REVA UNIVERSITY
Bengaluru, India

SCHOOL OF ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS

For

B. Tech in Electronics and Communication Engineering

Fourth Year

(Seventh Semester to Eighth Semester)

2017

Rukmini Knowledge Park,
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Phone No: +91-080-66226622, Fax: 080-28478539

B. Tech in Electronics and Communication Engineering

Scheme of Instruction:

Scheme for VII Semester							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7100	Information Theory and Coding	HC	3	1	0	4
2	BTEC15F7200	Computer Communication Networks	HC	3	0	0	3
3	BTEC15F73XX	Soft Core 4(SC4)	SC	3	0	0	3
4	BTEC15F74XX	Soft Core 5(SC5)	SC	3	0	0	3
5	BTEC15F75XX	Soft Core 6(SC6)	SC	3	0	0	3
6	BTEC15F76XX	Open Elective	OE	4	0	0	4
7	BTEC15F7700	Computer Communication Networks Lab	HC	0	0	2	2
8	BTEC15F7800	Embedded Systems Design Lab	HC	0	0	2	2
TOTAL CREDITS							**24**

Scheme for VIII Semester							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F8100	Wireless Communication and Networking	HC	3	0	0	3
2	BTEC15F82XX	Soft Core 7(SC7)	SC	3	1	0	4
3	BTEC15F83XX	Soft Core 8(SC8)	SC	3	0	0	3
4	BTEC15F8400	Major Project	HC	0	0	12	12
	TOTAL CREDITS						**22**

SC4							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
2	BTEC15F7310	Coded Modulation Techniques	SC	3	0	0	3
3	BTEC15F7320	Biomedical Signal Processing	SC	3	0	0	3
4	BTEC15F7330	Embedded Systems	SC	3	0	0	3
5	BTEC15F7340	Virtualization & Cloud Computing	SC	3	0	0	3

SC5							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7410	Satellite Communication	SC	3	0	0	3
2	BTEC15F7420	Adaptive Filters	SC	3	0	0	3
3	BTEC15F7430	Web Programming	SC	3	0	0	3
4	BTEC15F7440	SOC Design	SC	3	0	0	3
5	BTEC15F7450	Real Time Systems	SC	3	0	0	3

SC6							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7510	ASIC Design	SC	3	0	0	3
2	BTEC15F7520	Digital Signal Compression	SC	3	0	0	3
4	BTEC15F7530	Parallel Processing	SC	3	0	0	3
5	BTEC15F7540	Pervasive & Ubiquitous Computing	SC	3	0	0	3

SC7							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
2	BTEC15F8210	Mobile Adhoc& Sensor Networks	SC	3	1	0	4
3	BTEC15F8220	Real Time DSP	SC	3	1	0	4
4	BTEC15F8230	MEMS Technology	SC	3	1	0	4
5	BTEC15F8240	Device Driver Programming	SC	3	1	0	4
6	BTEC15F8250	Grid Computing	SC	3	1	0	4
7	BTEC15F8260	Multimedia communications and Networks	SC	3	1	0	4

SC8							
Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F8310	Analog Mixed Mode VLSI	SC	3	0	0	3
2	BTEC15F8320	Digital Audio & Video Broadcasting Systems	SC	3	0	0	3
4	BTEC15F8330	Automotive Electronic Systems	SC	3	0	0	3
5	BTEC15F8340	Big Data Analytics	SC	3	0	0	3
6	BTEC15F8350	Cryptography and Network Security	SC	3	0	0	3

Open Electives (OE)

Sl.No.	**Course code**	**Title of the Course**	**Types of course (HC/ SC/OE)**	**Credit Pattern & Credit Value**			
				L	**T**	**P**	**Total**
1	BTEC15F7610	Robotics & Automation	OE	3	1	0	4
2	BTEC15F7620	Neural Networks and Fuzzy Logic	OE	3	1	0	4
3	BTEC15F7630	MEMS	OE	3	1	0	4

HC= 76% SC=22% OE=2%

Detailed Syllabus

Semester VII

BTEC15F7100	**Information Theory and Coding**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Digital Communication, Fourier analysis of Signals and systems, Probability Theory and Bayesian Inference.

Course Objectives:

1. To equip students with the fundamental concept of information theory and entropy.
2. Understand various source coding techniques.
3. To familiarize with the reliability of data transmission using error-control coding techniques,
4. To build procedures for designing efficient coding schemes for controlling various types of errors in digital communication system.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Calculate the information content of dependent and independent sequences. (a,e,g)
2. Compute the efficiency and redundancy of information using various source encoding methods.(a,e,g)
3. Apply linear block codes and binary cyclic codes for error detection and correction. (a,e,c)
4. Apply convolution codes for encoding.(a,e,c)

Course Content:

Unit-1: Fundamentals of Information Theory [11]

Introduction: Historical Background, the Communication Process,

Information Theory: Measure of Information, Information content of a message, Average information content of symbols in long independent sequences, Properties of Entropy, Average information content of symbols in long dependent sequences, Markoff statistical model for information sources, Entropy and Information rate of Markoff Sources.

Unit-2: Source Coding [10]

Source coding theorem, Prefix coding- Kraft-McMillan inequality theorem, Huffman coding-minimum and maximum variance, Discrete memory less channels-Binary symmetric channel, Mutual information, Properties of mutual information, Shannon-Hartley theorem and its implications, Rate of information Transmission over a Discrete channel.

Unit-3: Linear Block Codes and Binary Cyclic codes [11]

Introduction, Examples of error control coding, Methods of controlling errors, Types of errors, types of codes, Linear Block Codes (LBC): Matrix description of LBC, Error detection and Correction capabilities of Linear Block Codes, single error correcting hamming codes, Table Lookup decoding using the standard array.

Binary Cyclic codes: Algebraic structure of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome Calculation, Error detection and error correction.

Unit-4: Convolutional Codes and Special Codes [10]

Convolutional encoder, Time-Domain Approach, Transform-Domain approach, Code tree, State diagram, Trellis diagram. Special Codes: Cyclic Redundancy Check Codes, Golay codes, Bose-Chaudhuri-Hocquenqhem (BCH) Codes, Reed-Solomon Codes Viterbi decoding.

Text Books:

1. Simon Haykin "**Digital Communication Systems**", Wiley student edition, reprint: 2013. John Wiley & Sons, ISBN: 978-81-265-4231-4.
2. K. Sam Shanmugam, "**Digital and Analog Communication Systems**" reprint: 2014, by John Wiley & Sons. ISBN: 978-81-265-3680-1

BTEC15F7200	Computer Communication Networks	L	T	P	C
Duration:14 Wks		3	0	0	3

Prerequisites

Digital Communication, C and C++

Course Objectives:

1. Build an understanding of the fundamental concepts and the underlying basic principles of computer communication networks through the discussion on existing protocols and standards.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking.
3. To understand OSI and TCP/IP layered models with Internet perspective.
4. Learn about data link layer protocols, routing protocols, transport layer and application layer protocols.
5. Introduction to analysis of computer and communication networks through understanding the network layered architecture and the protocol stack by conducting simulation activities.

Course Outcomes:

On completion of this course the student will be able to:

1. Understand the fundamentals of data communication and communication networks in terms of OSI and TCP/IP perspective. (a, d, e)

2. Design and analyze data transmission protocols and data link and routing algorithm. (a, b, e)
3. Appreciate and interpret various protocols in transport layer (a, b, e)
4. Summarize application layer protocols. (a, b, e)
5. Apply the principles of data communication and communication network techniques to design and evaluate new protocols(a, b, e)
6. Discuss major trends in industry and current research activities within the discipline. (a, e)

Course Content:

Unit-1.Introduction to Data Communication and Networking. [11]

Layered tasks, OSI Model, TCP/IP Suite, and Comparison of OSI Model & TCP/IP Suite. Addressing of TCP/IP Model. Framing, Flow and Error Control, Protocols**:** Noiseless channels and noisy channels, HDLC.

Unit-2. Multiple Access &LANs. [10]

Random access, Controlled access, Channelization. Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11

Unit -3.Connecting Devices& Network Layer. [11]

Connecting Devices**:** Repeaters, Hubs, Routers, Bridges & Switches, Back bone Networks, Virtual LANs. Network Layer**:** Logical addressing, Ipv4 addresses, Ipv6 addresses, Internetworking, Ipv4 Header Format and Ipv6 Header Format, Transition from Ipv4 to Ipv6.

Unit-4.Transport layer & Application Layer. [10]

Process to Process Delivery, UDP, TCP, Remote Logging, Electronic Mail and File Transfer, WWW, HTTP.

TEXT BOOK:

1. B Forouzan**"Data Communication and Networking",** 4th Ed, TMH 2006.

REFERENCE BOOKS:

1. James F. Kurose, Keith W. Ross "**Computer Networks"**, Pearson Education, 2nd Edition, 2003.
2. Wayne Tomasi"**Introduction to Data communication and Networking**" Pearson Education 2007.
3. S. Keshav, **"An Engineering Approach to Computer Networking",** Pearson Education.

SC-4

BTEC15F7310	**Coded Modulation Techniques**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal processing, Communication Systems, Analog and Digital communications, Information Theory and coding

Course Objectives:

1. To provide an understanding of advanced coded Modulation technique in the state of art communication systems.
2. To provide and understanding of the effective utilization of the power and Bandwidth
3. To have an understanding of the combination of coding and Modulation in effective control of Bandwidth
4. To provide a comprehensive look at the challenges in Engineering problems to provide an effective and efficient solution

Course Outcomes:

1. To determine various impairments of the communication systems using conventional modulation schemes.(a,b,c)
2. Determine the right combination of coding and modulation technique taking into account the need for conservation of Bandwidth and BER at optimum Power level.(a,b,e,c)
3. Apply the signal processing Techniques to quantify the outcome of combined modulation and coding schemes. (a,b,c,k)
4. To determine the final characteristics of the communication systems (a,b,c)
5. To derive holistic view of the communication systems performance with different combination of Modulation and coding Techniques(a,b,c,k)

Course Content:

Unit -1 Introduction to Modulation coding [11]

Introduction – Role of modulation and coding in Wireless communication – Performance parameters – Power & Bandwidth efficient schemes – Advantages of Modulation and coding

Unit-2: Principles of Modulation [10]

Principles of Modulation for Linear and Nonlinear systems – Modem Design – Principles of FEC coding – Coded Modulation Techniques

Unit-3: Multipath [11]

Multipath and its effects – Multipath countermeasures – Coded systems on the multipath channels;

Unit-4: OFDM [10]

OFDM – Description – Basic analysis – Effect of Excess Multipath Delay and Doppler effects – Effects of multipath on coded and uncoded systems – Application of FEC Coding – Equalization – Synchronization – Signal Envelope – Introduction to Turbo codes.

Text Books:

1. Alister Burr "Modulation and coding for Wireless communications" Prentice Hall Pearson Education; ISBN: 0-201-39857-5
2. Marvin K Simon, Sami Hinedi, William C Lindsey "Digital Communication Techniques – Signal Design and Detection" Pearson Education; ISBN: 978-93-325-4956-2;
3. John R Barry, Edward A Lee, David G Messerschmitt **"Digital Communications**" Springer International; ISBN: 81-8128-343-0

BTEC15F7320	**Biomedical Signal Processing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Signals & Systems, Digital Signal Processing, Linear Algebra,

Course Objectives:

1. Identify the application of the main signal processing tools to the analysis of biomedical signals.
2. Describe how clinically relevant information can be extracted from these signals.
3. Relate advanced signal processing for uni and multi-modal medical signals.
4. Discuss advanced signal processing for multidimensional medical signals.
5. Interpret and analyse medical signals from a set of specific medical applications.
6. Describe and apply signal processing methods for removal of artefacts in medical signals.
7. Estimate unique segments or regions in medical signals an - images using automatic signal processing methods for classification.

Course Outcomes:

1. Apply advanced signal processing techniques for uni and multi-modal medical signals.(k,g,d)
2. Apply statistical and adaptive signal modelling for multidimensional medical signals.(a, c, e)
3. Interpret and analyse medical signals from a set of specific medical applications(a, b, c)

4. Define and apply signal processing methods for removal of artefacts in medical signals(d, c)
5. Illustrate unique segments or regions in medical signals an - images using automatic signal processing methods for classification.(a,b)
6. Explain Smear signal processing methods for characterization of physiological and pathological phenomena(g,f)

Course Content:

Unit-1: Introduction to Biomedical Signals [10]

Nature of Biomedical Signals, Examples of Biomedical Signals (ENG, EMG, ECG, EEG, ERP, EGG, PCG, CP, VMG, VAG), Objectives of Biomedical Signal Analysis, Difficulties in Biomedical Signal Analysis, Computer aided Diagnosis.

Unit-2: Electrocardiography [11]

Basic Electrocardiography, ECG lead systems, ECG Signal characteristics, ECG QRS Detection, ECG Analysis Systems.

Unit-3: Neurological Signal Processing [11]

The Brain and its potentials, The Electrophysiological Origin of Brain Waves, EEG signal and its characteristics, EEG Analysis, Linear Prediction Theory, The AR method, Recursive Estimation of AR Parameters,

Unit-4: Sleep EEG [10]

Data Acquisition and Classification of sleep stages, The Markov Model and Markov Chains, Dynamics of Sleep-Wake Transitions, Hypnogram Model parameters, Event History Analysis for modeling Sleep

Text Books:

1. RangarajMRangayyan,"**Biomedical Signal Analysis**" A case study approach, John Wiley publications.
2. Willis J Tompkins, ED, **"Biomedical Digital Signal Processing**", Prentice-Hall of India, 2011
3. DC Reddy, **"Biomedical Signal Processing Principles and Techniques**", Tata McGraw-Hill, 2005.

Reference Books:

1. R E Chellis and R I Kitney, "**Biomedical Signal Processing**", in IV parts, Medical and Biological Engg. And current computing, 1990-91.
2. ArnonKohen, **"Biomedical Signal Processing**", Volumes I & II, CRC Press.

BTEC15F7330	**Embedded Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Microprocessor, Operating System

Course Objectives

1. Present brief idea about the embedded system components, memory, communication interfaces and other firmware components.
2. Prescribe the quality attributes, hardware and software co-design, computational models in embedded systems, unified modelling languages etc.
3. Present the firmware system development and firmware development languages.
4. Give a brief description of RTOS, integrated development environment, simulators and emulators.
5. Present the trends in embedded system development.

Course Outcomes

After completion of the course a student will be able to:

1. Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.(a,b,e,k)
2. Choose the model, architecture, language and hardware/software partitioning in hardware/software codesign.(b,c,d,f,)
3. Describe and identify embedded firmware.(b,d,e,f,k)

Course Content

Unit-1: Typical Embedded System [11]

Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware.Hardware Software Co-Design and Program Modeling.

Unit-2: Characteristics and Quality Attributes of Embedded Systems [10]

Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language (Self Study/Case Study), Hardware Software Trade-offs. **Embedded Firmware Design and Development**-Embedded Firmware Design Approaches, Embedded Firmware Development Languages.

Unit-3: Real-Time Operating System (RTOS) based Embedded System Design [11]

Operating System Basics, Types of OS, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Putting them altogether, Task Communication, Task Synchronization, Device Drivers, How to Choose an RTOS(Self Study/Case Study).

Unit-4: The Embedded System Development Environment [10]

The Integrated Development Environment (IDE)(Self Study/Case Study), Types of Files Generated on Cross-compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

Text Books:

1. Shibu K V, "**Introduction to Embedded Systems**", Tata McGraw Hill Education Private Limited, 2009.
2. James K Peckol, "**Embedded Systems**", A contemporary Design Tool - John Weily, 2008

Reference Books:

1. Rajkamal, "**Embedded Systems Architecture, Programming and Design**" , Tata McGraw Hill, 2nd Edition, 2008
2. Steve Heath, "**Embedded Systems Design**", Elsevier, 2nd Edition, 2003
3. Dr K.V.K.K. Prasad, "**Embedded/Real-Time Systems: Concepts, Design and Programming- The Ultimate Reference**", Dreamtech Press/Wiley India, 2007.

BTEC15F7340	**Virtualization and Cloud Computing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Computer Networks, Operating System

Course Objectives:

The objective of this course is to:

1. Provide knowledge in different layers of cloud computing, Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS);
2. Illustrate the use of various cloud computing technologies;
3. Introduce Virtualization technologies: Hypervisor, emulation, and application VM; Platform virtualization, storage virtualization, and network virtualization;
4. Provide Introduction to cloud security and secure computation in the cloud.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Explain virtualization and their role in elastic computing; (a, c, f)
2. Characterize the distinctions between Infrastructure, Platform and Software as a Service (IaaS, PaaS, SaaS) abstractions;(b, c, f)

3. Analyze the advantages and disadvantages of Public and Private Clouds.(a, e, f)
4. Create and deploy cloud applications (b, e, f)
5. Design Cloud security solutions (a, c, f)

Course Contents:

Unit-1: Cloud Computing Overview [11]

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service , Broad network access , Location independent resource pooling , Rapid elasticity , Measured service. Cloud scenarios – Benefits: scalability, simplicity, vendors, security.

Unit-2: Cloud architecture: Cloud delivery model [10]

SPI framework , SPI evolution , SPI vs. traditional IT Model. Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and Googleplatform – Benefits – Operational benefits - Economic benefits – Evaluating SaaS. Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Rack space – Force.com – Services and Benefits. Infrastructure as a Service (IaaS): IaaS service providers – Amazon EC2,Go Grid – Microsoft soft implementation and support – Amazon EC service level agreement – Recent developments – Benefits. Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing

Unit-3: Virtualization [11]

Virtualization and cloud computing - Need of virtualization – cost , administration , fast deployment , reduce infrastructure cost – limitations. Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization. Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization

Unit-4: Centralized computing vs Pervasive computing [10]

Peer to Peer Computing - Principles of pervasive computing – vision and challenges - Architecture for Pervasive computing. Platforms & Environments: Location Management - Context Awareness - Mobility of computing and communication Middleware – Object Request Broker (ORB) - Message Oriented Middleware - Object Middleware - RPC Middleware - Database Middleware - Transaction Middleware - General issues of middleware

References:

1. Anthony T.Velte , Toby J. Velte Robert Elsenpeter, "**Cloud computing a practical approach**", TATA McGraw- Hill , New Delhi - 2010
2. Michael Miller, "**Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online**", Que 2008

3. Sandeep Gupta, Frank Adelstein, Golden Richard, Loren Schweibert. "**Fundamentals of Mobile and Pervasive Computing**", McGraw Hill Publication 2004
4. Jochen Burkhardt , Horst Henn , Stefan Hepper , Klaus Rindtorff , Thomas Schaeck , "**Pervasive Computing**", Pearson Education - 2010

SC 5

BTEC15F7410	**Satellite Communication**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Knowledge of Basic Geometry, Insight of Geography, Fundamentals of Communication Systems and information coding.

Course Objectives

1. To provide an in-depth understanding of different concepts used in a satellite communication system.
2. To get knowledge of every aspects of satellite communication like orbital mechanics, launching techniques, satellite link design, earth station technology and different access system towards a satellite
3. To Understand Earth and space component.
4. To familiarize with different multiple access like TDMA FDMA and CDMA
5. To learn different communication networks.
6. To know application of satellite communication.

Course Outcomes

On completion of this course the student will be able to:

1. Describe the requirements for the following aspects of a satellite communications system: satellite subsystems, satellite orbits, frequency bands used, antennas and electromagnetic wave propagation for communications between earth stations and satellite (a, d)
2. Describe the systems required by a communication satellite to function efficiently, its trade-offs and also limitations encountered in the design of a communication satellite systems (a,d)
3. Describe the topologies and applications of analog and digital satellite communication networks (a, d, f)
4. Evaluate the advantages and disadvantages of the different types of satellite orbits (a, d, f)
5. Analyze the fundamentals of orbital mechanics, the characteristics of common orbits used by satellites and assess launch methods and technologies. (a,d,f)
6. Determine accurate link budget for a satellite communication link. (a,d,f)
7. Specify the specialized services of satellite. (a,d,f)

Course Contents

Unit-1: Satellite Systems and Orbits [11]

Overview of satellite systems: Introduction, Frequency allocations for satellite systems.

Orbits and launching methods: Kepler's three laws of planetary motion, terms used for earth orbiting satellites, orbital elements, apogee and perigee heights, orbit perturbations, inclined orbits, local mean solar point and sun-synchronous orbits, standard time.

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

Unit-2: Space Segment & Earth Segment [10]

The Space segment: Introduction, power supply, attitude control, station keeping, thermal control, TT&C subsystem, transponders, antenna subsystem.

The Earth segment: Introduction, receive-only home TV systems, master antenna TV system, Community antenna TV system, transmit-receive earth station.

Unit-3: Communication Satellite and Satellite link Design [10]

Communication Satellites- Satellite subsystem; Attitude and orbit control system (AOCS); Telemetry, Tracking, Command and Monitoring (TTC&M); power systems; communications subsystem-description, transponders; satellite antennas-basic antenna types, satellite antennas in practice.

Satellite link design and Satellite access: Basic transmission theory, system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit-4: Satellite Access Techniques and Application [11]

Access Techniques: Modulation and Multiplexing: Voice, Data, Video, Analog and Digital transmission systems, multiple access techniques: FDMA, TDMA, T1-T2 carrier systems, SPADE, SS- TDMA, CDMA, Assignment Methods, Spread spectrum communication.

Satellite Applications: INTELSAT Series, INSAT, VSAT, Remote sensing, Mobile satellite service: GSM. GPS, INMARSAT, Direct to Home service (DTH).

Text books:

1. Dennis Roddy, **"Satellite Communications",** McGraw-Hill international, 4th Edition, 2006.

Reference Books:

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt. **"Satellite Communications",** John Wiley Pvt Ltd & Sons, 2nd Edition, 2008.
2. W. L. Pitchand, H. L. Suyderhoud, R.A. Nelson., **"Satellite Communication system Engineering",** Pearson Education, 2ndEdition 2007.
3. Raja Rao: **Fundamentals of Satellite communications**, PHI Learning.
4. MonojitMitra: **Satellite Communication**: PHI Learning

BTEC15F7420	**Adaptive Filters**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal Processing, Probability Theory and basics of Linear Algebra.

Course Objectives:

1. To provide a significant understanding of adaptive filters in signal processing.
2. To introduce the mathematical framework necessary in understanding the adaptive filtering process.
3. To present the perspectives of adaptive filters towards present day communication systems.
4. To study the differences between algorithms adopted in adaptive filtering.
5. To know the performance measures used in comparing different adaptive filtering algorithms.

Course Outcomes:

On completion of this course the student will be able to:

1. Define, describe and outline adaptive models used for various categories of signal processing problems.(a,b)
2. Associate the adaptive model under consideration, with a well known mathematical framework.(b,c)
3. Develop optimum solutions for the adaptive model and thereby compute the performance measures.(g,f)
4. Investigate the suitability of available adaptive algorithms for a given situation.(g,c,d)
5. Develop the iterative design procedure for practical realization of adaptive filter.(c,d)
6. Generalize the application of adaptive filters to many communication related signal processing problems.(b,c,d)

Course Contents

Unit-1: Adaptive systems [11]

Definitions and characteristics, applications, properties and examples of adaptive linear combiner. Definitions of input signal and weight vectors, performance function-gradient and minimum mean square error, introduction to filtering, smoothing and prediction, performance surface.

Unit-2: Searching performance surface stability and rate of convergence [10]

Learning curve, gradient search - Newton's method and method of steepest descent, comparison, gradient estimation, performance penalty: variance, excess MSE and time constants, mis-adjustments.

Unit- 3 LMS algorithm convergence of weight vector: [10]

LMS/Newton algorithm, properties, sequential regression algorithm, comparisons

Unit-4 Applications of adaptive filters: [11]

Multipath communication channel, geophysical exploration, FIR digital filter synthesis, inverse adaptive modeling, equalization, and deconvolution, adaptive equalization of telephone channels-adapting poles and zeros for IIR digital filter synthesis.

TEXT BOOKS:

1. Bernard Widrow and Samuel D. Stearns, "Adaptive Signal Processing", Person Education, 2005.
2. Simon Haykin, "Adaptive Filter Theory", Pearson Education, 2003.

REFERENCE BOOKS:

1. John R. Treichler, C. Richard Johnson, Michael G. Larimore, **"Theory and Design of adaptive Filters"**, Prentice-Hall of India, 2002.
2. S. Thomas Alexander, **"Adaptive Signal Processing - Theory and Application",** Springer-Verlag.
3. D. G. Manolokis, V. K. Ingle and S. M. Kogar, **"Statistical and Adaptive Signal Processing",** Mc Graw Hill International Edition,2000.

BTEC15F7430	**Web Programming**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Programming using C

Course Objectives:

The objectives of this course are:

1. To provide students with conceptual and practical knowledge of web applications;
2. To impart skills required to develop web applications and services.
3. To introduce cascading styles.
4. To present Java Scripts.
5. To give a fundamental knowledge of Web Services

Course Outcomes:

On completion of this course, the student will be able to:

1. Identify tools and technologies for Web applications. (a, b)

2. Develop user-interfaces for Web Applications. (b, d)
3. Describe and transform data using XML and its related technologies. a, b)
4. Developing Web applications and Web services. (b, d, f)

Course Content:

Unit-1: Computers and Internet [11]

Introduction to Computers and the Internet: Computer Organization, History of the Internet and World Wide Web, World Wide Web Consortium, Personal, Distributed and Client/Server Computing, Key Software Trend: Object Technology, JavaScript: Object-Based Scripting for the Web , Browser Portability, BASIC, Visual Basic, Visual C++, C# and .NET Software Technologies. Introduction to XHTML: XHTML example, differences between HTML and XHTML, creation of list, tables, forms, images, links etc. in XHTML.

Unit- 2: Cascading Style Sheets [10]

Cascading Style Sheets(CSS): Introduction Inline Styles, Embedded Style Sheets, Conflicting Styles, Linking External Style Sheets, Positioning Elements, Backgrounds, Element Dimensions, Box Model and Text Flow, Media Types, Building a CSS Drop-Down Menu, User Style Sheets.
Web Servers (IIS and Apache): Introduction, HTTP Transactions, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, Accessing Web Servers
Microsoft Internet Information Services (IIS)

Unit-3: JavaScript [11]

JavaScript: Introduction to Scripting, Control statements-1, Control statements-2, Functions, Arrays, Objects, Events and programming examples on each of these. Document Object Model (DOM**):** Introduction, Modeling a Document: DOM Nodes and Trees, Traversing and Modifying a DOM Tree, DOM Collections, Dynamic Styles, Summary of the DOM Objects and Collections.

Unit-4: PHP [10]

PHP: Introduction, PHP Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Connecting to a Database Using Cookies, Dynamic Content, Operator Precedence Chart.

Text book:

1. Robert W. Sebesta, "**Programming the World Wide Web"**, 7th ed., Addison-Wesley, 2012
2. Kogent Learning Solutions Inc., **"Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML Black Book",**Dreamtech Press, ISBN-13: 978-9351192510, Paperback – 19 Dec 2013

Reference Books:

1. NavneetMehra, Bunny Mehra, **"Website Development Using HTML and CSS - A Practical Step-By-Step Guide to Develop E-Commerce Store"**, Unicorn Books (2012)
2. Jon Duckett, "HTML and CSS: **Design and Build Websites",**Wiley; 1 edition, ISBN-13: 978-1118008188

BTEC15F7440	**SoC Design**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Knowledge of CMOScircuits, Basics of VLSI design

Course Objectives:

1. Highlight the importance of complex VLSI circuits.
2. List the examples of SoC systems
3. Introduce the parts of a SoC
4. Providing the comparison of different VLSI design styles
5. Introduce the concept of H/W and S/W co-design
6. Introduce the system design process
7. Highlight the differences between the hard IP and soft IP
8. Provide a sound knowledge of embedded memories
9. Demonstrate the idea of NoC used for interconnection architecture

Course Outcomes:

On completion of this course the student will be able to:
1. Describe the different VLSI design styles (a, b, c, d, e)
2. Explain the idea of SoC (a, b, c, d, e)
3. Summarize the SoC design steps (a, b, c, d, e)
4. Integrate the H/W and S/W design for designing a SoC chip (a, b, c, d, e)
5. Asses different types of memories to be used as embedded memories. (a, f)
6. Apply the concept NoC for SoC interconnections (a, b, c, d, e)

Course contents:

Unit-1: Motivation for SoC and SoC design: **[11]**

Review of Moore's law and the state of art of VLSI. Meaning of SoC. Benefits of SoC integration in terms of cost, power and performance. Comparison of system on board, system on chip and system in package. Typical goals of SoC design- cost reduction, power reduction, design effort reduction, enhancement of performance. Productivity gap issues and the ways to reduce the gap-IP based design and design reuse.

Unit-2: SoC Design: [10]

A canonical SoC Design. Review of VLSI design flows- waterfall versus spiral, top down and bottom up approaches. SoC design flow. Specifications and requirements. Types of specifications. System design process, system level design issues. Concept of IP cores for SoC. Soft IP versus Hard IP. IP verification and Integration. H/W-S/W co-design. Design for timing closure

Unit-3: Embedded Memories [10]

Types of memories. Cache memories, flash memories, Embedded DRAM. Cache coherence. MESI protocol and Directory –based coherence .MPSoCs, Techniques to design MPSoCs, Performance and flexibility for MPSoC Design

Unit-4: Interconnect architectures for SoC: [11]

Bus architecture and its limitations. Concept of NoC. NoC topologies. Advantages of NoC. Mesh based NoC. Routing ina NoC. Packet switching and wormhole routing.

References:

1. SudeepPasricha and NikilDutt, "**On- Chip Communication Architectures: System on Chip Interconnect"**, Morgan Kaufman 2008
2. Rao R. Tummala, MadhavanSwaminathan, " **Introduction to system on package SOP-Miniaturization of the entire system"**, McGraw-Hill 2008
3. James K. Peckol, "**Embedded Systems: A contemporary Design Tool**" Wiley student Ed
4. Michael Keating, Pierre Bricaud, " **Reuse Methodology Manual for System on Chip designs**", Kluwer Edition,2008
5. Sung-Mo Kang, Yusuf Leblebici, "**CMOS Digital Integrated Circuits**", Tata McGraw-Hill, 3rd Ed.

BTEC15F7450	**Real Time Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Embedded System

Course Objectives:

1. Understand and Analyze Real Time Systems
2. Know the Importance of real time constraints and synchronization issues.
3. Introduce concepts of RTOS and resource management
4. Achieve multitasking and concurrency
5. Present RTOS tools and case studies

Course Outcomes:

On completion of this course the students will be able to:

1. Understand the basics and importance of real-time systems. (a,b)
2. Generate a high-level analysis document based on requirements specifications (a,b,c,d)
3. Generate a high-level design document based on analysis documentation (a,b,c,d)
4. Generate a test plan based on requirements specification (a,b,c,d,e)
5. Generate a validation plan based on all documentation (a,b,c,d,e)
6. Understand basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling (a,b,c)
7. Understand capabilities of at least one commercial off-the-shelf R-T kernel (a,b,c)
8. Participate in a team design project, utilizing varying skill sets of members. (a,b,d,e,k)

Course Contents:

Unit-1: Introduction to Real Time Systems: **[10]**

Basic Real-Time Concepts, Hardware Considerations, Clock Synchronization

Unit-2: Tasks and Task Scheduling: **[11]**

Task classes, Characterizing RTS and Tasks, Task assignment and Scheduling, Task management, Scheduler and Real-Time Clock Interrupt Handler

Unit-3: RTOS: **[11]**

Real-Time Kernels, Theoretical Foundations of Real-Time Operating Systems, Inter-task Communication and Synchronization, Memory Management.

Unit-4: RTOS Issues and Tools: **[10]**

Performance Metrices, Synchronization issues, Embedded Linux internals, RTOS Tools- mucos, VxWorks- case studies on these tools, POSIX Thread Programming.

Reference Books:

1. Philip A. Laplante, "**Real Time System Design and Analysis**," Third edition, Wiley India Edition, 2011.
2. C.M. Krishna and Kang G. Shin, "**Real Time Systems**", MGH, 1997.
3. Staurt Bennett, "**Real Time Computer Control**," Second Edition, Pearson, 2002
4. Raj Kamal , "**Embedded Systems Architecture, Programming and Design**," Second Edition, TMH, 2003
5. Jane W. S. Liu, "**Real Time Systems**," Pearson Education, 2000.

SC-6

BTEC15F7510	ASIC DESIGN	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Electronic Circuits

Course Objectives

1. Present brief idea about the ASIC design.
2. Give brief introduction to logic cell.
3. Present the idea of low level design entry.
4. Give a brief description of floor planning, placement and routing.
5. Present the trends in ASIC.

Course Outcomes

After completion of the course a student will be able to:

1. Describe the various logic cells and there utilization in system design. (a, b, e, k)
2. Design schematics and generate net list.(b, c, d, f)
3. Develop floor planning, placement and routing.(b, d, e, f, k)

Course contents:

Unit 1: Introduction **[11]**

Full Custom ASICs, Standard Cell based ASICs, Gate array based ASICs, Channeled gate array, Channelless gate array, structured gate array, Programmable logic devices, FPGA, Design flow, Economics of ASICs, ASIC cell libraries,I/O cells, Cell Compilers.

Unit 2: ASIC Library Design and Design entry **[10]**

ASIC Library Design: Logical effort: predicting delay, logical area and logical efficiency, logical paths, multistage cells, optimum delay, optimum number of stages, library cell design. Low-Level Design Entry: Schematic Entry: Hierarchical design. The cell library, Names, Schematic, Icons & Symbols, Nets, schematic entry for ASIC'S, connections, vectored instances and buses, Edit in place, Attributes, Netlist screener, Back annotation.

Unit 3: ASIC Construction Floor Planning **[11]**

Physical Design, CAD Tools, System Partitioning, Estimating ASIC size, partitioning methods. Floor planning tools, I/O and power planning, clock planning

Unit 4: Placement and Routing **[10]**

Placement algorithms, iterative placement improvement, Time driven placement methods. Physical Design flow, global Routing, Detail Routing, Special Routing, Circuit Extraction and DRC.

Text Books:

1. M.J.S .Smith, "**Application - Specific Integrated Circuits**", Pearson Education, 2003.

Reference Books:

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

BTEC15F7520	**Digital Signal Compression**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Digital Signal Processing

Course Objectives

1. Describe Compression techniques.
2. Discuss the elementary techniques used for modeling of data.
3. Summarize the issues relating to modeling, distortion criteria, differential Entropy, rate Distortion Theory.
4. Illustrate the Vector Spaces, Present Information theory,
5. Organize the models for sources.
6. Distinguish Contrast Coding, uniquely decodable codes, Prefix codes.
7. Explain the Kraft McMillan Inequality.

Course Outcomes

1. Explain various digital data compression techniques.(a, b)
2. Summarize the important issues in data compression.(b,c,d)
3. Explain the techniques for compression of binary programmes, data, sound and image and video. (e,c,d)

4. Explain Lossless Coding for the units of coverage.(f, e)
5. Apply the knowledge of compression in engineering design and analysis.(c,d)

Course contents:

Unit-1: Introduction [11]

Introduction: Compression techniques, lossless compression, lossy compression, measures of performance.

Unit-2: Mathematical preliminaries for lossless compression [10]

Overview, a brief introduction to information theory, derivation of average information, physical models, probability models, Markov models, composite source model, uniquely decodable codes, prefix codes, Kraft-McMillan inequality

Unit-3: Huffman coding [10]

Overview, The Huffman Coding Algorithm, Minimum variance Huffman codes, optimality of Huffman codes.

Unit-4: Transform coding [11]

K-L Transform, DCT, DST, Discrete Walsh-Hadamard Transform.

TEXT BOOKS:

1. Khalid Sayood, "**Introduction to Data compression**", Morgan Kaufmann, 4th edition, 2012.
2. Thierry Dutoit and Ferran Marques, **"Applied Signal Processing A MATLAB-Based Proof of Concept"**, Springer, 2009.

REFERENCE BOOKS:

1. John G. Proakis, MasoudSalehi, Gerhard Bauch, Contemporary Communication Systems Using MATLAB, 3rd edition, CENGAGE Learning.
2. Raymond w. Yeung, A First Course in Information Theory, Springer, 2002.

BTEC15F7530	**Parallel processing**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Computer fundamentals, Computer architecture

Course Objectives:

1. To present design of parallel programs and how to evaluate their execution
2. To Give knowledge of the characteristics, the benefits and the limitations of parallel systems and distributed infrastructures
3. To expose students to writing code in different parallel programming environments
4. Encourage students to Build experience with interdisciplinary teamwork

Course Outcomes:

On completion of this course the student will be able to:

1. Analyze the requirements for programming parallel and critically evaluate the strengths and weaknesses of parallel programming models and how they can be used to facilitate the programming of concurrent systems. (b, d)
2. Discuss the difference between the major classes of parallel processing systems and design software solutions for a number of parallel processing models. (a, b)
3. Design and implement a SIMD and MIMD parallel processing solution. (b, f, g)
4. Analyze the efficiency of a parallel processing system and evaluate the types of application for which parallel programming is useful. (b, d)
5. Reason about ways to parallelize a problem and evaluate a parallel platform for a given problem. (a, b)

Course Content:

Unit-1: Introduction and Architectures [10]

Why parallel programming?, Warnings, laws of caution, parallel processing, shared memory multiprocessing, distributed memory, using parallelism, parallel processing architectures: Introduction, multiprocessor architecture,Instruction set architecture.

Unit-2: instruction level parallelism [10]

ILP: Concepts and challenges; Basic Compiler Techniques for exposing ILP; Reducing Branch costs with prediction; Overcoming Data hazards with Dynamic scheduling; Hardware-based speculation, Exploiting ILP using multiple issue and static scheduling; Exploiting ILP using dynamic scheduling.

Unit-3: Shared memory programming and UNIX [11]

The Unix Operating System, The UNIX architecture and Command Usage, The File System, The Shell, The Process, general model of shared memory programming, introduction to threads, thread management, example with threads, attributes of thread.

Unit 4: Review of memory hierarchy and Memory hierarchy design [10]
Introduction, Cache performance, Cache Optimizations,Memory technology and optimizations, Protection:Virtual memory and virtual machines, Exploiting Instruction-Level Parallelism Statically, The Intel IA-64 Architecture and Itanium Processor

Text Books:

1. **Computer Architecture, A Quantitative Approach –** John L. Hennessey and David A. Patterson:, 5th Edition.
2. **UNIX – Concepts and Applications** -Sumitabha Das, 4th Edition, Tata McGraw Hill.

Reference Books:

1. **UNIX and Shell Programming** Behrouz A. Forouzan and Richard F. Gilberg:, Cengage Learning
2. **Advanced Computer Architecture Parallelism, Scalability** – Kai Hwang:, Programability, Tata Mc Grawhill

BTEC15F7540	**Pervasive and Ubiquitous Computing**	L	T	P	C
Duration :14Wks		3	0	0	3

Prerequisites:

Basics of computing and networking

Course Objectives:

The objectives of this course are to:

1. To Provide a sound conceptual foundation in the area of Pervasive Computing aspects;
2. To Provide a balanced treatment of the mechanisms and environments of ubiquitous computing;
3. To give an insight into successful mobile and pervasive computing applications and services.
4. To Provide an insight into characteristics of Explicit and Implicit Human-Computer Interface (HCI)
5. To Introduce to the architectures of Intelligent Systems.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Describe the Smart Device, Environment and Interfaces (DEI) model of Ubiquitous Computing Systems. (b, d, f)
2. Identify various devices used in Human Computer Interaction. (b, e)
3. Compare the usability of alternative design of interactions for specific ubiquitous computing systems. (a, b)
4. Describe the role of Sensors and MEMS in development of Context Aware Systems. (b,d,f)
5. Design and implement simple context aware applications, using standard sensor technology. (b, d, f)
6. Differentiate various Intelligent System (b. e)

Course Contents:

Unit-1: Ubiquitous Computing [10]

Basics and Vision - Living in a Digital World, Modeling the Key Ubiquitous Computing Properties, Architectural Design for UbiCom Systems: Smart DEI Model; Applications and Requirements - Example Early UbiCom Research Projects

Unit-2:Human Computer Interaction [11]

Introduction, User Interfaces and Interaction for Four Widely Used Devices, Hidden UI Via Basic Smart Devices, Hidden UI Via Wearable and Implanted Devices, Human-Centred Design (HCD), User Models: Acquisition and Representation, iHCI Design

Unit-3: Tagging, Sensing and Controlling [11]

Introduction, Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real-Time Systems, Control Systems (for Physical World Tasks), Robots.

Unit-4: Intelligent Systems (IS) [10]

Introduction, Basic Concepts, IS Architectures; Ubiquitous Communication – Introduction, Audio Networks, Data Networks, Wireless Data Networks, Ubiquitous Networks, Service-Oriented Networks.

Text Books:

1. Stefan Poslad, "**Ubiquitous Computing Smart Devices, Environments and Interactions"**, Wiley, 2009
2. Ed. John Krumm. Chapman, "**Ubiquitous Computing Fundamentals"** Hall/CRC 2009.

Reference books

1. Burkhardt, Henn, Hepper, Rintdorff, Schaeck. "**Pervasive Computing"**, 2002, Addison Wesley.
2. **Ambient intelligence, wireless networking, and ubiquitous computing**. Artech House, Boston : 2006.

BTEC15F7700	**Computer Communication Networks Lab**	L	T	P	C
Duration :14Wks		0	0	2	2

Prerequisites:

C/C++ programming, Network configurations, Network Parameters, Transmission characteristics.

Course Objectives

The objectives of this course are to:

1. Introduce the open source network simulators.
2. Discuss the Network topologies, Point to point Network on NS platform.
3. Conceptualize the Transport Protocols (TCP/UDP),SMTP, SNMP, FTP, HTTP, TELNET, HTML etc.
4. Discuss the C/C++ Programming
5. Conceptualize the factors such as security, error detection & correction methods of data.
6. Discuss the data transmissionand loss of data packets in a network.

Course Outcomes

After completion of this course, the students would be able to,

1. Generalise the open source network simulator on windows/Linux platform.(a,g)
2. Construct a network model for given configurations and establish a reliable connection by varying their factors such as transmission speeds (bandwidth), bit rate etc.(a,b,e,g)
3. Apply relevant application to a network that makes a network more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.(a,b,e,g)
4. Generalise the C/C++ Programming on windows/Linux platform. .(a,g)
5. Apply various Encryption/Decryption techniques,Error detection & correction methods for given message data to establish a reliable data transmission. (a,b,e,g)
6. Demonstrate working principle of various shortest path algorithms. (a,b,e,g)

Course Contents:

PART A – Simulation Exercises

1. Create a three node network topology and connect the duplex links between them.
2. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3, n1-n3. Apply relevant applications over TCP agents by changing the parameters and hence determine the number of packets transmitted.
3. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply UDP agent between n0-n3, n1-n3. Apply relevant applications over UDP agents by changing the parameters and hence determine the number of packets transmitted.
4. Simulate a three nodes point-to-point network and connect the duplex links between them. Set the queue size, vary the transmission speeds (bandwidth)and find the number of packets dropped.
5. Simulate an Ethernet LAN using N-nodes (6-10) with UDP/TCP connection. Apply relevant applications over UDP/TCP agents by changing the parameters and hence determine the number of packets transmitted.

PART B

The following experiments shall be conducted using C/C++.

1. Write a program for bit stuffing & de-stuffing using HDLC
2. Write a program for character stuffing & de-stuffing using HDLC
3. Perform the Encryption and decryption of a given message using substitution method
4. Perform the Encryption and decryption of a given message using transposition method
5. Write a program for error detecting code using CRC-CCITT (16-bits).
6. Write a program to find minimum spanning tree of a subset
7. Write a program tofind the shortest path for a given network.

Simulator: Any of the following simulators can be used.

1. NS2 Simulator (http://www.isi.edu/nsnam/ns/)
2. NS3 Simulator (https://www.nsnam.org/)
3. NCTUns (http://csie.nqu.edu.tw/smallko/nctuns/nctuns.htm)
4. BOSON simulator (http://www.boson.com/)

BTEC15F7800	**Embedded System Design Lab**	L	T	P	C
Duration :14Wks		0	0	2	2

Prerequisites

Embedded System Design theoretical aspects
Microcontroller & C language programming skills

Course Objectives

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

1. To understand and implement the concepts of embedded system

2. To write the programs on threads, process individually and execute them.

Course Outcomes

After completion of the course a student will be able to:

1. To understand the firmware system development and firmware development languages.(a,b,e,g)
2. Give a brief description of RTOS, Integrated Development Environment, Simulators and Emulators(a,b,e,g,k)
3. To understand the trends in embedded system development(a,b,e,g,k)

Course Content

Program 1: Write a program for Thread Creation and Termination

Program 2: Create independent threads each of which will execute some function and wait till threads are complete before main continues. Unless we wait run the risk of executing an exit which will terminate the process and all threads before the threads have completed.

Program 3: Create the N number of threads and find the how many threads are executed.

Program 4: Create threads numbers 1-3 and 8-10 as permitted by functionCount1 and create threads number 4-7 as permitted by functionCount2 and print final count value.

Program 5: Design develop and execute a program using any thread library to create the number of thread specified by the user, each thread independently generates a random integer as an upper limit and then computes and prints the number of primes less than or equal to that upper limit, along with that upper limit.

Program 6: Rewrite above program (Program 5) such that the processes instead of thread are created and the number of child processes created is fixed as two. The program should make use of kernel timer to measure and print the real time, processor time, User space time and kernel space time for each process.

Program 7: Design, develop and implement a process with a producer thread and a consumer thread which make use of a bounded buffer (Size can be prefixed at suitable value) for communication. Use any suitable synchronization construct.

Program 8: Design develop and excute a program to solve a system of n liner equations using successive over-relaxation method and n processes which use shared memory API

NOTE: Mini project using any embedded controller

REFERENCE BOOKS:

1. Jonathan W. Valvano, “Embedded Microcomputer Systems: Real Time Interfacing” Thomson
2. David E Simon, “An Embedded Software Primer”

Open Electives

BTEC15F7610	**Robotics and Automation**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Microcontrollers, Programming skills and Mathematics fundamentals

Course Objectives

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

1. Classify Robots and anatomy.
2. Actuators and Kinematics.
3. Sensors and vision systems used in robots.
4. Robot Programming.

Course Outcomes

After completion of the course a student will be able to:

1. Summarize the basic applications and advantages of using robots in the industry.(a,b,c,d)
2. Do the robot motion analysis. (a,b,c)
3. Relate mathematical modeling in robots. .(a,b,c,d)
4. Recognize the different types of sensors and cameras used in the field of robotics. .(a,b,c,d)
5. Write robot programs (a,b,c,d,e,.f)

Course Content

Unit-1: Introduction of Robotics [11]

Introduction–Robot Anatomy– Common robot configurations, robot motions, Work Volume Robot drive systems, Control systems and Dynamic performance, Precision, end effectors, Basic control system concepts and models Robot Applications:- Manufacturing Industry, Agricultural, Medical, Military, Space exploration.

Unit- 2: Sensors [10]

Sensor characteristics, Position sensors- potentiometers, Encoders, LVDT, Resolvers, Displacement sensor, Velocity sensor-encoders, tachometers, Acceleration sensors, Force and Pressure sensors piezoelectric, force sensing resistor, Torque sensors, Touch and tactile sensor, Proximity sensors-magnetic, optical, ultrasonic, inductive, capacitive, eddy-current proximity sensors. Machine Vision

systems : Introduction – Image processing Vs image analysis, image Acquisition, digital Images – Sampling and Quantization – Image definition, levels of Computation.

Unit- 3: Actuators and Kinematics [11]

Comparison of hydraulic, electric, pneumatic actuators, Hydraulic actuators, Electric motors: DC motors, Reversible AC motors, Brushless DC motors, Stepper motors- structure and principle of operation, stepper motor speed-torque characteristics. Rotation and Translation of robotics, Euler angle representation for xyz frames. Homogeneous Transformations.

Unit- 4 : Robot Programming [10]

Methods of Robot programming, A robot program as a path in space, methods of defining positions in space, motion interpolation, wait, signal and delay commands, branching, Robotic languages, constants variables and other data objects, motion command send effectors and sensor commands, program control and subroutines

TEXT BOOK:

1. Mikell P Groover, Mitchell Weiss, Roger N. Nagel and Nicholas G. Oderey, **" Indutrial Robotics**", Technology, programming and Apllications, Mc Graw Hill, USA 1986.
2. James G. Keramas,"**Robot Technology Fundamentals**" Cengage Learning, 1999

REFERENCE BOOKS:

1. Fu K. S., Gonzelez R. C., Lee C. S. G.,"**Robotics: Control, Sensing, Vision, Intelligence**" , McGraw Hill Book Co., International edition, 2008.
2. YoremKoren, **"Robotics for Engineers**",McGraw-Hill Publication, International edition, 1987
3. Craig, J. J.,"**Introduction to Robotics: Mechanics and Control**", Pearson Prentice-Hall Publications, 3rd edition, 2005.
4. Schilling R. J."**Fundamentals of Robotics, Analysis and Control**",, Prentice-Hall Publications, Eastern Economy edition, 2007
5. AppuKuttan K. K.,"**Robotics**" I.K. International Publications, First Edition, 2007
6. R. K. Mittal, I. J. Nagrath,"**Robotics and Control**" Tata-McGraw-Hill Publications, 2007.

BTEC15F7620	**Neural Networks and Fuzzy logic**	L	T	P	C
Duration :16 Wks		3	1	0	4

Prerequisites

Set theory, Calculus, Boolean algebra, Linear Algebra.

Course Objectives

1. To introduce the basics of Neural Networks and essentials of Artificial Neural Networks
2. To illustrate the essentials of Single Layer and Multilayer Feed Forward Networks and to deal

with Associate Memories and algorithms.
3. To introduce Fuzzy sets and Fuzzy Logic system components.
4. To discuss Neural Network and Fuzzy Network system applications to Electrical, Electronics and Communication Engineering .

Course Outcomes

After completion of this course, the students shall be able to

1. Describe the basic concepts of neural networks in terms of various models.(a,b,c)
2. Understand neuron activation functions and neuron dynamics and learning rules.(a,b,c,d)
3. Demonstrate various perceptron models in single layer and multilayer feed forward neural networks.(a,b,c,d)
4. Illustrate associative memory learning algorithms.(a,b,c,d)

Course Content

Unit – I: Introduction to Artificial Neural Networks [11 Hrs]

Introduction, Humans and Computers, Organization of the Brain, Historical Development of Neural Networks, Biological Neural Networks, Comparison between Brain and Computer. Comparison between Artificial and Biological Neural Network. Basic building Blocks of ANN: Network Architecture, Setting the weights, Activation Function. ANN Terminologies.

Fundamentals Models of ANN: Introduction, McCulloch-Pitts Neuron Model, Learning Rules, Hebbian Learning Rule, Perceptron Learning rule, Delta Learning Rule, Boltzman Learning, Memory based Learning.

Unit–II: Perceptron Networks and Associative Memory Networks [10 Hrs]

Perceptron Networks: Introduction, Single Layer Perceptron: Architecture, Algorithm, Application Procedure, Perception Algorithm for several Output Classes. Multi layer perceptron to solve EXOR

Associative Memory Networks: Introduction, Algorithms for Pattern Association: Hebb rule for Pattern Association, Delta Rule for Pattern Association, Extended Delta Rule. Hetero Associative Memory Neural Networks: Architecture, Application Algorithm.

UNIT III: Back Propagation Network and Applications of Neural Networks [11 Hrs]

Introduction, Back Propagation Network (BPN): Generalized Delta Learning Rule, Architecture, Training algorithm, Selection Parameters, Learning in Back Propagation, Application Algorithm, Local Minima and Global Minima. Merits and Demerits of BPN Applications: Any Two applications of Neural network applications such as a non linear mathematical expression, Pattern Recognition,fault diagnosis and Mackey Glass time series.

Unit – IV: Introduction to Fuzzy Sets and Systems [10 Hrs]

Classical & Fuzzy Sets Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH

References books:

1. S.N. Sivanandam, S.N.Deepa,"Principles of Soft Computing", Wiley India Edition,2010

BTEC15F7630	**MEMS**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Engineering Physics, Upper Division standing in Engineering, Chemistry or Chemical Engineering and Material Science, VLSI Technology, Elements of Mechanical Engineering.

Course Objectives

1. Introduce the basic three pillars of MEMS Design, Fabrication and Materials.
2. To introduce different materials used for MEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
4. Highlight the various electrical and mechanical concepts with regards to MEMS arena.
5. Demonstrate the various fabrication and micro machining techniques.
6. Recognize the basic operation principles Optical Lithography, Electron Lithography, X-Ray Lithography, Ion Lithography, Plasma properties.
7. Understand Etch mechanism, reactive Plasma Etching techniques and Equipment.
8. To introduce various sensors and actuators.

Course Outcomes

On completion of this course the student will be able to:

1. Differentiate between micro systems, MEMS and NEMS.(a,b,c,d,e,f)

2. Assess the various electro-mechanical properties of materials used for MEMS design. .(a,b,c,d,e,f)
3. Describe the various steps involved in the MEMS fabrication. .(a,b,c,d,e,f)
4. Understand the chemical and physical vapor processes; heteroepitaxy and defects; substrates and substrate engineering. .(a,b,c,d,e,f)
5. Convey knowledge of advanced concepts of lithography and etching. .(a,b,c,d,e,f)
6. Understand electrostatic, thermal, piezoelectric and magnetic actuators at micro scale.
7. Understand the applications of MEMS. .(a,b,c,d,e,f)
8. Understand device fabrication fundamentals: diffusion, ion implantation.(a,b,c,d,e,f)
9. Understand the concept of design of metallization. .(a,b,c,d,e,f)

Course Content

Unit-1: Introduction to MEMS [11]

Overview of MEMS and Microsystems: What are MEMS, Why MEMS, Microsystems versus MEMS, Why Miniaturization?, Microsystems versus MEMS, Why microfabrication? Smart Materials, Structures and systems, Integrated Microsystems, Typical MEMS and Microsystem Products, The Multidisciplinary nature of Microsystem design and manufacture, Applications of smart Materials and Micro Systems.

Materials for MEMS: Silicon compatible material System-Silicon, Czochralski Crystal Growing, Silicon oxide and Nitride, Thin metal Films, Polymers, Other material and substrates, Important materials properties and Physical effects.

Unit-2: Microsystems Fabrication Process: [10]

Introduction, Photolithography, Ion-implantation, diffusion, oxidation, CVD, PVD, etching and materials used for MEMS, Some MEMS fabrication processes: surface micro-machining, bulk micromachining, LIGA process, LASER micro machining, MUMPS, FAB-less fabrication.

Unit-3: Microsystems Design and Packaging: [11]

Assembly, Packaging, and Testing (APT) of Microsystems, Microsystem Packaging, overview of Mechanical Packaging of Microelectronics, interfaces in Microsystem Packaging, Essential Packaging Technologies, Three Dimensional Packaging, Assembly of Microsystems, Selection of Packaging Materials.

Unit-4: Applications: [10]

Case studies – silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conduct metric gas sensor, silicon micro-mirror arrays, piezo-electric based inkjet print head, electrostatic comb-drive and magnetic micro relay, portable clinical analyzer, active noise control in a helicopter cabin.

Text Books:

1. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat, V.K. Aatre, "**Micro and Smart Systems**", Wiley India, 2010.
2. Chang Liu, "**Foundation of MEMS**" Pearson Education International, 2006.
3. Tai Ran Hsu, "**MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering**, Wiley, 2008.
4. Nadim Maluf, Kirt Williams "**An Introduction to Microelectromechanical Systems Engineering"** Second addition.
5. Adams, Thomas M., Layton, Richard A. "**Introductory MEMS- Fabrication and Applications**" Springer, 2010.

Detailed Syllabus

Semester VIII

BTEC15F8100	**Wireless Communication and Networking**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Fourier analysis, Linear Systems, Probability Theory, Introductory Modulation and Antenna Theory

Course Objectives

The student should be made to:

1. Know the characteristic of wireless channel
2. Understand the concepts behind various digital signaling schemes for fading channels
3. Understand the various multipath mitigation techniques
4. Understand Wireless Networks
5. Understand Wireless LAN and Bluetooth Technology

Course Outcomes

On completion of this course the student will be able to:

1. Characterize wireless channels (a, b)
2. Design and implement various signaling schemes for fading channels (a, b, d, e)
3. Compare multipath mitigation techniques and analyze their performance (a, b, d)
4. Compare various types of wireless networks (a, b, d)
5.

Course Content

Unit- 1: Wireless Channels [11]

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

Unit-2: Multipath Mitigation Techniques [10]

Equalization – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

Unit-3: Satellite Networks and Wireless Application Protocol [11]

Satellite networks: Satellite parameters and configuration, Capacity allocation, Wireless system operations and standards: Cordless systems, Wireless local loop, Mobile IP and Wireless Application Protocol: Mobile IP, Wireless Application Protocol

Unit- 4:Wireless LAN and Bluetooth Technology [10]

Wireless LAN Technology: Infrared LANs, spread spectrum LANs, Narrowband Microwave LANs, Wi-Fi- and the IEEE 802.11 Wireless LAN standard: IEEE 802 architecture, IEEE 802.11 Architecture and services, Medium access control, Physical layer, other IEEE 802 standards, Wi-Fi protected access, Bluetooth and IEEE 802.15: Radio specification, Baseband specification, Link manager specification

Text Books:

1. Rappaport,T.S**., "Wireless communications",** Second Edition, Pearson Education, 2010**.**
2. Andreas.F. Molisch**, "Wireless Communications",** John Wiley – India, 2006**.**
3. William Stallings**, "Wireless Communication and Networks",** Second Edition, Pearson, 2013.

References:

1. David Tse and Pramod Viswanath**, "Fundamentals of Wireless Communication",** Cambridge University Press, 2005.
2. Behrouz A. Forouzan**, " Data Communication and Networking",** McGraw- Hill Higher Education, Second edition, 2000.

SC-7

BTEC15F8210	**Mobile Adhoc and Sensor Networks**	L	T	P	C
Duration :14 Wks.		3	1	0	4

Prerequisites:

Wireless communication, computer network, data communication

Course Objective:

The student should be made to:

1. Know the characteristic of Adhoc networks
2. Understand the concepts routing protocols
3. Understand the security issues in Adhoc networks
4. Understand MAC protocols for Sensor Networks

Course Outcomes:

On successful completion of this course, the student should be able to:

1. Characterize Adhoc Networks (a, b)
2. Explain the concepts of Adhoc networks and sensor networks (a, b)
3. Compare routing protocols of Adhoc networks (a, b, d)
4. Compare various data dissemination methods (a, b, d)

Course Content

Unit-1: Adhoc Networks [11]

Ad Hoc Networks: Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless internet. 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.

Unit-2: Routing Protocols for Ad Hoc Wireless Networks [10]

Routing Protocols For Ad Hoc Wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Table drive routing protocol, On-demand routing protocol.

Security: Security in wireless Ad hoc wireless Networks, Network security requirements, Issues & challenges in security provisioning.

Unit- 3: Sensor networks [10]

Sensor networks: Applications, Comparison with Adhoc Wireless Networks, Sensor network architecture: Layered and clustered architecture, Data dissemination, Data gathering: Power efficient gathering,

Unit-4 : MAC protocols for Sensor Networks [11]

MAC protocols for Sensor Networks: Self organizing MAC, Hybrid TDMA/FDMA, and CSMA based MAC protocols, Location Discovery: Indoor localization, Sensor network localization, Quality of Sensor Networks: Coverage and exposure, Evolving standards and other issues

Text Book

1. C. Siva Ram Murthy, B.S. Manoj, **"Ad Hoc Wireless Networks: Architectures and Protocols",** Pearson Education, 2004

Reference Books

1. HoudaLabiod , **"Wireless Ad Hoc and Sensor Networks",** John Wiley & Sons, 2010
2. PrasantMohapatra, Srikanth Krishnamurthy, **"Ad-Hoc Networks: Technologies and Protocols"** Springer Science & Business Media, 2006

BTEC15F8220	Real Time DSP	L	T	P	C
Duration :14 Wks.		3	1	0	4

Prerequisites:

Signals & Systems, Digital Signal Processing.

Course Objective:

1. Explain and give Overview of Real-time and Embedded Systems.
2. Discuss the embedded system lifecycle using DSP.
3. Summarize FPGA solutions.
4. Compare Programmable DSP Architectures.
5. Design of FPGA in Wireless Communications Applications.
6. Discuss the DSP Hardware/Software Continuum.

Course Outcomes:

7. Describe and give a overview of DSP Algorithms.(a,b,c)
8. Classify High-level Design Tools for Complex DSP Applications.(b,c,e)
9. Analyze Optimizing DSP Software e High-level Languages and Programming Models.(e,f)
10. Categorise Optimizing DSP Software e Code Optimization.(e,f)
11. Ascertain Software Optimization for Power Consumption.(b,f)
12. Summarize DSP Operating Systems.(e,f)
13. Interpret Managing the DSP Software Development Effort.(e,g)
14. Recall Multicore Software Development for DSP Developing and Debugging a DSP Application.(e,f)

Course Content

Unit-1: Introduction to TMS320C55x Digital Signal Processor: [11]

Introduction to RTDSP: Basic elements of Real-Time DSP systems, Input & output channels, DSP Hardware, DSP system design.

Introduction to TMS320C55x Digital Signal Processor: TMS320C55x Architecture, TMS320C55x Addressing Modes, TMS320C55x Instruction Set.

Unit-2: DSP fundamentals & Implementation Considerations [10]

Digital Signals and Systems, Introduction to Digital filters, Fixed-Point Representation & Arithmetic, Quantization Errors, Overflow and Solutions, Implementation procedure for Real-time applications, Program Examples.

Unit-3: Fast Fourier Transform & Implementation [11]

Discrete Fourier Transform, Fast Fourier Transform, Applications, Implementation considerations, Experiments using TMS320C55x & program examples.

Unit-4 : Design and Implementation of FIR Filter [10]

Introduction to FIR Filters, Design of FIR Filter, Implementation Considerations, Applications: Interpolation and Decimation Filters, Experiments and Program Examples.

Text Books:

1. Sen M. Kuo, Bob H. Lee, **"Real-Time Digital Signal Processing"**: Implementation, Applications and Experiments with TMS320C55x"- John Wiley& sons (2006).
2. John H. Karl, **"An Introduction to Digital Signal Processing",** Academic Press, 1989.

Reference Books:

1. Tolimieri R., An M., Lu C, "Algorithms for discrete Fourier transform and convolution", 2nd edition, Springer 1997.
2. Dimitris G. Manolakis, Vinay K. Ingle, "Applied Digital Signal Processing": Theory and Practice" Cambridge University Press, 2011

BTEC15F8230	**MEMS Technology**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Engineering Physics. VLSI Technology, Chemistry or Chemical Engineering and Material Science, Elements of Mechanical Engineering.

Course Objectives

1. Introduce the basic three pillars of MEMS Design, Fabrication and Materials.
2. To introduce different materials used for MEMS.
3. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices
4. Highlight the various electrical and mechanical concepts with regards to MEMS arena.
5. Demonstrate the various fabrication and micro machining techniques.
6. Recognize the basic operation principles Optical Lithography, Electron Lithography, X-Ray Lithography, Ion Lithography, Plasma properties.
7. Understand Etch mechanism, reactive Plasma Etching techniques and Equipment.

Course Outcomes

On completion of this course the student will be able to:

1. Differentiate between micro systems, MEMS and NEMS(a,b,c,d).
2. Assess the various electro-mechanical properties of materials used for MEMS design.(a,b,c)
3. Describe the various steps involved in the MEMS fabrication(a,b,c).
4. Understand the chemical and physical vapor processes; heteroepitaxy and defects; substrates and substrate engineering.(a,b,c,d)
5. Convey knowledge of advanced concepts of lithography and etching.(a,b,c,d)
6. Understand device fabrication fundamentals: diffusion, ion implantation(a,b,c)
7. Understand the concept of design of metallization.(a,b,c,d)

Course Content

Unit-1: Introduction to MEMS [11]

Overview of MEMS and Microsystems: What are MEMS, Why MEMS, Microsystems versus MEMS, Why Miniaturization?, Microsystems versus MEMS, Why microfabrication? Smart Materials, Structures and systems, Integrated Microsystems, Typical MEMS and Microsystem Products, The Multidisciplinary nature of Microsystem design and manufacture, Applications of smart Materials and Micro Systems.

Materials for MEMS: Silicon compatible material System-Silicon, Silicon oxide and Nitride, Thin metal Films, Polymers, Other material and substrates, Important materials properties and Physical effects.

Unit-2: Crystal Growth and Wafer Preparation: [10]

Introduction, Electronic-Grade Silicon, Czochralski Crystal Growing, Silicon Shaping, Process Considerations.

Epitaxy: Introduction, Vapour-Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.
Lithography: Introduction, Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography.

Unit-3: Microsystems Fabrication Process: [10]

Introduction, Photolithography, Ion-implantation, diffusion, oxidation, CVD, PVD, etching and materials used for MEMS, Some MEMS fabrication processes: surface micro-machining, bulk micromachining, LIGA process, LASER micro machining, MUMPS, FAB-less fabrication.

Unit-4: Microsystems Design and Packaging: [11]

Microsystem Packaging, overview of Mechanical Packaging of Microelectronics, interfaces in Microsystem Packaging, Essential Packaging Technologies, Three Dimensional Packaging, Assembly of Microsystems, Selection of Packaging Materials.
VLSI Process Integration: Introduction, Fundamental Considerations for IC Processing, NMOS IC technology, CMOS IC Technology, MOS Memory IC Technology, Bipolar IC Technology, IC Fabrication.

Text Books:

1. S. M. Sze, **"VLSI Technology",** *McGraw-Hill, Second Edition.*
2. G.K. Ananthasuresh, K.J. Vinoy, S. Gopalakrishnan, K.N. Bhat, V.K. Aatre, "**Micro and Smart Systems**", *Wiley India, 2010.*
3. Chang Liu, "**Foundation of MEMS***" Pearson Education International, 2006.*
4. Tai Ran Hsu, "**MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering**, *Wiley, 2008*.
5. *Adams, Thomas M.*, Layton, Richard A. "**Introductory MEMS- Fabrication and Applications**" *Springer, 2010.*

BTEC15F8240	**Device Driver Programming**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisites

Operating system , Embedded system

Course Objectives:

1. Understand the essentials of Linux device drivers.
2. Know practical experience in developing Linux device drivers.
3. Understand and develop device drivers for character devices, block devices and network devices.

Course Outcomes:

On completion of this course the students will be able to:

1. Design and describe the embedded Linux Kernel, Device Driver and Device Driver Modules.(a, c, f)
2. Innovate design, analysis and Implementation to hardware interfacing of embedded systems for Linux or Android platforms will be discussed.(b, d, f)
3. Implement race condition and concurrent programming. (c,e,f)

Course Content

Unit-1: Introduction [11]

Linux essentials, Building the Kernel, Loadable Modules, Kernel Mode and User Mode, Process Context and Interrupt Context, Kernel Timers, Concurrency in the Kernel, Process Filesystem, Allocating Memory, Kernel Threads, Introducing Devices and Drivers, Interrupt Handling, The Linux Device Model, Memory Barriers

Unit-2: Character Drivers [10]

Character Drivers ; Char Driver Basics, Device Example: System CMOS, Sensing Data Availability, Talking to the Parallel Port, RTC Subsystem, Pseudo Char Drivers, Misc Drivers, Character Caveats

Unit 3: Communication Interface Drivers [10]

Serial Drivers, UART Drivers, TTY Drivers, Input Drivers, Input Event Drivers, Input Device Drivers, Universal Serial Bus, USB Architecture ,Linux-USB Subsystem, Driver Data Structures, Enumeration Device Example: Telemetry Card, Class Drivers, Gadget Drivers, Debugging Video Drivers, audio drivers.

Unit 4: Block Drivers [11]

Network driver: Ethernet, Asynchronous Transfer Mode, Network Throughput, Debugging Device Drivers ,Kernel Debuggers, Kernel Probes ,Kexec and Kdump, Profiling, Tracing

Text book:

1. SreekrishnanVenkateshwaran, "**Essential Linux Device Driver**", Prentice Hall, 2008.

Reference Books:

1. Jonathan Corbet, Alessandro Rubini and Greg Kroah-Hatman, "**Linux Device Drivers**", 3rd edition. Oreilly, 2005.
2. Robert Love, "**Linux system Programming- Talking directly to the kernel and C Library**", O'Reilly Media, Sept 2007.
3. Daniel P. Bovet and Marco Cessti, "**Understanding the Linux Kernal**", 3rd Edition. Oreilly, 2000.

BTEC15F8250	**Grid Computing**	L	T	P	C
Duration :14Wks		3	1	0	4

Prerequisites

Programming with C C++, JAVA, DBMS, OS

Course Objectives:

The objectives of this course are to:

1. Be providing with an overview of the basic concepts of Grid Computing.
2. Provide an understanding of the need for and evolution of Grids in the context of processor- and data-intensive applications;
3. Become familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Design and implement Grid computing applications using Globus or similar toolkits. (a, b)
2. Justify the applicability, or non-applicability, of Grid technologies for a specific application. (a)
3. Explain programming toolkits such as Parallel Virtual Machine and Message Passing. (b, d)

Course Contents:

Unit-1: Overview of Grid Computing [11]

Introduction and Architecture: Introduction – Past; Present and Future Applications of grid computing organizations and their roles; Grid Computing anatomy ; Next generation of Grid computing initiatives; Merging the Grid services architecture with Web services architecture

Unit-2: Grid Computing Technologies [10]

OGSA; Sample use cases that drive the OGSA platform components; OGSA Basic Services – Security standards for grid computing

Unit-3: Grid Computing Tool Kit [10]

Globus Toolkit; Versions; Architecture; High Level Grid Services

Unit-4: Interface Standards [11]

Message Passing Interface (MPI) Standard: Overview;Procedures and Arguments;Data Types, Processes;Error Handling;Platform independence; Point-to-Point Communication; Collective Communication, Groups ;Contexts Communicators;

Text Books:

1. Joshy Joseph and Craig Fellenstein, "**Grid Computing**," Pearson/PHI PTR, 2003.
2. Fran Berman, Geoffrey Fox and Anthony J. G. Hey, "**Grid Computing: Making the Global Infrastructure a reality,"** John Wiley & Sons, 2003.

Reference Books:

1. Ahmar Abbas, "**Grid Computing: A Practical Guide to Technology and Applications,"** Charles River media, 2003.
2. J. Joseph, C. Fellenstein, **"Grid Computing***"*, Pearson Education, 2004.
3. V. Silva, **"Grid Computing for Developers***"*, Dreamtech Press, 2006.

BTEC15F8260	**Multimedia Communications and Networking**	L	T	P	C
Duration :14 Wks		3	1	0	4

Prerequisite:

Signal representation, Quantization techniques, Coding theory, OSI Reference model

Course Objectives:

1. To provide an understanding of impact of multimedia techniques in the day to day life.
2. To provide an understanding of various representations of graphics, image & video.
3. To provide an understanding of the total processing, storing and communication of multimedia data.
4. To provide a comprehensive understanding of multimedia communication over wireless networks.

Course Outcomes:

On completion of this course, the student shall be able to:

1. Understand the different representations of graphics, image and vide data types in multimedia. (a, e,k)
2. Compare the various industry standard compression techniques for digital audio. (g)
3. Understand the processing and storage techniques for video.(k,)
4. Compare various industry standard compression techniques for effective bandwidth utilization of the media and also storage capacity. (d, e)
5. Determine impact of multimedia communication techniques in the wireless networks. (h, I, j, k)

Course Contents:

Unit-1:Graphics, Image & Video Representation [11]

Graphics/Image data types, popular file formats, Color science – camera systems, XYZ to RGB transform, Color models in video, Fundamental concepts in video

Unit-2: Digital Audio & Compression Algorithms [10]

Digitization of sound, MIDI, Quantization & transmission of audio

Lossless compression: Basics of information theory, RLC, VLC – Shannon Fano, Huffman, LZW, Arithmetic Coding

Lossy compression: Distortion measures, rate distortion theory, quantization, transform coding.

Unit-3: JPEG & MPEG [11]

JPEG Standard, Video compression based on motion compensation, Search for motion vectors, H.261, H.263, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21

Unit-4: Multimedia Communication [10]

Quality of multimedia transmission, Multimedia over IP, Media on demand, Multimedia over wireless network, C-Bird Case Study

Text Book:

1.Ze-Nian Li, Mark S. Drew, **"Fundamentals of Multimedia**", Pearson Education, 2008

Reference Book:

1. Ralf Steinmetz, KlaraNahrstedt, "**Multimedia – Computing, Communications & Applications",** Pearson Education, 2004

SC-8

BTEC15F8310	**Analog and Mixed Mode VLSI**	L	T	P	C
Duration:14Wks		3	0	0	3

Prerequisites:

Analog Electronic Circuit Design, Digital Electronic Circuit Design, CMOSVLSI

Course Objectives:

1. Introduce the concept of analog and digital discrete signals.
2. Provide specifications of data converters.
3. Highlight the DAC and ADC architectures.
4. Introduce non linear analog circuits like comparators, and analog multipliers.
5. Demonstrate the sub micron CMOS process flow.
6. Present capacitors, resistors and switches using MOSFETs.

Course Outcomes:

On completion of this course the student will be able to:

1. Describe sample and hold circuits. (a, b, c, d, e)
2. Compare analog and digital signals. (a, b, c, d, e)
3. List DAC and ADC specifications. (a, b, c, d, e)
4. Design R-2R ladder for given specifications. (a, b, c, d, e, f)
5. Differentiate Current Steering and charge scaling DACs and SAR ADC. (a, b, c, d, e)
6. Analyze analog multipliers. (a, b, c, d, e, f)
7. Assess the different MOSFET biasing circuits. (a, b, c, d, e, f,)

Course Contents:

Unit-1: Data Converter Fundamentals [11]

Data converter fundamentals: Introduction to Analog design,Analog versus Digital, Discrete Time Signals, Converting Analog Signals to Data Signals, Front end signal conditioner circuit, Sample and Hold Characteristics, DAC Specifications, ADC Specifications, Mixed-Signal Layout Issues.

Unit-2:Data Converter Architectures [10]

DAC Architectures, Digital Input Code, Resistors String, R-2R Ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC. ADC Architectures, Flash, 2-Step Flash ADC, Pipeline ADC, Integrating ADC, Successive Approximation ADC.

Unit-3: Non Linear Analog Circuits [11]

Basic CMOS Comparator Design (Including characterization), Analog Multipliers, Multiplying Quad (excluding stimulation), Level Shifting (excluding input level shifting for multiplier). Op-Amp Design (Including noise circuits).

Unit-4: Sub-Micron CMOS Circuit Design [10]

Process Flow,Introduction to triple gate MOSFETs, Capacitors and Resistors, MOSFET Switch (upto Bidirectional Switches), Delay and adder Elements, Analog Circuits, MOSFET Biasing (upto MOSFET Transition Frequency).

Text Books:

1. R. Jacob Baker, Harry W Li, David E Boyce, "**Design, Layout, Stimulation, CMOS Circuit"**, *PHI Education, 2005*.
2. R. Jacob Baker**, "CMOS- Mixed Signal Circuit Design**",*(Vol II of CMOS: Circuit Design, Layout and Stimulation), John Wiley India Pvt. Ltd, 2008.*

References:

1. B Razavi**, "Design of Analog CMOS Integrated Circuits**", First Edition, *McGraw Hill,2001*.
2. Phillip. E. Allen and D R Holberg, "**CMOS Analog Circuit Design**", *2nd Edition, Oxford University Press,2002.*
3. Gray, Meyer, Lewis and Hurst "**Analysis and design of Analog Integrated Circuits**", *4th Edition Willey International, 2002*

BTEC15F8320	**Digital Audio and Video Broadcasting Systems**	L	T	P	C
Duration:14Wks		3	0	0	3

Prerequisites:

Knowledge of computer networks. Network protocol, Probability and Random Process

Course Objective:

1. To understand the benefits of simulation and modeling in a range of important application areas.
2. To study simulation software to understand event –scheduling, Time-advance algorithm in computer networks.
3. To study the Essentials of Probability and Random Process
4. To understand Discrete Event Stochastic Models and **Queuing Models**
5. To learn the concepts of simulation for the various layers.

Course Outcomes:

On completion of this course the student will be able to:

1. Analyze the concepts of simulation for systems. (a,b,c)

2. Describe the role of important elements of simulation and modeling paradigm.(a,c,f)
3. Apply the mathematical techniques to model and analyze structural and dynamical properties of Discrete-Event systems.(a,b,c,e)
4. Describe Output analysis for discrete-event simulation algorithms. (a,b,c,d)
5. Implement and apply simulation on various layers for Optimization(a,d,f)

Course Contents:

Unit-1: Introduction of Digital Multimedia [11]

Picture-Video-Television Transmission Standards, Analog Signal Formats-Digital Video Formats-Video Bit rate Reduction-Compression Standards-Compression MPEG

Unit-2: Audio and Video systems [10]

Audio-Speech/Sound Encoding-Audio Compression Techniques-Audio File standards-Video File Formats—H.264/ (MPEG-$ PART-10)

Unit-3: Mobile TV [11]

Mobile TV-What is Mobile TV-Difference between Terrestrial and Satellite TV-Standards for mobile TV-Resources for Delivering Mobile TV-New Growth Ares of Mobile TV

Unit-4: Technologies for Mobile TV [10]

Requirements for mobile TV-Mobile TV on Cellular Networks-Digital V Broadcast Networks-Digital Audio and Multimedia Broadcasts-Mobile TV using 3G-4G Networks, Overview of DVB-H services-DAB-DMB-TV based Mobile TV Technologies(DAB-Digital audio Broadcasting, DMB-Digital multimedia Broadcasting, DVB-Digital Video Broad casting, DTTB-Digital Terrestrial Broadcast)

Text books:

1. Aamitarh Kumar, "**Mobile Tv-Dvb-H,Dmb,3g Systems Of Rich Multimedia Applications**",Elseiver, Foeac Press. 2008
2. Hervé Benoit"**Digital Television**"Taylor & Francis, 2008
3. Mark Massel, "**Digital Television: DVB-T, COFDM and ATSC 8-VSB**", Lulu Press, Inc, 2013

BTEC15F8330	**Automotive Electronic Systems**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Embedded System Design
Microcontroller & Control systems

Course Objectives

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

1. Explain power train and drive train components in automotive systems.
2. Discuss the role of electronics in engine control systems.
3. Illustrate the concepts of in-vehicle networking.
4. Describe automotive safety systems & infotainment systems.

   Analyze the current status of software in the automotive industry and present the specifications elaborated within the AUTOSAR consortium in terms of standardization

Course Outcomes

After completion of the course a student shall be able to:

1. Explain power train and drive train components in automotive systems.(a,b,c,d)
2. Discuss the role of electronics in engine control systems(d,e.f)
3. Illustrate the concepts of in-vehicle networking.(a,b,d,f)
4. Describe automotive safety systems & infotainment systems.(a,b,c,f)

Analyze the current status of software in the automotive industry and present the specifications elaborated within the AUTOSAR consortium in terms of standardization

Course Content

Unit-1 Automotive Systems: [11]

Introduction to Power Train System, Transmission System, Braking System, Steering System, Starting System, Charging System. Need for Electronics: Performance, Control & Legislation

Unit-2: Bus Architecture and Protocols [10]

Introduction to control networking, Review of SPI, I^2C, USB, CAN, LIN, FLEXRAY, MOST, KWP200 Protocols.

Power train & Chassis Subsystem: Electronic fuel control in ignition systems, ABS, TCS , ESP, ECUs, and Airbags.

Unit-3: Automotive Sensors & Actuators [11]

Engine Speed Sensor, temperature sensor, Lambda sensor, Accelerometer (knock sensors), AUTOMOTIVE ENGINE CONTROL ACTUATORS, Solenoid actuator, Exhaust Gas Recirculation Actuator.

Automotive Diagnostics: On-board & Off-board diagnostics.

Unit-4: AUTOSAR Standard [10]

Motivation, AUTOSAR Architecture, Main Areas of AUTOSAR Standardization, AUTOSAR Models.

Infotainment & Navigation Systems: **Vehicle multimedia, Driver Assistance & Navigation.**

Text Books:

1. Denton.T – **"Automobile Electrical and Electronic Systems**", Edward Arnold publication, 1995.
2. William T.M – "**Automotive Electronic Systems**", Heiemann Ltd., London ,1978.

References :

1. Nicholas Navet – "**Automotive Embedded System Handbook",** CRC Press, 2009.
2. BOSCH Automotive Handbook, Wiley Publications, 8th Edition, 2011.
3. Co-Verification of hardware & software for ARM SoC Design – Jason.R.Andrews, Newnes Publications, 2004.
4. , F.Balarin, "**Hardware Software co-design of embedded systems**" Kluwer Academic Publishers, 1987.
5. , William B. Ribbens, **"Understanding Automotive Electronics"** Newnes Publications, 6th Edition, 2003.

BTEC15F8340	**Big Data Analytics**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites:

Basics of data base management system

Course Objectives:

1. To provide an understanding of big data for business intelligence
2. Describes the main trends of Big Data concepts.
3. This course on big data and hadoop introduces key concepts of big data, to manage big data without SQL.
4. Understanding map-reduce analytics using hadoop and related tools.
5. Integrate Big Data components to create an appropriate Data Lake
6. Select the correct Big Data stores for disparate data sets
7. Process large data sets using Hadoop to extract value
8. Query large data sets in near real time with Pig and Hive
9. Plan and implement a Big Data strategy for your organization

Course Outcomes:

On completion of this course the student will be able to:

1. Master the concepts of HDFS and MapReduce framework. (a, b)
2. Understand Hadoop Architecture. (a, b)
3. Write Complex MapReduce programs. (b, d, f)
4. Perform data analytics using Pig, Hive. (d, f)
5. Implement best practices for Hadoop development. (b, d, f)

Course Contents:

Unit-1: Introduction to Big Data [11]

Classification of digital data, characteristics of data, evolution of big data, definition of big data, challenges with big data, what is big data, why big data, traditional business intelligence (BI) versus big data, A typical data warehouse environment, A typical hadoop environment, top challenges facing big data, why is big data analytics, what kind of technologies are we looking toward to help meet the challenges posed by big data?

Unit-2: Introduction to Hadoop [10]

Introducing Hadoop, why Hadoop, why not RDBMS, RDBMS versus Hadoop, History of Hadoop, Hadoop overview, use case o fHadoop, Hadoop distributors, HDFS, Processing data with Hadoop, NoSQL, Hadoop-Features of Hadoop.

Unit-3:MapReduce [11]

A weather dataset, Analyzing data with UNIX tools, Analyzing data with Hadoop, scaling out, How Map Reduce Works, Anatomy of a Map Reduce job run, shuffle and sort, job scheduling.

Unit-4: Hadoop Related Tools [10]

Introduction to PIG, What is PIG, The anatomy of PIG,PIG on Hadoop, PIG Latin, Data types in PIG, running PIG, Execution modes ,HDFS Commands ,Relational operators ,PIG versus Hive, Introduction to HIVE, What is hive ,hive architecture, hive data types, hive file formats ,HQL, UDF.

Text Books:

1. Seema Acharya, Subhashini Chellappan, **“Big Data and Data Analytics**”, Wiley, 2015.
2. Tom White, **"Hadoop: The Definitive Guide"**, Third Edition, O'Reilley, 2012.

References:

1. VigneshPrajapati, **“Big data analytics with R and Hadoop”**, SPD 2013.
2. E. Capriolo, D. Wampler, and J. Rutherglen, **"Programming Hive"**, O'Reilley, 2012.

3. Lars George, **"HBase: The Definitive Guide"**, O'Reilley, 2011.
4. Alan Gates, **"Programming Pig"**, O'Reilley, 2011.
5. Eric Sammer, "**Hadoop Operations"**, O'Reilley, 2012.

BTEC15F8450	**Cryptography and Network Security**	L	T	P	C
Duration :14 Wks		3	0	0	3

Prerequisites

Basics of digital communication, computer communication

Course Objectives:

1. Explain the difference between cryptanalysis and brute force attack.
2. Explore the operation of substitution and transposition technique and DES. Present general structure of AES and 4 transformations.
3. Discuss basic principles of public key cryptosystems and familiarise with following algorithms: RSA, Diffie Hellman key exchange, Elgamal cryptographic system, Elliptic curve.
4. Summarise applications of cryptographic Hash functions, Message Authentication Codes and significance of Digital signatures.
5. Explain issues involved in: public key distribution and analyze risks, asymmetric encryption to distribute symmetric keys, web security threats, overview of SSL, transport layer and HTTPS.

Course Outcomes

On completion of this course the student shall be able to:

1. Illustrate different types of substitution and transposition techniques.(a,b,c,d,e)
2. Acquire the block cipher knowledge using DES and AES. .(a,b,c,d)
3. Describe different public key cryptosystems. .(a,b,d,e)
4. Discuss various types of Hash functions and MACs. .(a,b,c,d,e)
5. Illustrate different key management techniques. .(a,b,c,d)
6. Describe transport layer security.

Course Content

Unit-1: Encryption Techniques & DES **[11]**

Security attacks and security mechanisms.

Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machines, Steganography.

Data Encryption Standard (DES): DES encryption and decryption, Strength of DES, Block Cipher design principles.

Unit-2: AES and Public-Key Cryptography **[10]**

AES: Structure, transformation functions, key expansion.

Public-Key Cryptography: Principles of public key cryptosystems, RSA Algorithm, Diffie Hellman key exchange, Elgamal cryptographic system, Elliptic curve arithmetic.

Unit-3: Hash Functions, MACs and Digital Signature [11]

Cryptographic Hash Functions: Two Simple Hash Functions, Hash function based on cipher block chaining, Message authentication requirements.

Message authentication functions: Requirements of MAC, Security of MACs, MAC based on hash functions: HMAC, Digital Signatures.

Unit-4: Key Management and Transport Layer Security [10]

Key management: Symmetric key distribution using symmetric encryption, Symmetric key distribution using asymmetric encryption, distribution of public keys.

Transport-layer security**:** Web Security Considerations, Secure Sockets Layer, TLS, HTTPS.

Text Books:

1. William Stallings, "**Cryptography and Network Security, Principles and Practice**", 6th edition, Pearson/Prentice Hall, 2011.

Reference Books:

1. Atul Kahate, "**Cryptography and Network Security**", 2nd edition, Tata McGraw Hill, 2007
2. Eric Maiwald, "**Fundamentals of Network Security**", McGraw-Hill, 2003

DO'S AND DON'TS

DO'S

1. Maintain discipline and respect the rules and regulations of the university
2. Be regular and punctual to classes
3. Study regularly and submit assignments on time
4. Be respectful to your Teaches/friends and hostel staff/management.
5. Read the notice board (both at your college and the hostel) regularly.
6. Utilize your Personal Computer for educational purpose only.
7. Follow the code of conduct.
8. Visit Health Center on the campus whenever you are unwell.
9. Be security conscious and take care of your valuables especially Cash, Mobile Phones, Laptop and other valuables.
10. Carry your valuables along with you whenever you proceed on leave/vacation.
11. Use electric appliances, lights and water optimally.
12. Keep the campus clean and hygienic.
13. Use decent dressing.

DON'TS

1. Ragging inside / outside the campus.
2. Possession of Fire arms and daggers etc.
3. Use of Alcohols, Toxic drugs, sheesha, gutkha and hashish/heroin etc.
4. Use of Crackers, explosives and ammunition etc.
5. Smoking and keeping any kind of such items.
6. Misusing college & hostel premises/facilities for activities other than studies.
7. Playing loud music in the room which may disturb studies of colleagues / neighbours.
8. Making noise and raising slogans.
9. Keeping electrical appliances, other than authorized ones.
10. Involvement in politics, ethnic, sectarian and other undesirable activities.
11. Proxy in any manner.
12. Use of mobiles in the academic areas.

Note: 1. Rules are revised / reviewed as and when required.
2. Healthy suggestions are welcome for betterment of Institution.