt and program status register in brief.	**08**	**L6**	**CO3**
OR			
6) (a) Discuss the Software abstraction layers executing on hardware with diagram.	**05**	**L6**	
(b) Differentiate Von Neumann and Harvard architecture.	**05**	**L2**	
(c) List and explain types of data processing instructions with example.	**10**	**L1,L2**	
UNIT-IV			
7) (a) Explain ARM Thumb interworking with syntax.	**05**	**L2**	
(b) Discuss looping with fixed and variable number of iterations with examples.	**10**	**L6**	
(c) Explain branch instructions with syntax and example.	**05**	**L2**	
OR			**CO4**
8) (a) Discuss function calling with example.	**08**	**L6**	
(b) Explain stack and software interrupt instructions with			

example.	**06**	**L2**	
(c) Explain pointer aliasing in brief and list the drawbacks.	**06**	**L2**	
UNIT-V			
9) (a) Explain prioritized interrupt handler with diagram. Also list the advantage and disadvantage of it.	**10**	**L2**	
(b) Discuss the sandstone code structure execution flow.	**10**	**L6**	
OR			
10) (a) Explain device driver with relevant diagram.			**CO5**
(b) Discuss various stages of handling interrupt with non nested interrupt handler implementation.	**06** **08**	**L2** **L6**	
(c) Explain firmware execution flow in brief.	**06**	**L2**	

Course Title: Embedded and Real Time Systems			
Course Code: P13EC74	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits:4**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50%; SEE: 50%**		

Prerequisites:

1) Computer Concepts and C Programming - P13CS13
2) Computer Communication Network -P13EC62
3) Digital Signal Processing- P13EC44
4) Microprocessor and Microcontroller- P13EC45

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the knowledge about basic concepts of Embedded Systems.
2. Describe the architecture of embedded operating systems.
3. Outline the programming languages for embedded systems.
4. Provide the knowledge of software hardware co–design.
5. Highlight the basic communication interfaces.
6. Describe the concepts of real time embedded systems.
7. Apply the interfacing knowledge with Linux commands (device drivers).
8. Provide the knowledge of memory devices and interface standards.
9. Give the concepts of embedded systems using RFID.

Relevance of the Course:

1. Real time systems- P13EC844

Course Content

UNIT – I

Architecture of Embedded Systems: Hardware architecture, software architecture, application software, communication software, process of generating executable image, development / testing tools.

Programming for Embedded Systems : Overview of ANSI C, GNU development tools, bit manipulation using C, memory management, timing of programs, device drivers, productivity tools, code optimisation, C coding guidelines, programming in C++, programming in Java.

Text: 2.1 to 2.6 and 3.1 to 3.11 **11 Hrs**

UNIT – II

The Process of Embedded System Development: The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, managing embedded system development projects, embedded system fiascos.

Communication Interfaces: Need for communication interfaces, RS232/UART, RS232/RS485, USB, Infrared, IEEE 1394 Fire wire, Ethernet, IEEE 802.11, Bluetooth.

Text: Chapters 4.1 to 4.9 and 6.1 to 6.9 **10 Hrs**

UNIT – III

Embedded/Real–Time Operating System Concepts: Architecture of the kernel, tasks and task scheduler, interrupts service routines, semaphores, Mutex, mailboxes, message queues, event registers, pipes signals, timers, memory management, and priority inversion problem.

Overview of Embedded/Real–time Operating Systems: Off–the–shelf operating systems, embedded operating systems, Real–time operating systems, handheld operating systems.

Text: Chapters 7.1 to 7.13 and 8.1 to 8.4 **10 Hrs**

UNIT – IV

Programming in Linux: Overview of UNIX Linux, shell programming, System programming.

Programming in RT Linux: Overview of RT Linux, Core RT Linux API, Program to display a message periodically, Semaphore management, Mutex management, Case Study: Appliance control by RT Linux system.

Text: Chapters 11.1 to 11.3 and 12.1 to 12.6 **10 Hrs**

UNIT – V

RFID Systems: RFID system, RFID applications, RFID tag, RFID reader, Application development using RFID, OOPS for embedded systems, embedded C++.

DSP–Based Embedded Systems: Need for DSP based embedded systems, An overview of digital signal processing, Applications of DSP, Digital signal processor architecture, DSP based embedded system design process, DSP algorithm implementation using MATLAB.

Text: Chapters 20.1 to 20.7 and 21.1 to 21.6 **11 Hrs**

TEXT BOOK:

"Embedded Real time systems: Concepts, Design and Programming", 2005 Edition, Dr. K. V. K. K. Prasad, Dreamtech Press.

REFERENCE BOOKS:

1. "Real–Time systems design and analysis", Phillip A. Laplante., Willey India, 3rd Edition, 2005.
2. "Real–Time systems", Jane W.S. Liu, fourth impression, Pearson 2007.
3. "Real–Time systems", C. M. Krishna, Kang G. Shin ,Mc Hill 1997.
4. "Real–Time systems Programming", Sriram V Iyer, Pankaj Gupta, TMH, 2007.
   "Linux for Embedded and Real Time Applications", Dong Abbolt, Newnes Publications, 2003.

Course Outcomes

After learning all the units of the course, the student is able to;

01 Discuss the hardware architecture of an embedded system. – L2 (Unit – I)
02 Analyze the process of embedded system development. – L3 (Unit – II)
03 Explain the need of serial communication interfaces. – L2 (Unit – II)
04 Describe the architecture of the kernel of an operating system of embedded system. – L2 (Unit – III)
05 Express the Real Time Linux architecture. – L2 (Unit – IV)
06 Design the DSP based embedded systems with RFID. – L5 (Unit – V)

Model Question Paper

Q NO	Questions	Marks	BTL	CO
1. a)	Discuss the software architecture of an Embedded system.	6	L2	1
b)	With a neat block diagram explain the process of Generating Executable image for embedded software.	8	L2	1
c)	List different types of memory and explain their differences. **OR**	6	L1	1
2. a)	What are the special features of ANSI C?	6	L1	1
b)	Explain the process of creating a MIDlet.	6	L2	1
c)	Write a C program to calculate the CRC using CRC-CCITT algorithm.	8	L3	1
3. a)	Define development process? Explain waterfall model as applied to embedded system development.	6	L1	2
b)	Explain what is testing and types of testing.	7	L2	2
c)	Discuss the important issues in managing embedded system development. **OR**	7	L2	2
4. a)	Explain the RS232 interface specifications.	7	L2	3
b)	Illustrate the protocol architecture of Ethernet LAN.	8	L4	3
c)	Give the broad specifications of Bluetooth standard.	5		3
5. a)	Explain the task scheduling and various scheduling algorithms.	10	L2	4
b)	Explain how a semaphore can be used for inter-task synchronization.	6	L2	4
c)	Differentiate between preemptive and non-preemptive operating systems. **OR**	4	L4	4
6. a)	Explain all the aspects in which off-the-shelf operating system is differ from other operating systems.	10	L2	4
b)	List the various mobile/handheld operating systems and explain their features.	10	L1	4
7. a)	Explain the file manipulation commands of Linux.	10	L2	5
b)	Write the program to demonstrate multi-threading in RTLinux. **OR**	10	L3	5
8. a)	Write the program that demonstrates communication between 2 processes.	10	L3	5
b)	List the function calls provided in RTLinux for mutex and semaphore management.	10	L1	5
9. a)	List and Explain the features of RFID tags.	6	L1	6
b)	Define EPC? Explain the format of EPC and the various standards for the EPC.	4	L1, L2	6
c)	Design an RFID system for library automation if(a)Each book is attached with an RFID tag and (b)Each library user is given an RFID tag. **OR**	10	L5	6
10.a)	List the important features of embedded C++.	4	L1	6
b)	Give the broad classification of filters.	6	L2	6
c)	Discuss various applications of Digital signal processing.	10	L2	6

Course Title: Artificial Neural Networks			
Course Code: P13EC751	**Semester: VII**	**L – T – P : 4– 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52Hrs; Exam: 03Hrs.	**Weightage: CIE: 50 %; SEE: 50%**		

Course Learning Objectives (CLOs):

This Course aims to:

1. Explain the Basics and the Functional Units of Artificial Neural Networks for Pattern Recognition.
2. Analyze the Pattern Association, Classification and mapping of Feed forward Neural Networks.
3. Provide the Concepts of the Feedback Neural Networks for pattern storage tasks.
4. Analyze the simple network to perform the tasks of pattern clustering.
5. Understand the different application of artificial neural network.

Relevance of the Course:

1. Speech Processing
2. Fuzzy Logic

Course Content

UNIT-I

Basic of Artificial Neural Networks: Characteristics of Neural networks, Artificial Neural Networks– Terminology, Models of Neuron, Topology, Basic Learning Laws.

Activation and Synaptic Dynamics: Introduction, activation Dynamics Models, Synaptic Dynamics Models, Learning Methods, Recall in neural Network.

Functional Units of ANN for Pattern Recognition tasks: Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units.

Text: 1.1, 1.3, 1.4 to 1.6, 2.1 to 2.4 (till 2.4.7), 3.1 to 3.3 **11 Hrs**

UNIT-II

Feed forward Neural Networks: Introduction, Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks and Analysis of pattern mapping Networks.

Text: 4.1 to 4.4 **10 Hrs**

UNIT-III

Feedback Neural Networks: Introduction, Analysis of Linear Auto associative FF Networks, Analysis of Pattern storage Networks, Feedback Neural Networks, Stochastic Networks and simulated annealing, Boltzmann Machine.

Text: 5.1 to 5.5 **10 Hrs**

UNIT-IV

Competitive Learning Neural Networks: Introduction, Components of a competitive learning Network, Analysis of Feedback Layer for Different output functions, Competitive Learning Neural Networks, Analysis of Pattern Clustering Networks, Analysis of Feature Mapping Network.

Text: 6.1 to 6.5 **10 Hrs**

UNIT-V

Applications of ANN: Introduction, Direct Applications, Application Areas

Text: 8.1 to 8.3 **11 Hrs**

Text Book:

1. "Artificial Neural Networks", B.Yegnanarayana, PHI Publications.

Reference Books:

1. "Neural Networks – A comprehensive foundation", Simon Haykin, PHI, second edition.
2. "Introduction to Artificial Neural Systems", J. Zurada, Jaico, 2003

Course Outcomes

After learning all the units of the course, the student is able to:

1. Define topology, structures and functional units of artificial neural networks (UNIT-I)
2. Justify Activation and Synaptic dynamics models and Learning methods used with ANN (UNIT-I)
3. Analyze pattern classification networks and explain the significance of (a) determination of weights by computation and (b) determination of weights by learning.(UNIT-II)
4. Explain the concept of equilibrium in stochastic neural networks. (UNIT-III)
5. Explain the three different methods of implementing the feature mapping process.(UNIT-IV)
6. Describe the different application of artificial neural network in different domain such as speech ,image processing etc. (UNIT-V)

Model Question Paper

Questions	Marks	BTL	CO
Unit I			
1. (a)Describe some attractive features of the biological neural network that make it superior to the most sophisticated artificial intelligent computer system for pattern recognition tasks.	08 06	L2	CO1
(b)Explain briefly the terms cell body, axon, synapse and neuron with reference to a biological neural networks.	06	L2 L2	
(c)Explain the significance of the following a. $x_i = 0$, for all i b. $V(x) \leq 0$ c. $V(x) = 0$ d. $w_{ij} \neq 0$, for all I,j	08 06	L2 L2	
OR			
2. (a)Explain with an example the distinction between nearest neighbour and interpolative recall of information.	06	L2	CO2
(b) Give a real life example of a pattern mapping problems.			
(c) Discuss the pattern recognition tasks by competitive learning neural networks.			
Unit II			
3. (a) Differentiate between linearly independent set and orthogonal set of vectors.	06	L4	
(b) Explain the choice of $W = BA^+$ for linearly independent and linearly dependent cases of input vectors.	08 06	L2 L2	C03
(c) Distinguish between the linearly separable and linearly inseparable problems.	06	L2	
OR			
4. (a) Explain the difference between LMS learning and delta learning.	06	L2	C04
(b) Discuss few tasks that can be performed by a back propagation network.	08	L2	
(c) Explain the difference between method of steepest descent and Newton's method.			
Unit III			
5. (a) Explain the difference between discrete and continuous Hopfield models in terms of energy landscape and stable states.	08 06	L2 L2	
(b) Discuss the behavior of trajectories of the states during the transient portion when temperature is changed.	06	L2	CO5
(c) Show the result of Hopfield analysis, i.e., $\Delta V \leq 0$, for a feedback network with binary{0,1} units	08	L2	

OR			
6. (a) Explain the behavior of a stochastic neural network at thermal equilibrium with reference to Brownian particle motion. (b) Describe the Boltzmann machine. (c) Explain the mean-field approximation to Boltzmann learning.	06 06	L1 L2	
Unit IV			
7. (a) Describe the operation of an input layer when it is directly connected to the environment. (b) Describe the basic learning features of an instar and discuss its application. (c) Explain the distinction between eigenvectors of autocorrelation and covariance matrices.	06 06 08	L1 L1 L2	
OR	06	L2	C06
8. (a) Explain the build up of the 1-D features map of 1-D input values selected at random from an interval 0 to 1. (b) Illustrate the concept of feature mapping with the help of an example of mapping 2-D input onto a 2-D feature space. (c) Explain pattern clustering network.	06 08	L3 L2	
Unit V			
9. (a) Analyze an Explain how neural network principles are useful for a texture classification problem. (b) Classify some recent trends in neural networks	12 8	L4 L3	
OR			
10. (a) Study the solution of Travelling Salesman problem using SOM for the following different cases; a. 30 Cities, 30 units b. 30 Cities, 100 units c. 30 Cities, 1000 units d. 100 Cities, 100 units e. 100 Cities, 1000 units (b). Illustrate Optimization application	12 8	L4 L3	CO7

Course Title: Medical Imaging Systems			
Course Code: P13EC752	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.		**Weightage: CIE: 50% SEE: 50%**	

Prerequisites:

1. Digital Image Processing.- P13EC64

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge on medical imaging modalities.
2. Explain the various methods of radiography and its associated terms and definitions.
3. Describe the Fluoroscopic imaging principle, Digital fluoroscopic arm system and Angiography.
4. Describe the Spiral and the helical CT scanners and their advantages.
5. Illustrate the Ultrasound Characteristics and their use for diagnostic purposes.
6. Discuss the concept of CW and pulsed Doppler ultrasound and Color Doppler.
7. Outline the concepts of nuclear medical imaging techniques.
8. Describe the Magnetic Resonance Imaging–principles and applications.
9. Describe the role of medical imaging systems under human health care.

Relevance of the Course:

1. Biometrics.- P13EC841

Course Content

UNIT – I

Radiography : Characteristics of X–rays, Generation of X–rays, Various components of radiographic systems, X–ray tube design aspects, filament circuits and mA control, HF generator circuits KV control, control of exposure timers, collimators, scatter and grids, X–ray films and screens, image qualityfactors (resolution, contrast, noise), RO.

Detectors: Ionization chamber, proportional counter, scintillation detectors, semiconductor radiation detectors, Biological effects of ionizing radiation.

10Hrs

UNIT – II

Diagnostic Imaging Methods: Image Intensifiers, Introduction to digital radiography (DR) systems, Fluoroscopic imaging principle, Digital fluoroscopic arm system, Angiography, Digital subtraction angiography (DSA), Principle of linear and computed tomography, generation of CT scanner, data acquisition system in CT, Spiral and the helical CT scanners.

10 Hrs

UNIT – III

Ultrasound: Characteristics and intensity of sound waves, reflection, refraction and acoustic impendence, interactions of ultrasound with matter, working principle and construction of Piezoelectric transducers: single and multi element, quarter–wave matching mechanical and electronic sectors array scanners, beam characteristics, block diagram and controls of a digital ultrasound machine.

Modes of operation: A, B and M modes and their clinical application, CW and pulsed Doppler ultrasound, Colour Doppler

11Hrs

UNIT – IV

Nuclear Medicine: Interactions of Alfa Beta & Gamma radiation with matter, sources and units of radio activity.

Radionuclide production: cyclotron production, reactor production, generator production, rectilinear scanners, linear scanners, Construction and working principle of radioactive. **Detectors:** scintillation detector, photomultiplier tubes, gamma camera and semiconductor detectors; SPECT, PET scanners, basic safety principles and protocol. **11 Hrs**

UNIT – V

Magnetic Resonance Imaging: Principles of nuclear magnetic resonance, Magnetic spin and Larmor frequency, MRI instrumentation system, permanent and superconductor magnets, gradient system, RF coils, Transmitter and receiver system, Relaxation processes, pulse sequence, image acquisition and principles of image reconstruction, Functional MRI, applications of MRI, effects of magnetic field on humans. **10Hrs**

TEXT BOOKS:

1. "The physics of Diagnostic Imaging", Dowsett, Kenny & Johnson, Chapman & Hall medical, Madras/London.
2. "Fundamentals of Medical Imaging", Suetens Paul, Cambridge University Press, 2002.

REFERENCE BOOKS:

1. "Principles of Medical Imaging", Shung K. Kirik, Tsui Benjamin, Smith.B.Michael, Kindley.
2. "Hand Book of Biomedical Instrumention", Khandpur R.S, 2nd Edition, Tata– McGraw Hill, 2003.

Model Question Paper

Model Questions	Marks	BTL	CO
UNIT-I			
1) (a) List the general characteristics of X-rays and explain its construction briefly.	**08**	**L1**	
(d) Write note on **(i)** Scintillation detector **(ii)** Semiconductor radiation detector.	**08**	**L1**	
(e) Explain medical image quality factors in brief.	**04**	**L2**	**CO1**
OR			
2) (a) Explain HF generator circuits KV control.	**08**	**L2**	
(b) Write a note on X-ray films and screens.	**08**	**L1**	
(c) Discuss the various biological effects of ionizing radiation.	**04**	**L2**	
UNIT-II			
3) (a) Explain digital radiography systems.	**06**	**L2**	
(b) Differentiate spiral and helical CT scanners.	**06**	**L4**	
(c) Explain the DSA. How its employed for detection of any abnormalities	**08**	**L2**	
OR			**CO2**
4) (a) Explain image intensifiers in brief.			
(b) Describe working principle of linear and computed tomography.	**06**	**L2**	
(c) Write principle of fluoroscopic imaging. Explain digital fluoroscopic arm system	**06** **08**	**L1** **L1**	
UNIT-III			
5) (a) List the characteristics of ultrasound wave. Also explain any two applications.	**08**	**L1**	
(b) Explain working principle and construction of piezoelectric transducers.	**06**	**L2**	
(c) Describe A,B& M modes and clinical applications.	**06**	**L1**	**CO3**
OR			
6) (a) Discuss the controls of a digital ultrasound machine with block diagram.	**08**	**L2**	
(b) Explain the following in brief **(i)** CW & pulsed Doppler **(ii)** Color Doppler.	**07**	**L2**	
(c) Discuss the interactions of ultrasound with matter.	**05**	**L2**	
UNIT-IV			
7) (a) Mention types of radionuclide productions. Explain any one in brief.	**08**	**L1**	
(b) Differentiate rectilinear and linear scanners.	**05**	**L4**	
(c) Explain Scintillation detector in brief.	**07**	**L2**	
OR			**CO5**
8) (a) Discuss briefly how matter interacts with alfa, beta and gamma radiation.	**08**	**L2**	
(d) Describe the construction and working of radioactive.	**08**	**L1**	
(e) Write a note on Photomultiplier tubes.	**04**	**L1**	
UNIT-V			
9) (a) Describe the principle of nuclear magnetic resonance.	**06**	**L1**	
(c) Discuss the effects of magnetic field on humans.	**06**	**L2**	
(d) What is image acquisition. Explain principle of image reconstruction	**08**	**L1**	**CO6**

OR			
10) (a) Explain how MRI differs from functional MRI. Also list the applications of MRI.	**08**	**L2**	
(b) Explain permanent and super conductor magnets in brief.	**07**	**L2**	
(c) Write a note on magnetic spin and larmor frequency	**05**	**L1**	

Course Title: Operating Systems			
Course Code: P13EC753	**Semester: VIII**	**L – T – P : 4 – 0 - 0**	**Credits:4**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide an overview of the Operating Systems topics
2. Present an analysis of processes, multithreading, symmetric multiprocessing (SMP), and micro kernels.
3. Examine the key aspects of concurrency on a single system
4. Examine the issues of mutual exclusion and deadlock.
5. Provide techniques for memory management.
6. Provide the knowledge of virtual memory and its control structure.
7. Provides a comparative discussion of various approaches to process scheduling.
8. Examines the issues involved in Operating Systems control of the I/O function.
9. Provide an overview of file management
10. Provide a survey of threats and mechanisms for computer and network security.

Relevance of the Course:

Helpful for students who pursue career in IT industry

Course Content

UNIT – I

Operating System Overview: Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore.

Process Description and Control: What Is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues.

Threads: Processes and Threads, Types of Threads, Multicore and Multithreading,

Text 1: 2.1-2.6, 3.1-3.6, 4.1-4.3 **11 Hrs**

UNIT – II

Concurrency: Mutual Exclusion and Synchronization - Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem.

Concurrency: Deadlock and Starvation - Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem.

Text 1: 5.1 - 5.6, 6.1 - 6.6 **10 Hrs**

UNIT – III

Memory Management: Memory Management Requirements, Memory Partitioning, Paging, Segmentation, Security Issues.

Virtual Memory: Hardware and Control Structures, Operating System Software.

Text 1: 7.1 - 7.5, 8.1 - 8.2 **10 Hrs**

UNIT – IV

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk Cache.

File Management: Overview, File Organization and Access, B-Trees, File Directories, File Sharing, Record Blocking, Secondary Storage Management, File System Security.

Text 1: 11.1 - 11.7, 12.1 - 12.8 **10 Hrs**

UNIT – V

Computer Security Threats: Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software, Overview, Viruses, Worms, and Bots, Rootkits.

Computer Security Techniques: Authentication, Access Control, Intrusion Detection, Malware Defense, Dealing with Buffer Overflow, Attacks.

Text 1: 14.1 – 14.6, 15.5 – 15.5 **11 Hrs**

Text Book:

1. Operating Systems by William Stallings, 7e, Pearson India.

Reference book(s)

1. Operating systems by Silberschatz and Galvin, 9e, Wiley
2. Operating Systems by Godbole, 3e, McGraw Hill India

Course Outcomes

After learning all the units of the course, the student is able to

1. Understand the functions and objectives of operating system– L2 (Unit – I)
2. Discuss the principle of concurrency -L3 (Unit-II)
3. Identify the problems related to task synchronization and deadlock-L6(Unit-II)
4. Describe the requirements of memory management– L2 (Unit – III)
5. Compare the disk scheduling procedure-L3(Unit-4)
6. Outline the security concepts and its threats- L4 (Unit–V)

Model Question Paper

		Model Questions	Marks	CO	BTL
		Unit - I			
01	a.	Analyze the three objectives of an OS design?	08	1	L4
	b	What is a process and explain how is the execution context of a process used by the OS?	06	1	L2
	c	What is the purpose of system calls, and how do system calls relate to the OS and to the concept of dual-mode (kernel-mode and user-mode) operation?	06	1	L1
		OR			
02	a	Explain the distinction between a real address and a virtual address.	08	1	L2
	b	List reasons why a mode switch between threads may be cheaper than a mode switch between processes.	06	1	L1
	c	In the discussion of ULTs versus KLTs, it was pointed out that a disadvantage of ULTsis that when a ULT executes a system call, not only is that thread blocked, but also all of the threads within the process are blocked. Why is that so?	06	1	L5
03	a	Explain the three contexts in which concurrency arise?	08	2	L5
	b	Explain the basic requirement for the execution of concurrent processes?	06	2	L2
	c	Is busy waiting always less efficient (in terms of using processor time) than a blocking wait? Explain.	06	2	L2
		OR			
04	a	Distinguish between binary and general semaphores?	08	2	L4
	b	Explain the three conditions that must be present for deadlock to be possible?	06	2	L2
	c	Evaluate the banker's algorithm for its usefulness in an OS.	06	2	L5
05	a	What are some reasons to allow two or more processes to all have access to a particular region of memory?	08	3	L1
	b	Compare internal and external fragmentation?	06	3	L4
	c	Consider a dynamic partitioning scheme. Show that, on average, the memory contains half as many holes as segments.	06	3	L5
		OR			
06	a	Distinguish between simple paging and virtual memory paging?	08	3	L4
	b	Why is it not possible to enforce memory protection at compile time?	06	3	L1
	c	A process references five pages, A, B, C, D, and E, in the following order: A; B; C; D; A; B; E; A; B; C; D; E Assume that the replacement algorithm is first-in-first-out and find the number of page transfers during this sequence of references starting with an empty main memory with three page frames. Repeat for four page frames.	06		L5
07	a	Explain the differences among long-, medium-, and short-term scheduling.	08	4	L2

	b	Explain some of the key issues in the design of OS support for I/O.	06	4	L2
	c	Consider a program that accesses a single I/O device and compare un buffered I/O to the use of a buffer. Show that the use of the buffer can reduce the running time by at most a factor of two.	06	4	L5
		OR			
08	a	Analyze the principal design issues for secondary storage management.	08	4	L4
	b	Explain the I/O mechanisms in UNIX, Linux, and Windows 7	06	4	L2
	c	Briefly define the seven RAID levels.	06	4	L1
09	a	What are the fundamental requirements addressed by computer security?	08	5	L1
	b	Distinguish between passive and active security threats?	06	5	L4
	c	Consider an automated teller machine (ATM) in which users provide a personal identification number (PIN) and a card for account access. Give examples of confidentiality, integrity, and availability requirements associated with the system and, in each case, indicate the degree of importance of the requirement.	06	5	L5
		OR			
10	a	Explain key aspects of root kits.	08	5	L2
	b	Compare between a bot and a root kit.	06	5	L4
	c	Assume that passwords are limited to the use of the 95 printable ASCII character sand that all passwords are 10 characters in length. Assume a password cracker with an encryption rate of 6.4 million encryptions per second. How long will it take to test exhaustively all possible passwords on a UNIX system?	06	5	L5

Course Title:INTERNET ENGINEERING			
Course Code: P13EC754	**Semester: VII**	**L – T – P : 4 – 0 - 0**	**Credits: 4**
Contact Period - Lecture: 52 Hrs.; Exam: 3 Hrs.		**Weightage: CIE: 50 %; SEE:50%**	

Prerequisites:

1. Computer Communication Network- P13EC62

Course Learning Objectives (CLOs):

This Course aims to;

1.Study the growth of computer networking, multiplexing and dialup modems.
2. Provide knowledge on packets, error detection techniques and network topologies.
3. Analyze LAN wiring schemes, protocol layering for TCP/IP and OSI.
4. Discuss the concepts of internetworking, universal service and architecture.
5. Provide an overview of IP and its addressing schemes and ICMP for error reporting.
6. Study the TCP for reliable transport and functionality of client server interaction.

Relevance of the Course:

1. Multimedia Communications. –P13EC763

Course Content

UNIT-I

Introduction: Growth of computer Networking, Complexity in Network Systems, Mastering the complexity, Concepts and Terminology.

Long – Distance Communication: Introduction, Sending signals across long distances, Modem Hardware used for modulation and demodulation, Leased analog data circuits, Optical, Radio Frequency and Dialup modems, Carrier Frequency and multiplexing, Baseboard and broad band technologies, Wave length division multiplexing Spread Spectrum, Time Division multiplexing.

Text 1: 1.1 – 1.4, 6.1 – 6.10 **10 Hrs**

UNIT-II

Packets, Frames error detection: Introduction, the concept of packets, Packets and Time–Division Multiplexing, Packets and Hardware Frames, Byte Stuffing, Transmission Errors, Party Bits and Party Checking, Probability, Mathematics and Error Detection, Detecting Errors with checksums, Detecting Errors with Cyclic Redundancy checks, Combining Building Blocks, Burst Errors, Frame Format and Error Detection Mechanisms.

LAN Technologies and Network Topology: Introduction, Direct Point–Point Communication, Shared Communication Channels, Significance of LANs and Locality of Reference, LAN Topologies, Example Bus Network: Ethernet, Carrier Sense of Multi–Access Networks, Collision Detection and Back off with CSMA/CD wireless LANs and CSMA/CA, Example Bus Network: Local Talk, Example Ring Network: IBM Token Ring, Example Ring Network: FDDI, Example Star Network: ATM.

Text 1: 7.1 – 7.13, 8.1 – 8.13 **10 Hrs**

UNIT-III

LAN Wiring, Physical Topology and Interface Hardware: Introduction, Speeds of LANs and computers, Network Interface Hardware, The connection between A NIC and a network, Original Thick Ethernet wiring. Connection Multiplexing, Thin Ethernet Wiring, Twisted Pair Ethernet, Advantages and Disadvantages of wiring schemes, The Topology Paradox,

Network interface Cards and wiring schemes, Wiring Schemes and other Network Technologies.

Protocols and Layering: Introduction, The need of Protocols, Protocol Suites. A Plan for Protocol Design. The Seven Layers, Stacks: Layered Software, How Layered Software Works, Multiple, Nested Header, the Scientifics Basis for Layering, Techniques Protocols Use, the Art of Protocols Design.

Internetworking: Concepts, Architecture and Protocols: Introduction, The Motivation for Internetworking, The concepts of Universal service, Universal Service in a Heterogeneous World, Internetworking, Physical Network connection with Routers, Internet Architecture, Achieving Universal Service, A Virtual Network, Protocols for Internetworking, Significance of Internetworking and TCP/IP, Layering and TCP/IP Protocols, Host Computers, Routers and Protocol Layers.

Text 1: 10.1 – 10.11, 10.14, 16.1 – 16.11, 17.1 – 17.13 **11 Hrs**

UNIT-IV

IP: Internet protocol Addresses: Introduction, Addresses for the Virtual Internet, The IP Addressing Scheme, The IP Addressing Hierarchy, Classes of IP Addresses, Computing the class of an address, Dotted Decimal Notation, Division of the Address Space, Authority for addresses, An addressing Example, Special IP Addresses, Summary of Special IP addresses, The Berkeley Broadcast Address Form, Routers and the IP addressing Principle, Multi–Homed Hosts.

An Error Reporting Mechanism (ICMP): Introduction, Best – Effort Semantics and Error Detection, Internet Control Message protocol, ICMP Message Transport, Using ICMP Messages to test Reachability, using ICMP to Trace a Route, Using ICMP for path MTU Discovery.

Text 1: 18.1 – 18.11, 18.17 – 18.21, 23.1 – 23.8 **10 Hrs**

UNIT-V

TCP: Reliable Transport Service: Introduction, The Need for Reliable Transport, The Transmission Control protocol, The service TCP Provides to Applications, End–to–End Service and Data–grams, Achieving Reliability, Packet Loss and Retransmission, Adaptive Retransmission, Comparison of Retransmission Times, Buffers, Flow Control and Windows, Three–way Handshake, Congestion Control, TCP Segment Format.

Client–Server Interaction: Introduction, the functionality Application software provides, the functionality an Internet provides, Making Contact, The client–server paradigm, Characteristic of clients and services, Server programs and server–class computer, request, Responses and direction of Data flow, Transport Protocols and Client server Interaction, Multiple services on one computer, identifying a particular service Multiple copies of a Server for a single service, Dynamic Server Creation, Transport protocols and Unambiguous communication, Connection–oriented and connectionless transport, A service Reachable through Multiple protocols, complex Client–Server Interactions, Interactions and circular Dependencies.

Text 1: 25.1 – 25.13, 28.1 – 28.18 **11 Hrs**

Text Books:

"Computer Networks and Internets", D.E. Comer, Pearson, 4th Edition.

Reference Books:

1. "Internet and Internet Engineering", D. Minoli – TMH.
2. "The complete reference Internet", N.L. Young – TMH.

Course Outcomes

After learning all the units of the course, the student is able to;

1. Describe growth, complexity of computer Networking and multiplexing with modulation schemes.-L2 (Unit-I)
2. Describe error detection techniques, packet framing, LAN topology and channel access schemes.-L2 (Unit-II)
3. Summarize NIC operation and wiring schemes. Explain the protocols used to solve some of the problems in computer network.L2 (Unit-III)
4. Analyze addressing schemes and error reporting mechanism. L4 (Unit-IV)
5. Outline some of the most interesting client server interactions and TCP reliable service mechanism. L1(Unit-V)
6. Distinguish between connection oriented and connectionless transport.- L2 (Unit-V)

Model Question Paper

Q NO	QUESTIONS Unit-I	Marks	CO	Level
1. a)	Explain why each radio station in an area must be assigned a unique carrier frequency.	8	1	L2
b)	Calculate the S/N ratio of a modem has a data rate of 56000bits per second. If the bandwidth of the line is 4000Hz.	6	1	L4
c)	Compare TDM and FDM.	6	1	L4
2. a)	List the advantages of multiplexing.	6	1	L1
b)	Explain wavelength division multiplexing.	6	1	L2
c)	Define unicast, multicast, and broadcast addresses. Explain the meaning of each.	8	1	L1
	Unit-II			
3. a)	Discriminate the characteristics of LANs, MANs, and WANs.	10	2	L4
b)	Examine collision detection and prevention scheme.	10	2	L2
4. a)	Discuss the self healing token passing network topology	10	2	L2
b)	Compare point to point and shared communication channel.	10	2	L4
	Unit-III			
5. a)	Write the advantages and disadvantages of wiring schemes.	6	3	L3
b)	Explain the connection between NIC and a Network.	8	3	L2
c)	Explain twisted pair internet.	4	3	L2
6. a)	Describe seven layer protocol reference model.	10	3	L2
b)	Sketch and explain sliding window protocol.	10	3	L3
	Unit-IV			
7. a)	List the ICMP messages with type.	8	4	L1
b)	Describe the function of trace root in relation to ICMP messages.	8	4	L2
c)	Compare CIDR and classful addressing schemes.	4	4	L4
8. a)	Write the TCP segment format and explain its fields.	10	4	L3
b)	Design a protocol that reliably allows the two programs to agree to communicate. Give your design to someone, and see if they can find a sequence of loss, duplication, and delay that makes the protocol fail. Assume that messages sent between two programs can be lost, duplicated, delayed, or delivered out of order.	10	4	L5
	Unit-V			
9. a)	List the complex client server interactions.	8	5	L1
b)	Explain client server using TCP/IP protocol to communicate across an internet.	12	5	L2
10.a)	Describe multiple copies of server for a single service.	8	5	L2
b)	Compare connection-oriented and connection less transport.	6	5	L4
c)	List the characteristics of clients and server.	6	5	L1

Course Title: Speech Processing			
Course Code: P13EC761	**Semester: VII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period -Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Prerequisites:

1. Digital Signal Processing. -P13EC44
2. Fundamentals of Signals. -P13EC36
3. Engineering Mathematics -3 & 4

Course Learning Objectives (CLOs):

This course aims to

1. Provide knowledge of basic characteristics of speech
2. Provide the basic knowledge of speech production mechanism and their classification
3. Describe different digital models of speech
4. Explain the various methods & algorithms of speech processing in time –domain.
5. Describe the frequency domain methods of speech processing.
6. Design the filters for harmonic analysis.
7. Understanding the concept of homo–morphic speech processing.
8. Provide the knowledge on different application of speech processing.

Course Content

UNIT – I

Production and Classification of Speech Sounds: Introduction, mechanism of speech production.

Acoustic phonetics: Vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates.

10 Hrs

UNIT – II

Time–Domain Methods for Speech Processing: Time dependent processing of speech, short–time energy and average magnitude, short–time average zero crossing rates. Speech vs. silence detection, pitch period estimation using parallel processing approach, short–time autocorrelation function. Brief Applications of temporal processing of speech signals in synthesis, enhancement, hearing applications and clear speech. **11 Hrs**

Unit–III

Frequency Domain Methods for Speech Processing: Introduction, definitions and properties: Fourier transforms interpretation and linear filter interpretation, sampling rates in time and frequency. Filter bank summation and overlap add methods for short–time synthesis of speech, sinusoidal and harmonic plus noise method of analysis/synthesis.

11 Hrs

Unit–IV

Homo–morphic Speech Processing & Introduction to LPC analysis : Introduction, homo–morphic system for convolution, the complex cepstrum of speech, Pitch detection, Formant Estimation homo–morphic vocoder, Basic principles of Linear Predictive analysis

Basic principles of Linear Predictive Analysis, The Autocorrelation Method, The Covariance Method. **10 Hrs**

Unit–V

Applications of Speech Processing: Brief applications of speech processing in voice response systems, hearing aid design and recognition systems. **10 Hrs**

TEXT BOOK:

1. "Digital Processing of Speech Signals", L. R. Rabiner and R. W. Schafer, Pearson Education Asia, 2004.

REFERENCE BOOKS:

1. "Discrete Time Speech Signal Processing",T. F. Quatieri, Pearson Education Asia, 2004.
2. "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", B. Gold and N. Morgan, John Wiley, 2004.

Course Outcomes

After learning all the units of the course, the student is able to

1. Discuss the mechanism of speech production and generation of different sounds. – L1 (Unit – I)
2. Illustrate the Acoustic phonetics. – (Unit I)
3. Discuss and apply various methods & algorithms of speech processing techniques in time domain. – L3 (Unit – II)
4. Apply various methods & algorithms of speech processing techniques in frequency domain and design filer bank for harmonic analysis . – L3, L4 (Unit – III)
5. Explain the concept of Homo–morphic Speech Processing and LPC. – L2 (Unit – IV)
6. Discuss the various applications of speech processing. – L2 (Unit – V)

Model Questions	Marks	BTL	CO
UNIT-I			
1. **(a)** Describe the speech production mechanism and identify different categories of excitation.	**10**	**L1**	
(b) Draw a vowel triangle, showing the appropriate position of vowels in English. Explain its significance.	**10**	**L4**	
OR			
2. **(a)** Define the following and explain their way of production: i. Vowels ii. Diphthongs iii. Semivowels iv. Nasals	**10**	**L1**	**CO1**
(b) Discuss applications of speech communication.	**10**	**L2**	
UNIT-II			
3. (a) Explain speech V/S silence discrimination based on short time energy and short time average zero crossing rates.	**10**	**L2**	
(b) Explain short time energy and short time average zero crossing rate.	**10**	**L2**	
OR			**CO2**
4. **(a)** Explain in detail, the pitch period estimation, using parallel processing approach.	**10**	**L2**	
(b) Explain short–time energy and average magnitude.	**10**	**L2**	
UNIT-III			
5. **(a)** With a neat diagrams, discuss the filter bank summation method for short time synthesis.	**10**	**L2**	
(b) Explain linear filtering interpretation of short time Fourier transform.	**10**	**L2**	
OR			**CO3**
6. (a) Explain overlap add methods for short–time synthesis of speech.**(b)** With a neat diagrams, discuss sampling rates in time domain and frequency domain.	**10** **10**	**L2** **L2**	
UNIT-IV			
7. **(a)** Explain the harmonic Vocoder.	**10**	**L2**	
(b) Discuss the properties of complex cepstrum of a stable sequence.	**10**	**L2**	
OR			
8. (a) Compute the gain of linear predictive model for both voiced and unvoiced.	**10**	**L3**	**CO4**
(b) Derive an expression for minimum mean square error for autocorrelation function and write the autocorrelation Toeplitz matrix.	**10**	**L4**	**CO5**
UNIT-V			
9. (a) Explain the meaning of speech synthesis, using a block diagram; explain the different steps in speech synthesis.	**10**	**L2**	
(b) With neat block diagram, briefly explain multiple digital voice response system.	**10**	**L2**	
OR			**CO5**
10. (a) With neat block diagram, explain voice response system based on format coded words.	**10**	**L2**	
(b) Explain speaker verification system.	**10**	**L2**	

Course Title: Biomedical Signal Processing			
Course Code: P13EC762	**Semester: 7th**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture: 52Hrs, Exam: 3Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisites:

1. Fundamentals of signals – P13EC36
2. Digital signal processing – P13EC44

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the knowledge of microprocessor for using medical instruments.
2. Analyzing the characteristics of ECG signal.
3. Analyzing all integer filters in digital form.
4. Understanding the use of Adaptive filters and signal averaging in signal processing.
5. Explain the role of data reduction techniques in signal processing.
6. Analyzing high performance VLSI signal processing.

Relevance of the Course:

This course helps students who are interested in continuing research/ further studies in the field of,

1. Biomedical Engineering.
2. VLSI in Digital Signal Processing.

Course Content

UNIT – I

Introduction to Computers in Medicine: Characteristics of medical data, what is a medical instrument, Iterative definition of medicine, Evolution of microprocessor **–** based systems, the Microprocessor based medical instrument, Software design of digital filters.

Electrocardiography: Basic Electrocardiography, ECG lead systems, ECG signal characteristics.

Text: 1.1 to 1.6 and 2.1 to 2.3 **11 Hrs**

UNIT – II

Basics of Digital Filtering: Digital filters, the z transforms, elements of a digital filter, Types of digital filters, transfer function of a differential equation, the z**–**plane pole zero plots, and the rubber membrane concept.

Integer Filters: Basic design concept, Low pass integer filters, high pass integer filters, Band pass and Band Reject integer filters, the effect of filter cascades, other fast operating design techniques.

Text: 4.1 to 4.7 and 7.1 to 7.6 **11 Hrs**

UNIT – III

Adaptive Filters: Principal noise canceller model, 60**–**Hz adaptive canceling using a sine wave model, other applications of adaptive filtering.

Signal Averaging: Basics of Signal averaging, signal averaging as a digital filter. A typical average, Software for signal averaging, limitations of signal averaging.

Text: 8.1 to 8.3 and 9.1 to 9.5 **10 Hrs**

UNIT – IV

Data Reduction Techniques: Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding.

Other Time–And Frequency–Domain Techniques: The Fourier Transform, correlation, convolution, power spectrum estimation.
Text: 10.1 to 10.4 and 11.1 to 11.4 **10 Hrs**

UNIT – V

ECG Analysis Systems: ECG interpretation, ST– segment analyzer, Portable arrhythmia monitor.
VLSI in Digital Signal Processing: Digital signal processors, high performance VLSI signal processing, VLSI applications in medicine, VLSI sensors for biomedical signals, VLSI tools, choice of custom, ASIC or of the shelf components.
Text: 13.1 to 13.3 and 14.1 to 14.6 **10 Hrs**

Text Books and Reference Books

1. "Biomedical Digital Signal Processing", W.J. Tomkinss – PHI, 2001.
2. "Understanding Digital Signal Processing", Lyons – Addison Wesley.

Course Outcomes

After learning all the units of the course, the student is able to;

1. Define ECG and its role in biomedical signal processing.-L1
2. Explain the role of integer filters in biomedical signal processing.-L2
3. Interpret how signal averaging is used for signal analysis?-L3
4. Explain the role of Fourier transform in data reduction techniques.-L2
5. Analyze the role of fast operating design techniques in signal processing.-L4
6. Summarize the role of VLSI sensors in biomedical signal processing.-L5

Model Question Paper

Model Questions	M	CO	BL
UNIT-I			
1. **(a)** Summarize the characteristics of medical data.	**05**		**L5**
(b) Illustrate microcomputer based medical instrument.	**08**	**CO1**	**L3**
(c) Explain briefly basic elements of a medical instrumentation system.	**07**		**L2**
OR			
2. (a) Sketch and explain ECG signal Characteristics.	**06**		
(b) What are the two types of electrodes used in ECG? Which of them is popular? Why?	**06**		**L3** **L1**
(c) Explain the working of 12 lead ECG systems.	**08**	**CO1**	**L2**
UNIT-II			
3 (a) The z-transform of a filter is given by $H(Z) = \frac{1-Z^{-2}}{1-1.0605Z^{-1}+0.5625Z^{-2}}$ Calculate i) amplitude response ii) Phase response?	**10**	**CO2**	**L4**
(b) If the output sequence of a digital filter is {1,3,2}in response to a unit impulse, what is the transfer function of this filter? Draw the poles & zeros of this transfer function mentioning the ROC.	**10**		**L3**
OR			
4 (a) Explain placement of poles and zeroes in transfer function.	**10**	**CO2**	**L2**
(b) Analyze the effect of filter cascades.	**10**		**L4**
UNIT-III			
5. (a) What are the advantages of an adaptive filter? Design an adaptive filter using LMS algorithm.	**08**	**CO3**	**L1**
(b) Discuss briefly any two applications of adaptive filter**.**	**04**		**L2**
(c) Analyze how a sine wave model is used for 60Hz adaptive cancellation.	**08**		**L4**
OR			
6. (a) List the characteristics of noise and signal in signal averaging techniques. Explain a typical signal averager with the help of block diagram.	**10**		**L1**
(b) Show that signal averaging improves the SNR by a factor of √m, where m is the number of sweeps considered. What are the limitations of signal averaging?	**10**	**CO3**	**L3**

UNIT-IV			
1. (a) Given a sequence of 28 datapoints {1,1,1,1,1,1,1,2,2,2,2,2,2,3,3,3,3,3,4,4,4,4,5,5,5,6,6,7}, Illustrate Huffman coding.	**06**		**L3**
(b) What is a data reduction algorithm? Explain lossy and lossless data compression. Classify the four data reduction algorithms into these categories.	**06**	**CO4**	**L1**
(c) With an example, illustrate and explain turning point algorithm.	**08**		
OR			**L3**
8.(a) Explain the importance of parseval's theorem.	**08**		
(b) Employ the concept of fast fourier transform in data processing.	**06**	**CO4**	**L2**
(c) Compute correlation in frequency domain with an example.	**06**		**L3**
			L3
UNIT-V	**10**		
9. (a) With a block diagram, explain the portable arrhythmia monitor		**CO5**	**L2**
(b) Summarize the portable arrhythmia monitor, with a block diagram.	**10**		**L5**
OR	**06**		
10. (a) Analyze the role of VLSI sensors in biomedical signal processing.	**04**	**CO5**	**L4**
(b) Compare general purpose microprocessor & DSPs.	**10**		**L4**
(c) Differentiate between systolic arrays and wave front arrays. Which would operate more efficiently?			**L4**

Course Title: Multimedia Communications			
Course Code: P13EC763	**Semester: VII**	**L – T – P : 2 – 2 - 0**	**Credits:3**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Prerequisites

1. Information theory and coding-P13EC53
2. Digital Communication-P13EC54
3. Computer Communication Networks-P13EC62

Course Learning Objectives

This course aims to

1. Explain the types of multimedia network and its applications.
2. Describe the digitization principles of text and images.
3. Provide the understanding of digitization techniques of audio and video.
4. Discuss the compression techniques of different media.
5. Describe the standards related to multimedia communication.
6. Explain the concepts of World Wide Web.
7. Explain the types of multimedia network and its applications.

Relevance of the course

1. Data compression-P13EC845
2. Error Control Coding-P13EC834

Course Content (Syllabus)

UNIT – I

Multimedia Communications: Introduction, Multimedia information representation, Multimedia networks, Multimedia applications, Application and networking terminology.
Text: 1.1 to 1.5 **10 Hrs**

UNIT – II

Multimedia Information Representation: Introduction, Digitization principles, Text, Images, Audio, Video.
Text: 2.1 to 2.6 **10 Hrs**

UNIT – III

Text and Image Compression: Introduction, Compression principles, Text compression, Image compression.
Audio and Video Compression: Introduction, Audio compression, Video compression.
Text: 3.1 to 3.4 and 4.1 to 4.3 **11 Hrs**

UNIT – IV

Standards for Multimedia Communications: Introduction, Reference model, Standards relating to interpersonal communications, Standards relating to interactive applications over the internet, Standards for entertainment applications.
Text: 5.1 to 5.5 **11 Hrs**

UNIT – V

Entertainment Networks and High–Speed Modems: Introduction, Cable TV networks, Satellite television networks.
The World Wide Web: Introduction, URLs and HTTP, HTML.
Text: 11.1 to 11.3 and 15.1 to 15.3 **10 Hrs**

TEXT BOOK:

"Multimedia Communications, applications, networks, protocols and standards", Fred Halsall, Pearson, Fifth Impression, 2011.

REFERENCE BOOKS:

1. "Fundamentals of Multimedia", Ze Nian li and Mark.S.Drew, Pearson education, 2004.
2. "Multimedia: Computing, Communications and Applications", Ralf Steinmetz and Klara Nabrsted, Pearson Education, 2004.
3. "Multimedia Communication Systems", K.R Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Pearson Education, 2004.
4. "Multimedia: Making it Work", Tay Vaughan, Tata McGraw Hill, 2004.
5. "Multimedia Information Systems", PallapaVenkataram, Pearson Education, 2005.

Course Outcome (CO)

After learning all the units of the course, the student is able to

01 Describe the different types of multimedia network and its applications. – L1 (Unit – I)
02 Explain the digitalization principles related to different media. – L2 (Unit – II)
03 Illustrate the compression techniques of different media. – L3 (Unit – III)
04 Explain the reference model and standards related to enter personal communication. – L2 (Unit – IV)
05 Define the standards related to interactive applications related to entertainment applications. – L1 (Unit – IV)
06 Explain the concept of worldwide web. – L2 (Unit – V)

Model Question Paper

Model Questions	Marks	BTL	CO
UNIT-I			
10. (a) Describe in detail with diagrams a circuit switched network and a packet switched network**..**	**10**	**L1**	
(b) Explain the different QOS parameters associated with a packet switched network.	**06**	**L2**	
(c) Compute the maximum block size that should be used over a channel which has a mean BER probability of 10^{-4} if the probability of a block containing a error and hence being discarded is to be 10^{-1}.	**04**	**L3**	
OR			**CO1**
11. (a) With the help of a neat diagram, describe the various modes of multipoint conferencing operations.	**10**	**L1**	
(b) Calculate the propogation delay associated with the following communication channels	**04**	**L4**	
(i). Connection through a private network of 1 km.			
(ii). Connection through a PSTN of 200 km.	**06**	**L2**	
(c) Explain various network types associated with communication modes.			
UNIT-II			
12. (a) Explain the quantization procedures with the help of suitable waveforms	**08**	**L2**	
(b) Compute the time to transmit the following digitized images at both 64kbps and 1.5Mbps.	**04**	**L3**	
(i). 640*480*8 VGA compatible image			
(ii). 1024*768*24 SVGA compatible image			
(c) Explain the principle applied for digitization of document, its schematic and digitization format.	**08**	**L2**	**CO2**
OR			
13. (a) Explain the following file formats :	**12**	**L2**	
(i)SIF (ii)CIF (iii)QCIF.	**04**	**L4**	
(b) Differentiate between luminance and chrominance parameters..			
(c) Explain with a suitable diagram the base band spectrum of color TV signed in NTSC system.	**04**	**L2**	
UNIT-III			
14. (a) Explain the principle of operation of LZW compression algorithm and how this is different from LZ algorithm.	**08**	**L2**	
(b) Describe the various stages of JPEG encoder with the aid of neat schematic diagram.	**08**	**L1**	
(c) A file comprises of six different characters M,F,Y,N,0 and 1each of which occurs with a relative frequency of occurrence of 0.25,0.25,0.125,0.125,0.125 and 0.125 respectively. If the encoding algorithm under consideration uses the following set of codewords: M=10, F=11, Y=010, N=011,0=000,1=001	**04**	**L3**	**CO3**
Compute:			
(i) The average number of bits per codeword with the algorithm.			
(ii) The entropy of the source.			
OR			
15. **(a)** With the help of a neat diagram, explain the operation of basic DPCM signal encoder and decoder.	**12**	**L2**	

(b) With an implementation schematic, explain the basic principle of H.261 video encoder.	**08**	**L2**	
UNIT-IV			
16. (a) With aid of diagram describe the role of each of five layers of TCP/IP reference model.	**07**	**L1**	
(b) Explain two party call setup procedure using H.323 gate keeper.	**06**	**L2**	**CO4**
(c) Explain the process of interworking unit using H.323 gateway.	**07**	**L2**	
OR			
17. (a) Explain briefly the structure of interpersonal communication standards for circuit mode networks.	**10**	**L2**	**CO5**
(b) Explain the working of email over internet.	**10**	**L2**	
UNIT-V			
18. (a) With the help of neat schematic diagram explain the role of security gateway and proxy server.	**08**	**L2**	
(b) Explain the following: (i). GEO satellite positioning (ii). On board transponder sub system	**12**	**L2**	**CO6**
OR			
19. (a) Explain the following terms related to web: (i). HTTP (ii). HTML (iii). Hyper Text (iv). Hyperlink	**08**	**L2**	
(b) Give an example of URL that uses file method and explain one of its uses.	**06**	**L2**	
(c) Explain the various principles of HTTP standard application protocol with the aid of a neat diagram.	**06**	**L2**	

Course Title: Synthesis and Optimization of Vlsi Circuits			
Course Code: P13EC764	**Semester: VII**	**L – T – P : 2 – 1--0**	**Credits: 3**
Contact Period - Lecture:52Hrs.;Exam:3 Hrs.	**Weightage: CIE: 50%;**		**SEE: 50%**

Prerequisites:

1. Digital Electronic circuits- P13EC33
2. Digital CMOS VLSI Design- P13EC52
3. Digital System Design Using Verilog- P13EC65

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge of semiconductor technologies and algorithms.
2. Discuss the concept of graphs and Boolean algebra and Applications.
3. Define structural HDL and algorithms for logic minimization.
4. Describe algebraic model and optimization for rule base system logic.
5. Explain the sequential circuit optimization.
6. Discuss the concept of scheduling algorithm for delay optimization.
7. Explain problem formulation and analysis on FPGA
8. Describe the different types of simulators.

Relevance of the Course:

1. ASIC Design –P13EC833
2. CCN and VLSI lab –P13ECL77
3. For project work and Graduate studies

Course Content

UNIT – I

Introduction: Microelectronics, semiconductor technologies and circuit taxonomy, Microelectronic design styles, computer aided synthesis and optimization.

Graphs: Notation, undirected graphs, directed graphs, combinatorial optimization, Algorithms, tractable and intractable problems, algorithms for linear and integer programs, graph optimization problems and algorithms, Boolean algebra and Applications. **10 Hrs**

UNIT – II

Hardware Modeling: Hardware Modeling Languages, distinctive features, structural hardware language, Behavioral hardware language, HDLs used in synthesis, abstract models, structures logic networks, state diagrams, data flow and sequencing graphs, compilation and optimization techniques.

Two Level Combinational Logic Optimization: Logic optimization, principles, operation on two level logic covers, algorithms for logic minimization, symbolic minimization and encoding property, minimization of Boolean relations. **11 Hrs**

UNIT – III

Multiple Level Combinational Optimizations: Models and transformations for combinational networks, algebraic model, Synthesis of testable network, algorithm for delay evaluation and optimization, rule based system for logic optimization. **11 Hrs**

UNIT – IV

Sequential Circuit Optimization: Sequential circuit optimization using state based models, sequential circuit optimization using network models.

Schedule Algorithms: A model for scheduling problems, Scheduling with resource and without resource constraints, Scheduling algorithms for extended sequencing models, Scheduling Pipe lined circuits. **10 Hrs**

UNIT – V

Cell Library Binding: Problem formulation and analysis, algorithms for library binding, specific problems and algorithms for library binding (lookup table FPGA's and Anti fuse based FPGA's), rule based library binding.

Testing: Simulation, Types of simulators, basic components of a simulator, fault simulation Techniques, Automatic test pattern generation methods (ATPG), design for Testability (DFT) Techniques. **10 Hrs**

TEXT BOOKS:

1. "Synthesis and Optimization of Digital Circuits",Giovanni De Micheli, Tata McGraw–Hill, 2003.

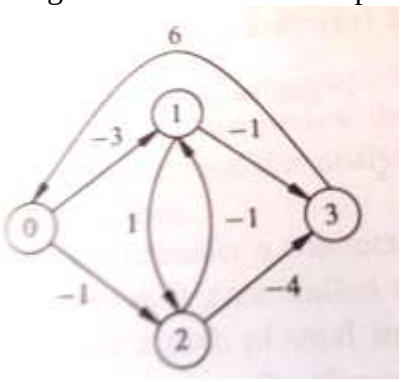
REFERENCE BOOKS:

1. "Logic Synthesis", Srinivas Devadas, Abhijit Ghosh, and Kurt Keutzer, McGraw–Hill, USA, 1994.
2. "Principles of CMOS VLSI Design: A System Perspective", Neil Weste and K. Eshragian, 2nd Edition, Pearson Education (Asia) Pte. Ltd., 2000.
3. "VHDL for Programmable Logic", Kevin Skahill, Pearson Education (Asia) Pvt. Ltd., 2000.

Course Outcomes

After learning all the units of the course, the student is able to;

1. Explain the semiconductor technology, algorithms on different types of graphs-L2(Unit-I)
2. Describe Hardware modeling and algorithms for logic minimization. –L1(Unit-II)
3. Create the Multiple Level Combinational Optimizations.-L5 (Unit-III)
4. Define sequential circuit optimization and scheduling algorithms for delay optimization.-L1(Unit-IV)
5. Explain problem formulation and analysis on FPGA and different types of Simulator and testing.-L2(Unit-V)

Model Question Paper	Marks	Levels	CO's
Unit-I			
1. a) Describe Microelectronic Design styles. Compare and contrast custom and semicustom design styles.	08	L1	
b) What is synthesis? Discuss synthesis aspects at different levels.	06	L1	
c) Discuss about the significance of optimization in circuits and its limiting constraints.	06	L2	
OR			
2. a)Explain tractable and intractable problems.			
b) Write a note on (i) Branch and Bound algorithm. (ii) Greedy algorithm.	08	L2	
c) Compute the shortest path weights of the graph shown in fig 1. By Bellman Ford algorithm show all the steps.	06	L1	CO1
 Figure 1:	06	L3	
Unit-II			
3. a) Write a note on HDL used for synthesis.	05	L1	
b) Write a VHDL program for full adder using its behavioural and structural modelling capability.	10	L1	
c) Explain abstract model for structural representation with graph and netlist.	05	L2	CO2
OR			
4. a) Explain the following operator for logic minimization i) Expand ii) Reduce iii) Irredundant iv) Reshape	08	L2	
b) Describe Espresso Minimiser.	06	L1	
c) Write a note on Exact Logic Minimization.	06	L1	
Unit-III			
5. a) Write a note on Optimization of the Logic network.	06		
b) With example, explain i) Elimination ii) Substitution iii) Decomposition.	06		
c) With example, explain single cube and multi cube expressions.	08		CO3
OR			
6. a) Describe the Delay modeling and Detection of false paths.	10		
b) Discuss about the significance of delay optimization algorithms in synthesis of minimal delay circuits.	10		
Unit-IV			
7.a) Describe the following (i) State Encoding for two level (ii) State Minimization.	06		
b) What are benefits of state machine decomposition and briefly describe the different state machine decompositions.	06	L1 L1	

c) Define non-hierarchical synchronous logical network. With an example show that the retiming a circuit reduces the delay of the critical path.	08		CO4
OR		L2	
8 .a) Explain HU's algorithm with an examples.			
b) Explain Loop Folding with an examples.	06	L2	
c) Describe Scheduling scheme with Pipelined Resources.	06	L2	
	08	L1	
Unit-V			
1. a) Explain Look- Up table FPGAs.	06		
b) Compare Algorithmic and Rule based library binding.	08	L2	
c) Describe the porcocess of Tree based covering and Boolean covering.	06	L1	
		L1	CO5
OR	06		
2. a) Write a note on fault simulators.			
b) Describe the ATPG (Automatic Test Patter Generation) methods.	08	L1	
	06		
c) Write a note on DFT (Design for testability).		L2	
		L1	

Course Title:Computer Communication Network and VLSI Laboratory			
Course Code: P13ECL77	Semester: VII	L – T – P : 0 - 0 – 3	Credits: 1.5
Contact Period - Lab: 36Hrs.; Exam: 3 Hrs.		Weightage: CIE: 50 %; SEE:50%	

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic practical knowledge of computer networks VLSI Design.
2. Write the program in 'C' to simulate bit/character stuffing in frames, shortest path algorithm, encrypt a given message and decrypt it.
3. Provide the understanding of throughput measurement and power levels in throughput.
4. Provide the simulation of the three–node point to point network with duplex links between them.
5. Explain the routing protocols.
6. Design the schematic and layout for an Inverter.
7. Verify the design the Op-amp and DAC circuits with DC, AC and Transient Analyses.

Course Curriculum (Syllabus):

EXPERIMENTS:

A. CCN–EXPERIMENTSUSING C–PROGRAMMING

1. Write the C–program to simulate bit/character stuffing in frames.
2. Write the C–program to simulate the shortest path algorithm.
3. Write the C–program to encrypt and decrypt a given message.

B. CCN–EXPERIMENTSUSINGHARDWARE/SIMULATION

1. Estimate and compare the through put by varying the number of clients.
2. Estimate and compare the throughput for different power levels and data communication protocols.
3. Simulateathree–nodepointtopointnetworkwithduplexlinksbetweenthem.Vary the routing protocol and find the number of packets dropped.
4. Simulateafour–nodepoint–to–pointnetworkwiththelinksconnectedasfollows: n0–n2,n1– n2andn2 – n3.ApplyTCPagentbetweenn0 – n3andUDPbetweenn1– n3.

Study Experiments:

1. Simple LAN.
2. The role of router in a network.
3. Static routing.
4. Dynamic routing.
5. How to configure network for browsing.

C. VLSI DESIGN

The design flow must consist of the following:

a) Draw the schematic and verify the following
   - DCAnalysis
   - TransientAnalysis

b) Draw the Layout and verify the DRC,ERC

c) Check for LVS

d) Extract RC and back annotate the same and verify the Design

DIGITAL DESIGN

01 Design the **INVERTER** with given specifications.

02 Design the **NAND and NOR** with given specifications.

Note: Verify and Optimize for Time, Power and Area to the given specifications.

ANALOG DESIGN

03 Design the following for the given specifications
   I. Common Source Amplifier
   II. Common Drain Amplifier
   III. Single–Stage Differential Amplifier

04 Design an **op–amp** for given specifications using differential amplifier.

05 Design a **4bit R–2R based DAC** for the given specifications.

Course Outcomes:

After learning all the experiments of the course, the student is able to;

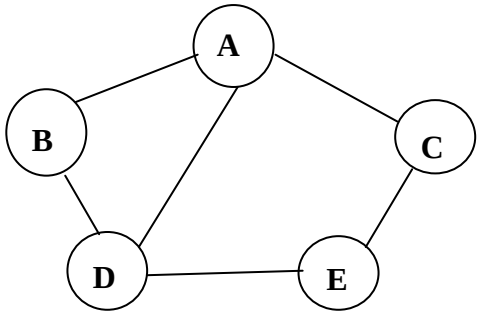
01. Write the program in C to simulate bit/character stuffing in frames. – L3
02. Develop the shortest path algorithm and program. – L5
03. Generate the program for encrypting and decrypting the given message. – L5
04. Test the throughput measurement and power levels in throughput. – L4
05. Generate the three–node point–to–point network with duplex links between them. Vary the routing protocol and find the number of packets dropped. – L5
06. Design the schematic and layout for an Inverter. – L5
07. Design the schematic and layout for the NAND and NOR. – L5
08. Design the Op–amp and 4–bit R–2R based DAC circuits and verify DC Analysis, AC Analysis and TransientAnalysis. – L5

Topic learning outcome:

After learning all the experiments, the student is able to

01. Apply bit stuffing for the frame formats

02. Find the shortest path between node A and B in a given network using Dijkastra's Algorithm



03. Perform the following operation for the given data using substitution method "WELCOME TO PESCE MANDYA" (a)Encrypt (b) Decrypt the output of (a)
04. Design and analyze CMOS inverter using 0.12µm Technology.
05. Design and verify the truth table of NAND and NOR gates.
06. Design common source and common drain amplifier and verify the output for Vin = 0.001v.
07. Design op-amp using differential amplifier and verify the output for differential input values.
08. Implement a 4-bit R-2R DAC for R=10KΩ and verify the analog output for various digital inputs.

Course Title:Embedded and Real Time System Laboratory			
Course Code: P13ECL78	**Semester: VII**	**L – T – P : 0 - 0 –3**	**Credits: 1.5**
Contact Period - Lab: 36Hrs.; Exam: 3 Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Course Learning Objectives (CLOs):

This course aims to

1. Outline the features of Linux operating system.
2. Expose to the basic commands in Linux.
3. Provide the working environment with the Vi editor.
4. Explore the shell programming concepts.
5. Provide the procedure to conduct the experiment on embedded system.
6. Demonstrate the working of serial communication interfaces.

Course Curriculum (Syllabus):

EXPERIMENTS:

A. LIST OF EXPERIMENTS IN LINUX PROGRAMMING

Familiarization of features of LINUX**:** Linux commands, file manipulation commands, editor, directory commands, I/O re–direction, pipes and filters, file protection process commands, shell programming, system programming

Exercises:

01 Write a program to display a message.
02 Write a program to create 3 threads using semaphore management and to print alphabets A, B, C each ten times.
03 Write a shell script to check whether a given string is a palindrome or not.
04 Write a menu driven shell script for converting all the capital letters in a file to a small case letters and vice versa.
05 Write a menu driven shell script for displaying the “result” as ‘pass’ or ‘fail’ using criteria given.
06 Write a menu driven shell script to perform the following operations.
   a. Enter the five names in the file.
   b. Sort the names in existing file.
   c. List unsorted and sorted file.
   d. Quit.

LIST OF EXPERIMENTS IN EMBEDDED SYSTEM PROGRAMMING

Write embedded C program for the following

01 To toggle LED.
02 To glow an LED when switch is pressed.
03 To send / receive data through UART port.
04 To transfer a file from host to board.
05 To obtain a string from the host system, calculate the CRC and send CRC value back to the host system.
06 To encrypt a string received from a serial port using a simple encryption algorithm and test the program using suitable message.

Course Outcomes:

After conducting all the experiments the student is able to

01 Memorize the Linux commands usage with the system. – L1
02 Use the VI Editor for writing the program. – L3
03 Discuss the process oriented commands. – L2
04 Distinguish between the Linux and windows working environments. – L2
05 Model the file transfer from host to board. – L4
06 Use the commands to make LED glow. – L3
07 Point out the function of UART port. – L4
08 Calculate the CRC for a given data packet. – L4
09 Construct the encryption algorithm with an example. – L5

VIII Semester			
Course Title: Satellite Communication			
Course Code: P13EC81	**Semester: 8**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture: 52 Hrs.; Exam:3 Hrs.	**Weightage: CIE: 50%; SEE: 50%**		

Prerequisites:

1. GSM communication and networks –P13EC71
2. Analog and Digital communication Theory – P13EC42/54
3. Microwave Devices and Integrated circuits – P13EC63
4. Antenna and wave propagation- P13EC46

Course Learning Objectives

This course aims to

1. Provide an idea of different frequency bands allocated to satellite communications.
2. Illustrate how Kepler's law of planetary motion be applied to the case of geo-stationary satellite.
3. Provide details about stabilizing a satellite.
4. Examine the concepts of MATV and CATV.
5. Distinguish between pre-assigned and demand-assigned traffic in relation to a satellite communications network.
6. Describe the general operating principles of a TDMA network.
7. Examine and noise factor with respect to satellite communication.
8. Examine the technical parameters used in measuring ATM performance?
9. Provide an overview of the process of video compression and audio compression.
10. Provide details about the classification of satellites.

Relevance of the Course:

This course helps students who are interested in continuing research/ further studies in the field of,

1. Wireless communications

Course content (Syllabus)

UNIT – I

Overview of Satellite Systems: Introduction, frequency allocations for satellite services, INTELSAT.

Orbits and Launching Methods: Introduction, Kepler's first law, Kepler's second law, Kepler's third law, definitions of terms for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations effects of a non spherical earth, atmospheric drag , inclined orbits, calendars, universal time, Julian dates, sidereal time.

The Geostationary Orbit: Introduction, antenna look angles, the polar mount antenna, limits of visibility, near geostationary orbits, earth eclipse of satellite, sun transit outage, launching orbits.

Text: 1.1 to 1.3, 2.1 to 2.8, 2.8.1, 2.8.2, 2.9, 2.9.1 to 2.9.4, 3.1 to 3.8 **11hrs**

UNIT – II

The Space Segment: Introduction, power supply, attitude control, Spinning satellite stabilization, momentum wheel stabilization, station keeping, thermal control, TT&C transponders, the wideband receiver, the input de–multiplexer, the power amplifier the antenna subsystem.

The Earth Segment: Introduction, receive–only home TV system, the outdoor unit, the indoor unit for analog(FM) TV, master antenna TV system, Community Antenna TV system, Transmit– Receive earth stations.
Text: 7.1 to 7.8, 8.1 to 8.5 **11hrs**

UNIT – III

Satellite Access: Introduction, single access, pre–assigned FDMA, Demand– assigned FDMA, Spade system, bandwidth limited and power–limited TWT amplifier operation, FDMA downlink analysis, TDMA, reference burst, preamble and post amble, carrier recovery, network synchronization, code–division multiple access, direct–sequence spread spectrum, the code signal c(t), acquisition and tracking, spectrum spreading dispreading, CDMA throughput.
Text: 14.1 to 14.7, 14.7.1 to 14.7.4, 14.10, 14.10.1 to 14.10.5 **10hrs**

UNIT – IV

The Space Link: Introduction , Equivalent Isotropic Radiated power, transmission losses, free–space transmission, feeder losses , antenna misalignment losses, fixed atmospheric and Ionospheric losses, the link power budget equation, system noise, antenna noise, amplifier noise temperature, amplifier in cascade, noise factor, noise temperature of absorptive networks, overall system noise temperature, carrier – to – noise ratio, the uplink, saturation flux density, input back off, the earth station HPA, Downlink, output back–off, satellite TWTA output.
Satellites in Networks: ATM over satellite, satellite links and TCP, enhancing TCP over satellite channels using standard mechanisms (RFC–2488) requests for comments, split TCP connections, asymmetric channels.
Text: 12.1 to 12.8, 15.5, 15.9 to 15.13 **10 hrs**

UNIT – V

Direct Broadcast Satellite (DBS) Television: Introduction, orbital spacing, power rating and number of transponders, frequency and polarization, transponder capacity, bit rates for digital television, MPEG compression standards, forward error correction (FEC), the home receiver outdoor unit(ODU), the home receiver indoor unit(IDU), downlink analysis, uplink, high definition television (HDTV) – HDTV displays, video frequency Bandwidth.
Satellite Mobile and Specializes Services: Introduction, satellite mobile services, VSATs, radar sat, global positioning satellite system (GPS), orb–comm, iridium.
Text: 16.1 to 16.14, 17.1 to 17.7 **10hrs**

TEXT BOOK:

"Satellite Communications", Dennis Roddy, 4th Edition, Special Indian Edition 2009, 11th reprint 2013 McGraw–Hill

REFERENCE BOOKS:

1. "Satellite Communications", Timothy Pratt, Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2008
2. "Satellite communications systems engineering", W.L.Pitchand, H.L. Suyderhoud, R.A. Nelson, 2nd edition, Pearson education.2007.
3. "Satellite Communications", Anil K.Maini, VarshaAgrawal, 3rd Edition, Wiley India Pvt.Ltd, Reprint, 2012

Course Outcomes

After learning all the units of the course, the student is able to;

1. Analyze the principles, concepts and operation of satellite communication systems.- L4 (Unit – I)
2. Examine the concepts of space segment and earth segment.- L4 (Unit – II)
3. Explain the concepts of TDMA, FDMA and CDMA with respect to satellite communication.- L3 (Unit – III)
4. Determine the concepts of signal propagation affects.- L5 (Unit – IV)
5. Summarize the concepts of satellite services to TV and mobile.- L2 (Unit – V)

Model Question Paper

		Model Questions	Marks	CO	BTL
		Unit - I			
01	a.	Comparisons are sometimes made between satellite and optical fibre communication systems. State briefly the areas of applications where each system is best suited.	08	1	L4
	b	What is meant by look angles? Explain them with reference to a geo-stationary satellite and the earth station.	06	1	L1
	c	A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 h. Given that the eccentricity is 0.002, calculate the semimajor axis.	06	1	L1
		OR			
02	a	Explain the effect of eclipse on the orbital motion of a satellite.	08	1	L2
	b	Analyze how can Kepler's law of planetary motion be applied to the case of geo-stationary satellite?	06	1	L4
	c	Calculate the time in days, hours, minutes, and seconds for the epoch day 324.95616765.	06	1	L5
03	a	What are the attitude and orbit control sub-systems? Explain how they perform their functions.	10	2	L5
	b	Explain different methods for stabilizing a satellite.	10	2	L2
		OR			
04	a	With the help of a block diagram, briefly explain the functioning of the indoor receiving unit of a satellite TV receiving system intended for home reception.	10	2	L2
	b	Explain with a block diagram the working of receiver part of earth station.	10	2	L5
05	a	Explain what is meant by a single access in relation to a satellite communications network. Give an example of the type of traffic route where single access would be used.	08	3	L2
	b	Distinguish between pre-assigned and demand-assigned traffic in relation to a satellite communications network.	06	3	L4
	c	Calculate the frame efficiency for an INTELSAT frame given the following information: Total frame length = 120,832 symbols, Traffic bursts per frame = 14, Reference bursts per frame = 2 Guard interval = 103 symbols	06	3	L5
		OR			
06	a	Explain in detail the operation of the Spade system of demand.	08	3	L4
	b	Explain the function of the preamble in a TDMA traffic burst. Describe and compare the channels carried in a preamble with those carried in a reference burst.	06	3	L2
	c	Determine how many carriers can access an 80-MHz transponder in the FDMA mode, given that each carrier requires a bandwidth of 6 MHz, allowing for 6.5-dB output backoff. Compare this number with the number of carriers possible without backoff.	06		L5
07	a	Explain what is meant by EIRP.	08	4	L2

	b	A transmitter feeds a power of 10 W into an antenna which has a gain of 46 dB. Evaluate the EIRP in (i) watts; (ii) dBW.	06	4	L5
	c	Calculate the gain in decibels and the effective area of a 30-m parabolic antenna at a frequency of 4 GHz.	06	4	L5
		OR			
08	a	Describe briefly the difference between a ATM digital cross connect switch, and an ATM switch.	08	4	L4
	b	What are the main technical parameters used in measuring ATM performance? Explain.	06	4	L2
	c	Describe the main distinguishing features between satellite relay, satellite access, and satellite interconnect, in connection with ATM over satellite.	06	4	L2
09	a	Draw accurately to scale the transponder frequency plan for the DBS transponders 5, 6, and 7 for uplink and downlink.	08	5	L2
	b	Calculate the bandwidth required to transmit a SDTV format having a resolution of 704 X 480 pixels at 30 frames per second.	06	5	L4
	c	Briefly describe the video compression process used in MPEG-2.	06	5	L2
		OR			
10	a	Describe the operation of a typical VSAT system. State briefly where VSAT systems find widest application.	08	5	L2
	b	Explain why a minimum of four satellites must be visible at an earth location utilizing the GPS system for position determination. What does the term dilution of position refer to?	06	5	L4
	c	Describe the main features and services offered by the Orbcomm satellite system. How do these services compare with services offered by geostationary satellites and terrestrial cellular systems?	06	5	L2

Course Title: Operations Research			
Course Code: P13EC82	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture: 52Hrs; Exam: 03Hrs.		**Weightage: CIE: 50 %; SEE: 50%**	

Prerequisites:

1. Engineering Mathematics – I – P13EC11

Course Learning Objectives (CLOs):

This course aims to

1. Provide the understanding of the importance of operation research and mathematical modeling.
2. Develop the linear programming model for a given system and solve it.
3. Explain the concepts of duality theory and sensitivity analysis.
4. Solve the transportation and assignment problems.
5. Use the network optimization models to solve different types of problems.
6. Apply the queuing theory and dynamic programming to solve various problems.
7. Describe the game theory and its applications.

Relevance of the Course:

1. Helps in scientific decision making

Course Content

UNIT – I

Introduction and Overview of the Operations Research Modeling Approach: The Origins of Operations Research, the Nature of Operations Research, the Impact of Operations Research, Algorithms and OR Courseware, Defining the Problem and Gathering Data, Formulating a Mathematical Model, Deriving Solutions from the Model, Testing the Model, Preparing to Apply the Model, Implementation.

Introduction to Linear Programming: Prototype Example, the Linear Programming Model, Assumptions of Linear Programming.

Solving Linear Programming Problems: The Simplex Method: The Essence of the Simplex Method, Setting Up the Simplex Method, The Algebra of the Simplex Method, The Simplex Method in Tabular Form, Tie Breaking in the Simplex Method Adapting to Other Model Forms, Post–optimality Analysis, Computer Implementation.

Text: 1.1 to 1.4, 2.1 to 2.6, 3.1 to 3.3 and 4.1 to 4.8 **11 Hrs**

UNIT – II

Duality Theory and Sensitivity Analysis: The Essence of Duality Theory, Economic Interpretation of Duality, Primal–Dual Relationships, Adapting to Other Primal Forms, the Role of Duality Theory in Sensitivity Analysis, the Essence of Sensitivity Analysis, Applying Sensitivity Analysis.

The Transportation and Assignment Problems: The Transportation Problem, a Streamlined Simplex Method for the Transportation Problem, the Assignment Problem, a Special Algorithm for the Assignment Problem. Text: 6.1 to 6.7, 8.1 to 8.4 **11 Hrs**

UNIT – III

Network Optimization Models: Prototype Example, The Terminology of Networks, The Shortest–Path Problem, The Minimum Spanning Tree Problem, The Maximum Flow Problem, The Minimum Cost Flow Problem, The Network Simplex Method and A Network Model for Optimizing a Project's Time–Cost Trade–Off. Text: 9.1 to 9.8 **10 Hrs**

UNIT – IV

Queuing Theory: Prototype Example, Basic Structure of Queuing Models, Examples of Real Queuing Systems and The Role of the Exponential Distribution, the Birth–and–Death Process and Queuing Models Based on the Birth–and–Death Process, Queuing Models Involving Non–exponential Distributions, Priority–Discipline Queuing Models, Queuing Networks and the Application of Queuing Theory. Text: 17.1 to 17.10 **10 Hrs**

UNIT – V

Dynamic Programming: A Prototype Example for Dynamic Programming, Characteristics of Dynamic Programming Problems, Deterministic Dynamic Programming, Probabilistic Dynamic Programming Conclusions.

Game Theory: The Formulation of Two–Person, Zero–Sum Games, Solving Simple Games **–** a Prototype Example, Games with Mixed Strategies, Graphical Solution Procedure, Solving by Linear Programming. Text: 10.1 to 10.4, 14.1 to 14.4 **10 Hrs**

TEXT BOOK:

"Introduction to Operations Research", Frederick S. Hiller, Gerald J. Lieberman, Tata McGraw Hill, 8th Edition.

REFERENCE BOOKS:

1. "Operations Research An introduction", Hamdy A. Taha, Prentice Hall of India, 9th Edition.
2. "Operations Research", Schaum's Series Bronson and Naadimuthu, Tata Mcgraw Hill, 2nd Edition.

Course Outcome (CO)

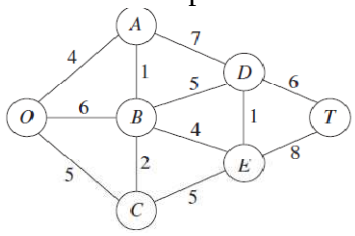
After learning all the units of the course, the student is able to

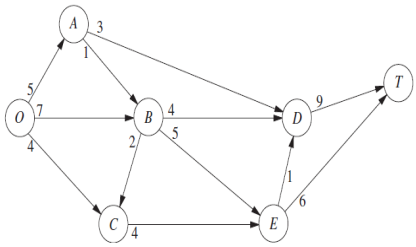
01 Formulate the mathematical model, derive and test the linear programming Model. – L5 (Unit – I)
02 Solve the Linear ProgrammingProblems using Simplex. – L3 (Unit – I)
03 Analyze the Streamlined Simplex Method for the Transportation Problem and develop a special Algorithm for the Assignment Problem. – L4 (Unit – II)
04 Explain the different network optimization problems. – L2 (Unit – III)
05 List the terminologies used in queuing system and its application areas. – L1 (Unit – IV)
06 Define the dynamic programming problem and formulate game theoretic problems. – L2 (Unit – V)

Model question paper

	Model question paper	Marks	COs	Level
1.	**Unit-1** a. Explain the steps fallowed by OR team and the need of each. b. What is a linear programming model explain with an example. c. Solve Graphically Maximize Z=4x1+6x2 subjected to x1≤5, 2x2≤12,3x1+2x2=18 and x1≥0, x2≥0. **OR**	6 6 8	1	L2 L3 L4
2.	a. Compare graphical and analytical method of solving .LP model. b. Using Big M Method solve Minimize Z=10x1+15x2 +20 x3 Subjected to 2x1+4x2 +6X3≥24, 3x1+9x2 +6x3≥30 with all variables non negative.	10 10	2	L3 L3
3.	**Unit-2** a. Explain the essence of duality theory and need of it in OR b. Find the dual of. : Maximize Z=2x1+3x2 subjected to -3x1 + x2 ≤ 1 ,4x1 + 2x2 ≤20, 4x1 + x2 ≤10 , -x1 +2x2 ≤ 5 and x1≥0, x2≥0 **OR**	10 10	3	L2 L3
4.	a. Solve the given transportation problem. b. Give the mathematical formulation of assignment problem. How does it differ from the transportation problem?	12 8	3	L4 L3
5.	**Unit-3** a. List three applications of Minimum spanning tree and Maximal flow problem. b. Find the shortest path from Node 'O' to all other nodes. Also mention the paths **OR**	10 10	4	L3 L3
6.	a. Find the maximum flow between the o to T b. Explain any algorithm for finding minimum spanning tree with an example	10 10	4	L3 L2

	D1	D2	D3	D4	Available
S1	1	2	1	4	30
S2	3	3	2	1	50
S3	4	2	5	9	20
Required	20	40	30	10	100





7.	**Unit -4** a. Explain birth death process. And its significance in queuing b. A queueing system has three servers with expected service times of 30 minutes, 20 minutes, and 15 minutes. The service times have an exponential distribution. Each server has been busy with a current customer for 10 minutes. Determine the expected remaining time until the next service completion. b. Explain with a figure, the steps of call flows for token based challenge in authentication procedure. **OR**	8 12	5	L3 L1
8.	a. List an explain the properties of exponential distribution b. 39 Newell and Jeff are the two barbers in a barber shop they own and operate. They provide two chairs for customers who are waiting to begin a haircut, so the number of customers in the shop varies between 0 and 4. For n =0, 1, 2, 3, 4, the probability Pn that exactly n customers are in the shop is P0 =1/16 , P1 =4/16 , P2=6/16, P3=4/16 , P4 =1/16 Calculate L. How would you describe the meaning of L to Newell and Jeff?	10 10	5	L2 L3
9.	**Unit-5** a. List and discuss the characteristics of dynamic programming model b. Use dynamic programming to solve $Z = 3x_1^2 - x_1^3 + 5x_2^2 - x_2^3,$ Maximize subjected to $x_1 + 2x_2 \leq 4$ and $x_1 \geq 0, \quad x_2 \geq 0$ x_1, x_2 are integers. **OR**	8 12	6	L1 L3
10	a. The payoff matrix with respect to player A is given. Why is this not a pure strategy game? Find the value of the game. Player B: 1, 2 Player A: 1 (6, 9); 2 (8, 4) b. What is dominance property? Explain the rules for dominance property of rows .and column	10 10	6	L3 L2

Course Title: SoC– Communication Architecture			
Course Code: P13EC831	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.		**Weightage: CIE: 50% SEE: 50%**	

Prerequisites

1. Computer communication Networks. – P13EC62

Course learning outcomes(CLOs)

This Course aims to;

1. Present the prevailing standards for on-chip communication architectures.
2. Deals with different types of synthesis concepts.
3. Provide the knowledge of custom bus-based communication architectures
4. Outline the concepts of communication architecture, refinement and interface synthesis
5. Highlight the verification and security issues in on-chip communication architectures design.
6. Cover the concepts on interconnects, Network on Chips and Emerging On–Chip Interconnect Technologies.

Relevance of the course

Will be helpful in graduate studies with specialization in Embedded systems and VLSI design

Course Content (Syllabus)

UNIT – I

ESL Design Flow, On–Chip Communication Architectures: AQuick Look Basic Concepts of Bus–Based Communication Architectures: Terminology, Characteristics of Bus–Based Communication Architectures, Data Transfer Modes, Bus Topology Types, On–Chip.

Communication Architectures Standards: Standards of On–Chip Bus–Based Communication Architectures, Socket–Based On–Chip Bus Interface Standards, Discussion of Off–Chip Bus Architectures. Text: 1.3, 1.4, 2.1 to 2.4, 3.1 to 3.3 **11 Hrs**

UNIT – II

Synthesis of On–Chip Communication Architectures: Bus Topology Synthesis, Bus Protocol Parameter Synthesis, Bus Topology and Protocol Parameter Synthesis, Physical Implementation Aware Synthesis, Memory–Communication Architecture Co–Synthesis.

Encoding Techniques for On–Chip Communication Architectures: Techniques for Power Reduction, Techniques for Reducing Capacitive Crosstalk Delay, Techniques for Reducing Power and Capacitive Crosstalk Effects, Techniques for Reducing Inductive Crosstalk Effects. Text: 6.1 to 6.5, 7.1 to 7.4 **11 Hrs**

UNIT – III

Custom Bus–Based On–Chip Communication Architecture Design: Split Bus Architectures, Serial Bus Architectures, CDMA–Based Bus Architectures, Asynchronous Bus Architectures, Dynamically Reconfigurable Bus Architectures.

Text: 8.1 to 8.5 **10 Hrs**

UNIT – IV

On–Chip Communication Architectures Refinement and Interface Synthesis: On–Chip Communication Architectures Refinement, Interface Synthesis, Discussion Interface Synthesis,

Verification and Security Issues In On–Chip Communication Architecture Design: Verification of On–Chip Communication Protocols, Compliance Verification for IP Block

Integration, Basic Concepts of SoC Security, Security Support in Standard Bus Protocols, Communication Architecture Enhancements for Improving SoC Security. **10 Hrs**

UNIT – V

Physical designs trends for interconnects, DMS Interconnect Design, Low power, high speed, circuit design techniques, repeater insertion, global power distribution networks, clock distribution networks, 3–D interconnects, summary and concluding remarks.

Network–On–Chip: Network Topology, Switching Strategies, Routing Algorithms, Flow Control,Clocking Schemes.

Emerging On–Chip Interconnect Technologies: Optical Interconnects, RF/Wireless Interconnects and CNT Interconnects.

Text: 11.1to 11.6, 12.1 to 12.5, 13.1 to 13.3 **10 Hrs**

TEXT BOOK:

"On–Chip Communication Architecture: System On–Chip Interconnect", SudeepPasricha and NikitDutt, Morgan Kaufmann Publishers –2008.

REFERENCE BOOK:

"Networks On Chips: Technology and Tools", Luca BeniniAnd Giovanni De Micheli, Morgan Kaufmann Publishers–2006.

Course Outcome (CO)

After learning all the units of the course, the student is able to

1. Explain the standards for on-chip communication architectures-L2 (unit-I)
2. Explain bus protocol parameter synthesis and bus topology synthesis-L2(unit-II)
3. Describe techniques for reducing power as well as capacitive and inductive crosstalk effects-L1(unit-II)
4. Outline the salient features of split bus architectures, serial bus architectures, CDMA-based bus architectures-L1(unit-III)
5. Describe various on-chip communication architecture refinement techniques-L1(unit-IV)
6. Discuss DSM interconnect design and various low power, high speed circuit design techniques-L2(unit-V)

Model Question Paper

Model Questions	Marks	BTL	CO
UNIT-I			
1. (a) Sketch and explain an idealized MPSoC ESL design flow.	**10**	**L2**	
(b) With neat sketches describe the ring bus On-Chip Communication Architectures	**04**	**L1**	
(c) Discuss the impact of Increasing Application Complexity.	**06**	**L2**	**CO1**
OR			
2. (a) List the different characteristics of bus-based communication architectures and explain	**10**	**L2**	
(b) Sketch a typical AMBA 2.0 system and explain.	**10**	**L3**	
UNIT-II			
3. (a) Explain Hierarchical Bus Architecture Topology Synthesis with necessary figures	**08**	**L2**	**CO2**
(b) Describe Bus Matrix (or Crossbar) Topology Synthesis	**06**	**L1**	
(c) Explain Component Mapping and Protocol Parameter Synthesis	**06**	**L2**	
OR			
4. (a) Describe COSMECA Co-synthesis Approach.	**07**	**L1**	
(b) Discuss the techniques for reducing inductive crosstalk effects	**06**	**L2**	**CO3**
(c) Explain memory–communication architecture co-synthesis	**07**	**L2**	
UNIT-III			
5. (a) Describe a scenario where simultaneous multiple accesses to a bus occur after a single arbitration with neat sketch.	**10**	**L1**	
(b) Draw the structure of the SAMBA bus architecture and explain.	**10**	**L2**	
OR			
6. (a) Explain the various Layers of asynchronous bus architecture	**08**	**L2**	
(b) Describe dynamically reconfigurable bus architectures	**06**	**L1**	**CO4**
(c) Write a note on lottery bus	**06**	**L3**	
UNIT-IV			
7. (a) Describe cosy methodology of on-chip communication architecture refinement	**10**	**L1**	
(b) Explain TIMA Approach for Connecting Components at Different Abstraction Levels	**10**	**L2**	
OR			**CO5**
8. (a) Explain static formal verification-based techniques	**10**	**L2**	
(b) Discuss different communication architecture enhancements for improving soc security.	**10**	**L2**	
UNIT-V			
9. (a) Explain various Lumped interconnect models			
(b) With necessary equations and diagrams describe CMOS Power Dissipation	**08** **12**	**L2** **L2**	
OR			
10. (a) Compare circuit and packet NoC switching strategy.	**06**	**L2**	
(b) Write notes on routing algorithms, flow control	**08**	**L3**	
(c) Describe optical interconnects.	**06**	**L2**	**CO6**

Course Title: AD-HOC WIRELESS NETWORKS			
Course Code: P13EC832	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Prerequisites:

1. Computer Communication Networks -P13EC62

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge of Ad-hoc Wireless networks.
2. Explain the design issues and classification of MAC for Ad-Hoc Wireless networks.
3. Discuss the contention-base MAC protocols with reservation and scheduling mechanisms and also MAC protocols that use directional antennas.
4. Describe the design issues and classification of Routing protocols for Ad-Hoc Wireless networks.
5. Discuss the Table-Driven, On-Demand, Hybrid, Hierarchical and Power-Aware Routing protocols.
6. Explain the design issues and classification of transport layer protocols for Ad-Hoc Wireless networks.
7. Describe the TCP over Ad-Hoc Wireless networks and other transport layer protocols.
8. Discuss the network security requirements, issues and challenges in security provisioning, network security attacks, key management and secure routing in Ad-Hoc Wireless networks.
9. Discuss the issues and challenges in providing QoS in Ad-Hoc Wireless networks and classification of QoS solutions.

Relevance of the Course:

1. For graduate studies in Networks and Communications

Course Content

UNIT – I

ADHOCNetworks: Introduction,IssuesinAdhocwirelessnetworks,Adhocwirelessinternet.

MAC Protocols for AD-HOC Wireless Networks: Introduction, Issues in designing a MAC protocol for Ad-hoc wireless Networks, Design goals of a MAC protocol for Ad-hoc wireless Networks, Classification of MAC protocols, Contention based protocols with reservation mechanisms.

(5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4, 6.6) **11Hrs**

UNIT – II

Contention–based MAC protocols with scheduling mechanism, MAC protocols that use directional antennas, Other MAC protocols.

Routing Protocols for AD-HOC Wireless Networks:

Introduction, Issues in designing a routing protocol for Ad-hoc wireless Networks, Classification of routing protocols, Table driver outing protocol, On–demand routing protocol.

(6.7, 6.8, 6.9, 7.1, 7.2, 7.3, 7.4, 7.5) **11 Hrs**

UNIT – III

Hybrid routing protocol, Routing protocols with effective flooding mechanisms, Hierarchical routing protocols, Power aware routing protocols.

Transport Layer Protocols for AD-HOC Wireless Networks: Introduction, Issues in designing a transport layer protocol for Ad-hoc wireless Networks, Design goals of a transport layer protocol for Ad-hoc wireless Networks, Classification of transport layer solutions.
(7.6, 7.7, 7.8, 7.9, 9.1, 9.2, 9.3, 9.4) **10Hrs**

UNIT – IV

Transport Layer Protocols for AD-HOC Wireless Networks:
TCP over Ad-hoc wireless Networks, Other transport layer protocols for Ad-hoc wireless Networks.
Security: Security in wireless Ad-hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning, Network security attacks, Key management, Secure routing in Ad-hoc wireless Networks.
(9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12) **10Hrs**

UNIT – V

Quality of Service in AD-HOC Wireless Networks:
Introduction, Issues and challenges in providing QoS in Ad-hoc wireless Networks, Classification of QoS solutions, MAC layer solutions, network layer solutions.
(10.1, 10.2, 10.3, 10.4, 10.5) **10Hrs**

TEXT BOOK:
"AD-HOC Wireless Networks", C. Siva Ram Murthy & B. S. Manoj, Pearson Education, 2ndEdition, reprint2005.

REFERENCE BOOKS:
1. "AD-HOC wireless Networks", Ozan K. Tonguz and Gianguigi Ferrari, Wiley.
2. "Wireless Networking", Xiuzhen Cheng, Xiao Hung, Ding– ZhuDu, Kluwer Academic publishers.

Course Outcomes

After learning all the units of the course, the student is able to
1. Describe the difference between cellular and Ad hoc networks, applications of Ad hoc networks and issues in Ad hoc networks. – L1 (Unit – I)
2. Explain the issues in designing MAC protocol for Ad hoc wireless networks and classification and operation of MAC protocols. – L2 (Unit – I, Unit – II)
3. Describe the operation of different routing protocols for Ad Hoc wireless networks. – L1 (Unit – II, Unit – III)
4. Explain the issues in designing transport layer protocol for Ad hoc wireless networks and classification and operation of transport layer protocols. – L2 (Unit – III, Unit – IV)
5. Discuss network security requirements, different issues and challenges in security provisioning, different network attacks, key management approaches and security-aware routing protocols – L3 (Unit – IV)
6. Describe the different QoS approaches. – L1 (Unit – V)

Model Question Paper

Model Questions	Marks	BTL	CO
UNIT-I	**06**	**L4**	
1. (a) Distinguish between cellular networks and Ad-Hoc networks**.**	**09**	**L2**	
(b) Explain any five issues of Ad-Hoc wireless networks**.**	**05**	**L3**	
(c) Write a short note on Ad-Hoc Wireless internet**.**			**CO1**
OR			
2. (a) Define soft reservation. Explain Soft Reservation Multiple Access with Priority Assignment (SRMA/PA), using frame structure.	**10**	**L2**	
(b) List the design goals of a MAC protocol for Ad-Hoc wireless networks.	**05**	**L1**	**CO2**
(c) Briefly explain the classification of MAC Protocols.	**05**	**L2**	
UNIT-II			
3. (a) With scheduling table updates, explain distributed priority scheduling.	**09**	**L2**	**CO2**
(b) Write a short note on MAC protocol using directional antennas	**05**	**L3**	
(c) Discuss about the classification of channel based on their usage in multichannel MAC protocol.	**06**	**L6**	
OR			
4. (a) Discuss the differences in topology reorganization in Destination Sequenced Distance-Vector Routing protocol and Cluster-Head Gateway Switch Routing protocol.	**06**	**L6**	**CO3**
(b) Explain Temporally ordered routing algorithm. Also, mention its advantages and disadvantages	**10**	**L2**	
(c) List the key differences between LAR 1 (Location-Aided Routing 1) and LAR 2 (Location-Aided Routing 2) algorithms.	**04**	**L1**	
UNIT-III			
5.(a) List the advantages and disadvantages of CEDAR protocol.	**04**	**L1**	
(b) Explain hierarchical state routing protocol	**08**	**L2**	
(c) Briefly explain the power aware routing metrics of Ad-hoc networks.	**08**	**L2**	**CO3**
OR			
6.(a) Explain the issues in designing the transport layer protocol for Ad-hoc wireless network.	**08**	**L2**	
(b) Explain the major reasons for throughput degradation of TCP when used in Ad-hoc wireless network.	**08**	**L2**	
(c) Write a short note on split TCP	**04**	**L3**	**CO4**
UNIT-IV			
7.(a) Explain with suitable diagram security aware Ad-hoc routing protocol.	**08**	**L2**	
(b) Explain hoe security provisioning in Ad-hoc wireless networks differs from that in infra-structured based network.	**06**	**L2**	
(c) List and explain how some of the inherent properties of the wireless Ad-hoc networks introduce difficulties while implementing security in routing protocol.	**06**	**L2**	
OR			**CO5**
8 (a) Explain the multilayer attacks.	**10**	**L2**	
(b) Describe the symmetric key algorithm for network security.	**06**	**L2**	
(c) List the requirements of secure routing protocols for Ad-hoc	**04**	**L1**	

wireless networks.			
UNIT-V			
9.(a) Explain the design choice for providing QoS support for Ad-hoc wireless networks.	**10**	**L2**	
(b) Explain Ticket-Based QoS routing protocol.	**10**	**L2**	
OR			**CO6**
10.(a) Discuss the issues and challenges in providing QoS in Ad-hoc wireless network.	**10**	**L6**	
(b) Explain QoS enabled Ad-hoc on-demand distance vector routing protocol.	**10**	**L2**	

Course Title: ASIC Design			
Course Code: P13EC833	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period -Lecture: 52Hrs;Exam: 4Hrs.	**Weightage: CIE: 50%;**		**SEE: 50%**

Prerequisites:

1. Digital circuits design- P13EC33
2. Digital CMOS VLSI design- P13EC52
3. Digital system design using Verilog HDL- P13EC65

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge of ASIC Design
2. Explain the Full custom, Semi custom and standard cell based ASIC
3. Describe the Programmable logic device and FPGA Design flow
4. Provide the understanding of Data Logic cells and ASIC Library Design
5. Explain the Low-level Design entry
6. Describe the various concepts of Programmable ASIC Design
7. Outline the concept of Low Level Design Language
8. Describe the various ASIC Construction Floor Planning
9. Outline the concepts of Placement and Routing of ASIC Design

Relevance of the Course:

Further helps the students for higher studies and research in Digital design

Course Content

UNIT – I

Introduction: Full Custom with ASIC, Semi custom ASICS, Standard Cell based ASIC, Gate array based ASIC, Channeled gate array, Channel less gate array, structured get array, Programmable logic device, FPGA design flow, ASIC cell libraries.

Data Logic Cells: Data Path Elements, Adders. **10 Hrs**

UNIT – II

Data Logic Cells: Multiplier, Arithmetic Operator, I/O cell, Cell Compilers **ASIC Library Design:** Logical effort: practicing delay, logical area and logical efficiency logical paths, multi stage cells, optimum delay, optimum no. of stages, library cell design.

10 Hrs

UNIT – III

Low–Level Design Entry: Schematic Entry: Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectore distances and buses, Edit in place attributes, Netlist, screener, Back annotation.

A Brief Introduction to Low Level Design Language: an introduction to EDIF, PLA Tools, and an introduction to CFI designs representation. Half gate ASIC. Introduction to Synthesis and Simulation **11 Hrs**

UNIT – IV

Programmable ASIC:ASIC I/O cell, ASIC Construction Floor Planning and Placement Routing: Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clock planning, placement algorithms, iterative placement improvement, Time driven placement methods.

11 Hrs

UNIT – V

ASIC Construction Floor Planning and Placement Routing: Physical Design flow, Global Routing, Local Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

10 Hrs

TEXT BOOK:

"Application –Specific Integrated Circuits", M.J.S .Smith, Pearson Education, 2003.

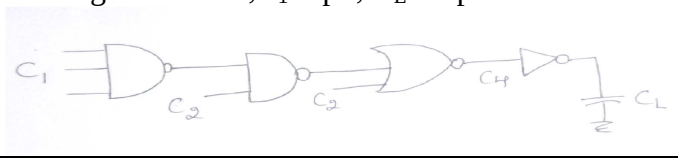
REFERENCE BOOKS:

1. "Design of Analog–Digital VLSI Circuits for Telecommunication and signal processing", Jose E.France, Yannis Tsividis, Prentice Hall, 1994.
2. "Analog VLSI Design – NMOS and CMOS", Malcolm R.Haskard; Lan. C. May, Prentice Hall, 1998.
3. "Analog VLSI Signal and Information Processing", Mohammed Ismail and Terri Fiez, McGraw Hill, 1994.

Course Outcomes

After learning all the units of the course, the student is able to;

1. Describe the Full custom, Semi custom ,ASIC Standard Cell based and Gate array based ASIC.(Unit-I)
2. Describe the Programmable logic device and FPGA Design flow.(Unit-I)
3. Explain the Data Logic cells and ASIC Library Design.(Unit-II)
4. Illustrate the various concepts of Low-level Design entry and low level design language.(Unit-III)
5. Explain the various types of Programmable ASIC .(Unit-IV)
6. Outline the concepts of Placement and Routing of ASIC Design.(Unit-V)

Q No	QUESTIONS	Marks	BTL	CO's
1. a)	List the types of semi-custom ASICs and explain each of them briefly with relevant diagram.	10	L1	1
b)	List the merits and demerits of FPGA over ASICs.	4	L4	1
c)	Discuss choices in ASIC cell libraries. **OR**	6	L2	1
2. a)	Explain the operation of 16-bit carry select with necessary diagram.	8	L2	2
b)	Explain briefly ASIC design flow, with necessary diagram and comment on logic design and physical design.	6	L5	2
c)	Discuss the merits and demerits of data path cells	6	L2	2
3. a)	Explain the (5,3)residue number system using suitable example for addition and multiplication.	8	L2	3
b)	Explain the operation of 16-bit carry select adder with neat diagram.	6	L5	3
c)	Write a note on cell compliers. **OR**	6	L1	3
4. a)	Consider the logic path with minimum size inverter used to drive on input of a 2X drive NOR_3 logic cell in C_5 library and calculate the total delay , given logic ratio r=1.5, C_{out} = 0.3pF.	6	L4	3
b)	Calculate the optimum path delay for the logic chain shown in figure Q4(b) and also compute capacitance C_2, C_3& C_4 and ignore p & q of each stage and logic ratio r=2,C_1=1pF, C_L=10pF. 	10	L4	3
c)	List the methods used to draw the layouts of library cells.	4	L4	3
5. a)	List the problems associated with the use of ASIC schematic libraries and explain briefly.	8	L1	4
b)	Define Netlist Screener and list the errors that can be detected by Netlist Screener.	6	L1	4
c)	Explain vectored instances with examples. **OR**	6	L2	4
6. a)	Define Back – annotation in ASIC design and explain briefly.	6	L1	4
b)	Write the CFI connectivity model defined using express – G language , with an example.	6	L3	4
c)	Define EDIF and explain hierarchical nature of an EDIF file.	8	L1	4
7. a)	Explain the Physical Design of ASIC construction.	6	L2	5
b)	List the steps used in the constructive partitioning algorithms.	4	L1	5
c)	Explain in detail different iterative placement improvement algorithm. **OR**	10	L5	5
8. a)	Outline the various concepts of Floor planning tools.	6	L4	5
b)	Explain clock distribution in floor planning stage.	6	L2	5
c)	Explain briefly timing driven placement methods.	8	L5	5
9. a)	With relevant diagram , Explain left – edge algorithm used for detailed routing.	6	L2	6
b)	With a help of neat diagram, Describe the concept of physical design flow.	8	L1	6
c)	Describe the problem associated with LVS check. **OR**	6	L2	6
10.a)	Describe the Circuit Extraction and DRC.	10	L1	6
b)	List the goals and objectives of global routing.	5	L4	6
c)	Explain briefly the clock routing.	5	L2	6

Course Title: Error Control Coding			
Course Code: P13EC834	**Semester: 8th**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture: 4Hrs.; Exam: 3Hrs.		**Weightage: CIE: 50%; SEE: 50%**	

Prerequisites:

1. Computer Communication Networks – P13EC62
2. Information Theory and coding-P13EC53
3. Digital Communication-P13EC54

Course Learning Objectives

This course aims to

1. Provide the knowledge of error control coding theorem.
2. Analyze the efficient data compression methods and describe the most efficient compression method.
3. Develop the channel model and channel capacity theorem.
4. Describe the linear block code and parity check matrix.
5. Discuss the concept of probability of error correction, hamming codes and cyclic codes.
6. Explain the matrix description of convolution codes, decoding of convolution codes & concept of trellis coded modulation.

Relevance of the Course:

Graduate studies in the area of Information theory and communication

Course Content

UNIT – I

Linear Block Codes for Error Correction: Introduction to Error Correcting Codes, Basic Definitions, Equivalent Codes, Parity Check Matrix and Decoding of a Linear Block Code, Syndrome Decoding and Error Probability after Coding (Probability of Error correction) and Perfect Codes. Hamming Codes, Low Density Parity Check (LDPC) Codes, Optimal Linear Codes, Maximum Distance Separable (MDS) Codes, Bounds on Minimum Distance, Space Time Block Codes, Concluding Remarks.

Text: 3.1, 3.2, 3.4 to 3.16 **11 Hrs**

UNIT – II

Cyclic Codes: Introduction to Cyclic Codes, Polynomials, The Division Algorithm for Polynomials, A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Quasi–cyclic Codes and Shortened Cyclic Codes, Fire codes, Cyclic Redundancy Check(CRC) codes, Circuit Implementation of Cyclic Codes, Concluding Remarks.

Text:4.1 to 4.6, 4.8, 4.10 to 4.12 **11 Hrs**

UNIT – III

Convolutional Codes: Introduction to Convolution Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolutional Codes (Analytical Representation), Distance Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Viterbi Decoding of Convolutional Codes.

Text: 6.1 to 6.7 **10 Hrs**

UNIT – IV

Distance Bounds for Convolutional Codes, Performance Bounds, Known Good Convolutional Codes, Turbo Codes, Turbo Decoding, Interleaver Design for Turbo Codes, Concluding remarks.

Text: 6.9 to 6.14 **10 Hrs**

UNIT – V

Trellis Coded Modulation: Introduction to TCM, the Concept of Coded Modulation, Mapping by Set partitioning, Underboeck's TCM Design Rules, TCM Decoder. Performance Evaluation for AWGN Channel, Computation of dfree, TCM for Fading Channels, Space Time Trellis Codes, Concluding Remarks.

Text: 7.1 to 7.10 **10 Hrs**

TEXT BOOK:

"Information Theory, Coding and Cryptography", Ranjan Bose 2nd Edition. Tata McGRAW Hill–2008

REFERENCE BOOK:

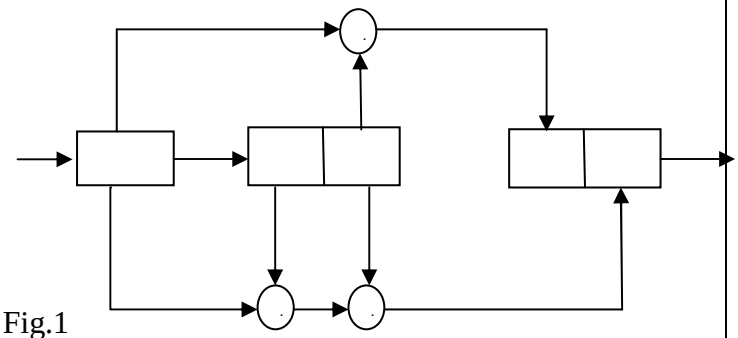
"Error Control Coding",Shulin, Daniel J. Costello, 2nd Edition, Pearson.

Course Outcomes

After learning all the units of the course, the student is able to

01 Explain the linear block codes and its decoding. – L2 (Unit – I)
02 Discuss the low density parity check (LDPC) codes & maximum Distance separable (MDS) codes.– L2 (Unit – I)
03 Discuss the cyclic codes, fire codes and golay codes. – L2 (Unit – II)
04 Compute the convolution codes and trellis code. – L3 (Unit –III)
05 Explain the concept of turbo codes & turbo decoding.– L2 (Unit- IV)
06 Explain the concept of coded modulation & TCM decoder. – L2 (Unit – V)

Model Question Paper	Marks	CO's	Levels
Unit-1			L1
1. a. Define fields and list its properties.	6M		
b. For a (6, 3) symmetric LBC, the three parity check bits C_4, C_5, C_6 areformed from the following equation$C_4=d_1 \oplus d_3$, $C_5=d_1 \oplus d_2 \oplus d_3$, $C_6=d_1 \oplus d_2$	8M		
I. Write down the generator matrix 'g'		CO1	
II. Construct all possible code words			L5
III. Suppose that received word is 010111. Decode this received word by finding the location of the error and the transmitted data bit.			
c.Construct an standard array for the (6, 3) code the parity matrix $P=\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 1\\ 1 & 1 & 0\end{bmatrix}$	6M		L5
2. a. Design a single error correcting hamming code for a message length 3bits.obtain G and H matrices and all valid codeword.	10M		L5
b. Construct a Tanner Graph for given Parity Check Matrix given below. Decode the received code vector R = [000100] using Bit Flipping Algorithm. $H=\begin{bmatrix}0 & 1 & 1 & 0 & 1 & 0\\ 0 & 0 & 1 & 1 & 0 & 1\\ 1 & 1 & 0 & 1 & 0 & 0\\ 1 & 0 & 0 & 0 & 1 & 1\end{bmatrix}$	10M	CO2	L5
Unit-2			
3. a. Explain cyclic code and their generation from generating polynomial.	5M		L2
b. Explain the matrix description of cyclic code.	10M		L2
c. A linear hamming code is describe by a generating polynomial g(D) =1 +D +D^3. Construct the Generator matrix G and Parity check matrix H.	5M	CO3	L5
4. a. Explain the following codes I. Quasi cyclic codes and Shortened cyclic code II. Fire code	6M 7M		L2
b. Design the shift register encoder for the (7, 4) binary cyclic code generated by g(x) = x^3+ x +1. Verify using the message vector (1011).	7M		L5

c. with a neat block diagram explain Meggitt decoder explain the decoding steps.			L2
Unit-3			
5. a. Consider the convolution encoder given in figure1 I. Write the incoming and outgoing bits of convolution encoder. II. Write the state diagram for the encoder. III. Draw Trellis diagram. IV. Obtain the encoded output for the message 1001101.  Fig.1	10M	CO4	L3
b. Explain the polynomial description of convolutional codes.	10M		L2
6. a. Calculate the free distance d_{free} of a convolutional encoder given in a above fig.1 using generating function.	10M	CO4	L4
b. Explain the Vitebri's decoding algorithm with example.	10M		L2
Unit-4			
7. a. Compute the upper bound of the bit error probability.	10M		L3
b. Explain turbo codes.	10M	CO5	L2
8. a.With the help of block diagram explain Iterative MAP decoding	10M		L2
b. Explain the interleaver design for turbo codes.	10M		L2
Unit-5			
9. a. Explain the concept of coded modulation.	10M		L2
b. Draw and explain the general structure of TCM encoder that process M input bits.	10M	CO6	L2
10. a. Compute an expression for upper bounds on error event probability.	10M		L3
b. Explain the space time trellis codes (STTC).	10M		L2

Course Title: BIOMETRICS			
Course Code: P13EC841	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Prerequisites:

1. Digital Image Processing. –P13EC64
2. Medical Imaging System. - P13EC752

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the basic knowledge on biometrics and its modality.
2. Analyze the handwritten character recognition and its experimental results.
3. Describe the concept of face biometrics.
4. Outline the concept of retina and iris biometrics.
5. Illustrate the concept of vein and fingerprint biometrics.
6. Interpret biometric hand gesture recognition for Indian sign language.
7. Discover the privacy issues and concerns related to biometrics.
8. Discuss biometric cryptography and multimodal biometrics.
9. Explain the importance of watermarking techniques in biometrics.
10. Summarize the scope and future of biometrics and its standards.

Relevance of the Course:

Pursuing specialization and research in Biometric based identification and verification

Course Content

UNIT – I

Introduction: What is Biometrics? History of biometrics**,** Types of biometric traits**,**General architecture of biometric system, Basic working of biometric matching (Templates)**,** Biometric system error and performance measures, Design of biometric systems**,** Applications of biometrics, Benefits of biometrics versus Traditional authentication methods.

Handwritten Character Recognition: Introduction**,** Character recognition**,** System overview**,** Feature extraction for character recognition**,** Neural network for handwritten Character recognition, Multilayer neural network for handwritten character recognition**,** Devanagari numeral recognition**,** Isolated handwritten devanagari character recognition using fourier descriptor and hidden**,** Experimental results. **11 Hrs**

UNIT – II

Face Biometrics: Introduction**,** Background of face recognition**,** Design of face recognition system**,** Neural network for face recognition**,** Face detection in video sequences**,** Challenges in face biometrics**,** Face recognition methods**,** Advantages and disadvantages.

Retina and Iris Biometrics: Introduction**,** Performance of biometrics**,** Design of retina biometrics, Design of iris recognition system**,** Iris segmentation method**,** Determination of iris region**,** Experimental results of iris localization**,** Applications of iris biometrics**,** Advantages and disadvantages. **10 Hrs**

UNIT – III

Vein and Fingerprint Biometrics: Introduction**,** Biometrics using vein pattern of palm**,** Fingerprint biometrics, Fingerprint recognition system, Minutiae extraction**,** Fingerprint indexing**,** Experimental results**,** Advantages and disadvantages.

Biometric Hand Gesture Recognition for Indian Sign Language: Introduction**,** Basics of hand geometry**,** Sign language, Indian sign language (ISL), SIFT algorithm, A practical approach, Advantages and disadvantages. **10 Hrs**

UNIT – IV

Privacy Enhancement Using Biometrics: Introduction**,** Privacy concerns associated with biometric deployments, Identity and privacy, Privacy concerns, Biometrics with privacy enhancement**,** Comparison of various biometrics in terms of privacy, Soft Biometrics.

Biometric Cryptography and Multimodal Biometrics: Introduction to biometric cryptography, General purpose cryptosystem, Modern cryptography and attacks, Symmetric key ciphers, Cryptographic algorithms, Introduction to multimodal biometrics, Basic architecture of multimodal biometrics, Multimodal biometrics using face and ear, Characteristics and advantages of multimodal biometrics, AADHAAR: An application of multimodal biometrics. **10Hrs**

UNIT – V

Watermarking Techniques: Introduction**,** Data hiding methods**,** Basic framework of watermarking**,** Classification of watermarking**,** Applications of watermarking**,** Attacks on watermarks, Performance evaluation**,** Characteristics of watermarks, General watermarking process**,** Image watermarking techniques**,** Watermarking algorithm.

Biometrics Scope and Future: Scope and future market of biometrics, Biometric technologies**,** Applications of biometrics**,** Biometrics and information technology infrastructure**,** Role of biometrics in enterprise security**,** Role of biometrics in border security**,** Smart card technology and biometrics**,** Radio frequency identification (RFID) biometrics, DNA biometrics**,** Comparative study of various biometric techniques.

Biometric Standards: Introduction**,** Standard development organizations**,** Application programming interface (API), Information security and biometric standards, Biometric template interoperability. **11Hrs**

TEXTBOOK:

"Biometrics: Concepts and Applications", G.R.Sinha, SandeepB.Patil, Wiley, 2013 edition.

Course Outcomes

After learning all the units of the course, the student is able to

1. Discuss the various biometric modalities.–L6(Unit – I)
2. Outline the concept of character recognition system.– L2(Unit – I)
3. Illustrate the application of biometrics in face, retina and iris systems –L2(Unit – II)
4. Analyze the use of biometrics in vein, finger print and Indian sign language recognition. – L4(Unit – III)
5. Discuss the privacy issues and concerns related to biometrics.–L6 (Unit – IV)
6. Explain the biometric cryptography and multimodal biometrics.–L2(Unit – IV)
7. Illustrate the watermarking techniques in biometrics.-L2(Unit-V)
8. Summarize the scope and future of biometrics and its standards.– L3(Unit – V)

Model Question Paper

	Model Questions	Marks	BTL	CO
	UNIT-I			
1)	**(a)**List any 4 biometric traits. How are these traits used inbiometrics? Explain.	**08**	**L1**	
	(b) Distinguish between enrolment and recognition modules ofbiometrics.	**06**	**L4**	
	(c) Define fraud detection and also explain how this is achieved.	**06**	**L1**	**CO1**
	OR			
2)	**(a)**Define dilation, boundary detection, feature extraction andrecognition accuracy.	**08**	**L1**	
	(b) Explain the hidden Markov model for recognizing Devanagarihandwritten character recognition.	**08**	**L2**	
	(c) Explain what is image normalization? Under whatcircumstances are the translation, rotation and scaling of animage important.	**04**	**L6**	
	UNIT-II			
3)	**(a)** Explain how do morphological operations help in face recognition systems?	**08**	**L2**	
	(b) Which are the major application areas of face recognition inproviding authentication and security?	**06**	**L1**	
	(c) What are the practical challenges in face recognition systems?	**06**	**L1**	**CO2**
	OR			
4)	**(a)**What are the difficulties of Iris biometrics? What is themethod used to evaluate the performance of Iris biometrics.	**08** **06**	**L1** **L2**	
	(b) Explain the various steps of k-means clustering algorithm.	**06**	**L1**	
	(c) What are the various advantages and disadvantages of Irisbiometrics?			
	UNIT-III			
5)	**(a)** Explain vein recognition system with the help of a suitable block diagram.	**08**	**L2**	
	(b) List the different types of sensors used in image acquisition offingerprints?	**06**	**L1**	
	(c) Define ridge, valleys, minutiae and region of interest.	**06**	**L1**	**CO3**
	OR			
6)	**(a)**What is the significance of sign language? Distinguishbetween sign and verbal languages and also classify the signlanguage.	**08**	**L4**	
	(b) Why is SIFT algorithm most widely used for feature extraction? What are the different stages to generate the set of image features.	**06**	**L1**	
	(c) List the advantages and disadvantages of hand geometrybiometrics.	**06**	**L1**	
	UNIT-IV			
7)	**(a)** Explain the privacy issues associated with face, fingerprint andiris biometrics.	**08**	**L2**	
	(b) Define soft biometrics. How does it help in the biometrics withhard biometric modalities?	**06**	**L1**	
	(c) Compare between personal and informational privacy issues.	**06**	**L2**	**CO5**
	OR			
8)	**(a)**Explain DES and RSA algorithms for biometric cryptographyand compare their performance.	**08**	**L2**	

	(b) Illustrate the basic block diagram of multimodal biometricsand explain the various components of the system.	**06**	**L2**	
	(c) What are the various types of attacks encountered incryptosystems?	**06**	**L1**	
	UNIT-V			
9)	**(a)** Illustrate a general block diagram of watermarking, clearlydescribing embedding and extraction processes.	**08**	**L2**	
	(b) Distinguish between steganography and watermarking.	**06**	**L4**	
	(c) What are the desired characteristics of image watermarking?Explain any one.	**06**	**L1**	**CO6**
	OR			
10)	**(a)**Explain the classification of biometrics on the basis ofscanning methods.	**08**	**L2**	
	(b) What are the issues and challenges in DNA and smart cardbiometrics?	**06**	**L1**	
	(c) What are the various standards for faces, fingerprints and iris images?	**06**	**L1**	

Course Title: Data Compression			
Course Code: P13EC842	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture:52Hrs.;Exam: 3Hrs.	**Weightage: CIE: 50% SEE: 50%**		

Prerequisites:

1. Information Theory and Coding- P13EC53
2. Engineering Mathematics- P13MAT31
3. Fundamentals of Signals. P13EC36
4. Digital Communication theory. P13EC54

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide the knowledge of various Compression techniques.
2. Explain the different coding algorithm used in data compression along with its applications
3. Provide the knowledge of producing Dictionary-based algorithms .
4. Provide knowledge of schemes used for compression of grayscale/color image.
5. Explain distortion criteria for Lossy coding techniques
6. Provide knowledge about Quantization principle and its application
7. Explain Digital modulation principles and its applications in speech and image coding techniques.
8. Explain applications of image compression and audio compression by applying Transformation techniques

Course Content

UNIT-I

Compression techniques: Modeling and coding: Mathematical preliminaries for Loss less compression: Overview; A Brief introduction to information theory; models; coding, Algorithm information theory; minimum description length principle.

Huffman coding: Overview; The Huffman coding algorithm, minimum variance Huffman codes, Application of Huffman coding forcoding , text compression.

Text: 1.1, 1.2, 2.1 to 2.6, 3.1, 3.2, 3.2.1, 3.8, 3.8.2. **11 Hrs**

UNIT – II

Dictionary techniques: Overview, Introduction**;** Static dictionary; Adaptive dictionary; Applications; Lossless image compression; Overview; Introduction; Basic; CALIC; JPEG–LS; Multi resolution approaches; FacsimileEncoding; run– length coding, CCITT Group 3 & 4 – Recommendations T.4 & T.6

Text: 5.1 to 5.5, 7.1 to 7.5, 7.6.1, 7.6.2. **10 Hrs**

UNIT – III

Mathematical Preliminaries for Lossy coding: Introduction; Overview; Distortion criteria; Models.

Scalar quantization: Overview; Introduction; quantization problem; Uniform quantizer; Adaptive quantization.

Text: 8.1 to 8.4, 8.6, 9.1 to 9.5 **10 Hrs**

UNIT – IV

Vector quantization: Overview; Introduction; Advantages of vector quantization over Scalar quantization; The Linde–Buzo0–Gray algorithm, initializing the LBG algorithm.

Differential encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

Text: 10.1 to 10.4, 10.4.1, 11.1 to 11.8. **10 Hrs**

UNIT – V

Mathematical preliminaries for Transforms, Sub band & Wavelets: Linear systems, Sampling, Discrete Fourier Transform, Z–Transform, Transform coding: Overview, introduction, The Transform, Transform of Interest, Quantization and coding of Transforms Coefficients, Application to image compression–JPEG, Application to Audio Compression–the MDCT.

Wavelet based compression: Overview; Introduction; Wavelets; Multi resolution and Analysis & scaling function

Text: 12.6 to 12.9, 13.1 to 13.7, 15.1 to 15.4 **11 Hrs**

TEXT BOOK:

"Khalid sayood: Introduction to data compression", 3rd edition, Morgan Kaufmann Publishers Elsevier, 2006.

REFERENCE BOOK:

"Data compression: The complete reference" ,David Salomon, 3rd edition, Springer, 2005.

Course Outcomes

After learning all the units of the course, the student is able to

1. Apply the Huffman Coding algorithm for coding, text compression-L3(Unit-I)
2. Describe the schemes used for Lossles image Compresssion-L2(Unit-II)
3. Explain Scalar Quantization and list out the problems in quantization-L2(Unit-III)
4. Explain Digital modulation principles and apply its knowledge in speech and image coding techniques-L3(Unit-IV)
5. Apply the knowledge of various transforms to audio/image compressions-L3(Unit – V)
6. Explain the concepts of wavelets and Multi resolution analysis-L2(Unit –V)

Model Question Paper

	Model Questions	Marks	BTL	CO
	UNIT-I			
1	a. Define data compression and why we need it? Describe two applications where lossy compression technique is necessary for data compression.	10	L2	CO1
	b. Explain different approaches for building mathematical model and also define two state Markov model for binary images	10	L2	CO1
	OR			
2	a. (i). Draw the Huffman tree for the following symbols whose frequency occurrence in a message text is started along with their symbol below: A:15, 8:6,C:7, D:12, E:25, F'.4, G:6, H:10,I: l5 and Decode the message 1110100010111011	06	L5	CO1
	(ii). Explain redundancy code with the help of one example.	04	L2	CO1
	b. (i) Differentiate between conventional Huffman coding and adaptive Huffman coding.	04	L4	CO1
	(ii). What are the various application of Huffman coding and also give various steps required in encoding procedure?	06	L5	CO1
	UNIT-II			
3	a. Describe Run Length Coding used in facsimile encoding with example	10	L3	CO2
	b. Encode the following sequence using the LZ77 algorithm: barrayarBbaBbbyBbarrayarBbay Assume you have a window size of 30 with a look-ahead buffer of size 15. Furthermore, assume that C(a) = 1, C(b) = 2, C(B) = 3, C(r) = 4, and C(y) = 5.	10	L3	CO2
	OR			
4	a. A sequence is encoded using the LZW algorithm and the initial dictionary shown in TABLE **Index** | **1** | **2** | **3** | **4** | **5** | **6** **Entry** | **a** | **b** | h | **i** | **s** | **t**			
	(i) The output of the LZW encoder is the following sequence: 6 3 4 5 2 3 1 6 2 9 11 16 12 14 4 20 10 8 23 13. Decode this sequence	04 06	L4 L4	CO2 CO2
	(ii) Encode the decoded sequence using the same initial dictionary. Does your answer match the sequence given above?	04	L2	CO2
	b. (i) Briefly explain Compression over modem and process of constructing Adaptive dictionary	06	L2	
	(ii) Explain image compression using PNG and GIF formats			
	UNIT-III			
5	a. Define Quantization. Describe the quantization problem with the help of an example in detail	06	L2	

	b. Differentiate between uniform and non uniform Quantization	04	L4	
	c. Define rate distortion criterion. Explain the rate distortion function for binary source and Gaussian source	10	L3	
	OR			
6	a. Describe any two popular measures of distortion	06	L2	
	b. Explain the encoder and decoder mapping for a 8-level and 3-bit quantizer	06	L2	
	c. Explain backward adaptive quantization with an example	08	L3	
	UNIT-IV			
7	a. Explain in detail about LBG algorithm	10	L5	
	b. Define Vector Quantization and Explain procedure for performing vector Quantization	10	L5	
	OR			
8	a. List the advantages of Vector Quantization over Scalar Quantization	06	L2	
	b. Considering a speech signal as input Demonstrate Adaptive DPCM	08	L3	
	c. Describe Delta Modulation	06	L2	
	UNIT-V			
9	a. Explain Discrete Walsh-Hadamard transform	08	L5	CO5
	b. Describe applications of transform in i. Image compression using JPEG ii. Audio Processing using MDCT	12	L5	CO5
	OR			
10	a. Describe Sampling theorem in frequency Domain	06	L3	CO5
	b. Find the inverse Z-transform of $H(Z) = \frac{2Z^4 + 1}{2Z^3 - 5Z^2 + 4Z - 1}$	08	L4	CO5
	c. Describe Wavelet based compression techniques	06	L2	CO6

Course Title: Wireless Sensor Networks			
Course Code: P13EC843	**Semester: VIII**	**L – T – P : 2 – 1 - 0**	**Credits: 3**
Contact Period - Lecture: 52 Hrs.; Exam: 3 Hrs.	**Weightage: CIE: 50 %; SEE:50%**		

Prerequisites:

1. Fundamentals of Communication (Analog/Digital) -P13EC42/55
2. Wireless Communication
3. Computer Communication Networks. – P13EC62

Course Learning Objectives (CLOs):

This Course aims to;

1. Provide an understanding of common wireless sensor node architectures.
2. Discuss various applications of wireless sensor architectures.
3. Provide an understanding of essential networking architecture.
4. Understand the MAC protocols developed for WSN.
5. Understand the routing protocols developed for WSN.
6. Describe current technology trends for the implementation and deployment of wireless sensor networks.
7. Discuss the general issues of task-driven sensing
8. Understand the utility-cost-based approach to distributed sensor network management.
9. Provide an overview of few sensor node hardware platforms.
10. Provide an overview of node level simulators such as ns-2 and TOSSIM.

Relevance of the Course:

Specialization in IoT and Wireless networking

Course Content

UNIT – I

OVERVIEW OF WIRELESS SENSOR NETWORKS: Characteristic requirements – ToS, QoS, fault tolerance, lifetime, scalability, wide range densities, programmability, maintainability. Required mechanisms–multihop, energy efficient, auto configuration, collaboration, data centric, locality, exploit trade–off. Unique constraints and challenges of sensor networks. Emerging technologies for wireless sensor networks. Advantages of sensor networks–energy advantage–detection advantage. Sensor network applications– Tracking chemical plumes–smart transportation. Collaborative processing and key definitions of sensor networks.

Text 1: Page nos.7–10, 13–15

Text 2: Page nos. 2–20 **10 Hrs**

UNIT – II

ARCHITECTURES: Hardware components– sensor node overview– controller– memory, communication device– sensors and actuators– power supply of sensor nodes, Energy consumption of sensor nodes–operation status with different power consumption– microcontroller energy consumption–memory, energy consumption– radio transceivers– computation and communication– power consumption, OS–Embedded OS– Programming Paradigms– Protocol Stack– Energy and Power Management, OS and execution environments– Case study– Tiny OS and nesC, Network architecture – Sensor network scenarios– types of sources and sinks – single hop Vs multi hop – multiple sources and sinks

– mobility, Optimization goals and figures of merit – Qos – energy efficiency – scalability – robustness, Gateway – Need – WSN to Internet – Internet to WSN – WSN tunneling.
Text 1: Page Nos–17–19, 21–31, 36–56, 59–67, 78–81 **11 Hrs**

UNIT – III

NETWORKING SENSORS: Communication protocols– physical layer and transceiver design in WSN: energy usage profile– choice of modulation scheme, Communication protocols– physical layer and transceiver design in WSN: dynamic modulation scaling– antenna, MAC protocol– low duty cycle protocols and wake up concepts: mediation device protocol, Wakeup radio concepts, Naming and addressing–Address and name management in WSN, Assessment of MAC addresses – distributed assignment of network wide addresses, Routing protocols– Energy efficient – overview and ex., unicast protocols, multipath unicast routing, Geographic routing– position based routing– Geocasting
Text 1: page nos. 103–108, 123, 126–127, 186–188, 295–303, 316–323. **10 Hrs**

UNIT – IV

INFRASTRUCTURE ESTABLISHMENT: Technology control– motivation and basic ideas– options and aspects of topology – controlling topology in flat networks – power control, Clustering – hierarchical networks by clustering – clusters– connecting clusters – rotating cluster heads, multi hop clusters– multilayer of clustering– passive clustering, Time synchronization – Need – properties– protocol– LTS – TPSN – RBS – HRTS, Clocks and Communication delays – Interval methods –reference broadcasts, Localization and positioning– properties– approaches – lateration problem – Single Hop localization, positioning in multi hop environment, Localization and localization services– ranging techniques – range based localization algorithms – location services, Sensor tasking and control – Task driven sensing – roles of sensor nodes and utilities– Information based sensor tasking, joint routing and information aggregation.
Text 1: page nos. 251–265, 274–284, 201–223, 231– 247
Text 2: page no 103–127, 136–162, 167–185 **11 Hrs**

UNIT – V

SENSOR NETWORK PLATFORMS AND TOOLS: Sensor node hardware – Barkeley motes, Sensor network programming challenges, Node – Level software platforms – Tiny OS, nesC component implementation, nesC– concurrency and atomicity, Tiny GALS, Node– Level simulators– ns2 simulator, TOSSIM, Programming behind individual nodes: collaboration groups – state – centric programming (PIECES), multi target tracking problem.
Text 2: page nos. 240–242, 245, 248, 252–269, 271–287 **10 Hrs**

TEXT BOOKS:

1. “Protocols and Architectures for Wireless Sensor Networks”, Holger Karl &AndressWillig, John Willey, 2005.
2. “Wireless sensor networks–An information processing Approach”, Feng Zhao &Leonidas.J. Guibas, Elsevier, 2007.

REFERENCE BOOKS:

1. “Wireless sensor networks technology, protocols and Applications”, KazemSohraby, Daniel Minoli, &TaiebZnati, John Wiley, 2007.
2. “Wireless Sensor Network Designs”, Anna Hac, John Wiley, 2003.
3. “Wireless Sensor Network”, Kazemshraby, Daniel Minoli, TaiebZnati, Wiley.
4. “Wireless Sensor Networks Signal Processing and Communications”, Ananthram Swami, Qing Zhao, Yao–Win Hong, Lang Tong, John Wiley & Sons.

5. "ADHOC Wireless Networks: Architectures and Protocols", Murthy Pub, Pearson Education.
6. "Wireless sensor networks Edited", C.S. Raghavendra, Springer.
7. "Funadamentals of sensor Network Programming; Applications and Technology", Sridhar S. Lyengar, NandanParameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka. D. Okoye, Wiley.
8. "AD HOC and Sensor Networks", Carlos de morris, DharmaprakashAgrawal, 2nd Edition, Word Scientific publisher.

Course Outcomes

After learning all the units of the course, the student is able to;

1. Appraise the needs of Wireless Sensor Network in current scenario of technology.-L5 (Unit-I)
2. Examine current technology trends for the implementation and deployment of Wireless Sensor Network architectures. –L4 (Unit-II)
3. Discover the challenges in designing MAC, routing and transport protocols for Wireless Sensor Network. -L5 (Unit-III)
4. Explain the techniques to establish a Wireless Sensor Network infrastructure. –L2 (Unit-IV)
5. Utilize various Wireless Sensor Network platforms, tools and applications. –L3 (Unit-V)

Model Question Paper

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Q NO	QUESTIONS Unit-I	Marks	CO	Level
1. a)	Explain the challenges in wireless sensor network designs	8	1	L5
b)	Explain the industrial applications of sensor networks	6	1	L2
c)	Explain the following key terms with respect to WSN a. Localization and tracking b. Uncertainty	6	1	L2
	OR			
2. a)	Explain the characteristic requirements in WSN	6	1	L5
b)	Describe Multihop Wireless communication channel and its necessity	6	1	L2
c)	Discuss the advantages of sensor networks	8	1	L1
	Unit-II			
3. a)	Explain with a block diagram the overview of main sensor node hardware component.	10	2	L5
b)	Compare the various nonradio frequency wireless communication	10	2	L4
	OR			
4. a)	Discuss QoS and energy efficiency	10	2	L6
b)	Examine the various operation states with different power consumption	10	2	L4
	Unit-III			
5. a)	Explain transceiver design procedures	10	3	L5
b)	Compare different modulation schemes that can be used in WSN	10	3	L2
	OR			
6. a)	Describe low duty cycle protocols and list its advantages.	10	3	L2
b)	Explain dynamic antenna scaling and unicast routing protocol.	10	3	L5
	Unit-IV			
7. a)	Explain the various aspects of topology-control algorithms	10	4	L2
b)	Define Cluster and explain Connecting clusters, Rotating clusterheads	10	4	L2
	OR			
8. a)	Explain (i)The Gabriel graph, (ii)The relative neighborhood graph	10	4	L2
b)	What is the the need for time synchronization in wireless sensor networks. Explain how time synchronization is achieved in wireless sensor networks	10	4	L2
	Unit-V			
9. a)	Explain the range based localization algorithm	10	5	L5
b)	Describe Tiny OS used for WSN	10	5	L3
	OR			
10.a)	Describe the challenges faced in sensor network programing	10	5	L3
b)	Explain multi target tracking by considering two crossing target example	10	5	L5

Course Title: Real Time Systems			
Course Code: P13EC844	**Semester: VIII**	**L – T – P : 2 - 2 - 0**	**Credits: 3**
Contact Period - Lecture: 52Hrs.; Exam:3Hrs.		**Weightage: CIE:50%; SEE: 50%**	

Prerequistes

1. Concepts of C Programming.
2. Embedded Real Time systems. –P13EC74
3. Microprocessor and Microcontroller- P13EC45

Course Learning Objectives (CLOs):

This Course aims to:

1. Describe a reference model of real time systems and its applications.
2. Characterize hard and soft real time systems.
3. Describes clock driven approach in safety critical applications.
4. Understand the concept of scheduler
5. Understand basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks.
6. Analyze the real time issues in communication network.
7. Summarizes the control and data dependence among tasks.
8. Describes the task execution and synchronization on different processors.

Relevance of the Course:

Graduate studies in Embedded systems

Course Curriculum (Syllabus)

UNIT – I

HARD VERSUS SOFT REAL TIME SYSTEMS: Jobs and processors, release times, deadlines and timing constraints, hard and soft timing constraints, hard real time systems, soft real time systems.

A REFERENCE MODEL OF REAL – TIME SYSTEMS: Processors and resources, temporal parameters of real – time workload, periodic task model, precedence constraints and data dependency, other types of dependencies, functional parameters, resource parameters of jobs and parameters of resources, scheduling hierarchy,

Text: 2.1 to 2.5, 3.1 to 3.8 **10 Hrs**

UNIT – II

COMMONLY USED APPROACHES TO REAL – TIME SCHEDULING: Clock – Driven approach, weighted round – robin approach, priority – driven approach, dynamic versus static systems, effective release times and deadlines, optimality of the EDF nd LST algorithms, nanoptimality in validating timing constraints in priority driven systems, off – line versus on – line scheduling

CLOCK – DRIVEN SCHEDULING: notations and assumptions, static, timer driven scheduler, general structure of cyclic schedules, cyclic executives, improving the average response time of aperiodic jobs, scheduling sporadic jobs, practical consider ations and generalizations, algorithm for constructing static schedules, pros and cons of clock driven scheduling.

Text: 4.1 to 4.9, 5.1 to 5.9 **11 Hrs**

UNIT – III

PRIORITY _ DRIVEN SCHEDULING OF PERIODIC TASKS: static assumption, fixed priority versus dynamic priority algorithms, maximum schedulable utilization, optimality of the RM and DM algorithms, a schedulability test for fixed priority tasks with short response times, schedulability test for fixed priority tasks with arbitary response times, sufficient

schedulability conditions for the RM and DM algorithms, practical factors.
Text: 6.1 to 6.8 **10 Hrs**

UNIT – IV

RESOURCES AND RESOURCE ACCESS CONTROL: assumptions on resources and their usage, effects of resource contention and resource access control, nonpreemptive critical sections, basic priority – inheritance protocol, basic priority – ceiling protocol, stack – based,priority – ceiling (ceiling – priority) protocol, use of priority – ceiling protocol in dynamic – priority systems, preemption – ceiling protocol, controlling accesses to multiple unit resources, controlling concurrent accesses to data objects.
Text: 8.1 to 8.10 **10 Hrs**

UNIT – V

MULTIPROCESSOR SCHEDULING RESOURCE ACCESS CONTROL AND SYNCHRONIZATION: model of multiprocessor and distributed systems, task assignment, multiprocessor priority – ceiling protocol, elements of scheduling algorithms for End – to End periodic tasks.
REAL – TIME COMMUNICATION : model of real – time communication, priority – based service disciplines for switched networks, weighted round – robin service disciplines, medium access – control protocols of broadcast networks.
Text: 9.1 to 9.4, 11.1 to 11.4 **11 Hrs**

TEXT BOOK:
"Real Time Systems", Jane.W.S.Liu, Pearson Education – 2000
REFERENCE BOOKS:
1. "Real Time Systems", C.M.Krishna, Kangg Shin,Tata.McGraw Hill International Editions, 1997.
2. "Real–Time Systems Design and Analysis", Phillip A.Laplante, Third Edition, John wiley,2007.

Course outcomes

After learning all the units of the course, the student is able to
1. Outline hard and soft real time systems. –L4 (UNIT –I).
2. Summarizes the concept of clock driven scheduling and its practical considerations. – L2 (UNIT –II).
3. Differentiate the fixed priority verses dynamic priority algorithms of periodic tasks. – L4 (UNIT –III)
4. Interpret the effects of resource contention and resource access control. –L2 (UNIT – IV)
5. Explain the model of multiprocessor and distributed systems. –L2 (UNIT –V)
6. Explain the priority based service disciplines for switched networks. –L2 (UNIT –V)

Model Question Paper

Q NO	QUESTIONS	Marks	BTL	CO
1. a)	Define (a) Release times (b)Deadlines and (c)Timing constraints.	6	L1	1
b)	Explain the steps involved in the process of validating a real time systems.	10	L2	1
c)	Differentiate between Hard and soft real time systems.	4	L4	1
	OR			
2. a)	List and explain different characterization parameters of a real time system.	8	L3	1
b)	With the neat diagram describe the model of real-time system.	7	L2	1
c)	Write a short note on (a) Scheduler and (b) Schedules.	5	L2	
3. a)	Name any two commonly used approaches to schedule real time systems. Explain the same.	10	L2	2
b)	State and prove the theorem with respect to the fact "Any feasible schedule of J can be systematically transformed into an EDF schedule".	10	L3	2
	OR			
4. a)	Prove theorem on the Optimality of the LST algorithm for scheduling pre-emptive jobs on one processor.	10	L5	2
b)	Sketch a network flow graph that we can use to find a pre-emptive cyclic schedule of the periodic tasks T_1=(3, 1, 7), T_2=(4, 1) T_3=(6, 2.4, 8).	10	L3	2
5. a)	Compare fixed priority algorithm and dynamic priority algorithm.	10	L4	3
b)	Explain Rate monotonic and Deadline Monotonic Algorithm.	10	L2	3
	OR			
6. a)	Explain the effect of blocking on schedule ability.	7	L3	3
b)	Write a short note on (a)Self-suspension and (b)Context switches.	6	L2	3
c)	Briefly explain schedulable utilization of the RM algorithm for multi frame tasks.	7	L2	
7. a)	Define With an example (a)Mutual exclusion (b)Critical sections.	4	L1	4
b)	Explain Non pre-emptive critical section(NPCS) protocol.	10	L2	4
c)	Differentiate between priority inheritance and priority ceiling protocol.	6	L4	4
	OR			
8. a)	With an illustration explain how the system of jobs can be scheduled by using stack based priority ceiling protocol.	10	L2	4
b)	Show that under the control of the priority-inheritance protocol, a job can be blocked directly by any lower-priority job for at most once for the duration of one outer most critical section, in the absence of a deadlock.	10	L3	4
9. a)	Differentiate between local and remote resources.	8	L5	5
b)	Explain the architecture of inter processor communication.	6	L2	5
c)	Discuss end-to-end tasks in heterogeneous systems.	6	L2	5
	OR			
10.a)	Explain real time communication model.	8	L2	5
b)	Explain medium access protocols in CAN and IEEE802.5 token ring.	12	L2	5