BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to SavitribaiPhule Pune University)

Curriculum for

TY B. Tech.

(Computer Engineering)

Pattern 2018

Vision and Mission of the Department

- **Vision**

  "Excellence in the field of Computer Engineering for rendering services to the industry and society".

- **Mission**

  - To empower our students for substantial contribution to **economical**, **technological**, **entrepreneurial** and **social progress** of the society.
  - To strive for excellence at **different levels** and **diverse** dimensions in the field of computer engineering.
  - To encourage students to pursue **research** and **advanced studies** for better adaptability towards **globalization**.

Program Specific Outcomes (PSOs)

At the end of program, students should be able to

- **PSO a:** Use knowledge to write programs and integrate them with the hardware/software products in the domains of embedded systems, data Science, networking and web technology.
- **PSO b:** Participate in planning and implement solutions to cater to business – specific requirements, displaying team dynamics and professional ethics.

T.Y. B. TECH (COMPUTER ENGINEERING), SEMESTER V (PATTERN 2018)

Course Code	Course Title		Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CE	ISE	SCE	ESE	PR/OR/TW		
CSUA31181	Language Processor and Compiler Construction*	TH	3	0	2	20	30	20	30	25	125	4
CSUA31182	Data Science*	TH	3	-	2	20	30	20	30	25	125	4
CSUA31183	Software Engineering and Project Management	TH	3	-	-	20	30	20	30	-	100	3
ES31184CS	Financial Technology	TH	3	-	-	20	30	20	30	-	100	3
CSUA31185	Professional Elective-I*	TH	3	-	2	20	30	20	30	25	125	4
CSUA31186	Design and Analysis of Algorithms	CE	2	-	2	-	-	50	-	25	75	3
M3	Mandatory course	AU	-	-	-	-	-	-	-	-	-	-
	Total	-	17	0	8	100	150	150	150	100	650	21

Professional Elective-I

CSUA31185A Computer Network – I
CSUA31185B Business Intelligence and Data Analytics
CSUA31185C Principles of Concurrent and Distributed Processing
CSUA31185D Computer Graphics and Image Processing

* Indicated courses [CSUA31181, CSUA31182 CSUA31185] are having PR/OR

List of Mandatory Courses:

Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge, Online certification course (minimum two weeks).

BOS Chairman **Dean Academics** **Director**

T.Y. B. TECH (COMPUTER ENGINEERING), SEMESTER VI (PATTERN 2018)

Course Code	Course Title		Teaching Scheme			Examination Scheme					Total	Credits
			L	T	P	CE	ISE	SCE	ESE	PR/OR/TW		
CSUA32181	Professional Elective-II*	TH	3	-	2	20	30	20	30	25	125	4
CSUA32182	Professional Elective –	TH	3	-	2	20	30	20	30	25	125	4
CSUA32183	Internet of Things*	TH	3	-	2	20	30	20	30	25	125	4
ES32184CS	Organizational Behaviour	TH	3	-	-	20	30	20	30	-	100	3
IOEUA32185	Open Elective- I	TH	3	-	-	20	30	20	30	-	100	3
CSUA32186	Employability Skills	CE	2	-	2	-	-	50	-	25	75	3
M3	Mandatory Course	AU	-	-	-	-	-	-	-	-	-	-
	Total	-	17	0	6	100	150	150	150	100	650	21

Professional Elective-II

CSUA32181A	Computer Network – II
CSUA32181B	Artificial Intelligence
CSUA32181C	Cloud Computing
CSUA32181D	Augmented and Virtual Reality

Professional Elective-III

CSUA32182A	Blockchain Technology
CSUA32182B	Soft Computing
CSUA32182C	Software Design and Architecture
CSUA32182D	Real Time Embedded Operating System

Open Elective- I

IOEUA32185A	Information and Cyber Security
IOEUA32185B	Automotive Electronics
IOEUA32185C	Industrial Engineering
IOEUA32185D	Artificial Neural Network in Engineering
IOEUA32185E	Social Media Analytics

* Indicated courses [CSUA32181, CSUA32182 CSUA32183] are having PR/OR

List of Mandatory Courses:

Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge, Online certification course (minimum two weeks).

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Department of Computer Engineering

CSUA31181 : Language Processor and Compiler Construction

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Computer Organization and Architecture.
- Processor Architecture and Interfacing.
- Data Structures
- Theory of Computation: DFA, NFA, Regular expressions, Grammars.

Course Objectives :

- To introduce language processing fundamentals and assemblers.
- To explain design of macro processors.
- To introduce compiler design process
- To explain working of syntax analyser.
- To explain importance of semantic analysis and intermediate code representation
- To introduce different code optimization methods

Course Outcomes :

After completion of the course, student will be able to

1. Develop hypothetical assembler. (Apply)
2. Illustrate macro processors, linkers and loaders. (Understand)
3. Implement lexical analyser using LEX tool (Apply)
4. Build parser using YACC tool (Apply)
5. Construct the intermediate code representations (Apply)
6. Demonstrate code optimization and code generation concept (Understand)

Unit I : Introduction To Systems Programming And Assemblers

Introduction: Need of System Software, Components of System Software, Language Processing Activities, Fundamentals of Language Processing, Interpreter

Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass structure of Assemblers, Design of Two Pass Assembler.

Unit II : Macro processors, Loaders And Linkers

Macro Processor: Macro Definition and call, Macro Expansion, Nested Macro Calls and definition, Advanced Macro Facilities, Design of two-pass Macro Processor.

Loaders: Loader Schemes, Compile and Go, General Loader Scheme, Absolute Loader Scheme, Subroutine Linkages, Relocation and linking concepts, Self-relocating programs, Relocating Loaders, Direct Linking Loaders, Overlay Structure. Linkers.

Unit III : Introduction To Compilers

Phase structure of Compiler and entire compilation process. Lexical Analyzer: The Role of the Lexical Analyzer, Input Buffering. Specification of Tokens, Recognition Tokens, Design of Lexical Analyzer using Uniform Symbol Table, Lexical Errors.

LEX: LEX Specification, Generation of Lexical Analyzer by LEX.

Unit IV : Parsers

Role of parsers, Classification of Parsers: Top down parsers- recursive descent parser and predictive parser (LL parser), Bottom up Parsers – Shift Reduce parser, LR parser.
YACC specification and Automatic construction of Parser (YACC).

Unit V : Semantic Analysis And Intermediate Code Generation

Need, Syntax Directed Translation, Syntax Directed Definitions, Translation of assignment Statements, iterative statements, Boolean expressions, conditional statements, Type Checking and Type conversion.
Intermediate Code Formats: Postfix notation, Parse and syntax trees, Three address code, Quadruples and triples.

Unit VI : Code Generation And Optimization

Code Generation: Code generation Issues. Basic blocks and flow graphs, A Simple Code Generator.
Code Optimization: Machine Independent: Peephole optimizations: Common Sub-expression elimination, Removing of loop invariants, Induction variables and Reduction in strengths, Use of machine idioms, Dynamic Programming Code Generation.
Machine dependent Issues: Assignment and use of registers

Text Books :

1 D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill, ISBN 13:978-0-07-463579-7, Second Revised Edition
2 Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers Principles, Techniques and Tools, Addison Wesley, ISBN:981–235–885 - 4, Low Price Edition
3 John R. Levine, Tony Mason & Doug Brown, "Lex & Yacc", O'Reilly

Reference Books :

1 J. J. Donovan, Systems Programming, McGraw-Hill, ISBN 13:978-0-07-460482-3, Indian Edition

List of Assignments :

Note: Students can implement following assignments using LEX/YACC, C/C++, JAVA, Python. Lab instructor can frame suitable assignment list from the following list.

1. Generate Symbol table, Literal table, Pool table & Intermediate code along with error table for first pass of a two-pass Assembler for the given source code.
2. Implement second pass of a two-pass Assembler and generate machine language code for the given intermediate code.
3. Design suitable data structures & implement first pass of a two-pass Macro processor
4. Design suitable data structures & implement second pass of a two-pass Macro processor
5. Write a program to implement a lexical analyzer for parts of speech.
6. Write a program to evaluate arithmetic expression, built-in functions and variables using Yacc specification.
7. Write a program to generate three address code for simple expression.
8. Write a program to apply various code optimization techniques for given three address code.
9. Write a program to generate assembly language code for given three address code.

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CSUA31182 : Data Science

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2Hrs/week

Examination Scheme

Continuous Evaluation (CE): 20 Marks
In-Semester Examination (ISE): 30 Marks
Skills & Competency Exam.(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Computer Architecture,
- Data Structures
- C/C++ programming

Course Objectives :

- Understand the data science life cycle
- Learn the principles and methods of statistical analysis
- Practice statistical methods using large data-sets
- Understand forecasting model
- Interpret classification outcome
- Learn effective data visualization

Course Outcomes :

After completion of the course, student will be able to

1. Describe the Data Science Process and explore components interaction. (Remember)
2. Apply statistical methods to the application dataset. (Understand)
3. Build inference using different statistical distribution like Gaussian , binomial etc. (Apply)
4. Develop regression model for data forecasting. (Apply, Analyze)
5. Categorize the data using classification methods for predictive analysis. (Analyze)
6. Analyze and organize data using visualization tools. (Apply)

Unit I : Introduction to Data Science

Introduction: Big data overview, state of the practice in Analytics- BI Vs Data Science, Current Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem and new approach.

Data Analytic Life Cycle: Overview, phase 1- Discovery, Phase 2- Data preparation, Phase 3- Model Planning, Phase 4- Model Building, Phase 5- Communicate Results, Phase 6- Operationalize. Case Study

Unit II : Statistical Inference of Data

Statistical Methods for Evaluation- Hypothesis testing, mean, mode, median, random variables (discrete and continuous), expected value, correlation, variance, standard deviation, limit theorem, difference of means

Unit III : Statistical distribution

Statistical distribution: Bernoulli Distribution,, Gaussian distribution, normal distribution, binomial distribution, Poisson distribution, Chi-Square distribution

Statistical Methods for Evaluation- Hypothesis testing Student T-test, Three types of T-test, P-test,Z-test,Wilcoxon rank–sum test, type 1 type 2 errors, power and sample size, ANNOVA

:introduction only.

Unit IV : Regression

Regression- linear, logistics, reasons to choose and cautions, additional regression models.

Unit V : Classification

Decision trees- Overview, general algorithm, decision tree algorithm, evaluating a decision tree using Gini Index and Entropy ,Naïve Bayes – Bayes Theorem and Algorithm, Naïve Bayes Classifier, smoothing, diagnostics. Diagnostics of classifiers, additional classification methods.

Unit VI : Data Visualization technique

Basic principles, ideas, types and tools for data visualization, Visualization of Numerical Data, Visualization of Non-Numerical Data, The Visualization Dashboard

Text Books :

1 David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications, 2012, ISBN0-07-120413-X
2 Cathy O'Neil and Rachel Schutt. "Doing Data Science, Straight Talk From The Frontline", O'Reilly.
3 Han and Kamber, "Data Mining"

Reference Books :

1 U Dinesh Kumar, "Business Analytics", Wiley
2 Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012

List of Assignments

1. Perform the following operations using R/Python on suitable data sets, read data from different formats(like csv, xls),indexing and selecting data, sort data, describe attributes of data, checking data types of each column, counting unique values of data, format of each column, converting variable data type (e.g. from long to short, vice versa), identifying missing values and fill in the missing values.
2. Perform the following operations using R/Python on the data sets Compute and display summary statistics for each feature available in the dataset. (eg. minimum value, maximum value, mean, range, standard deviation, variance and percentiles · Data Visualization-Create a histogram for each feature in the dataset to illustrate the feature distributions.
   · Data cleaning
   · Data integration
   · Data transformation
   · Data model building(e.g. using Linear Regression/Classification)
3. Visualize the data using R/Python by plotting the graphs for assignment no. 1 and 2. Use Scatter plot, bar plot, Box plot and Histogram OR Perform the data visualization operations using Tableau for the given dataset
4. Mini Project on data Analysis: Identify problem statement. Use Semi or unstructured data set. Define 3 to 4 objectives. Perform 1. Data Interpretation, 2. Data preprocessing, 3. Data Modeling (perform both Descriptive and Predictive analysis, Also perform Prescriptive Analysis (if required and fits for the data set)), and 4.data visualization. (Mini project is to be performed in a group of 3 to 4 students. PBL Philosophy is to be applied for entire Mini Project.)

CSUA31183 : Software Engineering and Project Management

Teaching Scheme

Credits : 3
Lectures : 3 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :

- NA

Course Objectives :

- To learn and understand the principles of Software Engineering
- To understand the nature of software complexity in various application domains, disciplined way of software development and software lifecycle process models
- To know methods of capturing, specifying, visualizing and analyzing software requirements
- To understand project planning, execution, tracking, audit and closure of project
- To understand risk and software configuration management of the project
- To learn the concepts of software development and operations

Course Outcomes :

After completion of the course, student will be able to

1. Select a proper process model for a software project development. (Apply)
2. Demonstrate agile development process for suitable software applications. (Understand)
3. Prepare Software Requirements Specification (SRS) of a system. (Apply)
4. Estimate cost and schedule of the software project. (Evaluate)
5. Implement SCM process and RMMM plan. (Apply)
6. Use advanced tools of software development and operations. (Understand)

Unit I : Introduction to Software Engineering

Nature of Software, The Software Process, Software Myths, A Generic Process Model, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Specialized Process Models, Unified Process.

Unit II : Agile Development Process

Agile Development: Agile manifesto, agility and cost of change, Agile principles, myth of planned development, Tools for Agile Project Management, Scrum- process flow, scrum roles, events and artifacts, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting, maintaining sprint backlog and burn-down chart, sprint review and retrospective.

Agile Practices: test driven development, refactoring, pair programming, continuous integration, exploratory testing versus scripted testing

Unit III : Requirement Engineering

Requirements Elicitation: Concept of Software Requirement, Categories and types of Requirements, Elicitation Techniques- real life application case study.

Requirements Analysis and Documentation: Textual and Graphical Documentation ,UML models: Use Case Diagram and class diagram, data modelling, data and control flow model,

behavioural modelling using state diagrams - real life application case study, Software Requirement Specifications (SRS).

Unit IV : Project Management: Process, Metrics, Estimations & Scheduling

Project Management Concepts

The Management Spectrum, People, Product, Process, Project, The W5HH Principle, Metrics in the Process and Project Domains, Software Measurement: size & function oriented metrics(FP & LOC), Metrics for Project and Software Quality

Project Estimation

Observations on Estimation, Project Planning Process, Software Scope and feasibility, Resources: Human Resources, Reusable software, Environmental Resources. Software Project Estimation, Decomposition Techniques, Empirical Estimation Models: Structure, COCOMO II, Estimation of Object-oriented Projects, Specialized Estimation, Software Tools for estimation, Case study

Project Scheduling

Project scheduling: Basic Concepts, Defining a Task Set for the Software Project, Defining Task Network, Scheduling with time-line charts, Schedule tracking

Tools: - Microsoft Project, Daily Activity Reporting & Tracking (DART)

Unit V : Risk and Configuration Management

Project Risk Management

Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMMM plan for case study project

Software Configuration Management

The SCM repository, SCM process, Configuration management for WebApps

Case study: CVS and Subversion Tools, Visual Source Safe from Microsoft & Clear Case

Maintenance & Reengineering

Software Maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering

Unit VI : Development and Operations (DevOps)

Introduction to DevOps, What Is DevOps, History of DevOps, DevOps definition, DevOps Main Objectives, DevOps and Software Development Life Cycle : Waterfall Model and Agile Model, Continuous Integration & Deployment:Jenkins, Containers and Virtual Development: Docker, Vagrant, Configuration Management Tools: Ansible, Puppet, Chef

Text Books :

1. Roger Pressman, "Software Engineering: A Practitioner's Approach", Mcgraw Hill
2. Ian Sommerville, " Software Engineering", Addision and Wesley

Reference Books :

1. Rajib Mall, "Fundamentals of Software Engineering, Prentice Hall India
2. PankajJalote, "An Integrated Approach to Software Engineering, Springer
3. Carlo Ghezzi, ""Fundamentals of Software Engineering", Prentice Hall India

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ES31184CS: Financial Technology

Teaching Scheme

Credits : 3
Lectures : 3 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :

- NA

Course Objectives :

- To Introduce FinTech and it's sub sectors
- To Explain the classification of various models of FinTech.
- To Describe the innovation in FinTech
- To Introduce an innovative Fin Tech strategy
- To Study the development of FinTech Application and about future trends in Fin Tech

Course Outcomes :

After completion of the course, student will be able to

1. Understand the concept of FinTech and it's sub sectors. (Understand)
2. Classify various models of the Fintech. (Analyze)
3. Illustrate various innovations done using latest technology trends in FinTech.
4. State the Critical Success Factors in FinTech. (Understand)
5. adopt an innovative FinTech strategy for digital transformation project. (Apply)
6. Develop an application using the concepts of FinTech. (Apply)

Unit I: Introduction to Fintech

Introduction, Financial Services and Fintech: Introduction, Changing Environment, Customer Centricity, Digital Transformation, Definition of Fintech, History of Fintech, Fintech stages, An Overview of Fintech Initiatives Around the World, Ecosystems, Ranking National Ecosystems, Downsides of Disruptive Fintech Initiatives.

Unit II: Model and Classifications

Introduction, Classification, Five Ws and one H : 1. Why a Fintech initiative was born? 2. For whom was it born? 3. Which are the services it aims to provide? 4. Where does it aim to perform its business? 5. When does it aim to operate, within the framework of the financial cycle? 6. How is fintech working? The organization and its elements, The V4 business model framework, A Business Model, A Business Model for Fintech, Revenue—Focus on Customer Lifetime Value, Components of an effective marketing plan.

Unit-III: Fintech Innovation

Introduction, Innovation and Fintech, Digital Transformation and Fintech, A model for an integrated innovation strategy, Types of Innovation : Product (or services), Process, Organization, Business models, Examples of Innovation, Fintech business model canvas, Process Innovation : Big Data Analytics, Value Creation from Big Data Analytics, Kreditech's self-learning algorithm, Internet of Things, Blockchain Technology, Organizational Innovation: Social Networks, Business Model Innovation, Robots, The V4 business model framework for Kreditech, Virtual Currencies, Technology Acceptance Model.

Unit-IV: Critical Success Factors

The Model, Low-Profit Margin, Agility, Scalability, Security Management, Innovation, Ease of Compliance, Metrics, Fintech and Financial Services, Structure of fintech initiatives, The Challenges, Aspects to Consider, A Cooperation Model, Open Innovation

Unit-V: Regulations

The Role of the Regulators, Equal Treatment and Competition, The Risks to Consider, Regtech, A Business Model for Insurtech Initiatives, Drivers of Disruption, The Impact of Technology, Insurance and Technology: Insurtech, Application of the Model to the Insurance Industry, The Empowerment of Customers, Mobility in Support of Insurance Companies, Digital Wholesale Insurance,

Unit VI: A Case Study

Introduction, Robotica, Business Model Canvas, The Value Proposition, Customer Experience, Channels, Processes and Activities, Resources and Systems, Partnership and Collaborations, Revenues, Costs and Investments,

The Future: Financial Services as Platforms

Text Books :

1. B. Nicoletti, The Future of FinTech, 1st ed. Palgrave Macmillan, 2017
2. Kelvin Leong and Anna Sung "FinTech (Financial Technology): What is It and How to Use Technologies to Create Business Value in Fintech Way?" International Journal of Innovation, Management and Technology, Vol. 9, No. 2, April 2018.

Reference Books

1 Accenture. (2015). The future of Fintech and banking: Digitally disrupted or reimagined? Accenture Research, 1–12
2 Dietz M., Khanna S., Olanrewaju T., and Rajgopal K. (2015). Cutting through the fintech noise: Markers of success, imperatives for banks. Practice, G. B. (Ed.), 1–18. McKinsey and Company. Retrieved from http://www.mckinsey.com/ industries/financial-services/our-insights/cutting-through-the-noise round financial - technology.
3 NadarNaifar,"Impact of Financial Technology (FinTech) on Islamic Finance and Financial Stability" 2019.

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CSUA31185A: Professional Elective - I
(Computer Network -I)

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Fundamentals of Computer Network

Course Objectives :

- To learn key switching concepts.
- To perform basic network configuration and troubleshooting, identify and mitigate LAN security threats.
- To learn key routing concepts.
- To Configure and Troubleshoot Static and Default Routes.
- To explain how WLANs enable network connectivity.
- To implement a WLAN using a wireless router and WLC.

Course Outcomes:

After completion of the course, student will be able to

1. Summarize the switching concepts. (Understand)
2. Interpret the switch security in LAN. (Apply)
3. Demonstrate the working of router. (Understand, Apply)
4. Experiment with different routing techniques.(Apply)
5. Outline the WLAN concepts. (Understand)
6. Demonstrate the WLAN configuration. (Apply)

Unit I: Switching Concepts

Basic Device Configuration: Configure a Switch with Initial Settings, Configure Switch Ports, Secure Remote Access, Basic Router Configuration, Verify Directly Connected Networks, Frame Forwarding, Switching Domains

Unit II: LAN and Switch Security:

VLAN: Overview of VLANs, VLANs in a Multi-Switched Environment, VLAN Configuration, VLAN Trunks, Dynamic Trunking Protocol,

Inter-VLAN: Inter-VLAN Routing Operation, Router-on-a-Stick Inter-VLAN Routing, Inter-VLAN Routing using Layer 3 Switches, Troubleshoot Inter-VLAN Routing

Unit III: Routing Concepts:

Routing Concepts: Path determination, Packet Forwarding, Basic Router Configuration review, IP Routing Table, Static and Dynamic Routing.

Unit IV : IP Static Routing:

IP Static Routing: Static Routes, Configure IP Static Routes, Configure IP Default Static Routes, Configure Floating Static Routes, Configure Static Host Routes.

Troubleshoot Static and Default Routes: Packet Processing with Static Routes, Troubleshoot IPv4 Static and Default Route Configuration.

Unit V : WLAN Concepts:

WLAN Concepts: Introduction to Wireless, Components of WLANs, WLAN Operation, CAPWAP Operation, Channel Management, WLAN Threats, Secure WLANs

Unit VI : WLAN Configuration:

WLAN Configuration: Remote Site WLAN Configuration, Configure a Basic WLC on the WLC, Configure a WPA2 Enterprise WLAN on the WLC, Troubleshoot WLAN Issues.

Text Books :

1 Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications
2 Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India .
3 Andrew S. Tanenbaum ,"Computer Networks", Pearson

Reference Books :

1 CCNA Basics and Fundamentals-Cisco
2 CCNA Routing and Switching 200-125 Official Cert. Guide Library
3 Cisco CCNA Command Guide- An introductory Guide for complete beginners

List of Assignments :

1. Implement a small network, verify the addressing on each device and verify the connectivity between the LANs
2. Implement VLANs
3. Configure Router on a stick VLAN routing
4. Troubleshoot Inter VLAN Routing
5. Configure a basic WLAN and WPA 2 Enterprise WLAN on the WLC
6. Troubleshoot WLAN issues
7. Configure IPv4 and IPv6 static and default routes
8. Troubleshoot static and default routes

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CSUA31185B: Professional Elective – I
(Business Intelligence and Data Analytics)

Teaching Scheme

Credits : 4

Lectures : 3 Hrs/week

Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks

In-Semester Examination(ISE): 30 Marks

Skills & Competency Exam(SCE): 20 Marks

End Semester Examination(ESE): 30 Marks

PR/OR: 25 Marks

Prerequisites :

- Database Management System,
- Data Structures

Course Objectives :

- To learn the basics of the Business intelligence Process
- To understand the Decision making support system.
- To learn the design of data warehouse
- To learn modelling a web based social business problem
- To design a dashboard using visualization technique.
- To understand different analytics techniques

Course Outcomes:

After completion of the course, student will be able to

1. Understand the Business intelligence concept for projects. (Understand)
2. Apply Decision support system techniques for BI applications. (Apply)
3. Apply the data warehouse for business intelligence. (Apply)
4. Understand the knowledge of emerging and critical area in social media analytics. (Understand)
5. Apply contemporary visualization techniques and tool for real/distinguished time applications. (Apply)
6. Understand analytical techniques for different case studies. (Understand)

Unit I: Business Intelligence Concepts

Introduction to data, Information and Knowledge, Operational and Informational data, Introduction to Business Intelligence, BI architecture and its components, BI opportunities, Benefits of BI, Role of mathematical model in BI, Factors Responsible for successful BI Project, Obstacle to Business Intelligence in an Organization.

Unit II: Decision Making and Support System

Concept of Decision Making system and its importance, Decision making process, Common strategies and approaches of decision makers, Decision support system(DSS) : Role of DSS, its main components, its various techniques, Types and classification, Applications of DSS, Role of Business intelligence in DSS.

Unit III: Data Warehouse

Introduction, Data Warehouse Modelling: Data Cube and OLAP Data Warehouse Design and Usage, Distributed Data-warehouse and materialized view, Different types of OLAP and their applications, Difference between OLAP and OLTP, Big Data Lakes

Unit IV : Web and Social Media Analytics

Introduction of unstructured data, Preprocessing of unstructured data, Challenges in processing of unstructured data, Applications, Introduction of Text Mining and Web Mining,

Social Media Platforms,
Performance and evaluation measures ,Basic & Advanced Web Metrics Google Analytics, Campaign analytics IP

Unit V : Visualization

Introduction to Tableau, Basic charts and Dashboards, Dashboard design and principal, Integrate Tableau with Google sheet

Unit VI : Recent application /case studies

Finance and Risk Analytics: Why Credit Risk-Using a market case study ,Comparison of Credit Risk Models
Overview of Probability of Default (PD) ,Modelling PD Models , types of models, Steps to make a good model, Supply Chain and Logistics Analytics: Introduction to Supply Chain Dealing with Demand uncertainty, Designing Optimal Strategy using Case Study, Inventory Control & Management

Text Books :

1 Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems, Second Edition
2 Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007

Reference Books :

1 Data Mining: Concepts and Techniques, Han, Elsevier ISBN:9789380931913
2 Natural Language Processing And Information Retrieval by Tanveer Siddiqui and U. S. Tiwary

List of Assignments:

Note : Lab instructor can frame suitable assignment list from the following list.

1. Design Decision support system for banking application- for example a bank loan officer verifying the credit of a loan applicant or an engineering firm that has proposal on several projects and wants to know if they can be competitive with their costs.
2. Choose a set of business processes like Sales, Customer Services, Accounting, Production, Marketing processes etc. for any organization and design star, snow flake and fact constellation schema. Also using ETL tool ,extract data from various sources and perform transform and load operations on data.
3. Perform text preprocessing with creation of inverted index for unstructured data (text). Consider suitable data set.
4. Study and implement opinion mining / sentiment analysis for sample online/offline application
5. Perform Visual analytics using Tableau /R/Python/Excelfor the given use case in assignment 1 and 2.
6. Create a dashboard using device designer for assignment 1 and 2
7. Integrate tableau with Google sheet and plot various graph like tableplot, histogram, boxplot for the suitable data
8. For the given use case perform sorting, using measure, Sorting using header and legends, grouping using data window and calculate static and dynamic grouping.
9. Design an inventory control management system using python/R for given case study.
10. Design a risk analysis model using Python/R to predict market risk using stock case study.

BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department of Computer Engineering

CSUA31185C: Professional Elective – I
(Principles of Concurrent and Distributed Processing)

Teaching Scheme

Credits: 4

Lectures: 3 Hrs/week

Practical : 2Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks

In-Semester Examination(ISE): 30 Marks

Skills & Competency Exam(SCE): 20 Marks

End Semester Examination(ESE): 30 Marks

PR/OR: 25 Marks

Prerequisites :

- Computer Architecture
- Data Structures
- C/C++ programming

Course Objectives :

- To learn Parallel programming and architectures.
- To understand and use parallel programming tools & environments.
- To learn GPU Architecture.
- To learn programming using CUDA
- To understand distributed systems
- To understand Distributed Computing Techniques

Course Outcomes:

After completion of the course, student will be able to

1. Understand parallel programming environments.
2. Demonstrate concepts of parallel programming tools and environments.
3. Comprehend GPU Architecture.
4. Implement programs using CUDA
5. Understand the concepts of distributed systems.
6. Develop distributed systems via a case study.

Unit I: Parallel Architectures

Basic Terminologies, Serial Programming, Why parallelism, Difference between Serial and parallel Programming Parallel architectures and Programming principles-Parallel computing, Parallel architecture, Architectural classification scheme, Parallel programming models, parallel algorithms, performance analysis of parallel algorithms.

Unit II: Parallel Programming Environments

Parallel Programming Environments: OpenMP, OpenCL, MPI, Pthreads, Parallel programming examples: Average, Mean square deviation, Matrix multiplication, Sorting, Minimum spanning Tree algorithm.

Unit III: Introduction to CUDA

The death of single core solution, NVIDA and CUDA, GPU hardware, alternatives to CUDA, Understanding parallelism with GPUs, CUDA hardware overview, CUDA Blocks and Threads.

Unit IV : CUDA Memory

Memory handling with CUDA, Multi-CPU and Multi-GPU solution. CUDA examples, Developing and Debugging CUDA Programs.

Unit V : Distributed Computing Systems: Models and Design Issues

Distributed Computing Systems, models, Issues in designing distributed operating systems, Distributed Computing Environment

Unit VI : Distributed Computing and Techniques

IPC, Message passing, Remote Procedure calls, Distributed Shared Memory, Synchronization, Resource and Process management, Distributed File Systems, Case Study: Hadoop

Text Books :

1. Concepts, Techniques, and Models of Computer Programming by Peter Van Roy and SeifHaridi -MIT Press Ltd, 2004
2. Distributed Operating Systems by P.K.Sinha, PHI Publications
3. Parallel Computing by M.R.Bhujade, New Age International (p) Ltd. New Age Science, 2nd Edition, ISBN-10: 1906574200, ISBN-13: 978-1906574208
4. Multicore Programming by Wiley publications

Reference Books :

1. Peter Barry, Patric Crowley, "Modern Embedded Computing, Elsevier, ISBN: 978-93-81269-77-0 (Chapter 15 Only,)
2. Advanced Computer Architecture, Hwang, TMH
3. Introduction to Parallel Computing, Second Edition, AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, Publisher: Addison Wesley ,ISBN: 0-201-64865-2
4. Shane Cook, "CUDA Programming", Elsevier, ISBN: 978-0-12-415933-4

List of Assignments:

1. Vedic Mathematics method to find square of 2-digit number is used in a distributed programming. Use shared memory programming to complete the task.
2. Implement program to find average of given numbers using OPENMP.
3. Implement a Parallel ODD-Even Sort algorithm using OPENMP.
4. Implement concurrent prims algorithm using OPENMP
5. Implement Vector Addition using CUDA GPU.
6. Implement a Multi-threading application for echo server using socket programming in JAVA
7. Implement Reader-Writer problem using OPENMP.
8. Case Study on Hadoop File System.

CSUA31185D: Professional Elective - I
(Computer Graphics and Image Processing)

Teaching Scheme

Credits: 4
Lectures: 3 Hrs/week
Practical : 2Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Knowledge of Programming
- Basic Data Structures
- Mathematics

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, projections and hidden surfaces.
- To understand and apply various techniques regarding segmentation, animation, using graphics tool.
- Understand the fundamental concepts of digital image processing including basic operations on 2-D data, image enhancement techniques and image filtering techniques.
- Study how image features are represented and how image segmentation is performed.

Course Outcomes:

After completion of the course, student will be able to

1. Apply mathematics and logic to develop computer programs for elementary graphic operations.
2. Develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics.
3. Learn the basic principles of projections, hidden surfaces,2D and 3D transformation using computer graphics.
4. Apply the logic to develop animation and gaming programs using graphic tools.
5. Apply basic mathematical operations, image enhancement techniques and filtering techniques on digital images.
6. Represent objects and regions of an image with appropriate methods and apply appropriate image segmentation techniques on digital images.

Unit I: Graphics Primitives and Scan Conversion

Basic Concepts: Concepts, applications of computer graphics, pixel, frame buffer, resolution, aspect ratio.

Plotting Primitives: Scan conversions, lines, line segments, vectors, pixels and frame buffers, vector generation

Scan Conversion: Line and line segments, line drawing algorithms: Digital Differential Analyzer (DDA), Bresenhams, Line styles: thick, dotted and dashed. Circle drawing

algorithm: Bresenham. Character generating methods: stroke and bitmap method.
Display Files: display file structure, algorithms and display file interpreter. Primitive operations on display file.

Unit II: Polygons and Clipping Algorithms

Introduction to Polygon, Types: Convex, Concave and Complex. Representation of polygon, Inside test, Polygon filling algorithms – Flood fill, Seed fill, Scan line fill.
Windowing and clipping: Viewing transformations, 2-D clipping: Cohen – Sutherland algorithm, Polygon clipping: Sutherland Hodgeman algorithm.

Unit III: 2-D, 3-D Transformations, Projections and Hidden Surfaces

2-D Transformations: Introduction, Matrices, Translation, Scaling, Rotation, Homogeneous coordinates and matrix representation, Rotation about an arbitrary point, inverse and shear transformation.
3-D Transformations: Introduction, 3-D geometry, primitives, 3-D transformations and matrix representation, rotation about an arbitrary axis, 3-D viewing transformations.

Unit IV : Segment, Animation and Graphics Tools

Segment: Introduction, Segment table, Segment creation, closing, deleting and renaming, Visibility. Animation: Introduction, Design of animation sequences, Animation languages, Key- frame, Morphing, Motion specification.
Colour models and applications: Properties of Light, RGB, HSV, CMY color Selection and applications.
Graphics Tools: Introduction to graphics tool: OpenGL& usage of at least one tool of computer graphics (3D studio, Maya, Blender or Similar open source tools).

Unit V : Introduction to Image Processing and Image Filtering

Introduction - Image sampling and quantization, classification of digital images, image types (optical and microwave), basic operations on image -image negative, image subtraction, image average, contrast stretching, gray level slicing, histogram equalization, local enhancement technique.
Image Filtering : Low-pass spatial filters, median filtering, high-pass spatial filter, derivative filters, Frequency domain techniques - Ideal low-pass filter, Butterworth low-pass filter, High-pass filter, Homo-morphic filters

Unit VI : Image Features and Image Segmentation

Image Features : Boundary representation, Region representation (Area, Euler number, Eccentricity, Shape matrix, Moment based descriptor), texture based features.
Image Segmentation : Watershed Segmentation, Edge-based Segmentation, Fuzzy Segmentation, Region approach, Clustering techniques and Thresholding

Text 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.
3. Donald D. Hearn, ―Computer Graphics with Open GL‖, 4th Edition, ISBN-13: 9780136053583 .
4. Gonzalez and Woods, "Digital Image Processing", Pearson Education, 3rd edition.

Reference Books :

1. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 – 7808 – 794 – 4.
2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw- Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.

3 J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition,
4 Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.

List of Assignments:

Part A: Computer Graphics

Note: Perform the following lab assignments using C++/JavaScript/Java

1. Write C++/JavaScript/Java program to draw line using DDA and Bresenham's algorithm.
2. Write C++/JavaScript/Java program to draw circle using Bresenham's algorithm.
3. Write C++/JavaScript/Java program to draw a polygon and fill it with desired color using Seed fill algorithm.
4. Write C++/JavaScript/Java program to fill polygon using scan line fill algorithm.
5. Write C++/JavaScript/Java program to draw 2-D object and perform following basic transformations, a) Scaling b) Translation c) Rotation.
6. Write C++/JavaScript/Java program to generate Bouncing ball animation using Direct3D / Maya / Blender.

Part B: Image Processing

Note: Perform the following lab assignments using Java/Python

1. Perform the following operations on images:
2. a. Image negative, Contrast stretching, Gray level slicing, Histogram equalization and Local enhancement technique
   b. Image subtraction and Image average of 2 images
3. Perform the following filtering operations on images: Median filtering, High-pass spatial filtering, Derivative filters, Low-pass filtering in frequency domain, Butterworth low-pass filter, High-pass filtering in frequency domain and Homomorphic filtering. Extract and display the moment-based descriptors and texture features of images.
4. Apply the following segmentation techniques on images:
   a. Watershed Segmentation
   b. Thresholding
   c. Edge-based Segmentation
   d. Region approach

CSUA31186: Design and Analysis of Algorithms

Teaching Scheme

Credits: 3
Lectures: 2 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Skills & Competency Exam(SCE): 50 Marks
TW: 25 Marks

Prerequisites :

- Discrete Mathematics
- Data Structures
- Theory of Computation

Course Objectives :

- To analyze the performance of algorithms
- To study algorithmic design strategies
- To understand NP-Completeness and intractability
- To study some advance algorithms

Course Outcomes:

After completion of the course, student will be able to

1. Determine the asymptotic performance of a given computational problem. (Understand)
2. Implement the correct algorithmic strategy for solving a given computational problem. (Apply)
3. Categorize problems into tractable and intractable problems using concept of NP-Completeness. (Understand)
4. Solve real world computationally intractable problems using suitable algorithm. (Apply)

Unit I: Introduction

Analysis of Algorithms, Best, Average and Worst case running times of algorithms, Mathematical notations for running times O, Ω, Θ, Divide and Conquer strategy: Quick Sort, Merge Sort, Exponentiation Greedy Method: General Strategy, Knapsack problem, Scheduling, Optimal merge patterns, Huffman code generation algorithm.

Unit II: Dynamic Programming, Backtracking, Branch and Bound

Dynamic Programming: General Strategy, OBST, multistage graphs Backtracking: 8 Queen's problem, Graph Coloring, Branch and Bound: 0/1 Knapsack, Traveling Salesperson Problem.

Unit III: Intractable Problems and NP-Completeness

Time-Space tradeoff, Tractable and Non-tractable Problems, Polynomial and non-polynomial problems, deterministic and non-deterministic algorithms P-class problems, NP-class of problems, Polynomial problem reduction NP complete problems- Vertex cover and 3-SAT and NP hard problem - Hamiltonian cycle

Unit IV : Advanced Algorithms

Evolutionary Algorithms and Evolutionary Computing, Randomized algorithms, Approximation Algorithms, String Matching- Introduction, The Naive string matching algorithm, The Rabin-Karp algorithm.

Text Books :

1. Gilles Brassard, Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN 978-81-203- 1131-2
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press; ISBN 978-0-262-03384-8

Reference Books :

1. Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
2. Parag Himanshu Dave, Himanshu Bhalchandra Dave, "Design And Analysis of Algorithms", Pearson Education, ISBN 81-7758-595-9
3. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, ISBN: 978-0-521-61390-3
4. Michael T. Goodrich, Roberto Tamassia , "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley, ISBN 978-81-265-0986-7
5. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press,ISBN:0-521- 7035-7

List of Assignments :

Note : Perform the following lab assignments using C++/Java/Python

1. Implement Divide and Conquer technique for the given problem.
2. Implement Greedy approach for the given problem.
3. Solve the given problem using dynamic programming approach.
4. Solve the given problem using backtracking.
5. Solve the given problem using branch and bound technique.
6. Implement an approximation algorithm to solve the given problem.
7. Perform string matching using Rabin–Karp algorithm.

BansilalRamnathAgarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
(An Autonomous Institute affiliated to Savitribai Phule Pune University)
Department of Computer Engineering

CSUA32181A: Professional Elective –II
(Computer Networks-II)

Teaching Scheme	**Examination Scheme**
Credits: 4	Continuous Evaluation(CE): 20 Marks
Lectures: 3 Hrs/week	In-Semester Examination(ISE): 30 Marks
Practical : 2Hrs/week	Skills & Competency Exam(SCE): 20 Marks
	End Semester Examination(ESE): 30 Marks
	PR/OR: 25 Marks

Prerequisites :

- Fundamentals of Computer Networks
- Computer Networks-I

Course Objectives :

- To understand the enterprise networking
- To identify the securities of enterprise
- To illustrate NAT services and WAN technologies
- To identify network QoS and network management
- To design and troubleshoot network
- To perform network virtualization and automation

Course Outcomes:

After completion of the course, student will be able to

1. Illustrate the enterprise network design. (Understand)
2. Discriminate the securities of enterprises. (Analyze)
3. Demonstrate the NAT services and WAN technologies. (Understand, Apply)
4. Examine the network QoS and management. (Analyze)
5. Design a network and troubleshoot. (Evaluate)
6. Construct network virtualization and automation. (Apply)

Unit I: Enterprise Networking

Single-Area OSPFv2 Concepts: OSPF Features and Characteristics, OSPF Packets, OSPF Operation.

Single-Area OSPFv2 Configuration: OSPF Router ID, Point-to-Point OSPF Networks, Multiaccess OSPF Networks, Modify Single-Area OSPFv2, Default Route Propagation, Verify Single-Area OSPFv2.

Unit II : Enterprise Security

Network Security Concepts: Current State of Cyber security, Threat Actors, Threat Actor Tools, Malware, Common Network Attacks, IP Vulnerabilities and Threats, TCP and UDP Vulnerabilities, IP Services, Network Security Best Practices, Cryptography.

ACL Concepts: Purpose of ACLs, Wildcard Masks in ACLs, Guidelines for ACL Creation, Types of IPv4 ACLs.

ACLs for IPv4 Configuration: Configure Standard IPv4 ACLs, Modify IPv4 ACLs, Secure VTY Ports with a Standard IPv4 ACL, Configure Extended IPv4 ACLs.

Unit III : NAT services and WAN technologies

NAT for IPv4: NAT Characteristics, Types of NAT, NAT Advantages, Configure Static NAT, Configure Dynamic NAT, Configure PAT, NAT64

WAN Concepts: Purpose of WANs, WAN Operations, Traditional WAN Connectivity, Modern WAN Connectivity, Internet-Based Connectivity,
VPN and IPsec Concepts: VPN Technology, Types of VPNs, IPsec

Unit IV : Quality of Service and Network Management

QoS Concepts: Network Transmission Quality, Traffic Characteristics, Queuing Algorithms, QoS Models, QoS Implementation Techniques.
Network Management: Device Discovery with CDP, Device Discovery with LLDP, NTP, SNMP, Syslog, Router and Switch File Maintenance, IOS Image Management

Unit V : Network Design and Troubleshooting

Network Design: Hierarchical Networks, Scalable Networks, Switch Hardware, Router Hardware
Network Troubleshooting: Network Documentation, Troubleshooting Process, Troubleshooting Tools, Symptoms and Causes of Network Problems, Troubleshooting IP Connectivity.

Unit VI : Network Virtualization and Automation

Network Virtualization: Cloud Computing, Virtualization, Virtual Network Infrastructure, Software-Defined Networking, Controllers.
Network Automation: Automation Overview, Data Formats, APIs, REST, Configuration Management, IBN and Cisco DNA Center.

Text Books :

1. Fourauzan B., "Data Communications and Networking", 5th edition, McGraw-Hill Publications
2. Stallings William., "Data and Computer Communications", Sixth Edition, Prentice Hall of India .
3. Andrew S. Tanenbaum ,"Computer Networks", Pearson

Reference Books :

1. CCNA Basics and Fundamentals-Cisco
2. CCNA Routing and Switching 200-125 Official Cert. Guide Library
3. Cisco CCNA Command Guide- An introductory Guide for complete beginners

List of Assignments:

1. Configuration of Point-to-Point Single-Area OSPFv2
2. Determine the DR and BDR based on scenario.
3. Modify Single-Area OSPFv2
4. Propagate a Default Route in OSPFv2 and Verify Single-Area OSPFv2
5. Configure Numbered and Named Standard IPv4 ACLs.
6. Configure and Modify Standard IPv4 ACLs
7. Configure Extended IPv4 ACLs based on scenarios.
8. Configure Static and Dynamic NAT
9. Configure PAT
10. Use CDP and LLDP to Map a Network
11. Configure and Verify NTP
12. Back Up Configuration Files and Use a TFTP Server to Upgrade a Cisco IOS Image
13. Troubleshoot the given Enterprise Networks

CSUA32181B : Professional Elective -II (Artificial Intelligence)

Teaching Scheme

Credits: 4
Lectures: 3 Hrs/week
Practical : 2Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Data Structure and Algorithm
- Discrete Mathematics

Course Objectives :

- To understand the various characteristics of Intelligent agents.
- To learn the different search strategies in AI.
- To learn how to represent knowledge in solving AI problems.
- To introduce the concepts of learning
- To know about the various applications of AI.

Course Outcomes:

After completion of the course, student will be able to

1. Explain different types of AI Agents and environment. (Understand)
2. Implement AI search algorithms.(Apply)
3. Solve fundamental problems using First Order Logic (Apply)
4. Understand Outline different planning strategies (Understand)
5. Implement supervised learning algorithms (Apply)
6. Understand different AI application (Understand)

Unit I: Introduction

Introduction to Artificial Intelligence (AI), History and Future of AI, Intelligent Agent- Agent and Environment, Rationality, The nature of Environment, Problem Solving by Searching-State Space Search

Unit II : Problem Solving Search

Problem Solving by Searching- Uninformed Search, Informed Search-A* Search-Heuristics-Local Search Algorithms and Optimization-Hill Climbing, , Constraint Satisfaction Problem (CSP)- Backtracking search for CSP, Games- Single Agent Games, Two-Agent Games-Optimal Decisions in Games-Min-Max Algorithm, Alpha Beta Pruning, Stochastic Games

Unit III : Knowledge Representation and Logic

Knowledge representation using Propositional logic, Knowledge Representation using First Order Logic(FOL), Reasoning using FOL, Resolution using FOL, Use of predicate calculus,, Rule Based System

Unit IV : Planning

Planning and acting in real world- Hierarchical Task Network Planning, Planning and Acting in Non-deterministic Domain, Conditional Planning-Fully Observable Environment, Partially Observable Environment, Executing, Monitoring and Re-planning, Continuous Planning, Multi Agent Planning

Unit V : Learning

Introduction to Learning, Machine Learning, Different Types of Learning, Hypothesis, Choosing the Best Hypothesis, Rule Induction and Decision Tree, Training Error and Test Set Error, Overfitting the data, Training and Validation.
Learning Using Neural Network, Perception, Gradient Descent, Multi Layer Network, Activation Functions, Applications of Neural Network.
Probabilistic Learning-Bayesian Learning

Unit VI : Applications

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – AI in Robotics – Robot Hardware, Robotic Perception, Planning, Moving

Text Books :

1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2 Kevin Night and Elaine Rich, Nair B., ―Artificial Intelligence (SIE), McGrawHill-2008.
3 Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998

Reference Books :

1 Peter Jackson, ―Introduction to Expert Systems, 3rd Edition, Pearson Education, 2007.
2 Deepak Khemani ―Artificial Intelligence, Tata McGraw HillEducation 2013.
3 Dan W. Patterson, ―Introduction to AI and ES‖, Pearson Education, 2007

List of Assignments:

1. Implement A* approach for any suitable application.
2. Assignment on Constraint Satisfaction Problem: Implement graph colouring problem.
3. Implementation of Min-Max Algorithm
4. Implement goal stack planning for the blocks world Problem
5. Implement Naive Bayes algorithm for sample data
6. Implementation of decision tree for sample data
7. Implementation of Multilayer Perceptron Neural Network for sample data
8. Write a program to correct the spelling of English paragraph.(NLP Based).
9. Mini project

CSUA32181C: Professional Elective –II
(Cloud Computing)

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Computer Networks

Course Objectives :

- To understand cloud computing concepts
- To study supporting technologies of cloud
- To study open research problems of cloud computing
- To study various platforms for cloud computing
- To explore the applications based on cloud computing
- To study and evaluate the contemporary technologies in cloud computing

Course Outcomes :

After completion of the course, student will be able to

1. Summarize the basic concepts of cloud computing. (Understand)
2. Make use of supporting technologies for cloud computing. (Understand, Apply)
3. Analyze the challenges and opportunities in the cloud computing. (Analyze)
4. Use the cloud services for deployment of his own applications. (Apply)
5. Correlate the IoT and Ubiquitous technologies with cloud . (Analyze)
6. Explore current trends of cloud computing, ((Understand)

Unit I : Basics of Cloud Computing

Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Software as a Service (SaaS)-Understanding the Multitenant Nature of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of Paas Solutions, Disadvantages of PaaS Solutions. Infrastructure as a Service (IaaS)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy
Case Study: Google Cloud Platform

Unit II : Virtualization

Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
Common Standards: The Open Cloud Consortium, Open Virtualization Format. Standards for Security. Case study : VirtualBox, vmware

Unit III : Data Storage and Security in Cloud

Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo Cloud data stores: Datastore and Simple DB Cloud Storage-Overview, Cloud Storage Providers. Case study: Firebase**. Securing the Cloud**- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding

the Threats. Case study: Discuss research problems of cloud security

Unit IV : Amazon Web Services

Services offered by Amazon Hands-on Amazon, EC2 - Configuring a server, Virtual Amazon Cloud, AWS Storage and Content Delivery Identify key AWS storage options Describe Amazon EBS Creating an Elastic Block Store Volume Adding an EBS Volume to an Instance Snap shooting an EBS Volume and Increasing Performance Create an Amazon S3 bucket and manage associated objects. AWS Load Balancing Service Introduction Elastic Load Balancer Creating and Verifying Elastic Load Balancer.

Unit V : Ubiquitous Clouds and the Internet of Things

Introduction to Ubiquitous computing, Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management)

Unit VI : Future of Cloud Computing

Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, The Docker Workflow. Docker compose file, Docker volume, Docker storage.

Kubernetes : introduction to Kubernetes, Features of Kubernetes, Kubernetes API, Basic Architecture, Minikube.

Text Books :

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.
2. Dr. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more" , Wiley Publications, ISBN: 978-0-470-97389-9
3. GautamShrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, *ISBN*: 9780511778476
4. Docker Documentation (https://docs.docker.com/get-started/)
5. Kubernetes Documentation (https://kubernetes.io/docs/home/)

Reference Books :

1. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication, ISBN10: 8126536039
2. Buyya, "Mastering Cloud Computing", Tata McGraw Hill, ISBN-13: 978-1-25-902995-0
3. Barrie Sosinsky,"Cloud Computing", Wiley India, ISBN: 978-0-470-90356-8
4. Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press
5. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, "Cloud Computing: Concepts, Technology and Architecture", Pearson, 1st Edition, ISBN :978 9332535923, 9332535922
6. Tim Mather, Subra K, ShahidL.,Cloud Security and Privacy, Oreilly, ISBN-13 978-81-8404-815-5

List of Assignments :

1. Case study on Case Study: Google Cloud Platform
2. Write a web based application and use Firebase.
3. Create a sample web based application using PhP/Pyhton and deploy it on AWS.
4. Assignment to install and use Docker. Create Docker file.
5. Assignment to install and use kubernetes.

BansilalRamnathAgarwal Charitable Trust's
Vishwakarma Institute of Information Technology, Pune-48
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Department of Computer Engineering

CSUA32181D : Professional Elective -II (Augmented and Virtual Reality)

Teaching Scheme	**Examination Scheme**
Credits: 4	Continuous Evaluation(CE): 20 Marks
Lectures: 3 Hrs/week	In-Semester Examination(ISE): 30 Marks
Practical : 2Hrs/week	Skills & Competency Exam(SCE): 20 Marks
	End Semester Examination(ESE): 30 Marks
	PR/OR: 25 Marks

Prerequisites :

- Discrete Mathematics
- Data Structures
- Theory of Computation

Course Objectives :

- To make students know the basic concept and framework of virtual reality.
- To introduce students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To aware students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.

Course Outcomes:

After completion of the course, student will be able to

1. To understand the basic concept and framework of virtual reality. (Understand)
2. To apply VR Tools in real time environment. (Analyze)
3. Design and prototype effective AR/VR applications using state-of-the-art tools. (Understand, Apply)
4. Compare AR/VR to other approaches; match technology to needs and use cases. (Analyze)
5. Articulate trends and trajectories in current and future AR/VR systems. (Analyze)
6. To understand the technology for multimodal user interaction and perception in VR. (Understand)

Unit I: Introduction

Introduction to Virtual Reality Fundamental Concept and Components of Virtual Reality, Primary Features and Present Development on Virtual Reality.

Multiple Modals of Input and Output Interface in Virtual Reality . Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based3D Menus & 3DScanner etc; Output --Visual / Auditory / Haptic Devices.

Unit II : Visual Computation in Virtual Reality

Fundamentals of Computer Graphics; Real time rendering technology; Principles of Stereoscopic Display; Software and Hardware Technology on Stereoscopic Display

Unit III : Environment Modeling in Virtual Reality

Geometric Modeling ; Behavior Simulation; Physically Based Simulation

Unit IV : Haptic & Force Interaction in Virtual Reality

Concept of haptic interaction; Principles of touch feedback and force feedback; Typical structure and principles of touch/force feedback facilities in applications

Unit V : VR Development Tools

Frameworks of Software Development Tools in VR; Modeling Tools for VR; X3D Standard; Vega, MultiGen, Virtoolsetc

Unit VI : Augmented Reality

Augmented Reality System Structure of Augmented Reality; Key Technology in AR; General solution for calculating geometric & illumination consistency in the augmented environment

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Text Books :

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009.
3. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005

Reference Books :

1. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces, Theory and Practice, Addison Wesley, USA, 2005.
2. Oliver Bimber and Ramesh Raskar, Spatial Augmented Reality: Meging Real and Virtual Worlds, 2005.
3. Burdea, Grigore C and Philippe Coiffet, Virtual Reality Technology, Wiley Interscience, India, 2003.
4. John Vince, Virtual Reality Systems, Addison Wesley, 1995
5. Howard Rheingold, Virtual Reality: The Revolutionary Technology and how it Promises to Transform Society, Simon and Schuster, 1991.
6. William R Sherman and Alan B Craig, Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics). Morgan Kaufmann Publishers, San Francisco, CA, 2002
7. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013

List of Assignments :

Lab instructor can frame suitable assignments based on above topics.

BansilalRamnathAgarwal Charitable Trust's

Vishwakarma Institute of Information Technology, Pune-48

(An Autonomous Institute affiliated to Savitribai Phule Pune University)

Department of Computer Engineering

CSUA32182A: Professional Elective -III
(Blockchain Technology)

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- NA

Course Objectives :

- To introduce fundamentals of Blockchain
- To explain Bitcoin Blockchain
- To explain Ethereum Architecture & Components
- To explain Blockchain creation using Ethereum Platform
- To explain Hyperledger Frameworks and Fabric Concepts
- To discuss Emerging Trends in Blockchain and Use cases

Course Outcomes:

After completion of the course, student will be able to

1. Explain fundamental knowledge of Blockchain (Understand)
2. Illustrate Bitcoin Blockchain (Understand)
3. Summarise Ethereum Architecture & Components (Understand)
4. Demonstrate Blockchain creation process using Ethereum Platform (Apply)
5. Introduce Hyperledger Frameworks and Fabric Concepts (Understand)
6. Explore emerging trends in Blockchain and Use cases (Understand)

Unit I : Overview of Blockchain

What is Blockchain?, History of Blockchain, Network and protocols, Smart Contract and Consensus Algorithms, Blockchain users and adoption, Blockchain challenges

Unit II : Bitcoin Blockchain

Cryptocurrency, Bitcoin Blockchain fundamentals, Keys as Identity, Digital Signatures, Hashes, Hashes as Addresses, Hash Pointers and Data Structures, Blockchain transactions, Blockchain block structure, Bitcoin Mining, Proof-of-Work

Unit III : Ethereum Architecture & Components

Evolution of Ethereum, Ethereum Components, Ethereum Virtual Machine, Types of Transactions, Solidity language, Ethereum Smart Contracts, Tokenization, Dapps.

Unit IV : Blockchain creation using Ethereum Platform

Mining explained, Ethereum Clients, The Ethereum network, The Ethereum Mining Process, Ethereum Genesis Block Creation, Creating a private network over Ethereum.

Unit V : Hyperledger Frameworks & Fabric Concepts

Overview of Hyperledger, Hyperledger Projects, Hyperledger Architecture, Consensus model for permissioned Blockchains, Fabric Elements, Transaction Execution in Fabric, Fabric Network Setup, Fabric Chaincode Development & Deployment.

Unit VI : Emerging Trends in Blockchain and Use cases

Introduction to Corda, Ripple, R3.

Blockchain and cloud computing, Blockchain and Artificial Intelligence,

Blockchain use cases in Health Care, Banking, Government Sector, Supply Chain Management, Identity Management, etc.

Text Books :

1 Mastering Bitcoin: Unlocking Digital Crypto currencies, by Andreas Antonopoulos
2 Blockchain by Melanie Swa, O'Reilly
3 Mastering Ethereum Building Smart Contracts and DApps, Andreas M. Antonopoulos, Gavin Wood, O'Reilly
4 Hyperledger Fabric - https://www.hyperledger.org/projects/fabric

Reference Books :

1 Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits
2 Etherium Yellow Paper : "Ethereum: A Secure Decentralised Generalised Transaction Ledger Petersburg", Dr. Gavin Wood

Suggested list of Assignments :

1 Study of various websites related Blockchain like
2 Case Study on various use cases of Blockchain.
3 Study of SOLIDITY programming.
4 Write Smart Contract for various use cases of Blockchain.
5 Implementations in Public Blockchain network such as – Bitcoin, Ethereum
6 Research & writing on topics such as Forking, Wallets, Consensus Mechanisms, Performance enhancement.
7 Comparative study of various Blockchain Platforms (Bitcoin, Ethereum, Hyperledger, Ripple, Corda, R3…).

CSUA32182B : Professional Elective - III

(Soft Computing)

Teaching Scheme
Credits : 4
Lectures : 3 Hrs/week
Practical : 2Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :
- Artificial Intelligence
- Design of Algorithms

Course Objectives :
- To design and develop intelligent systems in the framework of soft computing.
- To understand supervised learning.
- To understand unsupervised learning.
- To apply concepts of optimization techniques in the intelligent system in order get complete automated system.
- To apply soft computing techniques.

Course Outcomes:
After completion of the course, student will be able to
1. Know about the basics of soft computing techniques and also their use in some real life situations. (Understand)
2. Solve the problems using neural networks techniques for supervised learning. (Understand, Apply)
3. Solve the problems for unsupervised learning. (Understand, Apply)
4. Find the solution using different fuzzy logic techniques. (Analyze)
5. Use the genetic algorithms for different modeling. (Analyze, Apply)
6. Apply soft computing technique for real life application. (Analyze, Apply)

Unit I : Soft Computing Basics
Introduction, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Introduction: Neural networks, application scope of neural networks, fuzzy logic, genetic algorithm, machine learning.

Unit II : Neural Networks
Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto associative and hetro-associative memory, perceptron model, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, applications.

Unit III : Fuzzy Logic
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications and Defuzzifications, Fuzzy Controller, Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy propositions formation of

rules ,decomposition of compound rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference system, fuzzy expert systems

Unit IV : Genetic Algorithm

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, Traditional algorithm Vs genetic algorithm, simple GA, general genetic algorithm, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming, applications of genetic algorithm, Convergence of GA, Applications &advances in GA, Differences & similarities between GA & other traditional method, applications.

Unit V : Machine Learning

Learning form Examples - Inductive Concept Learning - Sequence Prediction - Effect of Noise in Input. Learning by Analogy- Concept formation - Derivational Analogy. Learning by Observation and Discovery - Search for Regularity- Conceptual Clustering, Computational Learning Theory

Unit VI : Applications of Computational Intelligence

Shortest Path Algorithm, Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction, Stock Marker Forecasting

Text Books :

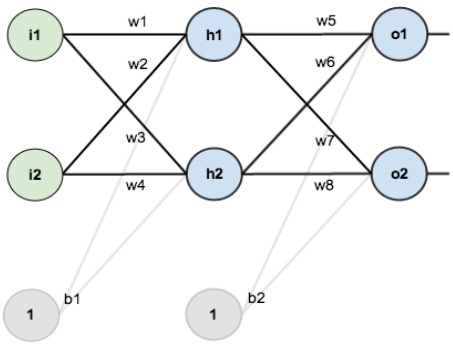
1. S. Rajsekaran& G.A. Vijaya Lakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.
2. N.P.Padhy,"Artificial Intelligence and Intelligent Systems" Oxford University Press.
3. Neuro-Fuzzy and Soft Computing, J S R Jang, CT Sun and E. Mizutani , PHI PVT LTD.

Reference Books :

1. Principles of soft computing –by Sivandudam and Deepa, John Mikey India.
2. SimanHaykin,"Neural Networks", Prentice Hall of India
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
4. Eiben and Smith, "Introduction to Evolutionary Computation", Springer
5. Introduction to Machine Learning, Ethem Alpaydin, The MIT Press, October 2004, ISBN 0-262- 01211-1

List of Assignments:

1. Generate ANDNOT function using McCulloch-Pitts neural net.
2. Write a program for solving linearly separable problem using Perceptron Model.
3. Design BPN algorithm for following neural network.



4. Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
5. Implement travelling sales person problem (TSP) using genetic algorithms.
6. For any real time application use soft computing.

CSUA32182C: Professional Elective -III
(Software Design and Architecture)

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Software Engineering

Course Objectives :

- To understand software design methods and UML notations.
- To learn architectural design for real time software architecture.
- To select and use appropriate design pattern applicable to software system.
- To use the Siemens four-views approach for developing.
- To use the documentation and Architecture Analysis & Design Language.
- To select and use appropriate archetype pattern for architectural system.

Course Outcomes:

After completion of the course, student will be able to

1. Explain various software design methods and UML notations.
2. Elaborate on different architectural views.
3. Apply appropriate design pattern in software design.
4. Analyze need of AOA four-views approach for developing software.
5. Understand relevance of the documentation for Architecture Analysis & Design Language.
6. Develop architectural system using appropriate archetype pattern

Unit I : Introduction to Software Design

Design Methods: Procedural and Structural Design methods, Object Oriented design method, Unified modelling Language overview, Static and Dynamic Modelling Advance Use case, Class, State, Sequence Diagrams

Unit II : Architectural Design

Need of Architectural Design, importance and architecture views, client-server, service oriented, component based concurrent and real time software architecture with case studies.

Unit III : Design Pattern

Introduction, creational, Structural and behavioural patterns, singleton, proxy, adapter, factory, abstract factory, iterator, observer pattern with application. Case study of any one pattern

Unit IV : Aspect-Oriented Architecture

Introduction to Aspect-Oriented Programming (basic concepts), Aspect oriented architecture, Aspect oriented Modelling using UML, Aspect Oriented Modelling tools, Model-Driven Architecture (MDA), Why MDA? State of the Art Practices and Tools.

Unit V : Documenting Architecture

Documenting Interfaces, documenting Behaviour, documenting architectural through views, reviewing architecture documents. Introduction to Architecture Analysis Languages (ADLs).

Unit VI : Archetype Pattern

Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modelling, Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rules for Archetype pattern.

Text Books :

1 "Software Design", 2nd edition, Pearson Education, David Budgen.

2 Software Architecture in Practice, 3rd Edition by Len Bass, Paul Clements, Rick Kazman, Addison-Wesley Professional

Reference Books :

1 The UML Users Guide, Pearson Publication, Grady Booch, James Rumbaugh, Ivar Jacobson

2 Software Design: From Programming to Architecture, Eric J.
3 Applied Software Architecture, Christine Hofmeister, Robert Nord, Deli Soni, Addison-Wesley Professional
4 Enterprise Patterns and MDA: Building Better Software with Archetype Patterns and UML Addison-Wesley Professional, Jim Arlow, IlaNeustadt
5 Documenting Software Architectures: Views and Beyond, 2nd Edition, Addison-Wesley, Clements, P., et al.
6 The Architecture Analysis & Design Language (AADL): An Introduction, CMU/SEI-2006-TN-011, Carnegie Mellon University, Gluch, D., Feiler. P., and Hudak. J.

List of Assignments:

1. Design and draw diagram in UML for software system of Realtime use using free UML tool (Linux/Unix based StartUML).
2. Perform architectural design and implement singleton pattern for software system using Linux/Unix based Java/C++/Python/any advanced programming language.
3. Perform architectural design and implement observer pattern for software system using Java/C++/Python/any advanced programming language.
4. Design and draw UML diagram using any one aspect-oriented approach for any software system with the help of Linux/Unix based JBoss AOP.
5. Perform detailed documentation of assignment no 4 using Doxygen/Swagger/any web-based tool etc.
6. Automate the use of any one of the archetype patterns by using the Model Driven Architecture which will describe business system of your choice using Linux/Unix based Eclipse Modelling Framework.

CSUA32182D: Professional Elective - III
(Real Time Embedded Operating System)

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- NA

Course Objectives :

- To understand a typical embedded system and its constituents
- To learn the selection process of processor and memory for the embedded systems
- To explain real-time operating system (RTOS) and the types of RTOS
- To learn various approaches to real-time scheduling
- To learn resource access control and inter-process communication for RTOS tasks
- To learn software development process and tools for RTOS applications

Course Outcomes:

After completion of the course, student will be able to

1. Recognize embedded and real-time systems. (Understand)
2. Comprehend about the RTOS. (Understand)
3. Exemplify scheduling algorithms. (Apply)
4. Apply software development process to a given RTOS application. (Apply)
5. Analyze Multiprocessor Scheduling in RTOS. (Analyze)
6. Design a given RTOS based application. (Apply)

Unit I : Introduction to real time and embedded application

Characteristics, Challenges, Processors in Embedded systems, hardware Units and devices in an embedded system, digital control, high-level controls, signal processing, other real-time applications.

Unit II : Real Time Operating System

Introduction to real-time operating systems. Hard versus soft real-time systems and their timing constraints. Temporal parameters of real-time process: Fixed, Jittered and sporadic release times, execution time. Types of real-time tasks, Precedence constraints and data dependency among real-time tasks, other types of dependencies for real-time tasks. Functional parameters and Resource parameters of real-time process, Real-time applications: Guidance and control, Signal processing, Multimedia, real-time databases.

Unit III : RTOS scheduling

Real-time task and task states, task and data. Approaches to real-time scheduling: clock driver, weighted round-robin, priority-driven- Fixed priority and dynamic priority algorithms –Rate Monotonic (RM), Earliest-Deadline-First (EDF), Latest-Release-Time (LRT), Least-Slack-Time-First (LST). Static and Dynamic systems, on-line and off-line scheduling, Scheduling aperiodic and sporadic real-time tasks.

Unit IV : Inter-process communication

Resources and resource access control-Assumption on resources and their usage, enforcing mutual exclusion and critical sections, resource conflicts and blocking, Effects of resource contention and resource access control - priority inversion, priority inheritance.

Inter-process communication-semaphores, message queues, mailboxes and pipes. Other RTOS services-Timer function, events, Interrupts - enabling and disabling interrupts, saving and restoring context, interrupt latency, shared data problem while handling interrupts. Interrupt routines in an RTOS environment

Unit V : Multiprocessor Scheduling

Multiprocessor Scheduling, resource access control and synchronization in Real-time Operating system. Real-time communication: Model, priority-based service disciplines for switched networks, weighted round-robin service disciplines, Medium access-control protocols for broadcast networks, internet and resource reservation protocols, real-time

protocols.

Unit VI : RTOS Case studies

Software development process for real time system: Requirements engineering, Architecture and design of an embedded system, Implementation aspects in an embedded system, estimation modelling in embedded software. Validation and debugging of embedded systems. Embedded software development tools. Debugging techniques

Real-time operating systems: Capabilities of commercial real-time operating systems, QNX/Neutrino, Microc/OS-II, VxWorks, Windows CE and RTLinux

Text Books :

1. Jane W. S. Liu, "Real-Time Systems", Pearson Education, ISBN: 10: 0130996513
2. Raj Kamal, "Embedded Systems: Architecture, programming and Design", 2nd Edition, McGraw-Hill, ISBN: 13: 9780070151253
3. David E. Simon, "An Embedded Software Primer", Pearson Education, ISBN: :8177581546

Reference Books :

1. Sriram V. Iyer, Pankaj Gupta, "Embedded Real-time Systems Programming", Tata McGraw-Hill, ISBN: 13: 9780070482845
2. Dr. K. V. K. K. Prasad, "Embedded Real-Time Systems: Concepts: Design and Programming", Black Book, Dreamtech Press, ISBN: 10: 8177224611,13: 9788177224610

List of Assignments:

Lab instructor can frame suitable assignments based on above topics

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Department of Computer Engineering

CSUA32183: Internet of Things

Teaching Scheme

Credits : 4
Lectures : 3 Hrs/week
Practical : 2 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks
PR/OR: 25 Marks

Prerequisites :

- Computer Networks

Course Objectives :

- To learn the fundamentals of IoT.
- To learn the building blocks of IoT
- To gain knowledge of IoT protocols.
- To comprehend fundamentals of security in IoT
- To know the cloud computing and fog computing concepts.
- To learn real world application scenarios of IoT along with its societal and

Course Outcomes :

After completion of the course, student will be able to

1. Understand the fundamentals of IoT. (Understand)
2. Design IoT Systems using building blocks of IoT. (Apply)
3. Compare the different IoT protocols. (Understand)
4. Explain the security issues in IoT. (Understand)
5. Summarize the concepts of Cloud & Fog Computing. (Understand)
6. Develop a small IoT system. (Apply)

Unit I : Introduction to IoT

IoT: Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Unit II : Protocols for IoT

IoT Protocols Organization, IoT Data Protocols: CoAP, MQTT, AMQP, DDS, IPv6, ZigBee, Bluetooth, Wifi, Comparison of Traditional Networking Protocols and IoT Protocols, Issues with IoT Standardization.

Unit III : IoT and M2M

Machine to Machine, Difference between IoT and M2M, Software define Network, Software define Network for IoT, IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with ArduinoIntroduction to Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python.

Unit IV : Security In IoT

IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modelling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for IoT

Unit V : Cloud Computing and Fog Computing

Introduction to Cloud Computing, Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, The Cloud of Things Architecture. Challenges and issues in cloud Computing. Fog Computing, Need of Fog computing, Fog Computing Architecture

Unit VI : IoT Case Studies

Case Studies: Home Intrusion Detection, Weather Monitoring, System, Air Pollution Monitoring, Smart Irrigation, Smart cities, Health Care.

Text Books :

1 ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515

2 Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012. ISBN : 9781439892992

3 Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", Springer, 2011. ISBN: 978-3-642-19156-5

Reference Books :

1 Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2012, 9781119958345

2 Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012, ISBN:978-1-119-99435-0

3 Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010.ISBN : 978-0-470-90356-8

4 Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014, ISBN: 978-1-118-43063-7

List of Assignments:

1. Study Write up on Arduino and Raspberry pi.
2. LED Blinking assignment using Arduino / Raspberry pi.
3. Interfacing Ultrasonic sensors with Ardinuo / Raspberry pi.
4. Interfacing pressure sensor & temperature sensor to Ardinuo / Raspberry pi.
5. Interface Rfid reader with Raspberry pi.
6. Study writeup : Compare IoT data protocols.
7. Implement a cloud based miniproject in IoT.

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ES32184CS : Organizational Behaviour

Teaching Scheme

Credits : 3
Lectures : 3 Hrs/week

Examination Scheme

Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :

- NA

Course Objectives :

- Explain the nature, scope, challenges and models of the organizational behavior
- Teach the perceptual Management using proper case studies
- Describe the importance of working in teams and group dynamics
- Teach the importance of job satisfaction
- Explain the acceptance of change at organization
- Study about the organizational goals and culture

Course Outcomes:

After completion of the course, student will be able to

1. Outline the nature, scope, challenges and models of the organizational behavior. (Understand)
2. Illustrate the nature, process, and selection of Perceptual Management. (Understand)
3. Work in the teams by understanding the group dynamics at the organization. (Apply)
4. Describe the concepts of motivation and job satisfaction. (Understand)
5. Accept the change at workplace and fit into the teams. (Apply)
6. Achieve the organizational goal by inculcating the organizational culture. (Apply)

Unit I : Introduction

Introduction: Nature and scope – Linkage with other social sciences - Individual roles and organizational goals - Perspectives of human behaviour, Approach to organizational behaviour - Models of organizational behaviour.

Unit II : Perceptual Management

Perceptual Management: Nature - Process – Selection- Organization and interpretation – Influencing factors -Motivation – Concepts – Motivational theories. Leadership and motivating people - Leadership theories; Attitudes and values- Formation – Types.

Unit III : Personality Development

Personality Development: Nature – Stages- Determinants of personality, - Johari Window - Transactional analysis; Learning process – theories; Group dynamics – Conflict resolution in groups and problem-solving techniques.

Unit IV : Managing People at Work

Performance Assessment: Evaluation & Appraisal- Objective & Subjective Techniques Performance Prediction- Job Knowledge, Applicant Ability & Skill, Experience, Personality, Medical record, Organizational Training- Overview, Types of Training

Unit V : Inter-Personal Communication

Inter-Personal Communication: Listening- feedback- Collaborative processes in work groups, Team building, Team decision making, Organizational change - Change dimensions- Over coming resistance to change.

Unit VI : Organizational Culture

Organizational Culture- Definition and characteristics, Creating and sustaining culture, Stress in organizations- Power and authority- Organizational development: Goals- Processes- Nature of OD - interventions, OD techniques.

Text Books :

1. Aswathappa K, "Organizational Behavior-Text, Cases and Games", Himalaya Publishing House, New Delhi, 2008.
2. Stephen B Robbins: "Organisational Behavior", PHI, NewDelhi,2008

Reference Books :

1. Schultz, D. & Schultz, S. E. (2013). Psychology and Work Today: An Introduction to Industrial and Organizational Psychology. 7th Edition. Pearson Education: New Delhi.
2. GregoryMoor head, Ricky W.Grif fin: "Organizational Behavior", Biztantra, New Delhi, 2009.
3. Jai B.P.Sinha: "Culture and Organizational Behavior", Sage Publication India Private Limted, New Delhi, 2008.
4. Nelson,Quick, Khandelwal, "An Innovative Approach to Learning and Teaching OrganisationalBehaviour" Cengage Learning,2012.

IOEUA32185A: Open Elective – I
(Information and Cyber Security)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :
- Fundamentals of Computer Networks

Course Objectives :
- To know the need and basic of security
- To learn various types of Cryptographic algorithm algorithm
- To learn various authentication technique
- To acquire knowledge of protocols employed to provide Confidentiality and integrity
- To understand various threats
- To acquaint with current security scenario

Course Outcomes :

After completion of the course, student will be able to
1. Identify the basics and need of security. (Understand)
2. Make use of various Cryptographic algorithm. (Apply)
3. Examine various authentication techniques. (Analyze)
4. Differentiate protocols for confidentiality and integrity. (Understand)
5. Select techniques for securing a network. (Remember)
6. Summarize Top OWASP top 10 vulnerabilities. (Understand)

Unit I : Security Basics and Introduction to cryptography

Introduction, Elements of Information Security, Understanding concepts: threat, exploit, privacy, vulnerability and policy, Types of Attacks, Operational Model of Network Security, Cryptography, Substitution Ciphers, Transposition Ciphers, Stenography applications and limitations

Unit II : Symmetric Key Cryptography

Introduction, Encryption Methods: Symmetric, Asymmetric, Block Ciphers and methods of Operations, Data Encryption Standard (DES), Advance Encryption Standard (AES).

Unit III : Asymmetric Key Cryptography

Public Key Cryptography, RSA Algorithm: Working, Key length, Security, Key Distribution, Deffie-Hellman Key Exchange,
Authentication methods, Message Digest, Kerberos, X.509 Authentication service.
Digital Signatures: Implementation, Algorithms, Standards (DSS), Authentication Protocol

Unit IV : Network Layer Security

IP Security: IPSec protocols, and Operations, AH Protocol, ESP Protocol, ISAKMP Protocol, Oakkey determination Protocol, VPN.
WEB Security:
Introduction, Secure Socket Layer (SSL), SSL Session and Connection, SSL Record

Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol.
Electronic Mail Security: Introduction, Pretty Good Privacy, MIME, S/MIME, Comparison. Secure Electronic Transaction(SET)

Unit V : Firewall And Intrusion

Introduction, Computer Intrusions. Firewall Introduction, Characteristics and types, Benefits and limitations. Firewall architecture, Trusted Systems, Access Control.
Intrusion detection, IDS:
Need, Methods, Types of IDS, Password Management, Limitations and Challenges.

Unit VI : Introduction to OWASP

Introduction, Top 10 Vulnerabilities, understanding Top 10 Vulnerabilities.

Text Books :

1 Atul Kahate, "Cryptography and Network Security", McGraw Hill Publication, 2nd Edition, 2008, ISBN : 978-0-07-064823-4
2 Dr. V.K. Pachgare, "Cryptography and Network Security", PHI, 2nd Edition, 2015

Reference Books :

1 William Stallings, "Cryptography and network security principles and practices", Pearson,
6th Edition, ISBN : 978-93-325-1877-3
2 Forouzan, "Cryptography and Network Security (SIE)", McGraw Hill, ISBN, 007070208X, 9780070702080

Web Resource:

1 www.owasp.org

IOEUA32185B: Open Elective - I
(Automotive Electronics)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :

- Basics of sensors and actuators
- General automotive system
- Basics of OS

Course Objectives :

- To make familiar about automotive system operations.
- To illustrate need for automation in automotive operations and appropriate electronics for the same.
- To discuss suitability of electronics hardware and software platform for control, compute and communication systems in automotive.
- To discuss control algorithms used in automotive.
- To introduce various communication standards used for intra and inter-cluster communication in automotive electronic system.
- To make awareness of fault diagnosis system in automotive.

Course Outcomes :

After completion of the course, student will be able to

1. Understand powertrain and transmission mechanism of SI and DI engine.
2. Identify need of automation in automotive operations and appropriate electronics for the same.
3. Select suitable electronics hardware and software platform for design and development of various control, compute and communicate oriented automotive systems.
4. Understand control theory for automotive systems
5. Understand communication and fault diagnostic protocols used in automotive
6. Able to use the techniques, skills, and modern engineering tools necessary for automotive engineering practice

Unit I : Power Train Engineering and fundamentals of Automotive

Fundamentals of Petrol, diesel and gas engines and electric motors. Basic Automotive System. Alternators and charging, battery technology, Ignition systems. Basic of Hybrid designs (solar power, electric/gasoline, LPG, fuel cells). Basic Transmission systems.

Unit II : Sensors and actuators in Automotive

In-vehicle sensors: Working principles, Characteristics, limitations and use within the automotive context of the following: Temperature sensing e.g. coolant. Position sensing e.g. crankshaft, throttle plate. Pressure sensing e.g. exhaust differential, tyre pressure measurement system. Distance sensing e.g. anti-collision, Velocity sensing e.g. speedometer, anti-skid, Torque sensing e.g. automatic transmission, Vibration sensing e.g. Airbags, Flow sensing and measurement e.g. Fuel injection.

Use of Actuators: Types, working principle, Characteristics, limitations and use within the automotive context of each type.

Unit III : Electronics processing System in automotive

Interfacing electronics: Operational amplifier circuits, Instrumentation amplifiers, Comparators. Level shifting, Wave-shaping, Filters. Noise mechanisms and reduction.
Electronics control unit: Automotive processors and OS, typical design consideration of ECU.

Unit IV : Automotive Control Systems

Control system approach in Automotive: Analog and Digital control methods. Cruise control, traction control, actuator limiting, wind-up, gain scheduling, adaptive control.
Special Control Schemes: Vehicle braking fundamentals, Antilock systems, Variable assist steering and steering control, Controls for Lighting, Wipers, Air-conditions/Heating, Remote keyless Entry and Anti-theft System. Spark Ignition and Compression Ignition Engines and their electronic controls.
Engine management testing: Engine management system strategies and implementation, Simulation and implementation methods.

Unit V : Automotive Communication Systems

Communication interface with ECUs: Interfacing techniques and interfacing with infotainment gadgets. Automotive Buses: Use of various buses such as CAN, LIN, Flexural, Recent trends in automotive buses (Such as OBDII, MOST, IE, IELLI, D2B, and DSI: Only Comparative study). **Application of Telematics in Automotive:** Global Positioning Systems (GPS) and General Packet Radio Service (GPRS), for use in an automotive environment.

Unit VI : Diagnostics and Safety in Automotive

Fundamentals of Diagnostics: Basic wiring system and Multiplex wiring system. Preliminary checks and adjustments. Self-Diagnostic system. Fault finding and corrective measures. Electronic transmission checks and Diagnosis. Diagnostic procedures and sequence. On board and off board diagnostics in Automotive.
Safety in Automotive: Safety norms and standards. Passenger comfort and security systems. Electromagnetic environment and Automotive EMC Standards. SAE and IEEE Standards.

Text Books :

1. 1. Williams. B. Ribbens, "Understanding Automotive Electronics", 6th Edition, 2003, Elsevier Science, Newness Publication
2. Robert Bosch, "Automotive Electronics Handbook", John Wiley and Sons, 2004.
3. K.P. Ramchandran, G.K. Vijayraghavan, M.S. Balsundaram, "Mechatronics: Integrated Mechanical and Electronic System", Wiley India, 2010.

Reference Books :

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
2. 2. James D Halderman, "Automotive Electricity and Electronics", PHI Publication 2005.

IOEUA32185C: Open Elective – I
(Industrial Engineering)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :
- NA

Course Objectives :
- To introduce the concepts, principles and framework of contents of Industrial Engineering.
- To acquaint the students with various productivity enhancement techniques.
- To acquaint the students with different aspects of Production Planning and Control and Facility Design.
- To introduce the concepts of various cost accounting and financial management practices as applied in industries
- To acquaint the students with different aspects of Human Resource activities and Industrial Safety rules.
- To acquaint students with different aspect of simulation modelling for various industrial engineering applications.

Course Outcomes :

After completion of the course, student will be able to
1. Compute the partial productivity and total productivity indexes considering different influencing factors.
2. Analyze each operation with a view to eliminate unnecessary operations, avoidable delays and other forms of waste.
3. Compute the standard time for a qualified worker to carry out a specified job at a defined level of performance.
4. Design a physical arrangement of facilities most economically at optimum plant location.
5. Design the production system considering an estimate of future event through past data.
6. Calculate optimum inventory level by establishing the relationship among the factors affecting profit.

Unit I : Introduction to Industrial Engineering and Productivity

Definition and Role of Industrial Engineering, Types of production systems and organization structure, Functions of management. Measurement of productivity: Factors affecting the productivity, Productivity Models and Index (Numerical), Productivity improvement techniques.

Unit II : Methods Study

Work Study: Definition, objective and scope of work-study, Human factors in work-study.

Method Study: Definition, objective and scope of method study, work content, activity recording and exam aids.

Charts to record movements: Operation process charts, flow process charts, travel chart, two-handed chart and multiple activity charts.

Principles of Motion Economy: Classification of movements, SIMO chart, and micro motion study. Definition and installation of the improved method, brief concept about synthetic motion studies. Introduction to Value Engineering and Value Analysis.

Unit III : Work System Design

Work Measurements: Definition, objectives and uses, Work measurement techniques.

Work Sampling: Need, confidence levels, sample size determinations, random observation, conducting study with the simple problems.

Time Study: Definition, time study equipment, selection of job, steps in time study. Breaking jobs into elements, recording information, Rating and standard rating, standard performance, scales of rating, factors affecting rate of working, allowances and standard time determination.

Introduction to PMTS, MTMand MOST.

Unit IV : Production Planning and Control

Introduction: Types of production systems, Need and functions of PPC, Aggregate production planning. Capacity Planning, ERP: Modules, Master Production Schedule, MRP and MRP-II.

Forecasting Techniques: Causal and time series models, moving average, exponential smoothing, trend and seasonality (Numerical), Demand Control strategies (MTO, MTA, MTS).

Introduction to Supply Chain Management: Basic terminologies.

Unit V : Facility Design

Plant Location: Need and factors influencing plant location, Plant Layout: Objectives, principles, types of plant layouts.

Introduction to Assembly Line Balancing and Layout parameters to evaluate.

Material Handling systems: Objectives, relation with plant layout, principles. Types and purpose of different material handling equipment, Selection of material handling equipment.

Inventory control and Management: Types of inventories, Need of inventories, terminology, costs, Inventory Models: Basic production models, (with and without shortage and discount), ABC, VED Analysis.

Unit VI : Engineering Economy, Human Resource and Industrial Safety

Introduction to Costing: Elements of Cost, Break-Even Analysis (Numerical). Introduction to Debit and Credit Note, Financial Statements (Profit and loss account and Balance Sheet), Techniques for Evaluation of capital investments.

Human Resource Development: Functions: Manpower Planning, Recruitment, Selection, Training. Concept of KRA (Key Result Areas), Performance Appraisal (Self, Superior, Peer, 360º). Industrial Safety: Safety Organization, Safety Program.

Text Books :

1 M Mahajan, Industrial Engineering and Production Management, Dhanpat Rai and Co.
2 O. P. Khanna, Industrial engineering and management, Dhanpat Rai publication
3 MartendTelsang, Industrial Engineering, S. Chand Publication.
4 Banga and Sharma, Industrial Organization& Engineering Economics, Khanna publication

Reference Books :

1 Introduction to Work Study by ILO, ISBN 978-81-204-1718-2, Oxford &IBHPublishing Company, New Delhi, Second Indian Adaptation, 2008.
2 H. B. Maynard, K Jell, Maynard 's Industrial Engineering Hand Book, McGraw Hill Education.

3 Askin, Design and Analysis of Lean Production System, Wiley, India
4 Zandin K.B., Most Work Measurement Systems, ISBN 0824709535, CRCPress,2002
5 Martin Murry, SAP ERP: Functionality and Technical Configuration, SAP Press; 3rdNew edition (2010).
6 Barnes, Motion and time Study design and Measurement of Work, Wiley India Raid Al-Aomar, Adwerd J Williams, Onur M. Uigen 'Process Simulation using WITNESS', Wiley

IOEUA32185D: Open Elective - I
(Artificial Neural Network in Engineering)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :
- NA

Course Objectives :
- To make students aware of various soft computing techniques in general and Artificial Neural Networks in particular, giving details about its working and analogy with Biological Neural networks.
- To give students ideas about designing and training an Artificial Neural network using different algorithms to solve univariate and multivariate time series problems.

Course Outcomes :

After completion of the course, student will be able to

1. Understand ANN as AI, soft computing and data driven model and describe its types
2. Compute the Net information given components of neuron
3. Describe various network training algorithms
4. Determine various design related aspects of ANN namely architecture, stopping criteria, performance function, overfitting
5. Describe working of Recurrent networks, Radial basis function networks, Generalized regression neural networks, Self-organizing maps using case studies
6. Design, train, and test 2 or 3 layered Feed forward back propagation neural network for time series and cause effect models

Unit I : Introduction to Artificial Neural Networks

Biological Neural Network, Introduction to Artificial Intelligence, soft computing techniques, Data driven modeling, ANN as AI, Soft computing and data driven technique, Artificial Neuron, ANN- history and general properties, ANN types according to architecture and Neuro-Dynamics, ANN Vs empirical, statistical, physical, physics based models.

Unit II : Artificial Neuron

Components of artificial neuron, methods of computing net information, Activation functions (linear, sigmoidal, hyperbolic tangent, hard limiter, soft-lin), perceptron, Multi-layered perceptron (MLP).

Unit III : Network training

Pre-training procedures- data normalization, network initialization, Types of training- Supervised and un-supervised, Network training using supervised training algorithms – Standard back propagation algorithm or gradient descent algorithm (mathematical treatment), introduction to Network training using conjugate gradient, resilient back propagation, Broydan-Fletcher-Goldfarb-Shanno algorithm, One step secant algorithm, Levernberg-Marquardt algorithm

Unit IV : Important Aspects of ANN design

Network architecture- inputs, outputs, number of hidden layers, number of hidden neurons, stopping criteria, overfitting, validation, testing, De-normalization, Evaluating model performance, data division, performance function

Unit V : Types of ANN

Recurrent networks, Radial basis function networks, Generalized regression neural networks, Self-organizing maps (discuss using case studies of each referring to published papers and literature).

Unit VI : Applications of Feed Forward Back Propagation Neural Networks

Time series (univariate and multivariate) models, cause-effect models, Applications in Civil engineering, Electronics and Telecommunications, Mechanical Engineering, Computer Engineering, design, train and test simple 2 or 3 layered feed forward back propagation ANN for time series and cause effect models.Image Classifications using ANN

Text Books :

1 Wasserman, P.D., (1993), " Advanced methods in neural computing", Van Nostrand Reinhold, New York
2 Kosko, B., (1992), "Neural Networks and Fuzzy systems", Prentice Hall, Englewood Cliffs, NJ
3 Bose, N. K., Liang, P. (1998), "Neural Network Fundamentals with Graphs, Algorithms and Applications", Tata McGraw-Hill Publication.

IOEUA32185E: Open Elective - I
(Social Media Analytics)

Teaching Scheme
Credits : 3
Lectures : 3 Hrs/week

Examination Scheme
Continuous Evaluation(CE): 20 Marks
In-Semester Examination(ISE): 30 Marks
Skills & Competency Exam(SCE): 20 Marks
End Semester Examination(ESE): 30 Marks

Prerequisites :
- NA

Course Objectives :
- To understand foundations of Social Media Analytics.
- To Visualize and understand the data mining aspects in social networks.
- To solve mining problems by different algorithms.
- To understand network measures for social data.
- To understand behavioral part of web applications for Analysis.
- To analyze the data available on any social media applications.

Course Outcomes :

After completion of the course, student will be able to
1. Understand the basics of Social Media Analytics.
2. Understand the visualization of social networks and the significance of Data mining in Social media.
3. Demonstrate the algorithms used for text mining.
4. Evaluate the performance of centrality measures on social graph.
5. Explain Behaviour Analytics techniques used for social media data.
6. Apply social media analytics for Facebook, LinkedIn and Twitter kind of applications.

Unit I : Introduction To Social Media Analytics (SMA) And Types Of Analytics Tools

Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas,
The foundation for analytics, Social media data sources, Defining social media data, data sources in social media channels, Estimated Data sources and Factual Data Sources, Public and Private data, data gathering in social media analytics

Unit II : The Social Networks Perspective And Its Visualization

The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks.
A Taxonomy of Visualization, The convergence of Visualization, Interaction and Analytics. Data mining in Social Media: Introduction, Motivations for Data mining in Social Media, Data mining methods for Social Media

Unit III : Text Mining In Social Networks

Introduction, Keyword search, Classification Algorithms, Clustering Algorithms-Greedy Clustering, Hierarchical clustering, k-means clustering, Transfer Learning in heterogeneous Networks, Sampling of online social networks, Comparison of different algorithms used for

mining, tools for text mining.

Unit IV : Network Measures

Centrality: Degree Centrality , Eigenvector Centrality, Katz Centrality , PageRank, Betweenness Centrality, Closeness Centrality ,Group Centrality ,Transitivity and Reciprocity, Balance and Status, Similarity: Structural Equivalence, Regular Equivalence

Unit V : Behavior Analytics

Individual Behavior: Individual Behavior Analysis, Individual Behavior Modeling, Individual Behavior Prediction Collective Behavior: Collective Behavior Analysis, Collective Behavior Modeling, Collective Behavior Prediction

Unit VI : Case Study

Mining Twitter: Overview, Exploring Twitter's API, Analyzing 140 Characters
Mining Facebook: Overview, Exploring Facebook's Social Graph API's, Analyzing Social Graph Connections. Mining Linked In: Overview, Exploring Linked In API

Text Books :

1 Reza Zafarani Mohammad Ali Abbasi Huan Liu, Social Media Mining, Cambridge University Press, ISBN: 10: 1107018854.
2 Charu C. Aggarwal, Social Network Data Analytics, Springer, ISBN: 978-1-4419-8461-6.
3 Matthew Ganis, Avinash Kohirkar Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Pearson publications,2016

Reference Books :

1 Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education, 978-0-07-176829-0. 2.
2 Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN:10: 1449367615.
3 Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Edition, ISBN: 13: 978-1-55860-901-3 ISBN: 10: 1-55860-901-6.
4 Bing Liu, Web Data Mining : Exploring Hyperlinks, Contents and Usage Data, Springer, 2nd Edition, ISBN: 978-3-642-19459-7

CSUA32186 : Employability Skills

Teaching Scheme
Credits : 3
Lectures : 2 Hrs/week
Practical : 2 Hrs/week

Examination Scheme
Skills & Competency Exam(SCE): 50 Marks
TW: 25 Marks

Prerequisites :

- Fundamentals of Data Structures
- Object Oriented Programming
- Data Structures and Files

Course Objectives :

- To adapt the usage of modern tools and recent software.
- To evaluate problems and analyze data using current technologies
- To learn how to employ Integrated Development Environment(IDE) for implementing and testing of software solution
- To acquire contemporary skills to make the students employable in computer engineering domain

Course Outcomes:
After completion of the course, student will be able to

1. Utilize current technologies in a wide variety of business and organizational contexts using modern tools. (Understand, Apply, Analyze)
2. Identify Integrated Development Environment (IDE) for implementing and testing of the software solution. (Analyze)
3. Apply best practices for building applications. (Apply)
4. Make use of contemporary skills to make them employable. (Apply)

Instructions:
Four Skill Development Modules are provided as below:

Module-I: Web Designing
Module-II: Internet and Web Technology
Module-III: Mobile Application Development
Module- IV: User Interface Technology

Department has to select at least one module out of four modules provided. Department can select more than one module also. Set of suggested assignments is provided. Each student must perform 4 to 5 assignments and at least one mini-project provided in each module. Instructor should frame set of mini projects or guide students to frame the problem statement of mini-project by sticking to technologies in respected module.
Term Work will be based on assignments be carried out by students and Oral Examination will be based on Mini-Project demonstration and related skill learned ONLY.

Module 1:- Web Designing

Unit I – UI Design
HTML5: What is HTML5 - Features of HTML5 – Semantic Tags – New Input Elements and tags - Media tags (audio and video tags) – Designing Graphics using Canvas API - Drag and

Drop features – Geolocation API - Web storage (Session and local storage).

CSS3: What is CSS3 – Features of CSS3 – Implementation of border radius, box shadow, image border, custom web font, backgrounds - Advanced text effects(shadow) - 2D and 3D Transformations - Transitions to elements - Animations to text and elements

Unit II - Responsive Web Design (RWD)

Responsive Design: What is RWD – Introduction to RWD Techniques – Fluid Layout, Fluid Images and Media queries - Introduction to RWD Framework

Twitter Bootstrap – Bootstrap Background and Features - Getting Started with Bootstrap - Demystifying Grids – OffCanvas - Bootstrap Components - JS Plugins - Customization

Unit III – Introduction to Javascript

Introduction - Core features - Data types and Variables - Operators, Expressions and Statements - Functions & Scope - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling – Browser Object Model - Windows and Documents - Form handling and validations.

Object-Oriented Techniques in JavaScript - Classes – Constructors and Prototyping (Sub classes and Super classes) – JSON – Introduction to AJAX.

Unit IV - Introduction to jQuery

Introduction – jQuery Selectors – jQuery HTML - Animations – Effects – Event Handling – DOM – jQuery DOM Traversing, DOM Manipulation – jQuery AJAX

List of assignments:-

1. Installation and Configuration of software & tools required for web application development.
2. Design and develop any suitable assignment using HTML
3. Modify assignment 2 by using CSS.
4. Apply validation in Assignment 3 using JavaScript.
5. Add Responsive Web Designs in Assignment 4 using RWD techniques, frameworks & bootstrap.
6. Add dynamic web application essence in assignment no. 5 using AJAX controls
7. Add dynamic web application essence in assignment no. 6 using JQuery.
8. Design and deploy dynamic web application using concepts covered in assignments 2 to 7.

Text Books:

1. Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How To Program", Fifth Edition, Pearson Education, 2011.
2. Achyut S Godbole and AtulKahate, "Web Technologies", Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
4. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
5. Bear Bibeault and Yehuda Katz, "jQuery in Action", January 2008

Reference Books:

1. Web link for Responsive Web Design - https://bradfrost.github.io/this-is-responsive/
2. Ebook link for JavaScript - https://github.com/jasonzhuang/tech_books/tree/master/js

Module 2: Internet and Web Technology

Unit I – Client-Server Architecture

configuration of apache tomcat server, set up Development Environment, Compiling and Deploying Web application, Web Application - directory structure, Deployment descriptor, Assigning custom URLs to Servlet

Unit II - Java Servlets

Servlet, Servlet's job, basic Servlet code, Servlet API, Page Generation, Servlet Life Cycle – Service methods, Servlet Init Parameters and Parameter Names, Request Parameter, path information, Serving files, Serving Resources, Request Headers, Handling Post Request, Structure of response, sending normal response, using persistent connection, response buffering, controlling response buffer, status codes, setting status code, HTTP headers, setting HTTP headers, Redirecting request, client pull, configuring error pages, session management, cookies

Unit III – Java Server Pages

Need for JSP, Benefits of JSP, Advantages of JSP over other technologies, Installation of JSP pages, Creating Template Text, Invoking Java Code From JSP, Limiting the JAVA code in JSP, Using JSP Expression, Example of JSP Expression, Comparing Servlet to JSP, Writing Scriptlets, Scriptlet examples, Scriptlet for conditional execution, Using Declaration, Declaration Example, Using Predefined Variables, JSP page Directive, JDBC Connectivity with JSP.

Unit IV – Client and server side frameworks

Overview, MVC architecture, Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations, EJB architecture, Session beans, Entity Beans. Introduction to application servers (i.e. JBoss, Weblogic etc.)

List of assignments:-

1. Installation and Configuration of Web Application Servers Tomcat, Apache, WebSphere, JBoss, GlassFish.
2. Design & Develop (mini project) web application using Java Servlets.
3. Design & Develop dynamic web application using Java Server Pages.
4. Design & Develop dynamic web application using Java Server Pages, Servelets and backend (MySQL database connectivity).
5. Re-Design, develop and deploy assignment no. 4 using Strut
6. Design, Develop and Deploy separate web application using EJB.

Text Books:

1.AchyutGodbole&AtulKahate, "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

Reference Books:

1. GiulioZambon, " Beginning JSP, JSF and Tomcat", Apress Publication, ISBN-10: 1430246235; ISBN-13: 978-1430246237
2. Black Book, "Struts 2", Dreamtech Press, ISBN 13, : 9788177228700
3. Black Book, " JDBC 4.2, Servlet 3.1 & JSP 2.3", Dreamtech Press, ISBN-13: 978-8177228700
4. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya,, "J2EE Architecture, an illustrative

gateway to enterprise solutions", Tata McGraw Hill Publishing Company. ISBN: 9780070621633

Module 3: Mobile Application Development

Unit I – 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 II - 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 III – Multimedia, Animation and Graphics

Playing Audio, Playing Video, Rotate Animation, FadeIn/FadeOut Animation, Zoom Animation, Scale Animation, 2D and 3D Graphics2D and 3D Graphics,Jetpack Compose

Unit IV – Advanced Components of Android

Data Storage, Shared Preferences, Internal Storage, External Storage, SQLite Databases, Content provider. and Remote Databases, Web App**,** JSON Parsing, Google Map, GPS, fused location provider, Sensors, Bluetooth/Wi-Fi Connectivity (Using API's With HTTP Calls)

List of assignments:-

1. Download Install and Configure Android Studio on Linux/windows platform.
2. Design a mobile app for media player using user interface components.
3. Develop Tic-tac-toe mobile game.
4. Design a mobile app to store data using internal or external storage.
5. Design a mobile app using Google Map and GPS to trace the location.
6. Design a mobile app using animation
7. 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.

Text Books :

1.Neil Smyth, "Android Studio 2 Development Essentials", Payload Media, ISBN: 1532853319
2. John Horton, "Android Programming for Beginners", ISBN 10:1785883267

Reference Books :

1. Reto Meier, "Professional Android 4 Application Development", Wrox, ISBN-10: 1118102274; ISBN-13: 978-1118102275
2.Greg Nudelman, "Android Design Patterns :Interaction Design Solutions for Developers", ISBN-10: 1118394151; ISBN-13: 978-1118394151

Module 4: User Interface Technology

Unit I – Introduction to Server-side JS Framework (Node.js)

Introduction - What is Node JS – Architecture – Feature of Node JS - Installation and setup - Creating web servers with HTTP (Request & Response) – Event Handling - GET & POST implementation - Connect to NoSQL Database using Node JS – Implementation of CRUD operations.

Unit II - Introduction to TypeScript

TypeScript : Introduction to TypeScript – Features of TypeScript – Installation setup – Variables – Datatypes – Enum – Array – Tuples – Functions – OOP concepts – Interfaces – Generics – Modules – Namespaces – Decorators – Compiler options – Project Configuration

Unit III – Introduction to Client-side JS Framework – Basics of Angular 4.0

Introduction to Angular 4.0 - Needs & Evolution – Features – Setup and Configuration – Components and Modules – Templates – Change Detection – Directives – Data Binding - Pipes – Nested Components

Unit IV – Introduction to Client-side JS Framework – Forms and Routing in Angular 4.0

Template Driven Forms - Model Driven Forms or Reactive Forms - Custom Validators - Dependency Injection - Services - RxJS Observables - HTTP - Routing

List of assignments:

1. Installation and setup for creating web servers with HTTP
2. Design and develop any suitable mini project using NodeJS architecture & database connectivity.
3. Add dynamic web application essence in assignment no. 2 using typescript.
4. Re-Design, develop and deploy assignment no. 2 using Angular

Text Books:

1. Nathan Rozentals, "Mastering TypeScript", April 2015
2. Nate Murray, Felipe Coury, Ari Lerner and Carlos Taborda, "ng-book, The Complete Book on Angular 4" September 2016
3. KrasimirTsonev, "Node.js by Example Paperback", May 2015

Reference Books:

1. Web link for TypeScript: https://www.typescriptlang.org/
2. Web link for Angular4.0: https://angular.io/
3. Web link for Node.js : https://nodejs.org/en/

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