Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Electronics and Telecommunication Engineering

Name of the Course: B.E.- IV (Sem. VII & VIII)

(Syllabus to be implemented from w.e.f. June 2019)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Engineering & Technology

CBCS structure of B.E.Electronics & Telecommunication Engineering W.E.F. 2019-20

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
ET411	Computer Communication Network	4	--	--	4	30	70	25	125
ET412	Embedded System Design	4	--	--	4	30	70	25	125
ET413	Satellite Communication	3	1	--	4	30	70	25	125
ET414	Database Management System (DBMS)	3	1	--	4	30	70	25	125
ET415	Elective - I	4	--	--	4	30	70	25	125
ET416	Seminar & Project	--	--	--	--	--	--	25	25
ET417	Vocational Training	--	--	--	--	--	--	25	25
Sub Total		18	2	--	20	150	350	175	675
Course Code	***Laboratory Course Name***								
							ESE		
							POE	***OE***	
ET411	Computer Communication Network	--	--	2	1	--	50	--	--	50
ET412	Embedded System Design	--	--	2	1	--	50	--	--	50
ET413	Satellite Communication	--	--	--	--	--	--	--	--	--
ET414	Database Management System (DBMS)	--	--	--	--	--	--	--	--	--
ET415	Elective - I	--	--	2	1	--	--	--	--	--
ET416	Seminar & Project	--	--	4	2	--	--	50	--	50
ET417	Vocational Training	--	--	--	1	--	--	--	--	--
Sub Total		--	--	10	6	--	150		--	150
Grand Total		**18**	**2**	**10**	**26**	**150**	**500**		**175**	**825**

Elective I

ET415A--- Image & Video Processing
ET415B---Optimization Techniques
ET415C---Electronic Product Design
ET415D---Advanced DSP

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Engineering & Technology (Revised from 2018-19)

CBCS structure of B.E. Electronics & Telecommunication Engineering W.E.F. 2019-20

Semester II

Course Code	Theory Course Name	Hrs./week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
ET421	Internet of Things (IoT)	3	1	--	4	30	70	25	125
ET422	Multimedia Communication Technique	4	--	--	4	30	70	25	125
ET423	VLSI Design	4	--	--	4	30	70	25	125
ET424	Elective – II	4	--	--	4	30	70	25	125
ET425	Project	--	--	--	--	--	--	100	100
Sub Total		15	1	--	16	120	280	200	600
Course Code	**Laboratory Course Name**								
							ESE		
							POE	OE	
ET421	Internet of Things (IoT)	--	--	--	--	--	--	25	--	25
ET422	Multimedia Communication Technique	--	--	2	1	--	--	50	--	50
ET423	VLSI Design	--	--	2	1	--	50	--	--	50
ET424	Elective – II	--	--	2	1	--	--	--	--	--
ET425	Project	--	--	8	4	--	100	--	--	100
Sub Total		--	--	14	7	--	225		--	225
Grand Total		**15**	**1**	**14**	**23**	**120**	**505**		**200**	**825**

Elective – II

ET424A---Network Security
ET424B---Soft Computing
ET424C---DSP Processors & Application
ET424D---Data Analytics

Note:

- Minimum strength of the students for Elective is 15.
- Term work assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.
- The batch size for the practical's/tutorials is of 15 students. On forming the batches, if the strength of remaining students exceeds 7 students, then a new batch be formed. For project the group shall be of three students.

➢ Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

ET411: Computer Communication Network

Teaching Scheme:	**Examination Scheme:**
Lecture :4Hrs/Week	ISE:30 Marks
Practical :2Hr/Week	ESE:70 Marks
	ICA:25 Marks
	POE:50 Marks

- **Course Objectives:**

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

1. Explain Data Communications System and its components.
2. Develop building skills of subnetting and understand routing mechanisms.
3. Enumerate the layers of the OSI model and TCP/IP and explain the function(s) of each layer.
4. Identify the different types of network topologies and protocols.
5. Acquaintance with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

- **Course Outcomes:**

After completion of this course, student will be able to

1. Explain Data Communications System and its components.
2. Develop building skills of subnetting and understand routing mechanisms.
3. Enumerate the layers of the OSI model and TCP/IP and explain the function(s) of each layer.
4. Identify the different types of network topologies and protocols.
5. Acquaintance with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

SECTION – I

Unit 1: Data Communication: [6Hrs]

Network- Need, Layers, Layer communication, OSI model, Network topologies TCPIP Suite, OSI Versus TCP/IP

Unit 2: Data Link Layer: [8Hrs]

Framing, Error detection and error correction, Flow control methods- Stop and wait protocol, sliding window protocol,Piggybacking, MAC – Collision oriented and collision based protocols,ALOHA, CSMA, CSMA/CD, CSMA/CA, HDLC

Unit 3: Transport Layer: [6Hrs]

TCP header format, UDP, IP header, IPv4, IP addressing, Subneting, Masking, TCP congestion control

SECTION-II

Unit 4: LAN Standards: **[8Hrs]**
IEEE 802.3- Performance of IEEE 802 LAN, Megabit LAN, Gigabit LAN, IEEE 802.4, IEEE802.5, ARP, RARP.

Unit 5: Network Layer: **[8 Hrs]**
Routing- Principle of optimality, shortest path routing, flow based routing, distance vector routing, link state routing, ICMP, IGMP.

Unit 6: Network Devices: **[6Hrs]**
RS232, MODEM, Repeaters, Switches, Bridges, Routers, Gateways.

Unit 7: Application Protocols: **[6Hrs]**
FTP, DNS, TELNET, SMTP, E-mail, DHCP, IPv6.

Internal Continuous Assessment (ICA):
ICA shall consist of minimum eight experiments on below mentioned topics

1. RS 232 based lab sessions-
   a. Character transfer using half duplex and Full duplex mode of operation (using bioscom function)
   b. File transfer using serial port
2. Flow control- Stop and Wait protocol
3. Implementation of Scrambler and descrambler
4. Error correction mechanism- Hamming Code
5. Error detection mechanism- CRC
6. Network analyzer (Protocol analyzer)-wire shark
7. Internet application protocol-FTP and DNS

- **Text books:**

1. Data communication- B.A. Forouzan4th Edition Tata Mc Graw hill Publication.
2. TCP/IP protocol suit- B.A. Forouzan4th Edition Tata Mc Graw hill Publication.
3. Computer networks- Andrew S. Tanenbaum.

- **Reference Books:**

1. Internetworking TCP/IP Principal, Protocol and Architecture -Douglas Comer- Addision -Wesley
2. TCP/IP Illustrated, The Protocols – W. Richard Slevens, G.Gabrani –PE pub.
3. Data and computer communication – William Stallings. - PE pub.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

ET412: Embedded System Design

Teaching Scheme:
Lecture: 4Hrs/Week
Practical: 2 Hr/Week

Examination Scheme:
ISE: 30 Marks
ESE: 70Marks
ICA: 25 Marks
POE: 50 Marks

- **Course Objectives:**

1. To make student realize different aspects and application areas of embedded systems.
2. To make student understand ARM core architecture.
3. To make student understand interfacing of input & output devices
4. To introduce to student concepts of Real time operating system.

- **Course Outcomes: Students will be able to**

1. To design, execution and evaluation of experiments on embedded platforms
2. To analysis, design and testing of systems that include both hardware and software.

SECTION – I

Unit 1: Embedded system Introduction [08Hrs]
Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing.

Unit 2 : System Architecture [10Hrs]
Introduction to ARM core architecture, LPC 2148**,** ARM extension family, instruction set, thumb instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I/O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc.

Unit 3 : Communication protocols [06Hrs]
Brief overview of SPI, SCI, SSP, I^2C, CAN, USB etc

SECTION – II

Unit 4 : Interfacing and Programming [10Hrs]
Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays and I/O devices.

Unit 5 : Real Time Operating System Concept [10Hrs]
Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to *µcosII*.

Unit 6: Case Study of Embedded system [04Hrs]
Case study of embedded system like digital camera, Mobile phones, Mobile Internet Device(MTD)

Term Work

Term work shall be based on minimum eight experiments using Embedded C. At least one experiment shall be included from each group mentioned below -

GROUP - A

1. I / O operations
2. Timers / counter

GROUP - B

1. Interrupts
2. UART operation

GROUP - C

1. I2C Protocol.
2. CAN Protocol.

GROUP - D

1. Interfacing LCD
2. Interfacing Keyboard and display key pressed on LCD
3. Interfacing stepper motor

GROUP - E

1. RF communication
2. AT commands and interface of GSM modem

GROUP - F

1. USB protocol and transferring data to PC.
2. Algorithm /program for the microcontroller for low power modes.

GROUP - G

1. Interfacing 4 x 4 matrix keyboards and 16 x 2 characters LCD displays to microcontroller writing a program using RTOS for displaying a pressed key.
2. Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

GROUP - H

1. Implementing a semaphore for any given task switching using RTOS on microcontroller board.
2. Creating two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Text books:

1. Embedded systems: a contemporary design tool, James K. Peckol- Wiley India
2. Embedded systems software primer- David Simon - Pearson
3. ARM System-on-Chip Architecture- Steve Furber - Pearson
4. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition

Reference Books:

1. DR.K.V.K.K. Prasad - Embedded / real time system - Dreamtech
2. Iyer, Gupta - Embedded real systems Programming -TMH
3. Steve Heath - Embedded System Design- Neuwans
4. Frank Vahid - Embedded Systems - Wiley India
5. Embedded Systems, Rajkamal -TMH.
6. ARM System Developer's Guide, Designing and Optimizing System Software - Andrew N. Sloss, Dominic Symes, Chris Wright - Morgan Kaufmann Publisher.
7. Datasheet of LPC 2148

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

ET413: Satellite Communication

Teaching Scheme:	**Examination Scheme:**
Lecture : 3Hrs/Week	ISE:30 Marks
Tutorial : 1Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. To introduce the students about principles of orbital mechanism and satellite subsystems.
2. To train the students with basic knowledge of satellite link design with design examples.
3. To make the students to understand the different types of earth stations.
4. To prepare the students with knowledge in Earth Station, satellite navigation & GPS system.

- **Course Outcomes:**

After completion of this course, students will be able to –

1. Explain basics of satellite communication
2. Solve problems related to orbital mechanism, satellite link design.
3. Explain the different types of earth stations.
4. Understand working principle of GPS and navigation system.

SECTION– I

Unit 1: Introduction to satellite communication, Orbit Mechanism and Launchers: [07Hrs]

Introduction – Introduction to satellite communication, frequency allocation.

Orbital Mechanism- Introduction, basic principle, Kepler's laws, Orbiting parameters-apogee, perigee, orbital time, velocity, sub-satellite point, types of satellite orbit (LEO, MEO, GEO), orbital perturbations, numerical on orbital parameters

Launchers- Launch vehicle introduction, Satellite launch vehicle (SLV), Polar Satellite launch vehicle (PSLV), Geo-Satellite launch vehicle (GSLV).

Unit 2: Satellite subsystems: [05Hrs]

Satellite subsystems, attitude and orbit control system (AOCS), Telemetry, Tracking command and monitoring, power system, communication subsystem, antenna subsystem, equipment reliability and space qualification.

Unit 3: Satellite Link Design: [07Hrs]

Introduction, basic transmission theory, system noise temperature and G/T Ratio, design of downlinks, uplink design, design of specified C/N-Combining C/N and C/I values in satellite links, system design examples.

SECTION-II

Unit 4: Earth station: **[05Hrs]**

Introduction, Types of earth stations- FSS, BSS, MSS, single frequency station, Gateway station, earth station architecture, earth station design consideration, performance parameters, optimization, earth station testing, R.F. equipment for earth station.

Unit 5: Propagation effects: **[06Hrs]**

Introduction, atmospheric absorption, cloud attenuation, tropospheric & ionospheric Scintillations &low angle fading, rain induced attenuation.

Unit 6: Satellite Navigation and Global Positioning system (GPS): **[06Hrs]**

Introduction, radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, VSAT. Home satellite TV, Digital DBS TV, satellite radio broadcasting.

Internal Continuous Assessment (ICA):

ICA shall be based on minimum six tutorials from following-

1. Three Tutorials based on problems from unit 1, 2, 3
2. One Tutorial based on Indian Satellite launchers-SLV, ASLV, PSLV, Mangalyaan (Mars Orbit Mission MOM).
3. One tutorial based on propagation effects.
4. One tutorial based on DBB and DBS TV.
5. One tutorial based on GPS.
6. One tutorial based on Home satellite TV, satellite radio broadcasting.

Note – Students are encouraged to visit satellite earth station / TV Relay / Radio station to understand working of satellite communication.

- **Text books:**

1. Satellite communication-Timothy Pratt, Charles Bostian, Jeremy Allnutt- John Wiley & Sons (2nd Edition)
2. Satellite Communication-Anil K. Maini, Varsha Agrawal- Wiley India PVT Ltd.
3. Satellite Communication- Dennis Roody- McGraw Hill.

- **Reference Books:**

1. Satellite communication- ManjitMitra- PHI Learning PVT Ltd.
2. Satellite communication- systems- Gerard Maral, Michel Bousquet - John Wiley & Sons
3. Satellite Communication- K.N. Raja Rao- Prentice Hall of india.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

ET414: Database Management System

Teaching Scheme:	**Examination Scheme:**
Lecture : 3Hrs/Week	ISE:30 Marks
Tutorial: 1Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. To understand the basics of database design, structure, implementation and applications.
2. To develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.
3. To understand and use Structured Query Language to query, update, and manage a database.
4. To apply normalization techniques to normalize the database.
5. To familiarize the students with the fundamentals of database transaction processing and learn techniques for concurrency control and recovery methods.

- **Course Outcomes:**

At the end of this course, the student will be able to,

1. Define and apply the basic concepts of database system, design, relational model and schemas.
2. Design principles for logical design of databases, including the E-R method and normalization approach for any real time application.
3. Evaluate, using relational algebra and SQL, solutions to a broad range of query problems in a relational DBMS.
4. Demonstrate an understanding of normalization theory and apply such knowledge to normalize a database.
5. Familiar with the basic issues of transaction processing (ACID properties), different methods of concurrency control and recovery techniques.

SECTION– I

Unit 1: Introduction: **[03Hrs]**

Database- System Applications, Purpose of Database Systems, View of data, Database Languages, Database Architectures, Database users and administrators, history of databases system.

Unit 2: E-R Model: **[05Hrs]**

Overview of design process, E-R Model, Constraints, E-R diagrams, E-R design issues, Weak Entity Sets, Extended E-R features, Reduction to relational schema.

Unit 3: Relational Model and SQL: **[08Hrs]**

Relational Model: Basic structure of relational databases, Database schema, keys, Schema diagrams, Relational Query languages, Relational algebra-Fundamental, Additional and Extended Relational Algebra Operations.

SQL: Overview, SQL data definition, SQL data types, Basic structure of SQL Queries, additional basic operations, Set operations, NULL values, Aggregate functions, Nested sub queries, Modification of the databases , Join operations, Views, Integrity constraints, Authorization.

Unit 4: Normalization: **[05Hrs]**

Features of good Relational Designs, Atomic Domains, First Normal Form, Keys and Functional dependencies, Second Normal Form, Boyce-Codd Normal Form, Third Normal Form, Functional dependency theory.

SECTION-II

Unit 5: Indexing and Hashing: **[04Hrs]**

Basic Concepts, Ordered Indices, B+ Tree Index Files, B Tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Indexing and Hashing, Index definition in SQL.

Unit 6: Transactions: **[04Hrs]**

Transaction concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Testing of Serializability.

Unit 7: Concurrency Control: **[04Hrs]**

Lock based protocol: Locks, Granting of Locks, Two-Phase Locking Protocol. Time Stamp-based protocols, Validation based protocols, Deadlock handling.

Unit 8: Recovery System: **[03Hrs]**

Failure Classification, Storage Types, Log-Based Recovery, Shadow paging.

Internal Continuous Assessment (ICA):

It should consist of 8-10 tutorial assignments on topics given above.

- **Text books:**

1. Database system concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan (McGraw Hill International Edition) sixth edition.
2. Database system concepts by Peter Rob, Carlos Coronel (Cengage Learning) ninth edition.

- **Reference Books:**

1. Fundamentals of Database systems by RamezElMasri, S. B. Navathe (Pearson Education) 5th edition.
2. Database Management Systems by RamkrishnanGehreke (Tata McGraw Hill) third edition.
3. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
4. Advanced Database Management System by RiniChakrabarti, ShilbhadraDasgupta (Dreamtech Press Publication).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

Elective –I

ET415A: Image & Video Processing

Teaching Scheme:	**Examination Scheme:**
Lecture : 4Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. To learn basic concepts of digital image and video processing which is the core technology of the area of computer vision.
2. To study the basic principles and tools used to process images and videos, and how to apply them in solving practical problems of commercial and scientific interests.
3. To describe and analyze images and videos as two- and three-dimensional signals in the spatial, spatio-temporal, and frequency domains.
4. To expose students to current applications in the field of image and video processing.

- **Course Outcomes:**

  After successfully completing the course students will be able to

  1. Develop and implement algorithms for digital image and video processing.
  2. Apply image and video processing algorithms for practical computer vision applications.

SECTION– I

Unit 1: Image fundamentals: [05Hrs]

Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models.

Unit 2: Two dimensional transforms: [04Hrs]

Discrete Fourier Transform, Discrete Cosine Transform, KL Transform, and Discrete Wavelet Transform.

Unit 3: Image Enhancement: [09Hrs]

Spatial Domain: Point Processing: Digital Negative, contrast stretching, thresholding, graylevelslicing, bit plane slicing, log transform and power law transform.

Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters.

Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothening and sharpening, and Homomorphic filters.

Histogram Modeling: Histogram equalization and histogram specification.

Unit 4: Image segmentation and Morphology: **[07Hrs]**

Point, line and edge detection, edge linking using Hough transform and graph theoretic approach, thresholding, and region based segmentation. Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images.

SECTION-II

Unit 5: Image Restoration: **[05Hrs]**

Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters.

Unit 6: Video Formation, Perception and Representation: **[08Hrs]**

Digital Video Sampling, Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601Digital Video formats, Digital video quality measure.

Video Capture and display: Principle of color video camera, video camera,digital video.

Sampling of video Signals: Required sampling rates, sampling in two dimensions and three dimensions, progressive virus interlaced scans.

Unit 7: Two Dimensional Motion Estimation: **[10Hrs]**

Optical Flow: 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.

Pixel based motion estimation: Regularization using motion smoothing constraints, using multipoint neighborhood.

Block Matching Algorithms: Exhaustive block matching algorithms, phase correlation method, Binary feature matching.

Multi resolution Motion Estimation: General formulation, Hierarchical blocks matching Algorithms.

Internal Continuous Assessment (ICA):

Note: Minimum Eight Laboratory experiments must be conducted on above topics for ICA.

- **Text books:**

1. Gonzales and Woods, ―Digital Image Processing, Pearson Education, India, Third Edition,
2. Murat Tekalp, ―Digital Video Processing, Pearson, 2010.
3. A.I.Bovik, ―Handbook on Image and Video Processing", Academic Press.

- **Reference Books:**

1. Anil K.Jain, ―Fundamentals of Image Processing, Prentice Hall of India, First Edition, 1989.
2. John W. Woods, ―Multidimensional Signal, Image and Video Processing, Academic Press 2012
3. J.R.Ohm , ―Multimedia Communication Technology", Springer Publication.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

Elective –I

ET415B: Optimization Techniques

Teaching Scheme:	**Examination Scheme:**
Lecture : 4Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. To understand the engineering Applications of Optimization
2. To learn formulation of design problems using basic mathematical background.
3. To know classical optimization techniques.
4. To compare linear and non linear programming.
5. To understand unconstrained optimization techniques.
6. To use modern techniques for optimization.

- **Course Outcomes:**

After completion of this course students will be able to:

1. Solve problems based on classical optimization techniques
2. Discuss linear and non linear programming methods.
3. Solve problems based on unconstrained optimization techniques.
4. Use modern techniques for optimization.

SECTION– I

Unit 1: Introduction to Optimization: [08Hrs]

Introduction: Historical Development, Engineering Applications of Optimization, Statement of an Optimization Problem, Formulation of design problems using Mathematical Background.

Unit 2: Classical Optimization Techniques: [08Hrs]

Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints, Multivariable Optimization with Inequality Constraints, Hessian matrix formulation, Eigen values, Kuhn-Tucker Conditions.

Unit 3: Linear Programming: [08Hrs]

Introduction, Applications of Linear Programming, Standard Form of a Linear Programming Problem, Simplex Method.

SECTION-II

Unit 4: Nonlinear Programming-I: **[08Hrs]**

Introduction to non-linear programming. One - dimensional minimization methods: Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Fibonacci method, Golden section method

Unit 5: Nonlinear Programming-II: **[08Hrs]**

Introduction to Unconstrained Optimization techniques, Direct Search Methods, Indirect Search Methods: Gradient of a Function, Steepest Descent (Cauchy) Method.

Unit 6: Modern Methods of Optimization: **[08Hrs]**

Genetic algorithms, Simulated annealing, Particle Swarm Optimization etc.

Internal Continuous Assessment (ICA):

Minimum six tutorials based on above topics should be completed for ICA.

- **Text books:**

1. Singiresu S Rao, ―Engineering optimization Theory and Practice‖, New Age International, 2009
2. Kalynamoy Deb, ―Optimization for Engineering Design, Algorithms and Examples‖,PHI

- **Reference Books:**

1. Hadley, G. ―Linear programming‖, Narosa Publishing House, New Delhi.
2. Ashok D Belegundu, Tirupathi R Chandrupatla, ―Optimization concepts and Application inEngineering‖, Pearson Education.
3. KantiSwarup, P.K.Gupta and Man Mohan, Operations Research, Sultan Chand and Sons.
4. J. S. Arora, Introduction to Optimum Design, McGraw-Hill Book Company.
5. David Lay, Steven L Lay, ―Linear Algebra and its Applications‖, Pearson Education.
6. Papalambros& Wilde, Principles of Optimal Design, Cambridge University Press, 2008

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

Elective –I

ET415C: Electronic Product Design

Teaching Scheme:	**Examination Scheme:**
Lecture : 4Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. Reliability analysis of electronic product
2. Ergonomics design of electronic product
3. Control panel design
4. Thermal design
5. CAD for electronic product design

- **Course Outcomes:**

At the end of the course students will be able to

1. Obtain reliability of electronic product
2. Design ergonomics of electronic product
3. Design control panel
4. Analyze thermal design
5. Use CAD for electronic product design

SECTION– I

Unit 1: System Reliability Concepts: [12Hr]

Introduction to concepts of reliability, nature of reliability problems in electronic equipment, series configuration, Parallel Configuration, Mixed Configuration, Methods of Solving Complex Systems, Mean Time to Failure (MTTF) and Mean Time between Failure (MTBF) of Systems. Maintainability, Availability Concepts, System Downtime, Mean time to Repair (MTTR), Fault Tree Analysis-Concepts and Procedures, Rules for Fault Tree Construction.

Unit 2: Ergonomics and Aesthetics in Electronic Product Design: [12Hr]

Overview of Electronic Product Design, Top Down and Bottom-Up Approach, Considering Power Supply Design as an example, Ergonomic and Aesthetics definition with Example, issues in Designing Electronic Products, Design of Controls and Display w.r.t. Ergonomic and Aesthetics Consideration.

SECTION-II

Unit 3: Control Panel Design and thermal consideration: [12Hr]

Types of Controls, Design and Organization of Control Panel, Engineering Considerations, Layout of Components, Selection of Materials, Sheet metals and plastic, Structural Design and Control Cabinets Fabrication. Thermal management of electronic equipment, Thermal design considerations, Component level, board level, system level, Fans and system operating characteristics, Heat Sink design.

Unit 4: Computer Aided design: **[08Hr]**

Introduction to Computer Aided Design, Applications and Examples, Finite Element Methods (FEM) and Analysis, Techniques for Surface Modeling, Rendering and Shading, Sources of New Ideas, Creativity Techniques, Form factor, Shape, Color, Graphics etc.

Unit 5: Packaging: **[04Hr]**

Standardization and modulation, Design considerations for interconnection, Types of interconnections, Wires, cables, connector, Treatment of Vibration.

Internal Continuous Assessment (ICA):

Experiments: -

It consist of at least 8 design assignments based on above syllabus

- **Text books:**

1. V. S. Bagad, "Electronic Product Design", Technical Publications.
2. Dave S. Steinberg, "Cooling techniques for electronic equipment", Wiley, 1991
3. Ernest Paul DeGarmo, J. T. Black, Ronald A. Kohser "Materials and Processes in Manufacturing",
4. Ergonomics at work, David J. Oborne, Pub. Wiley

- **Reference Books:**

1. Ralph Remsburg, "Advanced Thermal Design of Electronic Equipment", Springer
2. John Wiley & Sons. Military Handbook, Electronic

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.E. (Electronics and Telecommunication Engineering) Part-I

Elective –I

ET415D: Advanced Digital Signal Processing

Teaching Scheme:	**Examination Scheme:**
Lecture : 4Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

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

1. To Analyze Different types of filters and algorithms
2. To Apply Concept of Multirate DSP for solving numerical problems and algorithms
3. To Explain Theory of Prediction
4. To Explain Application of DSP at block Level

- **Course Outcomes:**

After completion of this course, student will be able to:

1. To understand theory of different filters and algorithms
2. To understand theory of multirate DSP, solve numerical problems and write algorithms
3. To understand theory of prediction and solution of normal equations
4. To know applications of DSP at block level.

SECTION– I

Unit 1: Design of Digital Filters: [08Hr]

Overview of DSP, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design & Structures, Design techniques of Linear phase FIR filters, Differentiators, Hilbert Transforms, IIR filters by Bilinear Transformation, FIR/IIR Cascaded lattice structures with Examples

Unit 2: Multirate Digital Signal Processing: [08Hr]

Multi rate DSP, Decimators and Interpolators, Implementation of Sampling rate conversion, Multistagedecimator & interpolator, Poly phase filters, M Channel QMF, Digital filter banks, Applications in subband coding.

Unit 3: Linear Prediction & Optimum Linear Filters: [08Hr]

Linear Prediction & Optimum linear filters, Stationary random process, forward-backwardlinear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

SECTION-II

Unit 4: Adaptive Filters: **[08Hr]**

Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean squarecriterion, LMS algorithm, Recursive Least Square Algorithm

Unit 5: Power Spectrum Estimation: **[08Hr]**

Estimation of Spectra from Finite-Duration Observations of Signals. NonparametricMethods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum-Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation.

Unit 6: Wavelet Transform & Application of DSP: **[08Hr]**

Application of DSP & Multi rate DSP, Introduction to wavelets,application to Image processing, DSP in Speech processing & other applications.

Term Work: Term work shall be based on minimum eight experiments covering above curriculum.

- **Text books:**

1. Digital Signal Processing, Principals, Algorithms and Applications-John G. Proakis and D GManolakis, Prentice Hall
2. Wavelet and Filter Banks -Gilbert Strang and Truong Nguyen by Wellesley-Cambridge Press
3. Digital Signal Processing A Practical Approach-2nd edition Emmanuel Ifeachor and BarrieW.Jervis, Prentice Hall

- **Reference Books:**

1. DSP Processor Fundamentals, Architectures & Features – Lapsleyetal. S. Chand & Co, 2000.
2. Digital Signal Processin - S.K. Mitra- Tata McGraw-Hill Publication, 2001

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B.E. (Electronics and Telecommunication Engineering) Part-II

ET421: Internet of Things

Teaching Scheme:	**Examination Scheme:**
Lecture : 3Hrs/Week	ISE:30 Marks
Tutorial : 1Hrs/Week	ESE:70 Marks
	ICA:25 Marks
	OE:25 Marks

- **Course Objectives:**

1. To make student aware of different components of an IoT System
2. To make student learn the architecture of Cortex M3 series ARM microcontroller.
3. To make student learn interfacing of different peripherals with microcontroller.
4. To make student learn different communication technologies and application protocols used in IoT.
5. To introduce to student different cloud platforms of IoT.

- **Course Outcomes:**

After completion of this course, student will be able to:

1. Student can elaborate different components of an IoT System.
2. Student can describe the architecture Cortex M3 series ARM microcontroller
3. Student can write interfacing program for different applications with ARMmicrocontroller.
4. Student can describe different communication technologies and application protocolsused in IoT.
5. Student can elaborate different cloud platforms of IoT.

SECTION– I

Unit 1: Introduction to Internet of Things: [05Hrs]

Introduction to IoT, different components of an IoT system: embedded systems, sensors, communication systems, cloud, applications of IoT in various domains.

Unit 2: Embedded Systems for IoT: [05Hrs]

Introduction to embedded systems, different components of an embedded system, and basics of microcontroller based embedded systems; basics of Linux based embedded systems, various embedded platforms used in in IoT, understanding the various IDEs used for embedded development.

Unit 3: Introduction to ARM: [08Hrs]

Introduction to ARM architecture, cortex series classification (A, R, M series), ARM Cortex-M series family, ARM Cortex-M3 processor overview, block diagram, registers, memory map, instruction set: data accessing, processing, arithmetic, program flow control etc., exception handling, low-power features, requirements, sleep mode, development of low-power applications, basic embedded C programs for on-chip peripherals, interfacing I/O devices like led's, switch's etc., serial communication, analog interfacing and data acquisition.

SECTION-II

Unit 4: Communication technologies for IoT: **[06Hrs]**

Basics of the communication technologies like Bluetooth Low Energy (BLE), Zigbee, Wifi, RFID, their architecture, characteristics, limitation, power consumption parameters and applications.

Unit 5: Internet connectivity principles and Application protocols for IoT: **[07Hrs]**

Internet connectivity, Communication, overview of Protocols: IPv4, IPv6, 6LoWPAN, Basics of application protocols like MQTT and CoAP, their features, framework, message formats, implementations and applications.

Unit 6: Cloud platforms for IoT: **[05Hrs]**

Cloud architecture for IoT, concepts of application programming interface (API), survey of various IoT cloud platforms, understanding the costing structure of cloud for IoT services, performance metrics for cloud platforms in IoT.

Internal Continuous Assessment (ICA):

ICA consists of minimum 8 tutorials based on above curriculum.

- **Text books:**

1. Internet of Things by Raj Kamal
2. The Definitive Guide to the ARM Cortex-M3 by Joseph Yiu
3. Internet of Things for Architects by Perry Lea
4. Analytics for the Internet of Things (IoT) by Andrew Minteer

- **Reference Books:**

1. Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies by DimitriosSerpanos, Marilyn Wolf
2. MQTT Essentials - A Lightweight IoT Protocol by Gaston C. Hillar
3. Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3 by Peter Waher.
4. Designing Embedded Systems and the Internet of Things (IoT) with the ARM mbed by Perry Xiao

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B.E. (Electronics and Telecommunication Engineering) Part-II

ET422: Multimedia Communication Techniques

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks
	OE:50 Marks

- **Course Objectives:**

1. After learning this course, students will get benefit to learn and understand the working of real life video system and the different elements of video system.
2. Students will get insight on functioning of individual blocks, different standards of compression and they will be acquainted with different types of analog, digital TV and HDTV systems.

- **Course Outcomes:**

After successfully completing the course students will be able to

1. Understand the concept of basic television signal processing and different types of multimedia data
2. Identify globally accepted colour TV standards
3. Demonstrate the need of audio and video compression techniques in real life
4. Analyze different compression algorithms.
5. Acquire knowledge of latest digital TV systems and applications.

SECTION– I

Unit 1: Fundamentals of Colour Television: [07Hrs]

Aspect ratio, scanning, perception of brightness and colour, colour mixing, composite video signal, video bandwidth, CCIR-B Standards, synchronisation details, digital TV camera, modulation of audio and video, terrestrial signal transmission, video displays: LCD vs LED.

Unit 2: Colour Standards and digital video: [08Hrs]

Color Spectrum, compatibility, Bandwidth of colour TV signal, *Standards*: NTSC, PAL, SECAM colour system, generalized colour TV receiver block diagram, interleaving process, study of functionality of each block, alignment issues, sampling of video signal, colour sub sampling, composite vs component video, interlace vs progressive scan.

Unit 3: Digital TV [09Hrs]

Digital video, resolution, notation, digital video formats, digital video quality measure, video restoration, video streaming, DTH, Video compression: MPEG-1, MPEG 2, comparison of SDTV, EDTV and HDTV, Introduction to UHDTV: 4K and 8K, IPTV/web TV, smart TV, Wi-Fi TV, digital surveillance, 3D TV concept.

SECTION-II

Unit 4: Audio and Video Recording Systems: [06Hrs]

Digital sound, sound recording, CD/ DVD player, MP3 player, Blue Ray DVD Player, ITU-T(G) compression standards, multichannel/Dolby 5.1sound in DTV.

Unit 5: Multimedia Authoring and Data Representations: [09Hrs]

Introduction to multimedia: what is multimedia?, multimedia and hypermedia, world wide web, overview of mu1timedia software tools, graphics and image data representations: graphics image data types, popular file formats, color in image and video: color science, color models in images, color models in video, fundamental concepts in audio and video.

Unit 6: Multimedia Data Compression: [09Hrs]

Lossless Compression Algorithms: Introduction, Run-Length Coding, Variable-Length Coding (VLC), Arithmetic Coding, Lossless Image Compression, Lossy Compression Algorithms: Introduction, Basic Video Compression Techniques: H.261, H.263.

Internal Continuous Assessment (ICA):

ICA shall be based upon minimum Eight Experiments from following list & the industrial visit report.

1. Voltage waveform analysis of Analog/Digital TV Receiver.
2. To perform analysis of Composite Video Signal
3. Study the Yagi-uda antenna
4. Study of direct to home TV and set top box.
5. Study of color pattern generator with pattern analysis
6. Study of DT/HDTV
7. Study of Wi-Fi TV system
8. Study of CD/ DVD/Blue ray player
9. Study of audio player: MP3 player
10. Study of audio and video coding scheme (soft)
11. Record speech & perform compression & decompression

Note: Students should visit *TV transmitter/ Digital TV Studio/ All India Radio / TV Manufacturing factory* and produce Report based on the same.

- **Text books:**

1. A.M. Dhake, Television and video Engineering, TMH Publication, 2nd Edition,2001
2. Kelth jack, Video Demystified: A Handbook for the Digital Engineer, 5th Edition, Newnes, 2007.
3. R.G. Gupta, Audio and Video Systems, McGraw Hill l Education (India), 2nd Edition, 2010.

- **Reference Books:**

1. S. P. Bali, Color Television Theory and Practice, McGraw Hill Education (India), 1994
2. A.M. Tekalp, Digital Video, Prentice Hall, 1995
3. R.P. Gulathi, Modern Television Practice, 4th edition, New Age International Publisher, 2014
4. Zi-Niam Li and Mark Drew, Fundamentals of Multimedia, Pearson, 2004.
5. Khalid Sayood, Data Compression, PHI.
6. R.P. Gulati, Mocochrome and Colour Television. 3rd edition, New Age International Publisher, 2014

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B.E. (Electronics and Telecommunication Engineering) Part-II

ET423: VLSI DESIGN

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks
	POE:50 Marks

- **Course Objectives:**

1. To make student learn EDA Tools for VHDL programming and simulation.
2. To enable student to design and simulate VHDL modules for combinational and sequential logic circuits.
3. To introduce MOS transistor theory and CMOS Logic.
4. To acquaint students to CPLD and FPGA architecture, ASIC, SOC and fault testing of combinational and sequential circuits.

- **Course Outcomes:**

After completion of this course, student will be able to

1. Explain different syntax of VHDL language.
2. Design, simulate and analyze combinational and sequential logic circuits using VHDL.
3. Explicate the terms associated to MOS transistor and CMOS logic.
4. Implement logic gates and simple Boolean expression using CMOS logic.
5. Describe CPLD and FPGA architecture and its internal components and explain concept of ASIC and SOC.
6. Explain different testing methods for combinational and sequential logic, IC testing and write test bench for simple combinational circuit.

SECTION– I

Unit 1: Introduction to EDA tool and VHDL programming: [10Hrs]

EDA tool Design Flow, Introduction to VHDL, entity, architecture, data types, operators and attributes, variables, signals, constants, concurrent and sequential code, packages and components, functions and procedures, libraries, delays, operator overloading, IEEE standard logic. VHDL modules for multiplexer, demultiplexer, comparator, encoder, decoder, 4-bit binary adder, Array multiplier.

Unit 2: VHDL modules for Sequential Logic and state machines: [08Hrs]

Latches, Flipflops, counters (synchronous and asynchronous), shift registers, static RAM. State machine using Moore and Mealy model, VHDL model using state machine for sequence detector, Traffic light controller, coffee vending machine, multiplier using ADD and SHIFT method.

Unit 3: Testing of Logic Circuits **[06Hrs]**

Testing combinational and sequential logic, Boundary scan, Built In Self-test, Test bench forCombinational design for binary adder, comparator, encoder, decoder, multiplexer and demultiplexer.

SECTION-II

Unit 4: MOS Transistor Theory: **[08Hrs]**

Enhancement type MOSFETS: construction and operating modes, MOS Device Design Equations, Resistance estimation, Parasitic Capacitance, Small signal AC characteristics, Pass Transistor Logic, Transmission gate and its applications.

Unit 5: CMOS Logic Design: **[08Hrs]**

CMOS Logic, DC characteristic of CMOS inverter, effect of βn/βp ratio, noise margin, switching characteristics, Power dissipation, Static load MOS inverter, CMOS logic gate design, dynamic CMOS Logic.

Unit 6: Architecture of Commercial Devices: **[08Hrs]**

CPLD Architecture, Xilinx XC9500, Altera Max7000, FPGA organization and architecture,Altera Flex 10k, Introduction to ASIC and System on Chip architecture.

Internal Continuous Assessment (ICA):

ICA shall be based on minimum ten programs based on above curriculum using suitable EDA tools. A suggestive list is as below.

Practicals: -

1. Design of half adder and full adder using VHDL
2. Design of 4 bit adder and carry look ahead adder using structural style modeling.
3. Design of code converters and comparators
4. Design of encoder and decoder
5. Design of 8:1 multiplexer
6. Design of flip flops
7. Design of universal shift register
8. Design of asynchronous and synchronous counters
9. Design of sequence detector using state machine
10. Design of Traffic light controller using state machine editor
11. Frequency multipliers and dividers
12. Design of ALU
13. Design of RAM with read write control
14. Writing test bench for adder, encoder

- **Text books:**

1. Fundamentals of Digital logic Design with VHDL, Brown,Vranesic – McGraw-Hill(2nd edition).
2. Digital Systems Design using VHDL, Charles H. Roth, Lizy Kurian John- Cengage Learning, Second Edition
3. Circuit Design using VHDL, Volnei A. Pedroni, PHI
4. VHDL Primer J.Bhasker – Prentice Hall

- **Reference Books:**

1. Principles of CMOS VLSI Design, Neil H.E.Weste, Kamran Eshraghian - Pearson
2. Essentials of VLSI circuits and Systems, Kamran Eshraghian, DuglusPucknell –PHI
3. Digital Logic Design and VHDL- Phadake –Wiley India
4. Datasheets of CPLDs and FPGAs.

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B.E. (Electronics and Telecommunication Engineering) Part-II

Elective – II

ET424A: Network Security

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. Provide an understanding of principal concepts, major issues, technologies, & basic approaches in information security.
2. Provide concept-level hands-on experience in specific topic area.
3. Provide the ability to examine and analyze real-life security cases.

- **Course Outcomes:**

After successfully completing the course students will be able to

1. Recognize common attack patterns, evaluate vulnerability of an information system & establish a plan for risk management.
2. Demonstrate how to detect and reduce threats in Web security, how to secure a wireless network
3. Evaluate the authentication and encryption needs of an information system.
4. Explain the Public Key Infrastructure process
5. Evaluate a company's security policies and procedures

SECTION– I

Unit 1: Introduction to Cryptography: [07Hrs]

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Plain Text and Cipher Text, Substitution Techniques and Transposition Techniques, encryption and Decryption, Symmetric and Asymmetric key cryptography, Steganography.

Unit 2: Block Cipher: [10Hrs]

Block Ciphers and the Data Encryption Standard, Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES, Block Cipher Design Principles, Basic Concepts in Number Theory and Finite Fields**:**Divisibility and the Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Groups, Rings, and Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2n)

Unit 3: Advanced Encryption Standard [07Hrs]

Finite Field Arithmetic, AES Structure, AES Transformation Functions, AES Key Expansion, An AES Example, AES Implementation , Multiple Encryption and Triple DES, Electronic Code book, Cipher Block Chaining Mode,Cipher Feedback Mode, Output Feedback Mode, Counter Mode, XTS-AES Mode for Block-Oriented Storage Devices

SECTION-II

Unit 4: IP Security and E-Mail Security: **[08Hrs]**

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security payload, Combining Security Associations, Key Management, Secure Socket Layer and Transport Layer Security. Electronic Mail Security – Secure Electronic Transaction, Pretty Good Privacy, S/MIME.

Unit 5: Attacks and Tools: **[10Hrs]**

Introduction: Security, CIA Triad, Viruses, Trojans, and Worms In a Nutshell, Security Concepts- exploit, threat, vulnerability, risk, attack. Malware Terminology: Rootkits, Trapdoors, Botnets, Key loggers, Honeypots. Active and Passive Security Attacks. IP Spoofing, Tear drop,DoS, DDoS,XSS, SQL injection, Smurf, Man in middle, Format String attack. Types of Security Vulnerabilities- buffer overflows, Invalidated input, race conditions, access-control problems, weaknesses in authentication, authorization, or cryptographic practices. Access Control Problems. Need for secure

Unit 6: Introduction to Cybercrime: **[06Hrs]**

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are cybercriminals? Classifications of Cybercrimes, Cybercrimes: The Legal Perspectives and Indian Perspective.

Internal Continuous Assessment (ICA):

ICA shall consist of minimum six to eight experiments from the following.

List of Experiments:

1. Write a program to implement demonstrate cipher.
2. Write a program to implement cryptography by transposition.
3. Write a program to implement Data encryption standard.
4. Write a program to implement Advanced Encryption Standard
5. Write a program to implement RSA algorithm.
6. Write a program to implement RSA algorithm using BigInteger.
7. Install and configure FIREWALL.
8. Study of PGP protocol.
9. Study of Digital signature standards

Text Books:

1. Cryptography and Network Security, Willam Stallings, Third Edition, Pearson Education
2. Network Security, Private Communication in a public world, Cbarlie Kaufman, Radia Perlman, Mike Speciner, Second Edition, Pearson Education Asia, 2002.
3. Cryptography and Network Security, AtulKahate,TataMcGrawhill, 2003.

Reference Books:

1. Writing Secure Code, Michael Howard and David LeBlanc,Microsoft Press, 2nd Edition, 2004
2. Buffer Overflow Attacks: Detect, Exploit, Prevent by Jason Deckar,Syngress,1st Edition, 2005
3. Threat Modeling, Frank Swiderski and Window Snyder,Microsoft Professional, 1st Edition, 2004.

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B.E. (Electronics and Telecommunication Engineering) Part-II

Elective – II

ET424B: Soft Computing

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**

1. To conceptualize the working of human brain using ANN.
2. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
3. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
4. To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.

- **Course Outcomes:**

After successfully completing the course students will be able to

1. Ability to analyze and appreciate the applications which can use fuzzy logic.
2. Ability to design inference systems.
3. Ability to understand the difference between learning and programming and explore practical applications of Neural Networks (NN).
4. Ability to appreciate the importance of optimizations and its use in engineering fields and other domains.
5. Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

SECTION– I

Unit 1: Introduction to Soft Computing: [08Hrs]

Introduction to Soft Computing- Soft Computing versus Hard Computing, Soft-Computing Systems, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets, Fuzzy arithmetic and extension principle.

Unit 2: Fuzzy Logic: [08Hrs]

Properties of Membership Functions, Fuzzification, and Defuzzification, Fuzzy (Rule-Based) Systems, Membership Value Assignments, Fuzzy Control Systems- Assumptions in a Fuzzy Control System Design, Simple Fuzzy Logic Controllers.

Unit 3: Introduction to ANN [08Hrs]

Introduction to Artificial neural networks- biological neurons and its artificial model, models of ANN, learning and adaptation, Single & Multilayer perceptron, delta rule algorithm, Back Propagation algorithm.

SECTION-II

Unit 4: ANN- II: **[08Hrs]**

Unsupervised learning- Kohonen model, learning vector quantization, ART1, Boltzmann machine, Application of ANN- networks for robot kinematics, expert system for medical diagnosis (Breast cancer with BPN)

Unit 5: Introduction to genetic algorithm: **[08Hrs]**

Introduction to GA, Basic operators in GA, Simple GA, General genetic algorithm, Adaptive genetic algorithm

Unit 6: Hybrid system: **[08Hrs]**

Adaptive Neuro-Fuzzy Inference Systems- general architecture, problem solving in ANFIS, Evolving ANN – fixed structure, Evolving fuzzy system- fixed structure, Application of soft computing- speech recognition using ANFIS (algorithm), Signature classification.

Internal Continuous Assessment (ICA):

Practicals: -

1. To implement Fuzzy Sets.
2. To implement Fuzzy Relations.
3. To implement Fuzzy Controllers.
4. To implement Basic Neural Network learning rules.
5. To implement any Supervised Learning algorithm.
6. To implement any Unsupervised Learning algorithm.
7. To implement a simple application using Genetic Algorithm.
8. Any IEEE/ Science Direct/ Springer paper on soft computing application as a case study

- **Text books:**

1. Principles of soft computing by S N Sivanandam and S N Deepa, Wiley publications
2. Fuzzy logic with engineering applications by Timothy Ross, 3rd Edition, Wiley publication
3. Introduction to Artificial neural systems by Jacek M Zurada, Jaico Publishing House.
4. Real life applications of soft computing by Anupam Shukla, Ritu Tiwari and Rahul Kala, CRC Press.

- **Reference Books:**

1. S.Rajasekaran and G.A.VijayalakshmiPai "Neural Networks, Fuzzy Logic and Genetic Algorithms" PHI Learning.
2. Satish Kumar "Neural Networks A Classroom Approach" Tata McGrawHill
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989

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B.E. (Electronics and Telecommunication Engineering) Part-II

Elective – II

ET424C: DSP Processors & Application

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**
  At the end of the course, the students will be able to:

1. Understand mathematical aspects of DSP
2. Know fundamentals of DSP Processor
3. Develop application programs in C54X
4. Study the architecture and programming of TMS320C5X, TMS320C3X Processors for real time applications.

- **Course Outcomes:**
  After successfully completing the course students will be able to

1. Apply mathematical fundamentals to DSP Processors
2. Use fundamentals of Programmable DSP Processors for different applications
3. Write Assembly language programs for DSP Processors
4. Knowledgeable in the architecture and programming of TMS320C5X, TMS320C3X Processors for real time applications.

SECTION– I

Unit 1: Numeric Presentation and arithmetic: [04Hrs]

Number formats for signals and coefficients in DSP systems, Dynamic Range and precision, Sources of Error in DSP implementations, A/D conversion errors, DSP computational errors,D/A conversion errors.

Unit 2: Fundamentals of programmable DSPs: [10Hrs]

Multiplier and multiplier accumulator, modified bus structure and memory access in P-DSPs, multiply access memory, multi-ported memory, VLIW architecture, pipelining, special addressing modes in P DSPs, on-chip peripherals, computational accuracy in DSP processors.

Unit 3: TMS320C5X Processors [10Hrs]

Architecture, Assembly Language Syntax, Addressing Modes Assembly Language Instructions Pipeline Structure, Operation Block Diagram of DSP Starter Kit, Application Program for Processing Real Time Signals.

SECTION-II

Unit 4: Programmable Digital Signal Processors: **[12Hrs]**

Data Addressing Modes of TMS320C54XX DSPs, Data Addressing Modes of TMS320C54XX Processors, Memory Space of TMS320C54XX Processors, Program Control, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Structure of TMS320C54XX Processors

Unit 5: Application programs in C54X: **[06Hrs]**

Pipeline operation, Code composer studio, overview of the 'C5402-Based DSK', Introduction to C54X Assembly language programming, and Applications programs in C54X.

Unit 6: Advanced Processors: **[06Hrs]**

Code composer studio- Architecture of TMS320C6X, Architecture of Motorola DSP563XX, Comparison of the features of DSP family processors.

Internal Continuous Assessment (ICA):

Minimum eight experiments should be performed based on above topic using DSP Processor kit and code composer studio.

- **Text books:**

1. Digital Signal Processors, Architecture, Programming - B. VenkataRamani and M. Bhaskar TMH, 2004.
2. DSP Implementation using DSP microprocessor with Examples from TMS32C54XX – Avatar Singh,S.Srinivasan -Thamson 2004
3. Digital signal processing- Salivahanan,Ganapriya - TMH ,second Edition

- **Reference Books:**

1. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.
2. Digital Signal Processing - S.K. Mitra -Tata McGraw-Hill Publication, 2001

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B.E. (Electronics and Telecommunication Engineering) Part-II

Elective – II

ET424D: Data Analytics

Teaching Scheme:	**Examination Scheme:**
Lecture : 4 Hrs/Week	ISE:30 Marks
Practical : 2 Hrs/Week	ESE:70 Marks
	ICA:25 Marks

- **Course Objectives:**
  At the end of the course, the students will be able to:
  1. To understand Data Analytics Life Cycle and Business Challenges.
  2. To understand Analytical Techniques and Statically Models.
  3. To understand methods for data analytics practitioners.

- **Course Outcomes:**
  On completion of the course, student will be able to–
  1. Deploying the Data Analytics Lifecycle to address data analytics projects.
  2. Use the right method to solve real problem.
  3. Selecting appropriate data visualizations to clearly communicate analytic insights.
  4. Use the tools and techniques to apply different algorithms and methodologies.

SECTION– I

Unit 1: Introduction to Data Analytics: [06Hrs]

What Can We Do With Data? Big Data and Data Science, Big Data Architectures, Small Data ,What is Data?, A Short Taxonomy of Data Analytics , Examples of Data Use , A Project on Data Analytics.

Unit 2: Descriptive statistics and analysis: [09Hrs]

Scale Types , Descriptive Univariate Analysis , Univariate Frequencies , Univariate Data Visualization , Univariate Statistics , Common Univariate Probability Distributions , Descriptive Bivariate Analysis , Multivariate Frequencies , Multivariate Data Visualization , Multivariate Statistics.

Unit 3: Data Quality and Preprocessing: [08Hrs]

Data Quality, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction.

SECTION-II

Unit 4: Clustering and FPM: **[08Hrs]**

Clustering: Distance Measures, Clustering Validation, Clustering Techniques, **Frequent Pattern Mining**: Frequent Itemsets, Association Rules, Behind Support and Confidence, Other Types of Pattern

Unit 5: Regression and Classification: **[08Hrs]**

Regression: Predictive Performance Estimation, Finding the Parameters of the Model, Technique and Model Selection, **Classification**: Binary Classification, Predictive Performance Measures for Classification, Distance-based Learning Algorithms, Probabilistic Classification Algorithms.

Unit 6: Predictive Methods: **[09Hrs]**

Search-based Algorithms, Optimization-based Algorithms, Ensemble Learning, Algorithm Bias, Non-binary Classification Tasks, Advanced Data Preparation Techniques for Prediction, Description and Prediction with Supervised Interpretable Techniques.

Internal Continuous Assessment (ICA):

Total six to eight assignments from the given list shall be completed using python or JAVA or any other preferred tool. All assignments shall take data from sources mentioned in the text book number 1.

1. Considering the table 2.1 from the text book 1 perform following task:

A. Present the absolute and relative frequencies and respective cumulative frequencies for the attribute "weight".

B. Choose and demonstrate the most appropriate plot for the following attributes from the table 2.1: - i) weight ii) gender iii) weight per gender

C. Draw the histogram for the "height" attribute.

2. Given the list of contact in table 2.1 calculate the covariance and the correlation between the "maxtemp" and "weight" predictive attributes.
3. Solve any three problems from exercise 3.6 from textbook 1.
4. Solve any three problems from exercise 4.7 from textbook 1.
5. Using social network dataset, run the k-means algorithm for different values of k (k= 2, 3 and 5).
6. Using social network dataset, run the DBSCAN algorithm and test different values for the two main hyper-parameter.
7. Solve the problem 7 from the exercise 5.5 from textbook 1.
8. Prepare data given in problem 3 in exercise 5.5(Lecture_Data) and solve any 3 from problem 4 to 8 .
9. Solve the problem 7 to 10 from the exercise 8.5 from textbook 1.
10. Solve the problem 6 to 8 from the exercise 9.6 from textbook 1

- **Text books:**

1. A General Introduction to Data Analytics, by Joao Moreira, Andre Carvalho, Tomas Horvath, Wiley Publication.
2. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer

- **Reference Books:**

1. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.
2. Digital Signal Processing - S.K. Mitra -Tata McGraw-Hill Publication, 2001