Savitribai Phule Pune University
Faculty of Science & Technology

Curriculum

For
Bachelor of Engineering
(Electronics and Computer Engineering)
(Choice Based Credit System)

(With Effect from Academic Year 2020-21)

Savitribai Phule Pune University
Faculty of Science & Technology

Proposed Curriculum

For

TE (Electronics & Computer Engineering)
(Choice Based Credit System)

(With Effect from Academic Year 2022-23)

Savitribai Phule Pune University, Pune
TE (Electronics & Computer Engineering) 2019 Course
(With effect from Academic Year 2022-23)

Semester-V

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
1	Microcontroller and Applications	03	-	-	30	70	-	-	-	100	03	-	-	**03**
2	Power Electronics and Applications	03	-	-	30	70	-	-	-	100	03	-	-	**03**
3	Digital Signal Processing and Applications	03	-	-	30	70	-	-	-	100	03	-	-	**03**
4	*Elective – I	03	-	-	30	70	-	-	-	100	03	-	-	**03**
5	Advanced Data Structures	03	-	-	30	70	-	-	-	100	03	-	-	**03**
6	Microcontroller and Power Lab	-	04	-	-	-	25	50	-	75	-	02	-	**02**
7	DSP and Elective-I Lab	-	04	-	-	-	-	50	-	50	-	02	-	**02**
8	Advanced Data Structures Lab	-	02	-	-	-	25	-	-	25	-	01	-	**01**
9	Seminar	-	01	-	-	-	50	-	-	50	-	-	-	**01**
10	Audit Course 5 (Mandatory)	-	-	-	-	-	-	-	-	-	-	-	-	**-**
	Total	**15**	**11**	**-**	**150**	**350**	**100**	**100**	**-**	**700**	**15**	**05**	**-**	**21**

Abbreviations:
TH : Theory   TW : Term Work   PR : Practical
OR : Oral   TUT : Tutorial

Note: Interested students of T.E. (Electronics/E&TC/Electronics & Computer) can opt any one of the audit course from the list of audit courses prescribed by BoS (Electronics & Telecommunications Engineering)

*Elective-I
1 Computer Graphics
2. Advanced JAVA and Mobile Application Development
3. Mechatronics
4. Fundamentals of HDL

Savitribai Phule Pune University, Pune
TE (Electronics & Computer Engineering) 2019 Course
(With effect from Academic Year 2022-23)

Semester-VI

Course Code	Course Name	Teaching Scheme (Hours/Week)			Examination Scheme and Marks						Credit			
		Theory	Practical	Tutorial	IN-Sem	End-Sem	TW	PR	OR	Total	TH	PR	TUT	Total
1	Advanced Processor	03	-	-	30	70	-	-	-	100	03	-	-	**03**
2	Database Management System	03	-	-	30	70	-	-	-	100	03	-	-	**03**
3	Data Communication	03	-	-	30	70	-	-	-	100	03	-	-	**03**
4	**Elective-II	03	-	-	30	70	-	-	-	100	03	-	-	**03**
5	Advanced Processor and Data Communication Lab	-	04	-	-	-	25	50	-	75	-	02	-	**02**
6	DBMS and Elective-II Lab	-	04	-	-	-	25	50	-	75	-	02	-	**02**
7	Project Based Seminar	-	02	-	-	-	50	-	-	50	-	01	-	**01**
8	Internship	-	04	-	-	-	100	-	-	100	-		-	**04**
9	Audit Course 6 (Mandatory)	-	-	-	-	-	-	-	-	-	-	-	-	**-**
	Total	**12**	**14**		**120**	**280**	**200**	**100**	**-**	**700**	**12**	**05**	**-**	**21**

Abbreviations:

TH : Theory   TW : Term Work   PR : Practical
OR : Oral   TUT : Tutorial

Note: Interested students of T.E. (Electronics/E&TC/Electronics & Computer) can opt any one of the audit course from the list of audit courses prescribed by BoS (Electronics & Telecommunications Engineering)

**Elective-II
1. Web Technology
2. Multimedia Techniques
3. Programmable Logic Controller and Application
4. Network Analysis and Synthesis

Semester I

Microcontroller and Applications

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To understand the applications of Microprocessors & Microcontrollers.
- To understand need of microcontrollers in embedded system.
- To understand architecture and features of typical Microcontroller.
- To learn interfacing of real world input and output devices
- To study various hardware & software tools for developing applications
- To learn MSP430 Microcontroller and low power features.

Course Outcomes:

- After successfully completing the course students will be able to
- Learn importance of microcontroller in designing embedded application
- Describe the 8051 & PIC18FXX microcontroller architectures and its feature.
- Develop interfacing to real world devices
- Learn use of hardware & software tools
- Design simple applications using MSP430

UNIT I: Introduction to microcontroller Architecture   7L

Microprocessor and microcontroller comparison, advantages & applications, Harvard & Von Neumann architecture, RISC & CISC processors. Role of microcontroller in embedded system. Selection criteria of microcontroller. Overview of MCS-51 architecture, Block diagram and explanation of 8051, Port structure, memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Sample programs (assembly): Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port.

Unit II: Interfacing-I   6L

Software and Hardware tools for development of microcontroller based systems such as assemblers, compliers, IDE, Emulators, debuggers, programmers, development board, DSO, Logic Analyzer. Interfacing LED with and without interrupt, Keypads, Seven Segment multiplexed Display, LCD, ADC Interfacing. All Programs in embedded c language.

Unit III: Interfacing-II   5L

Interfacing of DAC, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Opto- isolators. All programs are in embedded C- language.

Unit IV: MSP430 Microcontroller Architecture and Low Power Features   7L
Low Power 16-bit MSP430x5xx microcontroller architecture, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of MSP430 devices; Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power; reliability.

Unit V: Real World Interfacing   5L
GPIO programming and I/O multiplexing; Interrupts and interrupt programming. Watchdog timer. Timers & Real Time Clock (RTC), PWM control. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA. Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.

Unit VI: Applications using 8051 and MSP430 Microcontrollers   4L
Design of DAS, Design of frequency counter with display on LCD, Design of Digital Multimeter, Home protection System, Design of environment monitoring system, Design of water level monitoring and control. All programs are in embedded C.

Text Books:
1. Mazidi, 8051 microcontroller & embedded system 3rd Edition ,Pearson
2. Mazidi, PIC microcontroller & embedded system 3rd Edition ,Pearson
3. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN- 13: 978-0750682763

Reference Books:
1. Getting Started with the MSP430 Launch pad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880 1
2. I2C, RTC data sheets from www.ti.com

Power Electronics and Applications

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To equip the students with the basic knowledge of Power semi conductor Devices
- To study the controlled Rectifiers, Inverters and DC to DC converters.
- To understand the working AC and DC Drives.
- To study the application of Power Electronics.

Course Outcomes:

Students will be able to

- Understand the working of Power Electronics Devices.
- Understand working of Controlled Rectifiers, Inverters and DC to DC converters.
- Understand the Working of AC/DC Drives.

Unit 1:- Power Semiconductor Devices   7 L

Introduction to construction, characteristics, ratings & applications of power diodes, power BJT, power MOSFET & IGBT. Study of Thyristors: construction, characteristics, ratings of SCR, TRIAC, DAIC. Switching/ triggering methods: switching methods/types of triggering devices like DIAC, UJT & PUT Thyristor commutation Tech. (basic concepts) ,protection scheme against over-current, over voltage, dv/dt cooling technique

Unit 2:- Thyristor Application   7 L

Controlled rectifiers: Principles of operations of phase controlled converters, single phase half bridge, semi converter & bridge converters, effect of source inductance on fully controlled bridge converter, performance parameters Design of SCR based DC power circuits including UJT as triggering device AC power control using SCR-UJT & TRIAC-DIAC like universal speed controller fan regulator Design of SCR/TRIAC based AC power control circuits including UJT/DIAC as a triggering device.

Unit 3:- Inverter   6 L

Principles of operation of inverters, PWM inverter, bridge inverter, basic circuit scheme of IGBT/ power MOSFET based inverter circuits harmonic reduction in inverter output. Inverter circuits using H-Bridge for 3-phase output (180 and 120 degree conduction)

Unit 4:- DC to DC Converters   6 L

Basic operation of choppers, study of diff. types of chopper circuits like step up, step down chopper, four quadrant operation of chopper, Basic concept of SMPS and Analysis of various conduction modes of Buck, Boost, Buck-Boost, Cuk converter; design and selection of inductor and capacitor for converters.

Unit 5:- Drives AC Motor Drives   5 L
Concept & requirement of drives, Current fed & Voltage fed drives, rotor resistance control & v/f control of AC motors DC Motor Drives : DC Drives for brushed/brushless motors

Unit 6:- Industrial Applications   5 L
Induction & dielectric heating process, block diagram, merits/demerits Applications of power electronics in traction. HVDC transmission system. UPS: ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Power Electronics in Battery Charging Applications, Power Electronics in Induction heating, Electronic lamp ballast.

Text Books:

1. P.S. Bhimbra, Power Electronics, Khanna publishers, 2004

2. M. H. Rashid, Power Electronics, 2nd Edition, PHI, 2005

3. Power Electronics & its applications, by Alok Jain, PENRAM International Publishing (India) Pvt. Ltd.

4. T. J. E.Miller." Brushless magnet & Reluctance motor drives" Claredon Press London Power Electronics &Variable frequency drives- Technology & Application , Bimal Bose

Reference Books: 1. P.C. Sen, Power Electronics, Tata McGraw Hill, 2005

2. Mohan Undeland Robbins, Power Electronics- Converters application & Design, Wiley Eastern,1996

3. Dubey, Dorald, Thyristorised Power Controller, Wiley Eastern Ltd.1993

4. G.K. Dubey, Power Electronics & control, PHI 1986

5. S.K. Bhattacharya, Industrial Electronics & Control, TATA McGraw Hill, 2007

6. P.C. Sen Modern Power Electronics, Wheeler Publication

7. Modern Electric Traction by Pratab , Dhanpat Rai and sons ,Delhi

8. Power Electronics by Cyril W. Lander, Mc Graw Hill Europe

9. Fundamentals of power Electronics with MATLAB, by Randall Shaffer, Book News, INC, Portland(E-book Available)

10. Advanced Electric Drives-Analysis, control & modeling using SIMULINK, Ned Mohan, MNPER-2001

Digital Signal Processing And Applications

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To understand DTFT and DFT.
- To understand, analyze and design FIR and IIR filters.
- To understand realization of FIR and IIR Filters.
- To understand its hardware implementation using DSP Processor

Course Outcomes:

Upon successful completion of this course, the student will be able to:
- Apply DFT as an analytical tool.
- Analyze LTI Systems using FFT algorithms.
- Design FIR and IIR systems.
- Implement FIR and IIR Systems.
- Implement various DSP Systems on DSP Processor

Unit 1: Z-transform and its application to the analysis of LTI systems: 6L

Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

Unit 2: Discrete Fourier Transform: 7L

 Frequency domain sampling and reconstruction of discrete time signals – DFT, properties of the DFT, use of DFT in linear filtering, filtering of long data sequences, DFT as linear transformation, Efficient computation of the DFT- FFT Algorithms, Radix 2 DITFFT and DIFFFT, Goertzel Algorithm.

Unit 3: Design of IIR filters & FIR Filter: 7L

IIR:- Classical design by impulse invariance, bilinear transformation and matched Z transform, characteristics and design of commonly used filters – butter worth, Chebyshev and elliptic filters, Spectral transformations, Direct design of IIR filters.

FIR:- General considerations, Linear phase FIR Filters, Symmetric and anti-symmetric impulse response, Design using windows, frequency sampling design, Optimum design.

Unit 4: Implementation of Discrete time Systems: 6L

Structures for FIR systems – Direct form, cascade form, Frequency sampling and lattice structures. Structures for IIR systems – Direct form, cascade and parallel form, lattice ladder structures. Finite word length effects.

Unit 5: Multi rate Signal Processing: 5L

Multi rate Signal Processing:-Sampling rate reduction: decimation by integer factors, Sampling rate increase: interpolation by integer factors, sampling rate conversion by non integer factors.

Unit 6, DSP Processors and Application of DSP: 5L

DSP Processors: -Need for Special architecture of DSP processor, Difference between DSP processor & microprocessor, A general DSP processor TMS320C54XX series,

Application of DSP: Case study of Real Time DSP applications to Speech Signal Processing and Biomedical Signal Processing

References:

1. Proakis J.G and.Manolakis D.G. Mimitris D. (2003) ―Introduction to Digital Signal Processing, Prentice Hall, India

 2. Oppenheim A.V.and Schafer R.W. (2003) ―Discrete Time Signal Processing‖, Pearson education.

3. Ifeachar and Jervis (2003) ―Digital Signal Processing: A Practical approach‖ Pearson education, Asia

4. Rabiner L.R and Gold D.J (1988) ―Theory and applications of digital signal processing‖ Prentice Hall, India

5. Sanjit Mitra K (2001) ―Digital Signal Processing: A computer based approach‖, TMH

6. Johnson J.R,(1994) ―Introduction to Digital Signal Processing‖ Prentice Hall, India

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Computer Graphics

Course Objectives:

- To acquaint the learner with the basic concepts of Computer Graphics
- To learn the various algorithms for generating and rendering graphical figures
- To get familiar with mathematics behind the graphical transformations
- To understand and apply various methods and techniques regarding projections, animation, shading, illumination and lighting

Course Outcomes:
After successfully completing the course students will be able to
- Apply mathematics and logic to develop Computer programs for elementary graphic operations
- Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics
- Develop the competency to understand the concepts related to Computer Vision and Virtual reality
- Apply the logic to develop animation and gaming programs

Unit I: Basic Concepts   **8L**
Introduction to Computer Graphics, Basics of graphics systems, Raster scan & Random scan displays, basic display processor Display Files: display file structure, algorithms and display file interpreter. Primitive operations on display file Plotting Primitives: Scan conversions, lines, line segments, vectors, pixels and frame buffers, vector generation Line drawing Algorithms: DDA, Bresenham Circle drawing Algorithms: - DDA, Bresenham Character Generation: Stroke Principle, Starburst Principle, Bit map method, Introduction to aliasing and anti-aliasing

Unit II: Polygons and Graphical Transformations   **6L**
Polygon and its types, inside test, polygon filling methods: Seed fill, Scan Line, Flood fill and Boundary fill 2D Geometric Transformations - translation, scaling, rotation, other

transformations such as reflection, shearing, matrix representation and homogeneous coordinate system, Composite transformations

Unit III: 3-D Transformations and Projections   6L
Translation, scaling, rotation, rotation about X, Y, Z and arbitrary axis reflection about XY, YZ, XZ and arbitrary plane. Projections: Types Parallel - Oblique: Cavalier, Cabinet and orthographic :Isometric, Dimetric, Trimetric and Perspective - Vanishing Points as 1 point, 2 point and 3 point.

Unit IV: Segments, Windowing and Clipping   6L
Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility Windowing: Concept of window and viewport, viewing transformations Line Clipping: Cohen Sutherland Method, Midpoint subdivision method Polygon Clipping: Sutherland Hodgman method for clipping convex and concave polygons

Unit V: Shading, Animation and Gaming   6L
Shading: Halftoning, Gouraud and Phong Shading Computer Animation: Animation sequences, functions & Languages, Key-frame Systems, Motion Specifications. Gaming platforms: Graphics Memory Pipeline, Block diagram of NVIDIA workstation and i860 Introduction to OpenGL ES

Unit VI: Curves and Fractals   6L
Introduction, Curve generation, Interpolation, interpolating algorithms, interpolating polygons, B-Splines and corners, Bezier curves, Fractals, fractal lines and surfaces Interactive Graphics & usage of the tools of computer graphics – 3D Studio and Maya

Text Books
1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987.
2. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001.

Reference Books
1. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003.
2. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002,
3. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002.
4. Zhigang Xiang, Roy Plastock, "Computer Graphics", Schaum"s Series outlines
5. Shirley, Marschner, "Fundamentals of Computer Graphics", Third Ed, A K Peters SPD
6. F.S. Hill JR, "Computer Graphics Using Open GL", Pearson Education
7. D.P. Mukharjee, Debasish Jana, "Computer Graphics Algorithms and implementation", PHI Learning
8. Samuel R. Buss, "3D Computer Graphics", Cambridge University Press

Advanced JAVA and Mobile Application Development

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

1. To adapt the usage of modern tools and recent software.
2. To evaluate problems and analyze data using current technologies
3. To learn the process of creation of data-driven web applications using current technologies
4. To understand how to incorporate best practices for building enterprise applications
5. To learn how to employ Integrated Development Environment(IDE) for implementing and testing of software solution
6. To construct software solutions by evaluating alternate architectural patterns.

Course Outcomes:

1. On completion of the course, student will be able to–
2. Evaluate problems and analyze data using current technologies in a wide variety of business and organizational contexts.
3. Create data-driven web applications
4. Incorporate best practices for building applications
5. Employ Integrated Development Environment(IDE) for implementing and testing of software solution
6. Construct software solutions by evaluating alternate architectural patterns.

Unit I : Advanced Java-1   **8L**

Data Structures in Java: Enumeration, BitSet, Vector, Stack, Dictionary, Hash table, Properties. Generics and Collection Framework: Generic Methods and Generic Classes. Interfaces (Set, List, Queue, and Dequeue) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, and TreeSet)

Unit II : Advanced Java-2   **6L**

Serialization and Networking: Serializing an Object and Deserializing an Object, Socket Programming. Database Connectivity and Multithreading: SQL, JDBC, Thread life cycle, Thread methods, Thread Pools, Executor Service. GUI in JAVA: AWT, Applet, Swing.

Unit III: Mobile Application Development   **7L**

Introduction to Android: Android Platform Architecture, Basic components of android, Features of ART and Delvik Virtual Machine, Activity Life Cycle, Intents and Intent Filters, Resources, System Permissions, Android Application Structure, Device screen size compatibility, Android Emulator.

Unit IV: User Interface components   **6L**

User Interface components: Layouts, Recycler View, List View, Grid View and Web view, Input Controls: Buttons, Checkboxes, Radio Buttons, Toggle Buttons, Spinners, Input Events, Menus, Toast, Dialogs, Styles and Themes.

Unit V: Multimedia, Animation and Graphics   **7L**

Multimedia, Animation and Graphics: Playing Audio, Playing Video, Rotate Animation, FadeIn/FadeOut Animation, Zoom Animation, Scale Animation, 2D and 3D Graphics. Data Storage: Shared Preferences, Internal Storage, External Storage, SQLite Databases, Content provider. and Remote Databases.

Unit VI: Advanced Components of Android   **6L**

Advanced Components of Android: Web App, JSON Parsing, Google Map, GPS, Sensors, Bluetooth/Wi-Fi Connectivity

Text Books

1. Herbert Schildt, "Java: The Complete Reference", TMG Publication, ISBN 9780070636774
2. Thomas Powell, "Java generics and collections", O'Reilly Media, ISBN: 0596527756
3. Neil Smyth, "Android Studio 2 Development Essentials", Payload Media, ISBN: 1532853319
4. John Horton, "Android Programming for Beginners", ISBN 10:1785883267

Reference Books

1. Sharanam Shah and Vaishali Shah , "JAVA EE 7 for Beginners", SPD, ISBN: 13:978-93-5110- 349-3
2. Reto Meier, "Professional Android 4 Application Development", Wrox, ISBN-10: 1118102274; ISBN-13: 978-1118102275
3. Greg Nudelman, "Android Design Patterns :Interaction Design Solutions for Developers", ISBN-10: 1118394151; ISBN-13: 978-1118394151
4. Sharanam Shah, Vaishali Shah," Core Java 8 for beginners", THE TEAM, ISBN: 13:978-93- 5213-080-1

Mechatronics

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To understand the concept and key elements of Mechatronics system, representation into block diagram
- To understand principles of sensors their characteristics
- To Understand of various data presentation and data logging systems
- To Understand concept of actuator
- To Understand various case studies of Mechatronics systems

Course Outcomes:

On completion of the course, student will be able to–

- Identification of key elements of mechatronics system and its representation in terms of block diagram
- Understanding basic principal of Sensors and Transducer.
- Able to prepare case study of the system given.

Unit I: Introduction to Mechatronics   6L

Basics of Mechatronics Systems: Definition of Mechatronics, Key elements of Mechatronics Systems, Levels of mechatronics systems, Measurement Characteristics, Examples of Mechatronics systems in daily life as , Washing Machines, Digital Cameras, CD Players, camcorders, Mechatronics design process, phases of mechatronics design process, integrated design approach. Mechanical Components and Servo mechanism: Mechanical System and Motion, Mass Inertia and Dashpot, Gears, types of Gears, Servomechanism (Concepts and Theory, Problems).Case study Mechatronics Design of Coin Counter/Coin Separator

Unit II: Overview of Sensors, Transducers and their Characteristics Specifications   6L

Specifications related to selection criterion for force, pressure, temperature and motion (Rotary and Linear). Classification and selection of transducers: Force: Load Cell, Cantilever Beam (Design aspect example) Pressure: Strain Gauge, Piezoelectric Motion: Rotary and Linear motions, Proximity sensors Inductive, Capacitive and Magnetic, sources detectors in optical proximity sensors. Comparison of Various proximity sensors Temperature: Optical Fibre and its use in temperature measurement, Fibre Optic Temperature sensors, Ultrasonic Transducers for applications as position, level, flow measurement. Gas sensors, Wind sensors: Gyroscope, Accelerometer, Magnetometer (As used in smart phones) Smart Sensors: Concept, Radiation

Sensors - Smart Sensors - Film sensor, IR- temperature sensors Introduction to MEMS& Nano Sensors . Rotary Optical Encoder

Unit III: Hydraulic Systems   6L

Introduction to Hydraulic Actuators Fluid Power systems: Concept of Actuators, Classification of Actuators: Pneumatic, Hydraulic and Electrical Actuators, Fluid Power systems Hydraulic Systems: Physical Components of a Hydraulic systems, Hydraulic Pumps (e.g. Gear Pumps, Vane Pumps, Piston Pumps and Axial Piston Pumps) , Filters and Pressure Regulation, Relief Valve, Accumulator.

Unit IV: Pneumatic Systems   6L

Introduction to Pneumatic a Actuators Physical Components of a Pneumatic Systems, Pneumatic Cylinders, Pneumatic Actuators (e.g. Spring Actuator and Spring Actuator with positioner), Air compressor, Air Receiver, Air Dryer, Air Service Treatment: Air Filter, air regulator and Gauge, Air Lubricator and Pressure regulation Intake and Air Filter. Case study of Robotic Pick and Place robot

Unit V: Electrical Actuators, Electron-Mechanical Actuators   6L

 Electrical-Actuation system: Selection criteria and specifications of stepper motors, solenoid valves, relays (Solid State relays and Electromechanical relays). Election Criterion of control valve, Single acting and Double acting Cylinders. Electro-Pneumatic: Pneumatic Motors, Valves: Electro Hydraulic: 3/2 Valves, 4/2 Valves, 5/3 Valves Cables: Power cable and Signal cables

Unit VI: Mechatronics Systems in Automobile   6L

 (Treatment with Block Diagram Approach) Boat Autopilot, High Speed tilting trains, Automatic car parking systems, Engine Management systems, Antilock Brake systems (ABS) ,CNC Machines(Only Black Diagram and explanation)

Text Books:
1. W. Boltan-Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering‖ 6th Edition, Pearson Education, 2016
2. David Alciatore and MaichaelB Histand, -Introduction to Mechatronics and Measurement Systems‖,4th Edition, Tata McGraw Hill 2013.
3. K.P.Ramachandran, G.K.Vijayaraghavan and M.S. Balasundaram, -Mechatronics- Integrated
4. Mechanical Electronic Systems‖, Willey Publication 2008

Reference Books:

1. Nitaigour P. Mahalik ,Mechatronics-Principles, Concepts and Applications, Tata McGraw Hill, Eleventh reprint 2011.
2. Devdas Shetty and Richard A.Kolk, -Mechatronics System Design, Thomson India Edition 2007.
3. HMT Limited, -Mechatronics, Tata McGraw-Hill Publishing House

Credits: TH-03

Teaching Scheme:	Examination Scheme:

Lectures: 3 Hrs/ Week

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To study basic programming in VHDL
- To learn Concepts of Verilog HDL

Course Outcomes:

After successfully completing the course students will be able to

1. Learn the role of HDL in digital system design using latest tools like VHDL and Verilog.
2. Describe and test digital logic circuits in data flow description, structural description, behavioral description and advanced constructs (procedures, tasks, functions) usingboth VHDL and Verilog.
3. Develop VHDL code to model and simulate basic combinational networks and sequential machines

Unit I: Introduction to HDL   6L

Introduction: Why HDL? A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog

Unit II: Modelling styles in VHDL   6L

Data-Flow Descriptions: Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors. Behavioral Descriptions: Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement, sequential statements. Structural Descriptions: Highlights of structural Description, Organization of the structural Descriptions, state Machines

Unit III: Programmable Logic Devices   6L

Complex Programmable Logic Devices – Architecture of CPLD, Organization of FPGAs, FPGA Programming Technologies (SRAM, Antifuse), Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs

Unit IV: Procedures and Functions   6L

Procedures and Functions: Procedures, Tasks, and Functions: Highlights of Procedures, tasks,

and Functions, Procedures and tasks, Functions.

Unit V: Introduction to Verilog HDL   6L

Program structure, Logic System, Nets, Variables, and Constants, Vectors and Operators, Arays, Logical Operators and Expressions.

Unit VI: Design Elements in Verilog   6L

Compiler directives, structural design elements, Dataflow design elements, Behavioral design elements (Procedural Code)

Text Books:
1. HDL Programming (VHDL and Verilog)- Nazeih M.Botros- Dreamtech Press
   (Available through John Wiley – India and Thomson Learning), 2006 Edition
2. John F Wakerly, Digital Design- Principles and Practices, Pearson education, 4 Edition

Reference Books:
1. VHDL -Douglas Perry, TMH
2. Stephen Brown & ZvonkoVranesic, Fundamentals of Digital Logic Design with VHDL, Tata McGrw-Hill, New Delhi, 2nd Ed., 2007
3. Verilog HDL –Samir Palnitkar, Pearson Education
          Fundamentals of Digital Logic with Verilog Design-Stephen Brown, TMH

Advance Data Structures

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To develop a logic for graphical modeling of the real life problems.
- To suggest appropriate data structure and algorithm for graphical solutions of the problems.
- To understand advanced data structures to solve complex problems in various domains.
- To operate on the various structured data
- To build the logic to use appropriate data structure in logical and computational solutions.
- To understand various algorithmic strategies to approach the problem solution.

Course Outcomes:

On completion of the course, student will be able to–

- To apply appropriate advanced data structure and efficient algorithms to approach the problems of various domain.
- To design the algorithms to solve the programming problems.
- To use effective and efficient data structures in solving various Computer Engineering domain problems.
- To analyze the algorithmic solutions for resource requirements and optimization
- To use appropriate modern tools to understand and analyze the functionalities confined to the data structure usage.

Unit I Trees   6 L

Tree- basic terminology, General tree and its representation, representation using sequential and linked organization, Binary tree- properties, converting tree to binary tree, binary tree traversals- in order, preorder, post order, level wise -depth first and breadth first, Operations on binary tree. Binary Search Tree (BST), BST operations, Threaded binary tree- concepts, threading, insertion and deletion of nodes in in-order threaded binary tree, in order traversal of in-order threaded binary tree. Case Study- Use of binary tree in expression tree-evaluation and Huffman's coding

Unit II Graphs   6 L

Hours Basic Concepts, Storage representation, Adjacency matrix, adjacency list, adjacency multi list, inverse adjacency list. Traversals-depth first and breadth first, Introduction to Greedy Strategy, Minimum spanning Tree, Greedy algorithms for computing minimum spanning tree-Prims and Kruskal Algorithms, Dikjtra's Single source shortest path, Topological ordering. Case study- Data structure used in Web graph and Google map.

Unit III Hashing   6 L

Hash Table- Concepts-hash table, hash function, bucket, collision, probe, synonym, overflow, open hashing, closed hashing, perfect hash function, load density, full table, load factor, rehashing, issues in hashing, hash functions- properties of good hash function, division, multiplication, extraction, mid-square, folding and universal, Collision resolution strategies-open addressing and chaining, Hash table overflow- open addressing and chaining, extendible hashing. Dictionary- Dictionary as ADT, ordered dictionaries. Skip List- representation, searching and operations- insertion, removal.

Unit IV Search Trees   6 L

Symbol Table-Representation of Symbol Tables- Static tree table and Dynamic tree table, Introduction to Dynamic Programming, Weight balanced tree, Optimal Binary Search Tree (OBST), OBST as an example of Dynamic Programming, Height Balanced Tree- AVL tree.

Unit V Indexing and Multiway Trees   6 L

Indexing and Multiway Trees- Indexing, indexing techniques, Types of search tree- Multiway search tree, B-Tree, B+Tree, Trie Tree, Splay Tree, Red-Black Tree, K-dimensional tree, AA tree. Set- Set ADT, realization of Set and operations. Heap-Basic concepts, realization of heap and operations, Heap as a priority queue, heap sort

Unit VI File Organization   6 L

Sequential file organization- concept and primitive operations, Direct Access File- Concepts and Primitive operations, Indexed sequential file organization-concept, types of indices, structure of index sequential file, Linked Organization- multi list files, coral rings, inverted files and cellular partitions. External Sort- Consequential processing and merging two lists, multiday merging- a k way merge algorithm.

Text Books:

1. Horowitz, Sahani, Dinesh Mehata, Fundamentals of Data Structures in C++‖, Galgotia Publisher, ISBN: 8175152788, 9788175152786.

2. M Folk, B Zoellick, G. Riccardi, File Structures, Pearson Education, ISBN:81-7758-37-5 3. Peter Brass, Advanced Data Structures‖, Cambridge University Press, ISBN: 978-1-107-43982-5

References Books:

1. A. Aho, J. Hopcroft, J. Ulman, Data Structures and Algorithms, Pearson Education, 1998, ISBN-0-201-43578-0.

2. Michael J Folk, File Structures an Object Oriented Approach with C++, Pearson Education, ISBN: 81-7758-373-5.

3. Sartaj Sahani, Data Structures, Algorithms and Applications in C++, Second Edition, University Press, ISBN:81-7371522 X.

4. G A V Pai, Data Structures and Algorithms, The McGraw-Hill Companies, ISBN - 9780070667266.

5. Goodrich, Tamassia, Goldwasser, Data Structures and Algorithms in Java‖, Wiley Publication, ISBN: 9788126551903.

Credits: PR-02

Teaching Scheme:

Practical: 4 Hrs/ Week

Examination Scheme:

Practical: 50 Marks

Term work: 25 Marks

Microcontroller and Application Experiments:

List of Experiments:

(4 from each group (8051 & MSP430)

1) Interfacing LED bank to 8051 microcontroller using timer with interrupt.

2) Interfacing Seven Segment Display to 8051 microcontroller

3) Interfacing DAC to 8051 microcontroller for generating various waveforms

4) Interfacing stepper motor to 8051 microcontroller.

5) Interfacing of LCD to 8051 microcontroller.

6) Learn and understand how to configure MSP-EXP430G2 digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the code to make the green and red LEDs blink.

   b) Modify the delay with which the LED blinks.

7) Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.

   b) Write the code to turn on interrupts globally.

8) Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises: a) Observe the PWM waveform on a particular pin using CRO.

9) Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 to control the DC motor using external analog input.

   Exercises: a) Create a PWM signal of 75% duty cycle on particular PWM pin.

10) Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

   Exercise: Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

   char str1[ ]="MSP430G2553 MCU"

   char str2[ ]= " Ultra low power mixed signal processing applications"

Power Electronics and Application Experiments

List of Experiments: Any -8

1. Study of V-I Characteristics of MOSFET / SCR.
2. Study of TRIAC & DIAC characteristics.
3. Study of UJT based triggering circuits
4. Study of Half wave & full wave controlled rectifier
5. Study of IGBT/ MOSFET based inverter
6. Study of SCR/TRIAC based AC power control circuit
7. Study of DC motor speed control using chopper
8. Study of PWM drive for Induction motor using IGBT
9. Simulation of Three phase Semi/Full converter for R and RL load.
10. Simulation of Three phase PWM inverters for R and RL load
11. Simulation of chopper circuit for R and RL load .

DSP and Elective -I Lab

Credits: PR-02

Teaching Scheme: **Examination Scheme:**
Practical: 4 Hrs/ Week   Practical: 50 Marks

Digital Signal Processing and Applications.

Note: Experiments 1 to 8 can be performed in any appropriate software like C /MATLAB / Scilab etc. Minimum six experiments to be performed. Experiment No. 9 & 10 are mandatory.

1. To find Z and inverse Z transform and pole zero plot of Z-transfer function.
2. To solve the difference equation and find the system response using Z-transform.
3. To study the properties of DFT. Write programs to confirm all DFT properties.
4. Implementation of FFT algorithms
5. Program for finding linear convolution & circular convolution.
6. Program for finding linear convolution using circular convolution
7. To study the effect of different windows on FIR filter response.
8. Design and implement two stage sampling rate converter.
9. To plot the mapping function used in bilinear transformation method of IIR filter design.(assignment may be given)
10. Effect of coefficient quantization on the impulse response of the filter using direct form I and II realization and cascade realization.(theory assignment)

Computer Graphics

List of Practical's :- Any -8

Implement any 4 Practicals from group A and any 4 assignments from group B

List of Practicals: Group A

1. A Mandelbrot Set is a set of complex number z that does not diverge under the transformation $z_{n+1} = z_n^2 + x$ with $x_0 = 0$. Where, both x and z represent the complex numbers.
   a) Plot the Mandelbrot set for the threshold $|x| = 2$.
   b) Plot Julia set choosing $z \neq 0$. Use 254 colors for plotting in both cases. Change the threshold to observe different patterns.

2. Draw the polygons by using the mouse. Choose colors by clicking on the designed color pane. Use window port to draw. (Use DDA algorithm for line drawing)

3. Draw inscribed and Circumscribed circles in the triangle as shown as an example below (Use any Circle drawing and Line drawing algorithms)
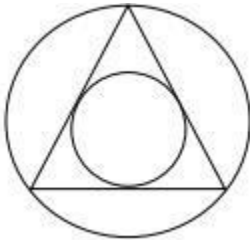
4. Draw the following pattern using any Line drawing algorithms.
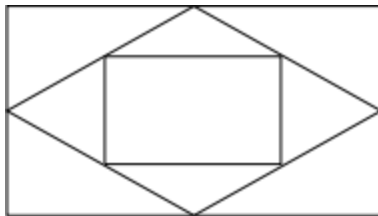
5. Draw a 4X4 chessboard rotated 45˚ with the horizontal axis. Use Bresenham algorithm to draw all the lines. Use seed fill algorithm to fill black squares of the rotated chessboard

Group B

1. Implement Cohen Sutherland Hodgman algorithm to clip any given polygon. Provide the vertices of the polygon to be clipped and pattern of clipping interactively.
2. Implement translation, sheer, rotation and scaling transformations on equilateral triangle and rhombus.
3. Implement Cube rotation about vertical axis passing through its centroid.
4. Generate fractal patterns by using Koch curves.
5. Animation : Implement any one of the following animation assignments,
   i) Clock with pendulum
   ii) National Flag hoisting
   iii) Vehicle/boat locomotion
   iv) Falling Water drop into the water and generated waves after impact
   v) Kaleidoscope views generation (at least 3 colorful patterns)

Reference Books

1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.

2. D. Rogers, "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371 – 4.

Advance Java and Mobile Application Development

List of Practical"s:- Any -8

Assignments for Advanced JAVA

1. Design a system with the help of advance data structures in Java and enhance the system using collections and generics.
2. Enhance the above system with the help of socket programming use client server architecture.
3. Enhance above system by using JDBC, Multithreading, concurrency, synchronous and asynchronous callbacks, ThreadPools using ExecutorService.
4. Transform the above system from command line system to GUI based application Suggested

Mobile Application Development

1. Download Install and Configure Android Studio on Linux/windows platform.
2. Design a mobile app for media player.
3. Design a mobile app to store data using internal or external storage.
4. Design a mobile app using Google Map and GPS to trace the location.

Suggested Mini Project on Advanced JAVA and Mobile Application Development

Design and develop a mobile app for novice trekkers by recording the paths from regular trekkers by using, Material Design Pattern for UI, Storage [SQLite database/File/Shared Preference/cloud], Internet connection /Wi-Fi/Bluetooth, GPS and Google Map

Mechatronics

List of Practical's :- Any -8

1. Servomotor position control using photo electric pickup

2. Position and velocity measurement using encoders

3. Study of liquid flow measurement.

4. Study on the application of data acquisition systems for industrial purposes.

5. Interfacing of any 2- sensors with data acquisition systems.

6. Study of Hydraulic Trainer.

7. Study of Pneumatic Trainer.

8. Study of Electro-Pneumatic Trainer.

9. Study of Electro-Hydraulic Trainer.

10. Demonstration of any one case study

Fundamental of HDL

1. List of Experiments:

1. Simulate Half adder and Full Adder using VHDL

2. Simulate 4:1 Mux using VHDL

3. Simulate all types of FlipFlops using VHDL

4. Simulate Shift Register(Left and Right shift) using VHDL

5. Simulate Half adder and Full Adder using Verilog

6. Simulate 3:8 Decoder using Verilog

7. Simulate Counter using Verilog

8. Simulate ALU using Verilog

Advance Data Structures

Each student must perform at least 13 Practicals as at least 02 from group A, 02 from group B, 2 from group C, 2 from group D, 01 from group E, 01 from group F and 3 from group G.

Operating System recommended : 64-bit Open source Linux or its derivative Programming tools recommended:

Open Source: C++ Programming tool like G++/GCC Suggested List of Laboratory Assignments Write C++/Java program for following-

Group A

1. A book consists of chapters, chapters consist of sections and sections consist of subsections. Construct a tree and print the nodes. Find the time and space requirements of your method.
2. Beginning with an empty binary search tree, Construct binary search tree by inserting the values in the order given. After constructing a binary tree - i. Insert new node ii. Find number of nodes in longest path iii. Minimum data value found in the tree iv. Change a tree so that the roles of the left and right pointers are swapped at every node v. Search a value
3. For given expression eg. a-b*c-d/e+f construct inorder sequence and traverse it using postorder traversal(non recursive).
4. Read for the formulas in propositional calculus. Write a function that reads such a formula and creates its binary tree representation. What is the complexity of your function?
   Given binary tree with n nodes, assign this tree to another [operator=] and then erase all nodes in a binary tree.
5. Convert given binary tree into threaded binary tree. Analyze time and space complexity of the algorithm.
6. Consider threading a binary tree using preorder threads rather than inorder threads. Design an algorithm for traversal without using stack and analyze its complexity.
7. A Dictionary stores keywords & its meanings. Provide facility for adding new keywords, deleting keywords, updating values of any entry. Provide facility to display whole data sorted in ascending/ Descending order. Also find how many maximum comparisons may require for finding any keyword. Use Binary Search Tree for implementation.

Group B

8. Write a function to get the number of vertices in an undirected graph and its edges. You may assume that no edge is input twice. i. Use adjacency list representation of the graph and find runtime of the function ii. Use adjacency matrix representation of the graph and find runtime of the function
9. There are flight paths between cities. If there is a flight between city A and city B then there is an edge between the cities. The cost of the edge can be the time that flight takes to reach city B from A, or the amount of fuel used for the journey. Represent this as a graph. The node can be represented by airport name or name of the city. Use adjacency list

representation of the graph or use adjacency matrix representation of the graph. Justify the storage representation used.

10. You have a business with several offices; you want to lease phone lines to connect them up with each other; and the phone company charges different amounts of money to connect different pairs of cities. You want a set of lines that connects all your offices with a minimum total cost. Solve the problem by suggesting appropriate data structures.

11. Tour operator organizes guided bus trips across the Maharashtra. Tourists may have different preferences. Tour operator offers a choice from many different routes. Every day the bus moves from starting city S to another city F as chosen by client. On this way, the tourists can see the sights alongside the route travelled from S to F. Client may have preference to choose route. There is a restriction on the routes that the tourists may choose from, the bus has to take a short route from S to F or a route having one distance unit longer than the minimal distance. Two routes from S to F are considered different if there is at least one road from a city A to a city B which is part of one route, but not of the other route.

12. Consider the scheduling problem. n tasks to be scheduled on single processor. Let t1, ..., tn be durations required to execute on single processor is known. The tasks can be executed in any order but one task at a time. Design a greedy algorithm for this problem and find a schedule that minimizes the total time spent by all the tasks in the system. (The time spent by one is the sum of the waiting time of task and the time spent on its execution.)

Group C

13. Consider telephone book database of N clients. Make use of a hash table implementation to quickly look up client,‚s telephone number.

14. Implement all the functions of a dictionary (ADT) using hashing. Data: Set of (key, value) pairs, Keys are mapped to values, Keys must be comparable, Keys must be unique Standard Operations: Insert(key, value), Find(key), Delete(key)

15. For given set of elements create skip list. Find the element in the set that is closest to some given value.

16. The symbol table is generated by compiler. From this perspective, the symbol table is a set of name-attribute pairs. In a symbol table for a compiler, the name is an identifier, and the attributes might include an initial value and a list of lines that use the identifier. Perform the following operations on symbol table: (1) Determine if a particular name is in the table (2) Retrieve the attributes of that name (3) Modify the attributes of that name (4) Insert a new name and its attributes (5) Delete a name and its attributes

Group D

17. Given sequence k = k1 <k2 < … < kn of n sorted keys, with a search probability pi for each key ki . Build the Binary search tree that has the least search cost given the access probability for each key.

18. A Dictionary stores keywords & its meanings. Provide facility for adding new keywords, deleting keywords, updating values of any entry. Provide facility to display whole data sorted in ascending/ Descending order. Also find how many maximum comparisons may require for finding any keyword. Use Height balance tree and find the complexity for finding a keyword

Group E

19. To create ADT that implements the SET concept. a. Add (newElement) -Place a value into the set b. Remove (element) Remove the value c. Contains (element) Return true if element is in collection d. Size () Return number of values in collection Iterator () Return an iterator used to loop over collection e. Intersection of two sets, f. Union of two sets, g. Difference between two sets, h. Subset

20. Read the marks obtained by students of second year in an online examination of particular subject. Find out maximum and minimum marks obtained in that subject. Use heap data structure. Analyze the algorithm.

Group F

21. Assume we have two input and two output tapes to perform the sorting. The internal memory can hold and sort m records at a time. Write a program in java for external sorting. Find out time complexity. 23 Department maintains a student information. The file contains roll number, name, division and address. Allow user to add, delete information of student. Display information of particular employee. If record of student does not exist an appropriate message is displayed. If it is, then the system displays the student details. Use sequential file to main the data.

22. Company maintains employee information as employee ID, name, designation and salary. Allow user to add, delete information of employee. Display information of particular employee. If employee does not exist an appropriate message is displayed. If it is, then the system displays the employee details. Use index sequential file to maintain the data.

Group G

23. Implement the Heap/Shell sort algorithm implemented in Java demonstrating heap/shell data structure with modularity of programming language.

24. Any application defining scope of Formal parameter, Global parameter, Local parameter accessing mechanism and also relevance to private, public and protected access. Write a Java program which demonstrates the scope rules of the programming mechanism.

25. Write a Java program which will demonstrate a concept of Interfaces and packages: In this assignment design and use of customized interfaces and packages for a specific application are expected.

26. Write a Java program which will demonstrate a concept of cohesion and coupling of the various modules in the program.

27. Write a program on template and exception handling in Java: in this assignment multiple templates are to be designed as a pattern and these patterns to be used to take decisions.

28. Write a Java program for the implementation of different data structures using JAVA collection libraries (Standard toolkit library): at least 5 data structures are used to design a suitable application.

29. Design a mini project using JAVA which will use the different data structure with or without Java collection library and show the use of specific data structure on the efficiency (performance) of the code.

Credits: PR-01

Teaching Scheme: **Examination Scheme:**

Practical: 1 Hr. / Week   Term work: 50 Marks

Course Objectives:

- To explore the basic principles of communication (verbal and non-verbal) and active,
- empathetic listening, speaking and writing techniques.
- To expose the student to new technologies, researches, products, algorithms, services

Course Outcomes:

On completion of the course, student will–

- be able to be familiar with basic technical writing concepts and terms, such as audience
- analysis, jargon, format, visuals, and presentation.
- be able to improve skills to read, understand, and interpret material on technology.
- improve communication and writing skills

Guidelines:

1. Each student will select a topic in the area of Computer Engineering and Technology
2. preferably keeping track with recent technological trends and development beyond scope of syllabus.
3. The topic must be selected in consultation with the institute guide.
4. Each student will make a seminar presentation in the term making use of audio/visual aids for a duration of 20-25 minutes and submit the seminar report prepared in latex
5. Active participation at classmate seminars is essential.
6. A panel of staff members from the institute will assess the seminar internally during the Presentation.

Guidelines for Assessment:

As a panel of staff members along with a guide would be assessing the seminar work based on these parameters-Contents and Presentation, Punctuality and Timely Completion, Question and Answers, Seminar Report, Paper presentation/Publication, Attendance and Active Participation.

Recommended Format of the Seminar Report:

- Title Page with Title of the topic, Name of the candidate with Exam Seat Number, Roll Number, Name of the Guide, Name of the Department, Institution and Year
- Seminar Approval Sheet/Certificate
- Abstract and Keywords
- Acknowledgement
- Table of Contents, List of Figures, List of Tables and Nomenclature
- Chapters Covering topic of discussion- Introduction with section including organization of the report, Literature Survey/Details of design/technology/Analytical and/or experimental work, if any/ …..,Discussions and Conclusions ,Bibliography/References

- Plagiarism Check report
- Report Documentation page

References:

1. Rebecca Stott, Cordelia Bryan, Tory Young, "Speaking Your Mind: Oral Presentation and Seminar Skills (Speak-Write Series)", Longman, ISBN-13: 978-0582382435
2. Johnson-Sheehan, Richard, "Technical Communication", Longman. ISBN 0-321-11764-6.

Semester II

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

1. To understand need and application of ARM Microprocessors in embedded system.

2. To study the architecture of ARM series microprocessor

3. To understand architecture and features of typical ARM7& DSP Processors.

4. To learn interfacing of real world input and output devices

5. To learn embedded communication systems.

Course Outcomes:

On completion of the course, student will be able to

1. Describe the ARM microprocessor architectures and its feature.

2. Interface the advanced peripherals to ARM based microcontroller

3. Design embedded system with available resources.

4. Use of DSP Processors and resources for signal processing applications.

Course Contents
Unit I : ARM7, ARM9, ARM11 Processors   6L

Introduction to ARM processors and its versions, ARM7, ARM9 & ARM11 features, advantages & suitability in embedded application, registers, CPSR, SPSR, ARM and RISC design philosophy, ARM7 data flow model, programmers model, modes of operations

Unit II :ARM7 Based Microcontroller   6L

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer, Instruction set, programming in assembly language.

Unit III : Real World Interfacing with ARM7 Based Microcontroller-1   6L
Interrupt structure of LPC2148, Interfacing with LED, LCD, GLCD, KEYPAD, simple LPC2148 GPIO Programming examples Using timers of LPC2148 to generate delay, serial communication programming for transmission and reception from computer, programming for UART.

Unit IV : Real World Interfacing with ARM7 Based Microcontroller -2   **6L**

GSM and GPS module interfacing, on-chip ADC using interrupt (VIC) and without using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

Unit V : Digital signal Processors –I   **6L**

Introduction, Computer Architectures for signal processing, General purpose Digital signal Processors, selecting digital signal processors, Special purpose DSP Hardware, Architecture of TMS320C67X, Features of C67X processors, CPU, General purpose register files, Functional units and operation, Data paths, Control register file.

Unit VI : Digital signal Processors-II   **6L**

TMS320C67X Functional units, Internal memory, External memory, on chip peripherals, Interrupts, Instruction set and addressing modes, Fixed point instructions, Floating point instructions, Conditional operations, Parallel operations, Pipeline operations, Code Composer studio, Application programs in C67X

Text Books:

1. Andrew Sloss, Dominic Symes, Chris Wright,-ARM System Developer„s Guide – Designing and Optimizing System Software‖, ELSEVIER
2. Digital Signal Processors: Architecture, Programming and Applications By B. Venkatramani, M Bhaskar McGraw Hill Second Edition

Reference Books:

1. LPC 214x User manual (UM10139) :- www.nxp.com
2. ARM architecture reference manual : - www.arm.com
3. Trevor Martin, An Engineer„s Introduction to the LPC2100 series, Hitex (UK)
4. TMS320C67XX User manual: www.ti.com
5. Digital Signal Processing A Practical Approach by Emmanuel Ifeachor, Barrie W. Jervis Pearson Second edition
6. Joseph Yiu, -The Definitive Guide to the ARM Cortex-M, Newness, ELSEVIER.

Database Management System

Credits: TH-03

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives :

1. To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation
2. To provide a strong formal foundation in database concepts, technology and practice
3. To give systematic database design approaches covering conceptual design, logical design and an overview of physical design
4. Be familiar with the basic issues of transaction processing and concurrency control
5. To learn and understand various Database Architectures and Applications
6. To learn a powerful, flexible and scalable general purpose database to handle big data

Course Outcomes :

On completion of the course, student will be able to–
1. Design E-R Model for given requirements and convert the same into database tables.
2. Use database techniques such as SQL & PL/SQL.
3. Use modern database techniques such as NOSQL.
4. Explain transaction Management in relational database System.
5. Describe different database architecture and analyses the use of appropriate architecture in real time environment.
6. Use advanced database Programming concepts Course Contents

Unit I Introduction   7L
Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

Unit II SQL AND PL/SQL   7L
SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges , Embedded SQL, Dynamic SQL.

Unit III Relational Database Design   8L

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, Modeling Temporal Data.

Unit IV Database Transactions and Query Processing   8L

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods, Recovery methods : Shadow-Paging and Log-Based Recovery, Checkpoints, Query Processing, Query Optimization, Performance Tuning.

Unit V Parallel and Distributed Databases   7L

Introduction to Database Architectures: Multi-user DBMS Architectures, Case study- Oracle Architecture. Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases. Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.

Unit VI NoSQL Database   8L

Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study-unstructured data from social media. Introduction to Big Data, HADOOP: HDFS, MapReduce.

Text Book :

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, "NoSQL Distilled", Addison Wesley, ISBN- 10: 0321826620, ISBN-13: 978-0321826626 References: 1. C J Date, "An Introduction to Database Systems", Addison-Wesley, ISBN: 0201144719 2. S.K.Singh, "Database Systems : Concepts, Design and Application", Pearson, Education, ISBN 978-81-317-6092-5 3. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide" ,O"Reilly Publications, ISBN: 978-1-449-34468-9.
4. Adam Fowler, "NoSQL For Dummies", John Wiley & Sons, ISBN-1118905628
5. Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749

6. Joy A. Kreibich, "Using SQLite", O'REILLY, ISBN: 13:978-93-5110-934-1
7. Garrett Grolemund, "Hands-on Programming with R", O'REILLY, ISBN : 13:978-93- 5110-728-6

Data Communication

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To provide an in-depth introduction to all aspects of data communication system.
- To define different data formats for better data transmission.
- To introduce various digital baseband and bandpass modulation schemes.
- To identify the need of data coding and error detection/correction mechanism.
- To provide knowledge of various multiplexing schemes.

Course Outcomes:

After successfully completing the course, students will be able to

- Define and explain terminology of data communications
- Understand the impact and limitations of various modulation techniques.
- Get exposure to entropy and other coding techniques.
- Identify and explain error detection and correction using appropriate techniques.
- Design of data communication system.
- To acknowledge the need of spread spectrum schemes.

Unit I: Data Transmission Fundamentals   (8L)

Data transmission concepts and terminology, analog and digital data transmission, Transmission modes (simplex, half duplex, full duplex), Transmission Impairments and Channel Capacity, transmission media : Guided (UTP, STP, Optical, coaxial) & wireless(Radio wave, Microwave, Infrared), Data Transmission(parallel and serial-synchronous and asynchronous transmission), analog and digital signal properties, Bandwidth, bit rate, baud rate data rate limits, Connecting devices: Hubs/Repeaters, Switches, Bridges, Routers, Layered Architecture (OSI Model), ISDN

Unit II: Baseband Signal Encoding   (6L)

Block Diagram of Digital Communication System, Digital Versus Analog Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, DM, ADM, DPCM and applications, **Basic line codes**: RZ, NRZ, Unipolar, Polar, Bipolar, AMI, Manchester: properties and comparison; Multilevel line codes: MLT3, 2B1Q.

Unit III: Bandpass Digital Signalling   (8L)

Bandpass Digital Signalling Generation, detection, signal space diagram ASK, FSK, PSK, QPSK, OQPSK, QAM schemes, comparison. **M-arysignalling**: MPSK, MFSK signalling, OFDM.

Unit IV: Multiple Access Techniques   (6L)

Introduction to Multiple Access Techniques – TDMA, FDMA, CDMA Spread spectrum techniques DSSS and FHSS, introduction to orthogonal codes and their properties; suitable example of orthogonal code and its autocorrelation, random access, Pure and slotted ALOHA, Media access control protocol (CSMA)

Unit V: Error Control Coding   (6L)

Linear block codes, Hamming code, Hamming distance, CRC, syndrome detection, convolution code, trellis diagram, coding gain, Veterbi algorithm for detection Error control systems: FEC, ARQ Stop and Wait, Hybrid ARQ, go back N, selective repeat

Unit VI: Information Theory   (6L)

The concept of Information, Information rate, entropy, mutual information, channel capacity, Bandwidth-SNR tradeoffs, use of orthogonal signals to achieve Shannon"s limit. **Entropy coding:** overview of BSC, Huffman coding, Shannon-Fano coding, code efficiency, channel through put.

Text Books :

1. Bernard Sklar, Digital Communication,2/E, Pearson Education India, 2009
2. Willam Stallings, Data and Computer

Reference Books:

1. Behrouz A. Forouzan, Data Communications and Networking, 4/E, McGraw-Hill, 2006
2.   Leon W. Couch II, Digital and Analog Communication Systems, 6/E, Pearson Education Asia, 2002 3.Taub Schilling, Principals of Communication Systems, 2/E, Tata McGraw Hill, 2004
4.John J Proakis, Digital Communications, 3/E, McGraw-Hill Higher Education, 2001
 5. Simon Haykin, Digital Communication, 4/E, Wiley,1988

Elective II

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Web Technology

Course Objectives:

1. To understand the principles and methodologies of web based applications development process.
2. To understand current client side and server side web technologies.
3. To understand current client side and server side frameworks.
4. To understand web services and content management.

Course Outcomes:

On completion of the course, student will be able to–

1. Analyze given assignment to select sustainable web development design methodology.
2. Develop web based application using suitable client side and server side web technologies.
3. Develop solution to complex problems using appropriate method, technologies, frameworks, web services and content management.

Unit I Web Development Process, Front End Tools   **7L**

Introduction to web technology, internet and www, Web site planning and design issues, HTML: structure of html document , HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors, XML: Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.

Unit II Client Side Technologies   **8L**

JavaScript: Overview of JavaScript, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.

Unit III Server Side Technologies   **8L**

Introduction to Server Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet, elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP.

Unit IV Server Side Technologies   7L
PHP: Introduction to PHP, Features, sample code, PHP script working, PHP syntax, conditions & Loops, Functions, String manipulation, Arrays & Functions, Form handling, Cookies & Sessions, using MySQL with PHP, WAP & WML, AJAX: Introduction, Working of AJAX, AJAX processing steps, coding AJAX script.

Unit V Client and Server Side Frameworks   7L
Angular JS : Overview, MVC architecture, directives, expression, controllers, filters, tables, modules, forms, includes, views, scopes, services, dependency injection, custom directives, Internationalization, Introduction to NodeJS. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.

Unit VI Web Services   8L
Web Services: Overview, types of WS, difference between SOAP and REST, EJB: types of EJB, benefits, Architecture, EJB technology, JNDI lookup, Introduction to Content Management System(CMS) ,Wordpress / Joomala, Advanced Technology: Bootstrap, JSF, Spring.

Text Book:
1. Achyut Godbole & Atul Kahate, "Web Technologies: TCP/IP to Internet Application Architectures", McGraw Hill Education publications, ISBN, 007047298X, 9780070472983
2. Ralph Moseley & M. T. Savaliya, "Developing Web Applications", Wiley publications, ISBN 13 : 9788126538676

References:
1. Adam Bretz & Colin J Ihrig, "Full Stack Javascript Development with MEAN", SPD, ISBN-13: 978-0992461256
2. Giulio Zambon, "Beginning JSP, JSF and Tomcat", Apress Publication, ISBN-10: 1430246235; ISBN-13: 978- 1430246237
3. Jeremy McPeak& Paul Wilton," Beginning JavaScript", Wrox Publication, ISBN-13: 978-0470525937
4. Black Book, "Struts 2", Dreamtech Press, ISBN 13, : 9788177228700
5. Black Book, "JDBC 4.2, Servlet 3.1 & JSP 2.3", Dreamtech Press, ISBN-13: 978-8177228700
6. Sandeep Panda, "Angular JS: Novice To Ninja", SPD, First Edition 2014, ISBN-13: 978-0992279455

7. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya,, "J2EE Architecture, an illustrative gateway to enterprise solutions", Tata McGraw Hill Publishing Company. ISBN: 9780070621633

Multimedia Technologies

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

1. To learn 5 basic components of multimedia (text, image, audio, video and animation)
2. To learn the advance graphics
3. To learn compression techniques for various multimedia components
4. To learn Gaming and animation

Course Outcomes:

At the end of this course students will be able to
1. To create their own file formats for specific application
 2. To do some projects based on current trends in multimedia
3. To use of open sources for authoring tool for animation and presentations
4. To develop simple games and animation

Unit I Introduction to Multimedia   6 L

Goals, objectives, and characteristics of multimedia, Multimedia building blocks, Multimedia architecture, hardware support Distributed multimedia applications, streaming technologies, multimedia database systems Multimedia authoring tools, overview of multimedia software tools, Multimedia Applications Media Entertainment, Media consumption, web-based applications, e-learning and education Text: Types of text, Text compression: Huffman coding, LZ & LZW Text file formats: TXT, DOC; RTF, PDF, PS

Unit II Digital Image   6 L

Basic Image fundamentals, image File formats - (BMP, TIFF, JPEG, GIF) Image acquisition, storage processing, Communication, and display Image Enhancement: Enhancement by point processing, Spatial filtering Image Compression: Types of Compression: Lossy & Lossless, Symmetrical & Asymmetrical, Intra-frame &Inter-frame Hybrid JPEG, Lossless: RLE, Shannon

- Fano algorithm, Arithmetic coding. Lossy: Vector quantization, Fractal Compression Technique, Transform Coding, Psycho-analysis, and inter-frame Correlation. Hybrid: JPEG-DCT

Unit III Audio And Audio Compression   6 L
Nature of sound waves, characteristics of sound waves, psycho-acoustic, MIDI, digital audio, CD formats. Audio file formats: WAV, AIFF, VOC, AVI, MPEG Audio File formats, RMF, WMA Audio compression techniques : DM, ADPCM and MPEG Audio file conversions Multimedia Supported audio formats in Android, Media Playback

Unit IV Video   6 L
Video signal formats, Video transmission standards: EDTV, CCIR, CIF, SIF, HDTV, digitization of video Video file formats: MOV, Real Video, H-261, H-263, Cinepack, Nerodigtal,Video editing, DVD formats, MPEG, Video streaming Multimedia Supported video formats in Android, Media Playback.

Unit V Animation And Opengl   6 L
Animation: Basics of animation, types of animation, principles of animation, techniques of animation, Creating animation OpenGL: Open GL over windows/Linux, Extension, programming languages, SDK, shadowing techniques, rendering,

Unit VI Advances In Multimedia   6 L
Virtual Reality : Concept, Forms of VR, VR applications, VR devices: Hand Gloves, Head mounted tracking system, VR chair, CCD, VCR, 3D Sound system, Head mounted display Synchronization: Multimedia Communication and applications, Study of Multimedia networking, Quality of data transmission, Multimedia over IP, Media on Demand Multimedia in Android: Android Multimedia Framework Architecture, G Streamer :Introduction, G Streamer Based Multimedia Framework, Open Core Multimedia Engine

Text Books
1. Ralf Steinmetz and Klara Nahrstedt "Multimedia Computing, Communication and Applications", Pearson Education.
2. K.R. Rao, "Multimedia Communication Systems: Techniques, Standards, and Networks", TMH.
3. Ranjan Parekh, "Principles of Multimedia", 2/E, Tata McGraw-Hill, ISBN: 1259006506

Reference Books
1. Ashok Banerji, Ananda Ghosh, "Multimedia Technologies", ISBN: 9780070669239 2. Gonzalez, Woods, "Digital Image Processing" Addison Wesley
2. Ze-Nian Li, Marks S. Drew, "Fundamentals of Multimedia", Pearson Education. Edward Angel, "OpenGL: A Primer", Addison-Wesley.
3. Parag Havaldar, Gerard Medioni, "Multimedia Systems", Cengage Learning.

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

1. Ability to recognize industrial control problems suitable for PLC control.

2. Overview of Ladder Logic Programming to Program PLC.

3. The ability to select the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach.

Course Outcomes:

After successfully completing the course students will be able to

1. Understand concepts of PLC, its uses & applications.

2. Develop PLC ladder programs for simple industrial applications.

3. Use knowledge of Installation, troubleshooting & maintenance of PLC to provide solution for industrial automation problems.

Unit I : PLC Overview   8L

Definition & History of PLC, Basic structure & Components of PLC, Principle of Operation, Selection of PLC, Why Use PLC, PLC I/O Modules, Memory & How it is used, PLC advantages & Disadvantages, PLC vs Computers, , Overview of Micro PLCs. Conventional ladders vs PLC Ladder logic, What is Logic? Overview of Logic functions, Number systems & Codes, Hardwired Logic vs Programmed logic, Programming word level logic instructions, Relation of digital gate logic to contact/coil logic, Relay logic, Relay Sequencers

Unit II : Basics of PLC Programming -I   6L

Processor memory organization, PLC Programming languages, Ladder diagrams, Relays, contactors, switches, sensors, output control devices, latching relays, ladder diagram elements. Instructions: Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming. Write ladder logic for a) two switches labelled as A & B are wired in parallel controlling a lamp, where two switches are separate inputs. b) That will cause output, pilot light PL, to be on when selector switch SS is closed, push button PB is closed and limit switch LS is open.

Unit III: Basics of PLC Programming -II   6L

Basic Functions : PLC Timer & Counter functions, Timer & Counter Industrial applications, Arithmetic functions, Comparison functions, Jump functions, Data handling functions, Digital Bit functions, PLC matrix Functions, Advanced PLC Functions: Analog PLC operation, PID control of Continuous processes. Write a PLC program for a) controlling lubricating oil being dispensed from a tank, b) Automatic water sprinkler system of a garden

Unit IV: PLC Installation, Troubleshooting & Maintenance   6L

Installation : Consideration of operating environment, Receiving test, check & assembly, Electrical Noise, Leaky inputs & outputs, Grounding, voltage variations & surges, Circuit protections & wiring, Program Editing & Commissioning. Troubleshooting: Processor module, Input & Output malfunctions, Ladder logic program. PLC Maintenance.

Unit V: Process control, HMI & SCADA   6L

Types of processes, structure of control systems, on/off control, PID Control, Motion control, SCADA (Supervisory control and data acquisition): Block diagram, RTU (Remote terminal unit), Functions of RTU, MTU (Main terminal unit), functions of MTU, operating interfaces & applications, HMI (Human Machine Interface, Interfacing technique of PLC with HMI

Unit VI: PLC Networking & Applications   6L

Types of communication interface, Types of networking channels, Advantages of standard industrial network, Serial communication, Industrial network : CAN (Controller area network), Devicenet, Controlnet, Ethernet/IP, Modbus, Fieldbus, Profibus-PA/DP, SCADA (Supervisory control & data acquisition), HMI (Human Machine Interface), Two-axis, three axis robot control with PLC

Text Books

1. "Programmable Logic Controllers" Frank D. Petruzella, Fourth Edition, McGraw-Hill Education
2. "Programmable logic controllers & Industrial Automation" Madhuchandra Mitra, Samarjeet Sen Gupta, Fourth reprint 2012. Penram International Pvt.Ltd.

Reference Books

1. "Programmable Logic Controllers, Principles & Applications" John W. Wobb, Ronald A. Rais, Fifth Edition, PHI publishing.
2. "Introduction to Programmable Logic Controllers "Garry Dunning, 3rd Edition, Thomson, Delmar Learning.
3. Curtis Johnson, "Process Control Instrumentation Technology"; 8th Edition, Pearson Education.

Teaching Scheme:

Lectures: 3 Hrs/ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

1. Understand, Analyze the basic AC and DC circuits using KCL,KVL and network Theorems
2. Determine the voltages, currents, power and impedances at various nodes and loops using all the simplification techniques.
3. Understand and apply graph theory to solve network equations
4. Understand, identify and analyze the series, parallel resonance circuits, calculate the bandwidth, selectivity, Q-factor also.
5. To synthesize passive network by various methods

Course Outcomes:

After successfully completing the course, students will be able to
1. Apply the time and frequency method of analysis.
2. Find the various parameters of two port network.
3. Apply network topology for analyzing the circuit
4. Synthesize the network using passive elements.

Unit I: Basic Circuit Analysis and Simplification Techniques (6L)

Kirchoff's Current and Voltage Laws, Independent and dependent sources and their interconnection, and power calculations.
Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Source transformation and source shifting.
Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems.

Unit II: Graph Theory and Network Equations (6L)

Network graph, tree, co-tree, and loops. Incidence matrix, tie-set, cut-set matrix. Formulation of equilibrium equations in matrix form, solution of resistive networks and principle of duality.

Unit III: Frequency Selective Networks (6L)

Series Resonance: Impedance, Phase angle variations with frequency, Voltage and current variation with frequency, Bandwidth, Selectivity. Effect of Rgon BW & selectivity. Magnification factor.

Parallel resonance: Resonant frequency and admittance variation with frequency, Bandwidth and selectivity. General case: Resistance present in both branches.Comparison and applications of series and parallel resonant circuits.

Unit IV: Network Functions & Fundamentals of Network Synthesis   (6L)

Network functions, properties of all types of network functions, Effect of poles and zeros on the system function, network synthesis problems, elements of reliability, causality and stability, Hurwitz"s polynomial, Positive real function testing, elementary synthesis procedures.

Unit V: Synthesis of One Port Networks   (6L)

Properties of RC, RL and LC driving point functions and their synthesis in Foster and Cauer forms. Synthesis of RLC driving point functions in terms of partial fraction and continued fractions for simple driving point functions.

Unit V: Passive Filter Design   (6L)

Introduction to various approximation techniques, Butterworth and Chebyshev approximation, derivation of normalized low pass filter transfer function upto 3rd order by Butterworth approximation from basic principles. Evaluation of transfer function for Chebyshev filters from pole zero plots. Synthesis of above mentioned filters with 1ohm termination. Frequency transformation to high pass,band pass and band stop forms. Normalized low pass filters, frequency scaling and Impedance scaling.

Text Books :

1. Franklin Kuo, "Network Analysis and Synthesis", Wiley international.
2. GobindDaryanani, "Principles of Active Network Synthesis and Design", Wiley International.

Reference Books:

1. M.E. Van Valkenberg, "Analog Filter Design", Harcourt Brace Jovanovich College Publishers.
2. Wai-Kai Chen , "Passive and Active Filters, theory and implementations", Wiley international
3. Lawrence Huelsman, "Active and Passive Analog Filter Design", McGraw-Hill Inc

Credits: PR-02

Teaching Scheme:

Practical: 4 Hrs/ Week

Examination Scheme:

Practical: 50 Marks

Term work: 25 Marks

Advanced Processors

List of Practical's

Group A: LPC2148 Based Experiments (Any 6)

1. 1 Interfacing LPC2148 with LCD display
2. GPIO configuration and control with simple LED example
3. Interfacing of ultrasonic sensor with LPC 2148
4. Using UART of LPC2148 for serial reception and transmission from/to computer
5. Interfacing GSM with LPC2148 for sending and receiving message
6. Interfacing GPS with LPC2148 for finding current location latitude and longitude values
7. Using built-in ADC of LPC2148 for displaying its values (Programming built-in ADC with
8. interrupt and without interrupt) OR
9. Interfacing SD card to LPC2148 using SPI
10. Interfacing EEPROM to LPC2148 using I2C protocol

Group B: DSP Based Experiments (Any 2) The programs may be written in assembly language, C language and combination of both

1. Convolution
2. Discrete Fourier Transform Using FFT Algorithm
3. Discrete Fourier Transform Using DFT FFT Radix 2 Algorithm
4. FIR filter
5. Real time audio signal capture

TMS320C6748 DSP Development kit(LCDK) with XDS100 V2 JTAG Emulator may found useful.

Data Communication

List of Practical's (Any six from 1 to 9)

1. Experimental Study of PCM and Companded PCM.

2. Experimental study delta modulation and signal reconstruction

3. Experimental study of basic line codes and Multi level line codes

4. Experimental study of ASK modulation and demodulation

5. Experimental study of PSK modulation and demodulation

6. Experimental study of FSK modulation and demodulation

7. Experimental study of QPSK and OQPSK modulation and demodulation

8. Design of PN sequence generator.

9. Experimental study of generation and detection of Spread Spectrum System (DSSS)

Software Assignments: (Any two from 10 to 12):

10. Implementation of linear block code

11. Implementation of Convolution code and Viterbi algorithm

12. Implementation of Shannon Fano and Huffman codes

Credits: PR-02

Teaching Scheme:

Practical: 4 Hrs/ Week

Examination Scheme:

Practical: 50 Marks

Term work: 25 Marks

Database Management System

Each student must perform at least 13 assignments (8-Mandotory plus 4 from remaining 8 assignments) from group A , 5 from group B and 2 mini projects from Group C Operating System recommended

Suggested List of Practicals:

Group A- Database Programming Languages – SQL, PL/SQL

1. Study of Open Source Relational Databases : MySQL

2. Design and Develop SQL DDL statements which demonstrate the use of SQL objects such as Table, View, Index, Sequence, Synonym

3. Design at least 10 SQL queries for suitable database application using SQL DML statements: Insert, Select, Update, Delete with operators, functions, and set operator.

4. Design at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.

5. Cursors: (All types: Implicit, Explicit, Cursor FOR Loop, Parameterized Cursor) Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped. Frame the separate problem statement for writing PL/SQL block to implement all types of Cursors inline with above statement. The problem statement should clearly state the requirements.

6. PL/SQL Stored Procedure and Stored Function. Write a Stored Procedure namely proc_Grade for the categorization of student. If marks scored by students in examination is <=1500 and marks>=990 then student will be placed in distinction category if marks scored are between 989 and900 category is first class, if marks 899 and 825 category is Higher Second Class Write a PL/SQL block for using procedure created with above requirement. Stud_Marks(name, total_marks)   Result(Roll,Name, Class) Frame the separate problem statement for writing PL/SQL Stored Procedure and function, inline with above statement. The problem statement should clearly state the requirements.

7. Database Trigger (All Types: Row level and Statement level triggers, Before and After Triggers). Write a database trigger on Library table. The System should keep track of the records that are being updated or deleted. The old value of updated or deleted records should

be added in Library_Audit table. Frame the problem statement for writing Database Triggers of all types, in-line with above statement. The problem statement should clearly state the requirements.

Group B Large Scale Databases

1. Study of Open Source NOSQL Database: MongoDB (Installation, Basic CRUD operations, Execution)

2. Design and Develop MongoDB Queries using CRUD operations. (Use CRUD operations, SAVE method, logical operators)

3. Implement aggregation and indexing with suitable example using MongoDB.

4. Implement Map reduces operation with suitable example using MongoDB.

5. Design and Implement any 5 query using MongoDB

6. Create simple objects and array objects using JSON

7. Encode and Decode JSON Objects using Java/Perl/PHP/Python/Ruby

Group C   Mini Project : Database Project Life Cycle

1. Write a program to implement MogoDB database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit etc.) using ODBC/JDBC.

2. Implement MYSQL/Oracle database connectivity with PHP/ python/Java Implement Database navigation operations (add, delete, edit,) using ODBC/JDBC.

3. Using the database concepts covered in Part-I & Part-II & connectivity concepts covered in Part C, students in group are expected to design and develop database application with following details: Requirement Gathering and Scope finalization Database Analysis and Design:

    a. Design Entity Relationship Model, Relational Model, Database Normalization Implementation :

    b. Front End : Java/Perl/PHP/Python/Ruby/.net

    c. Backend : Mongo DB/MYSQL/Oracle

    d. Database Connectivity : ODBC/JDBC Testing : Data Validation Group of students should submit the Project Report which will be consist of documentation related to different phases of Software Development Life Cycle: Title of the Project, Abstract, Introduction, scope, Requirements, Data Modeling features, Data Dictionary, Relational Database Design, Database Normalization, Graphical User Interface, Source Code, Testing document, Conclusion. Instructor should maintain progress report of mini project throughout the semester from project group and assign marks as a part of the term work

Web Technology

List of experiments

   a) Installation and Configuration of Web Application Servers Tomcat, Apache, WebSphere, JBoss, GlassFish.
   b) Design and develop any suitable web application using HTML, CSS and XML in consultation of course instructor.
1. Perform validation of all fields in assignment no.1 by using Java script/JQuery.
2. Add dynamic web application essence in assignment no. 2 using Servlet, JSP and backend.
3. Add dynamic web application essence in assignment no. 2 using PHP, MySQL database connectivity and AJAX controls.
   a) Re-Design, develop and deploy assignment no. 3 of unit –III using Strut
   b) Re-Design, develop and deploy assignment no. 4 of unit –IV using Angular JS
4. Design, Develop and Deploy separate web application using EJB/CMS/JSF/Spring/Bootstrap.

Multimedia Technologies

List of experiments

1. Create a new file format to store a multimedia data.
2. Implement a compression technique and check the efficiency on different inputs.
3. To develop a theme based multimedia presentation
4. To add a digital signature onto a document
5. To perform steganography of text onto an image and check the efficiency with different inputs.

Programmable Logic Controller and Application

List of Experiments (Any 8)
 Design & Simulate using any PLC simulation software
1. Simple Start/Stop Ladder Logic Relay
2. Single Push Button On/Off Ladder Logic
3. PLC Program Example with On Delay Timer
4. PLC Program Example with Off Delay Timer

5. PLC Program Example with Retentive Timer
6. Star Delta PLC Ladder Diagram
7. Ladder Diagram for DOL Motor Starter
8. Industrial Visit to Nearest Process Control Plant for study of PLC, SCADA, HMI.
9. Traffic Light Ladder Logic Diagram
10. Ladder Diagram for Bottle Filling Plant
11. PLC Ladder Diagram for Elevator Control
12. 13, 14. Implement experiments 9, 10, and 11 using PLC hardware

Network Analysis and Synthesis

List of Experiments :-
1. Determine the current through the various branches and voltages across the various branches using Thevnins Theorems
2. Determine the current voltages across the various branches using Norons Theorems
3. Determine the current voltages across the various branches using Superposition Theorems
4. For two port LC network, find all network functions and sketch plot poles and zeros.
5. To carry out synthesis of one port LC network into any of the Canonical forms and verify practically.
6. Design a Butterworth low/high pass filter Sallen Key circuit and verify (at least 2nd order).
7. Design a Chebyshev low/high pass filter Sallen Key circuit and verify (at least 2nd order).
8. Design build and test a simple audio equalizer using filter concepts.

Credits: PR-01

Teaching Scheme: **Examination Scheme:**
Practical: 2 Hrs/ Week   Term work: 50 Marks

Introduction:
Graduates of final year IT program are supposed to design and implement projects through knowledge and skills acquired in previous semesters. Students should identify complex engineering problems and find effective, efficient and innovative ways of solving them through their projects. In a technical seminar, students should aim to review literature in a focused way for identifying a complex problem to be attempted in their final year project. Seminar should make the student attain skills like
(a) Gathering of literature in specific area in a focused manner
(b) Effectively summarizing the literature to find state-of-the-art in proposed area
(c) Identifying scope for future work
(d) Presenting (arguing) the case for the intended work to be done as project
(e) Reporting literature review and proposed work in scientific way using good English.

Course Objectives:
1. To perform focused study of technical and research literature relevant to a specific topic.
2. To study, interpret and summarize literature scientifically.
3. To build independent thinking on complex problems.
4. To build collaborative work practices.
5. To communicate scientific information to a larger audience in oral and written form.
6. To use presentation standards and guidelines effectively.

Course Outcomes :
1. To gather, organize, summarize and interpret technical literature with the purpose of formulating a project proposal.
2. To write a technical report summarizing state-of-the-art on an identified topic.
3. Present the study using graphics and multimedia presentations.
4. Define intended future work based on the technical review.
5. To explore and enhance the use of various presentation tools and techniques.
6. To understand scientific approach for literature survey and paper writing.

Guidelines for Project Based Seminars
1. A project group consisting of 3 to 4 students shall identify problem(s) in Computer Engineering /Information Technology/Electronics Engineering referring to recent trends and developments in consultation with institute guide.
2. The group must review sufficient literature (reference books, journal articles, conference papers, white papers, magazines, web resources etc.) in relevant area on their project topic as decided by the guide.

3. Internal guide shall define a project statement based on the study by student group.
4. Students should identify individual seminar topic based on the project undertaken in consultation with guide.
5. Seminar topics should be based on project undertaken. Guide should thoughtfully allocate seminar topics on different techniques to solve the given problem (project statement), comparative analysis of the earlier algorithms used or specific tools used by various researchers.
6. Research articles could be referred from IEEE, ACM, Science direct, Springer, Elsevier, IETE,CSI or freely available digital libraries like Digital Library of India (dli.ernet.in), National Science Digital Library, JRD Tata Memorial Library, citeseerx.ist.psu.edu, getcited.org, arizona.openrepository.com, Open J-Gate, Research Gate, worldwidescience.org etc.
7. The group shall present the study as individual seminars in 20 – 25 minutes.

Guidelines for Seminar Report Format:

1. Each student shall submit two copies of the seminar report in a prescribed format duly signed by the guide and Head of the department/Principal.
2. First chapter of a project group may talk about the project topic. At the end of the first chapter individual students should begin with introduction of seminar topic and its objectives.
3. Broad contents of review report (20-25 pages) shall be
   i. Introduction of Project Topic
   ii. Motivation, purpose and scope of project and seminar
   iii. Related work (of the seminar title) with citations
   iv. Discussion (your own reflections and analysis)
   v. Conclusions
   vi. Project definition. (Short version of RUP"s vision document if possible).
   vii. References in IEEE Format
4. Students are expected to use open source tools for writing seminar report, citing the references and plagiarism detection. (Latex for report writing; Mendeley, Zatero for collecting, organizing and citing the resources; Dupli Checker , Paper Rater, Plagiarism Checker and Viper for plagiarism detection)

Guidelines for Seminar Evaluation
1. A panel of examiners appointed by University will assess the seminar externally during the presentation.
2. Attendance for all seminars for all students is compulsory.
3. Criteria for evaluation
   i. Relevance of topic - 05 Marks
   ii. Relevance + depth of literature reviewed- 10 Marks
   iii. Seminar report (Technical Content) - 10 Marks
   iv. Seminar report (Language) - 05 Marks

v. Presentation Slides - 05 Marks

vi. Communication Skills - 05 Marks

vii. Question and Answers - 10 Marks

Guidelines for Seminar Presentation

1) A panel of examiner will evaluate the viability of project scope and seminar delivery.

2) Oral examination in the form of presentation will be based on the project and seminar work completed by the candidates.

3) Seminar report must be presented during the oral examination.

References

1. Sharon J. Gerson, Steven M. Gerson, Technical Writing: Process and Product, Pearson Education Asia, ISBN: 130981745, 4th Edition.

2. Andrea J. Rutherfoord, Basic Communication Skills for Technology, Pearson Education Asia, 2nd Edition.

3. Lesikar, Lesikar's Basic Business Communication, Tata McGraw, ISBN: 256083274, 1st Edition.

Internship

Credits: PR-01

The students are required to undergo exhaustive Industrial Training of minimum three to four weeks immediately after the completion of sixth semester and before the commencement of seventh semester in an industry of repute in the field of Electronics or Computer engineering. The relevant industry is to be finalized in consultation with the head of concerned department before the end of sixth semester.

During the training period the students are expected to undergo rigorous exposure of the industry, its working style, various departments and their working, hands on experience on the various equipment"s available with the industry. Student should maintain a log book mentioning day to day activity he / she has carried out during the training period.

Students are required to submit neatly typed and bound training report after joining the college. The report should include information about working of the industry as also specific information of the work done by the student in the industry. The students are also required to attach the Original Certificate issued by the competent authority from the industry where he / she has undergone training mentioning the successful completion of the training.

The industrial report is to be submitted within first 15 days of commencement of the seventh term in bound format and soft copy. The department will conduct industrial report presentation session for every student under the head „Term work" under Industrial training evaluation by the internal examiner. Evaluation of Industrial training by students will carried out after Semester VI based on -

i) Knowledge acquired by him during the industrial training

ii) His/her performance in presentation

iii) Report

iv) Discussion.