



KESHAV MEMORIAL INSTITUTE OF TECHNOLOGY

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B. Tech in COMPUTER SCIENCE AND ENGINEERING COURSE STRUCTURE (KR23 Regulations) Applicable from A.Y 2023-24 Admitted Batch

III Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	23CC501PC	Software Engineering	3	0	0	3
2	23CC502PC	Design and Analysis of Algorithms	3	0	0	3
3	23CS503PC	Web Technologies	3	0	0	3
4	23CS504PC	Computer Networks	3	0	0	3
5	PE-I	Professional Elective-I	3	0	0	3
6	23CC505PC	Software Engineering Lab	0	0	2	1
7	23CS506PC	Web Technologies Lab	0	0	2	1
8	23CS507PC	Computer Networks Lab	0	0	2	1
9	23CS508HS	Advanced English Communication Skills Lab	0	0	2	1
10	23CS509PC	Skill Development Course -2 (UI Design Using Flutter)	0	0	2	1
		Total Credits	15	0	10	20

Note: *Mandatory Course(*MC)- Satisfactory/Unsatisfactory

Professional Elective-I

23CS511PE	Artificial Intelligence
23CE512PE	Data Analytics
23CE513PE	Advanced Computer Architecture

**B. Tech. in COMPUTER SCIENCE AND ENGINEERING****III Year I Semester Syllabus (KR23)****SOFTWARE ENGINEERING (23CC501PC)****Common to CSE, IT, CSE (AI&ML) and CSE (DS)**

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CC305PC- OOPS through Java

Course Objectives: The course will help to

1. Analyze end-user needs to formulate detailed system requirements with UML, constructing a Software Requirements Document (SRD) that aligns with Agile, DevOps.
2. Analyze user requirements to determine an optimal process model, integrating Git and GitHub for proficient version control
3. Apply relevant software architectures and patterns for the high-level design of a system, integrating CI/CD processes through tools like Jenkins.
4. Apply various testing strategies to showcase understanding, while skillfully grasping Docker and Kubernetes concepts for project deployment.
5. Evaluate the essential role of risk management in project execution, integrating AWS cloud principles for strategic project deployment

Course Outcomes: After learning the concepts of the course, the student is able to

1. Identify and translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Illustrate appropriate process model depending on the user requirements understanding the concept of DevOps.
3. Apply appropriate software architectures and patterns to carry out the high-level design of a system, CI/CD process using Jenkins,
4. Demonstrate different testing strategies and develop a simple testing report
5. Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society

UNIT – I:

Introduction to Software Engineering: The Nature of Software, Software Application Domains, Legacy Software, Software myths.

Software Process Structure: Software engineering- a layered technology, a process framework, Generic Processmodel.

Process models: The waterfall model, Incremental process models, evolutionary process models.

Agile and DevOps: Agile Process, Scrum agile methodology, Introduction and Benefits of working in a DevOps environment, DevOps Lifecycle: DevOps Stages, DevOps Delivery Pipeline.

UNIT – II:

Understanding Requirements: Functional and non-functional requirements, user requirements, system requirements, software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation, and analysis, requirements monitoring, and validation.

Git & GitHub: Version control, Branches, Merge, Revert, Fork and working with remote repository.

UNIT – III:

Design Engineering: The design process and design quality, design concepts, the design model.

Architectural design: software architecture, architectural styles and patterns, context model.

Conceptual model of UML: class diagrams, sequence diagrams, use case diagrams, component diagrams.

Build Tools and Continuous Integration using Jenkins: Introduction to Maven - Installation and configuration, Jenkins Architecture, Build Pipeline project using Jenkins script.

UNIT – IV:

Testing Strategies: A strategic approach to software testing, Verification and validation, Software Test strategy, TestStrategies for conventional software, black- box and white-box testing, validation testing, system testing, the art of debugging.

Continuous Deployment: Understand Containerization, Handling Docker Containers- Docker Image, Building and pushing images to Docker Hub, Orchestrating Containers- Setup Docker Compose, Deploy a multi- container application using Docker Compose.

Orchestration using Kubernetes - Understand Container Orchestration, Kubernetes Core Concept, Deploy Pods, Create Deployments to manage Pods. Introduction to Continuous Monitoring using Nagios.

UNIT-V:

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

Introduction to cloud and its services: Cloud, cloud services, Understand and create cloud infrastructure using AWS. Deployment of the web application on to the cloud.

TEXTBOOKS:

1. Software Engineering, A practitioner's Approach-Roger S. Pressman, 7th edition, McGraw Hill International Edition, 2010.
2. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education, 2005.
3. Learning DevOps, 2nd Edition, by Mikael Krief, PackT Publications.
4. Learning Docker, 2nd Edition by Jeeva S. chelladurai, Vinod Singh, Pethuru Raj by PackT publications.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach-James F.Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice-Waman S Jawadekar,The McGraw-Hill Companies.
3. <https://kubernetes.io/docs/tutorials/hello-minikube/>
4. <https://minikube.sigs.k8s.io/docs/start/>
5. <https://www.jenkins.io/doc/>
6. <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/concepts.html>
7. Introducing Maven by, Balaji Varanasi and Sudha Belida, APRESS publications.
8. Practical Devops, Second Edition. By Joakim Verona. Ingram short title; 2nd edition (2018).



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

DESIGN AND ANALYSIS OF ALGORITHMS (23CC502PC)

Common to CSE and CSE (AI&ML)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CC402PC - Data Structures

Course Objectives: The course will help to

1. Introduce the notations for analysis of the performance of algorithms and recursion.
2. Relate major algorithmic techniques (divide-and-conquer, greedy) and mention problems for which each technique is appropriate.
3. Introduce the applications of graphs and trees.
4. Understand dynamic programming with applications.
5. Understand Branch and Bound technique and introduce P, NP problems.

Course Outcomes: The student will be able to

1. Analyse the performance of algorithms and illustrate the use of divide and conquer in applications.
2. Illustrate the use of greedy method and binary search in real world applications.
3. Apply BFS, DFS and backtracking in different applications.
4. Develop different applications using dynamic programming.
5. Design different applications of branch and bound and understand P, NP problems.

UNIT-I:

Introduction: Algorithm, Performance Analysis-Space Complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation and Little oh notation.

Recursion: Introduction, Fibonacci sequence, Climbing Stairs, Reverse String, Happy Number, Greatest Common Divisor, Strobo grammatic Number II.

Divide and Conquer: General method, Quick sort, Merge sort, Applications: Majority Element, Calculate pow(x,n).

UNIT-II:

Binary Search- Introduction, Applications: Median of two sorted arrays, Find the fixed point in a given array, Find Smallest Common Element in All Rows, Longest Common Prefix, Koko Eating Bananas.

Greedy Method: General method – Applications –Minimum product subset of an array, Best Time to Buy and Sell Stock, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT-III:

Breadth First Traversal and Depth First Traversal: BFS Introduction, Applications: Find All The Lonely Nodes, Max Area of Island, Number of Distinct Islands. DFS Introduction, Applications: The Maze, Boundary of Binary Tree.

Trees: Binary Tree Introduction, Applications: Symmetric Tree, Balanced Binary Tree, Average of Levels in Binary Tree, Find Largest Value in Each Tree Row, Binary Tree Right Side View.

Backtracking: General method, Applications: N Queens Problem, Hamiltonian Cycle, Brace Expansion, Gray Code, Path with Maximum Gold, Generalized Abbreviation, Campus Bikes II.

UNIT-IV:

Dynamic Programming: Introduction, DP Techniques, Applications – Matrix Chain Multiplication, Optimal Binary Search Tree, All Pairs Shortest Paths, Traveling Salesperson Problem, Climbing Stairs, Min Cost Climbing Stairs, Maximum Sub Array, Number of Corner Rectangles, 0/1 Knapsack Problem.

Strings Problems: Introduction, Count Substrings with Only One Distinct Letter, Valid Word Abbreviation, Longest Repeating Substring, Longest Common Subsequence, Longest Increasing Subsequence.

UNIT-V:

Branch and Bound: General Method, FIFO Branch and Bound, LC Branch and Bound, Applications: 0/1 knapsack Problem, Traveling Salesperson Problem.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP-Hard and NP-Complete classes, Cook's theorem.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Raja sekharan, University Press.2nd edition, 2019.
2. Introduction to Algorithms, Thomas H Coremen, Charles E. Leiser, Ronald L. Rivest, Clifford Stein, 4th edition, 2022.
3. Design and Analysis of Algorithms: A Contemporary Perspective, Cambridge University Press, Sandeep Sen, Amit Kumar, 2019

REFERENCE BOOKS:

1. Design and analysis of algorithms, Aho, Ullman and Hopcroft, Pearson Education, 2016.
2. Algorithm design: foundations, Analysis and Internet Examples, M.T. Goodrich and Tamassia, John Wiley and Sons, 2020
3. Algorithms Design and Analysis by Harsh Bhasin, Oxford Publishers, 2015.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

WEB TECHNOLOGIES (23CS503PC)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CC305PC- OOPS through Java
2. 23CC302PC – Database Management Systems Course

Course Objectives: The course will help to

1. Comprehend and apply the concepts of JavaScript.
2. Gain knowledge and to build a web page using HTML and Bootstrap.
3. Implement the server-side functionality using NodeJS and ExpressJS.
4. Comprehend and demonstrate the application of Express routing mechanism.
5. Practice and demonstrate the working of NoSQL databases and to implement the integration of front end with backend database (MongoDB) using ExpressJS.

Course Outcomes: The student will be able to

1. Apply asynchronous programming techniques using java script.
2. Apply HTML and JavaScript effectively to create an interactive and responsive website.
3. Develop a simple client server model using NodeJS and ExpressJS.
4. Analyze and Implement routing methodologies using ExpressJS.
5. Design and create a NoSQL(Mongo) database and then integrate it with the front end using ExpressJS.

UNIT-I:

HTML Common Tags: Semantic elements, Lists – ordered lists, unordered lists, lists attributes, tables, images, forms.

Bootstrap Framework: Bootstrap tags like tables, images, forms, grid model. Bootstrap components like Navbar, Card, Badge, buttons and pagination.

UNIT- II

Client Side Scripting: Basic Java Script, DOM Manipulation from JS, Strings and regular expressions, functions, arrays, sets and maps, objects, destructuring of arrays and objects, JSON, Asynchronous operations using promises, callbacks and async/await.

UNIT- III

Getting Started with Node: Introduction to NodeJS, NPM, Node Module System – Path, OS, FS, http modules.

Introduction to ExpressJS: Life cycle and routing of Express App, first web server, reading configuration parameters, Handling request and response parameters.

UNIT- IV

Introduction to Middleware: Route, Express Route Methods - GET, POST, PUT, DELETE, Route Paths- strings,

UNIT- V

Introduction to No-SQL Databases: Introduction to MongoDB, Importing and exporting documents, querying (CRUD)—creating and manipulating documents.

Aggregation Pipeline - group, limit, project, sort, match, addFields, count,lookup out, Integration with Express.

TEXT BOOKS:

1. Understanding ECMAScript 6: The Definitive Guide for JavaScript Developers 1st Edition, Nicholas C. Zakas, No Starch Press, 2016.
2. Web Programming with Html, CSS, Bootstrap, Javascript, Jquery, Php, and Mysql, Larry Sanchez, Createspace Independent Pub, 2017.
3. Web Development with Node and Express, Ethan Brown, O’Reilly, 2020.
4. MongoDB: The Definitive Guide, 2ndEdition, Kristina Chodorow, O’Reilly, 2019

REFERENCE BOOKS:

1. Exploring ES6, A book by Dr. Axel Rauschmayer, Learnpub, 2018.
2. Beginning Node.js, Express & MongoDB Development, Greg Lim, 2019.
3. MongoDB Basics by Peter Membrey David HowsEelcoPlugge, aPress, 2014.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

COMPUTER NETWORKS (23CS504PC)

L	T	P	C
3	0	0	3

Pre-requisites:

1. 23CC403PC - Operating Systems.

Course Objectives: The course will help to

1. Learn the basic concepts of computer networks.
2. Gain knowledge on Framing, Error – Detection and Correction and Data link layer Protocols.
3. Gain the knowledge on network layer subnetting and routing algorithms.
4. Understand the TCP, UDP protocols, and various Application layer protocols.
5. Understand the basic categories of threats to computers and networks.

Course Outcomes: After learning the concepts of this course, the student can

1. Understand basic computer network technology and the functions of each layer in OSI and TCP/IP model.
2. Examine various data link layer design issues and data link protocols.
3. Interpret network layer and routing algorithms for desired communication
4. Understand transport and application layer protocols, connection control, congestion control, QoS techniques.
5. Understand security principles, attack types, security mechanisms, and cryptographic techniques for secure communication.

UNIT – I

Data Communications: Components –Direction of Data flow –Networks –Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, TCP-IP Model.

Physical layer: Transmission modes, Multiplexing, Transmission Media- Guided Transmission Media, Unguided Transmission Media.

Data link layer: Introduction, Framing and Error–Detection and Correction–Hamming code, CRC, Checksum.

UNIT – II

Flow and Error Control: Noiseless Channels- Simplex, Simplex-Stop and Wait Protocol, Noisy Channels- Stop and Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ. Medium Access sub layer: Multiple Access Protocols- Random Access Protocols- ALOHA, CSMA/CD, CSMA/CA, LAN, Ethernet IEEE 802.3.

UNIT – III

Network layer: Logical Addressing- IPV4- Classful and Classless Addressing, Subnetting, NAT, IPV6Addressing.

Internetworking- Tunneling, Address mapping- ARP, RARP, Bootp, DHCP, ICMP, IGMP.

Routing –Distance Vector Routing, Link State Routing, Shortest path routing.

UNIT – IV

Transport Layer: Process to Process Delivery, UDP and TCP protocols, TCP Connection Control, Congestion Control-Types, Quality of Service (QoS), QoS Techniques - Leaky Bucket and Token Bucket algorithms.

Application Layer: Domain name space, Remote Logging-Telnet, Electronic mail, SMTP, FTP, WWW, HTTP,SNMP.

UNIT – V

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

TEXT BOOKS:

1. Data Communications and Networking-Behrouz A. Forouzan, Fourth Edition TMH,2006.
2. Computer Networks- Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.
3. Cryptography and Network Security-Principles and Practice: William Stallings, Pearson Education, 6th Edition
4. Cryptography and Network Security: Atul Kahate, McGrawHill,3rdEdition.

REFERENCE BOOKS:

1. Data communications and Computer Networks- P.C Gupta,PHI.
2. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.
3. Understanding communications and Networks- W.A. Shay, Cengage Learning 3rd Edition.
4. Data and Computer Communication-William Stallings, Pearson Education,6thEdition ,2000.
5. Cryptography and Network Security: Forouzan, Mukhopadhyay, McGrawHill,3rdEdition
6. Information Security, Principles, and Practice: Mark Stamp, Wiley India.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

ARTIFICIAL INTELLIGENCE (23CS511PE)

(Professional Elective-I)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

23CC404PC - Machine Learning

Course Objectives: The course will help to

1. To Understand the Basics of Deep Learning and also provides students with a foundational understanding of neural network concepts and architectures.
2. To implement Neural network algorithms using popular frameworks such as TensorFlow.
3. To implement Artificial Neural network algorithms with Keras.
4. To understand Image processing and analysis with CNN.
5. To understand sequence learning with RNN.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Develop Neural network models using Deep Learning.
2. Evaluate and compare different neural network architectures based on their performance in specific tasks using TensorFlow and Keras.
3. Develop Neural network algorithms and implement deep learning models with multiple layers using Keras.
4. Develop Image classification model using CNN.
5. Develop models for sequence learning and implement RNNs and LSTMs to process sequential data.

Unit-I:

Introduction to Deep Learning: Fundamentals of Neural Networks and Deep Learning, Deep Learning Applications, Deep Learning Framework

Regression: Neuron Model, Optimization Method, Linear Model in Action.

Classification: Hand Written Digital Picture Dataset, Build a model, Error Calculation, Non-Linear model, model complexity, Optimization Method, Hands-On Hand-Written Digital Image Recognition.

Unit – II:

TensorFlow: Data Types, Numerical Precision, Tensors to Be Optimized, Create Tensors, Typical Applications of Tensors, Indexing and Slicing, Dimensional Transformation, Broadcasting, Mathematical Operations, Merge and Split, Common Statistics, Tensor Comparison, Fill and Copy, Data Limiting, Advanced Operations, Load Classic Datasets.

Artificial Neural Networks: Perceptron, Fully Connected Layer, Neural Network, Activation function, Design of Output Layer, Error Calculation, Types of Neural Networks, Hands-On of Automobile Fuel Consumption Prediction.

UNIT-III:

Backward Propagation Algorithm: Derivatives and Gradients, Common Properties of Derivatives, Derivative of Activation Function, Gradient of Loss Function, Gradient of Fully Connected Layer, Chain Rule, Back Propagation Algorithm. Hands-On Handwritten Digital Image Recognition.

Keras Advanced API: Common Functional Modules, Model Configuration, Training, and Testing, Model Configuration, Model Saving and Loading, Custom Network, Model Zoo, Metrics, Hands-On Accuracy Metric, Visualization.

Overfitting: Model Capacity, Overfitting and Underfitting, Dataset Division, Model Design, Regularization, Dropout, Data Augmentation, Hands-On Overfitting.

Unit-IV:

Convolutional Neural Networks: Problems with Fully Connected, Convolutional Neural Network, Convolutional Layer Implementation, Hands-On LeNet-5, Representation Learning, Gradient Propagation, Pooling Layer, Batch Norm Layer, Classical Convolutional Network, Hands-On CIFAR10 and VGG13. Convolutional Layer Variants, Deep Residual Network, DenseNet, Hands-On CIFAR10 and ResNet.

Unit-V:

Recurrent Neural Networks: Sequence Representation Method, Recurrent Neural Network, Gradient Propagation, How to Use RNN Layers, Hands-On RNN Sentiment Classification, Gradient Vanishing and Gradient Exploding, RNN Short-Term Memory, LSTM Principle, How to Use the LSTM Layer, GRU, Hands-On LSTM/GRU Sentiment Classification.

TEXT BOOKS:

1. Beginning Deep Learning with TensorFlow: Work with Keras, MNIST DataSets, and Advanced Neural Networks by Liangqu Long, Xiangming Zeng, A Press, 2022.
2. Deep Learning from the Basics, Koki Saitoh, Packt Publishing, 2021.

REFERENCE BOOKS:

1. Deep Learning Methods and Applications by Li Deng, Dong Yu, Now Publishers Inc, 2014.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

DATA ANALYTICS (23CE512PE)

Common to CSE, IT, CSE (AI&ML) and CSE (DS)

(Professional Elective – I)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CC303BS – Computer Oriented Statistical Methods
2. 23CC302PC – Database Management Systems Course

Course Objectives: The course will help to

1. Explore the fundamental concepts of data analytics.
2. Learn the principles and methods of statistical analysis.
3. Discover interesting patterns, analyse supervised and unsupervised models.
4. Estimate the accuracy of the algorithms.
5. Understand the various search methods and visualization techniques.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Outline the impact of data analytics for business decisions and strategy.
2. Illustrate data analysis/statistical analysis.
3. Demonstrate standard data visualization and formal inference procedures.
4. Design Data Architecture.
5. Summarize various Data Sources.

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT - III

Regression: Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

UNIT - V

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers, 2010.

REFERENCE BOOKS:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira, 2014
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs, Jeffrey D Ullman Stanford Univ, 2014.

**B. Tech. in COMPUTER SCIENCE AND ENGINEERING****III Year I Semester Course Syllabus (KR23)****ADVANCED COMPUTER ARCHITECTURE (23CE513PE)****Common to CSE, IT, CSE(AI&ML) and CSE(DS)****(Professional Elective – I)**

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

23CC405PC – Computer Organization and Architecture

Course Objectives: The course will help to

1. Impart the concepts and principles of parallel and advanced computer architectures.
2. Develop the design techniques of Scalable and multithreaded Architectures.
3. Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems.

Course Outcomes: The student will be able to

1. Computational models and Computer Architectures.
2. Concepts of parallel computer models.
3. Scalable Architectures, Pipelining, Superscalar processors, multiprocessors.

UNIT-I:

Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multicomputers, Multivector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

UNIT- II:

Principals of Scalable performance, Performance metrics and measures, Parallel Processing applications, Speed up performance laws, Scalability Analysis and Approaches, Hardware Technologies, Processes and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.

UNIT- III:

Bus Cache and Shared memory, Backplane bus systems, Cache Memory organizations, SharedMemory Organizations, Sequential and weak consistency models, Pipelining and superscalar techniques, Linear Pipeline Processors, Non-Linear Pipeline Processors, Instruction Pipeline design, Arithmetic pipeline design, superscalar pipeline design..

UNIT- IV:

Parallel and Scalable Architectures, Multiprocessors and Multicomputers, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of Multicomputers, Message-passing Mechanisms, Multivector and SIMD computers, Vector Processing Principles, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-

UNIT- V:

Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multi-computers, Scalable and multithreaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOKS:

Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.

REFERENCE BOOK:

1. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor & Francis.
2. Advanced Computer Architectures, S.G. Shiva, Special Indian edition, CRC, Taylor & Francis.
3. Introduction to High Performance Computing for Scientists and Engineers, G. Hager and G. Wellein, CRC Press, Taylor & Francis Group.
4. Advanced Computer Architecture, D. Sima, T. Fountain, P. Kacsuk, Pearson education.
5. Computer Architecture, B. Parhami, Oxford Univ. Press.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

SOFTWARE ENGINEERING LAB (23CC505PC)

Common to CSE, IT, CSE (AI&ML) and CSE (DS)

L	T	P	C
0	0	2	1

Pre-requisites/ Co-requisites:

1. 23CC501PC – Software Engineering
2. 23CC305PC- OOPS through Java

Course Objectives: The course will help to

1. Formulate problem statements and Software Requirement Specifications by comprehensively grasping project requirements.
2. Demonstrate proficiency in designing, developing, and testing diverse project modules.
3. Utilize Git Framework and GitHub while implementing Continuous Integration/Continuous Deployment (CI/CD) pipelines through Jenkins.
4. Implement project deployment using Docker and Kubernetes.
5. Acquire knowledge in AWS cloud infrastructure.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Transform end-user needs into system and software requirements through a structured process.
2. Depict the system's high-level design using CASE tools based on the software requirements.
3. Employ Jenkins CI/CD for project building purposes.
4. Implement project deployment utilizing Docker and Kubernetes.
5. Create a project within the AWS Cloud environment.

Software to be used: The students must use JDK 11/17/21 Version, STAR UML, GIT Bash, Jenkins, DockersDesktop, Mini KUBE, Eclipse, Tomcat, and Visual Studio Editor.

List of Experiments:

Do the following exercises for any one project given in the list of sample projects or another projects?

1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Study and usage of any Design phase CASE tool
4. Creating the project and committing using Git and GitHub
5. Creating Maven Java and Maven Web project using Eclipse and Push them to GitHub.
6. Building the CI/CD pipeline using Jenkins for the project in the previous experiment.
7. Local Deployment of project using Docker, Kubernetes and Monitoring using Nagios tool.
8. Cloud Deployment of a project in the AWS Cloud using EC2 instance.

Sample Projects:

1. Book Bank
2. Online course reservation system
3. E-ticketing
4. Recruitment system
5. Hospital Management system
6. Online Banking System

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition, 2015.
2. Software Engineering- Sommerville, 7th edition, Pearson Education, 2017.
3. The unified modeling language user guide Grady Brooch, James Rumbaugh, Ivar Jacobson, Pearson Education, 2016.
4. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, 2015.

REFERENCE BOOKS:

1. <https://kubernetes.io/docs/tutorials/hello-minikube/>
2. <https://minikube.sigs.k8s.io/docs/start/>
3. <https://www.jenkins.io/doc/>
4. <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/concepts.html>
5. Introducing Maven by, Balaji Varanasi and Sudha Belida, APRESS publications.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

WEB TECHNOLOGIES LAB (23CS506PC)

L	T	P	C
0	0	2	1

Pre-requisites/ Co-requisites:

1. 23CC305PC- OOPS through Java
2. 23CC302PC – Database Management Systems
3. 23CS503PC Web Technologies

Course Objectives: The course will help to

1. Comprehend and apply the concepts of JavaScript.
2. Gain knowledge to build a web page using HTML and Bootstrap.
3. Implement the server-side functionality using NodeJS and ExpressJS.
4. Comprehend and demonstrate the application of Express routing mechanism.
5. Practice and demonstrate the working of NoSQL databases and to implement the integration of front end with backend database (MongoDB) using ExpressJS.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Apply asynchronous programming techniques using java script.
2. Apply HTML and JavaScript effectively to create an interactive and responsive website.
3. Develop a simple client server model using NodeJS and ExpressJS.
4. Analyze and Implement routing methodologies using ExpressJS.
5. Design and create a NoSQL (Mongo)database and then integrate it with the front end using ExpressJS, this, by better understanding client-server communication.

Software to be used: The students must use VS Code, Node Js, Mongo DB

List of Programs:

1. Write a JavaScript program --
 - a) which accepts a string as input and swap the case of each character. For example, if you input 'TheQuick Brown Fox' the output should be 'tHEqUICKbROWNfOX'.
 - b) to find the most frequent item of an array.
 - c) to remove duplicate items from an array (ignore case sensitivity).
 - d) to perform a binary search.
 - e) to list the properties of a JavaScript object.
 - f) to check whether an object contains given property.
 - g) to sort a list of elements using Quick sort.
 - h) to implement Bubble Sort.
 - i) to read from a JSON object and display the data in a table (HTML page).
 - j) that takes name, rollno, marks from user from a form and on form submission displays them in a tabular format, with GPA (like a marks sheet).
2. Write JS code in an HTML page such that based on location selected by user an AJAX request is made and weather details for that location are fetched and displayed.
3. Write a Node JS program that accepts a port from the user and runs a node server at that port.

4. Write a NodeJS program to read from a file and display the content on screen.
5. Write a NodeJS program to accept a file name from user, text from user, if file exists append the text to the file. If not create a new file and add the text to it.
6. Create a student database in Mongo DB with all the details of students of a class.
7. Create a form such that, based on student roll number provided by user, the student details should be fetched (using ExpressJS).

Additional Programs-

8. Create a form such that CRUD operations can be performed on the student DB using ExpressJS.
9. Create a simple website for the CRUD operations on student DB and apply Express Routing.

TEXTBOOKS:

1. Understanding ECMAScript 6: The Definitive Guide for JavaScript Developers 1st Edition, Nicholas C.Zakas, No Starch Press, 2016.
2. Web Programming with Html, CSS, Bootstrap, Javascript, Jquery, Php, and Mysql, Larry Sanchez, Createspace Independent Pub, 2017.
3. Web Development with Node and Express, Ethan Brown, O'Rielly, 2020.
4. MongoDB: The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Rielly, 2019.

REFERENCE BOOKS:

1. Exploring ES6, A book by Dr. Axel Rauschmayer, Learnpub, 2018.
2. Beginning Node.js, Express & MongoDB Development, Greg Lim, 2019.
3. MongoDB Basics by Peter Membrey David HowsEelcoPlugge, aPress, 2014.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Semester Syllabus (KR23)

COMPUTER NETWORKS LAB (23CS507PC)

L	T	P	C
0	0	2	1

Pre-requisite/ Co-requisites:

1. 23CS103ES - Programming for problem solving Course.
2. 23CC305PC- OOPS through Java.
3. 23CS504PC- Computer Networks

Course Objectives: The course will help to

1. Introduce CRC Mechanism.
2. Understand the concepts of Data link layer.
3. Gain the knowledge on network layer subnetting and routing algorithms.
4. Understand the concepts Congestion.
5. Learn and understand basic cryptographic algorithms

Course Outcomes: After learning the concepts of this course, the student can

1. Compute CRC Mechanisms.
2. Demonstrate and implement the Go-Back-N mechanism.
3. Demonstrate and Apply routing algorithms.
4. Illustrate and implement congestion control algorithms.
5. Implement encryption and decryption techniques.

Software to be used: The students can use any OS with Java.

List of Programs: Using C/Java programming

1. Implement the data link layer framing methods such as character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
5. Implement distance vector routing algorithm for obtaining routing tables at each node.
6. Implement Dijkstra's algorithm to compute the shortest path through a network.
7. Write a program for congestion control using Leaky bucket algorithm.
8. Implementation of DNS.
9. Implementation of Ping service.
10. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
11. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
12. Write a Java program to perform encryption and decryption using the following algorithms
 - a. Ceaser cipher
 - b. Substitution cipher
 - c. Hill Cipher

TEXT BOOKS:

1. Data Communications and Networking-Behrouz A. Forouzan, Fifth Edition TMH,2017.
2. Computer Networks- Andrew S Tanenbaum, 6th Edition. Pearson Education, PHI,2022.
3. Cryptography and Network Security-Principles and Practice: William Stallings, Pearson Education, 6th Edition
4. Cryptography and Network Security: Atul Kahate, McGrawHill,3rdEdition

REFERENCE BOOKS:

1. Data communications and Computer Networks- P.C Gupta, PHI.
2. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.
3. Understanding communications and Networks- W.A. Shay, Cengage Learning 3rd Edition.
4. Cryptography and Network Security: Forouzan, Mukhopadhyay, McGrawHill,3rdEdition
5. Information Security, Principles, and Practice: Mark Stamp, Wiley India.



B. Tech. in COMPUTER SCIENCE AND ENGINEERING (AI&ML)

III Year I Semester Syllabus (KR23)

SKILL DEVELOPMENT COURSE-II (23CS509PC)
(UI Design Using Flutter)

L	T	P	C
0	0	2	1

Pre-requisites/ Co-requisites:

1. 23CC305PC- Object Oriented Programming through Java
2. 23CC302PC- Database Management Systems Course
3. 23CS503PC- Web Technologies

Course Objectives: The course will help to

1. **Understand Flutter Framework:** To familiarize students with the fundamental concepts of the Flutter framework, including widgets, layouts, and state management.
2. **UI Design Principles:** To teach students the principles of effective UI/UX design, focusing on creating user-friendly and visually appealing interfaces.
3. **Widget Development:** To equip students with the skills to build custom widgets and utilize pre-built widgets to create complex UI layouts.
4. **State Management:** To introduce students to different state management solutions in Flutter, enabling them to handle dynamic data and UI updates efficiently.
5. **Cross-Platform Development:** To enable students to develop and deploy Flutter applications on multiple platforms (Android and iOS) from a single codebase.

Course Outcomes: The student will be able to

1. Design and develop responsive and interactive UIs using Flutter widgets.
2. Implement state management techniques to build dynamic applications.
3. Create custom themes and animations to enhance user experience.
4. Integrate REST APIs to fetch and display data in Flutter applications.
5. Build and deploy cross-platform applications for Android, iOS, and web using Flutter.

List of Exercises:

1. **Basic UI Components:** Create a simple Flutter app showcasing common UI elements like Text, Buttons, Images, Icons, and basic layouts (Row, Column, Stack). Include styling options like colors, fonts, and padding.
2. **Interactive List Views:** Develop an application that uses ListView to display a scrollable list of items. Implement tap functionality on each item to navigate to a detail view. Consider using different list view constructors (e.g., ListView.builder).
3. **Form Handling:** Build a form with various input fields (TextField, Dropdown, Radio Buttons). Implement form validation to ensure data integrity. Display entered data upon submission.
4. **Navigation and Routing:** Create a multi-screen application using Flutter's navigation and routing system. Implement different navigation patterns (e.g., push, pop, named routes) and pass data between screens.
5. **State Management (Simple):** Develop an application that demonstrates basic state management using setState. For example, create a counter application where the count increments on button press.
6. **Fetch data from a REST API and display it in a ListView or GridView.** For Example: Build a weather app that fetches and displays weather data from an API.

TEXT BOOKS:

1. "Flutter for Beginners: An Introductory Guide to Building Cross-Platform Mobile Applications" by Alessandro Biessek
2. "Flutter in Action" by Eric Windmill

REFERENCE BOOKS:

1. "Beginning App Development with Flutter: Create Cross-Platform Mobile Apps" by Rap Payne
2. "Flutter Recipes: Mobile Development Solutions for iOS and Android" by Fu Cheng
3. "Programming Flutter: Native, Cross-Platform Apps the Easy Way" by Carmine Zaccagnino



B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year I Sem (KR23)

ADVANCED ENGLISH COMMUNICATION SKILLS LAB (23CS508HS)

L	T	P	C
0	0	2	1

INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen, to read, to speak and to write in English both for their professional and interpersonal communication in the globalized context.

The proposed course is a laboratory course to enable students to use ‘good’ English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. COURSE OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students fluency in English through a well-developed vocabulary.
2. To listen and respond appropriately in formal context.
3. To enhance Reading skills by adequate exposure to different techniques of reading.
4. To communicate ideas relevantly and coherently.
5. To instil writing skills to respond effectively.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language –Role Play in different situations & Discourse Skills-using visuals-Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving

one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

1. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P-IV Processor, Hard Disk – 80 GB, RAM – 512 MB Minimum, Speed – 2.8 GHZ
- T.V, a digital stereo & Camcorder
- Headphones of High quality

2. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's Key to the Next Generation TOEFL Test: Advanced Skill Practice.
- LinguaTOEFLCBTInsider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXTBOOKS:

1. Effective Technical Communication by M Ashraf Rizvi. McGrawHill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGrawHill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

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B. Tech in COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE (KR23 Regulations)
Applicable from A.Y 2023-24 Admitted Batch

III Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	23CC601PC	Cloud Computing	3	0	0	3
2	23CS602PC	Competitive Programming	3	0	0	3
3	PE-II	Professional Elective-II	3	0	0	3
4	PE-III	Professional Elective-III	3	0	0	3
5	OE-I	Open Elective-I	3	0	0	3
6	23CS603PC	Competitive Programming Lab	0	0	2	1
7	23CC604PC	Cloud Computing Lab	0	0	2	1
8	PE-II LAB	Professional Elective-II Lab	0	0	2	1
9	23CS605PROJ	Industrial Oriented Mini Project	0	0	4	2
10	*23MC606HSM	Intellectual Property Rights	3	0	0	0
Total Credits			18	0	10	20

Note: *Mandatory Course(*MC)- Satisfactory/Unsatisfactory

Professional Elective-II

23CS611PE	Cyber Security
23CS612PE	Augmented Reality and Virtual Reality
23CS613PE	Mobile Application Development

Professional Elective-III

23CS621PE	Parallel Programming
23CS622PE	Distributed Databases
23CS623PE	Design Patterns

Professional Elective-II LAB

23CS631PE	Cyber Security Lab
23CS632PE	Augmented Reality and Virtual Reality Lab
23CS633PE	Mobile Application Development Lab

Open Elective - I

23IT602PC	Internet of Things
23IT603PC	Embedded Systems



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

CLOUD COMPUTING (23CC601PC)

Common to CSE, IT and CSE(AI&ML)

L	T	P	C
3	0	0	3

Prerequisites/Co requisites:

1. 23CC501PC -Software Engineering.
2. 23CS504PC –Computer Networks.

Course Objectives: The course will help to

1. Gain a thorough understanding of cloud computing, including its basics and management challenges.
2. Understand cloud computing, with a focus on Amazon Web Services (AWS) as a case study.
3. Possess the knowledge and practical skills necessary to effectively manage cloud infrastructure, applications, and perform successful migrations using AWS services.
4. Understand various cloud services, enabling them to make informed decisions regarding cloud service adoption based on business requirements and considerations.
5. Possess a well-rounded understanding of cloud governance, billing service.

Course outcomes: The student will be able to

1. Understand the various advanced computing technologies, enabling them to optimize solutions across diverse application domains.
2. Leverage AWS services and Docker for efficient, scalable, and secure cloud computing solutions.
3. Apply learned concepts to analyze a complex cloud management and migration scenario.
4. Develop criteria for selecting the most suitable cloud service model and provider for specific use cases.
5. Understand the cloud governance and billing issues.

UNIT-I:

Computing Paradigms: High performance computing, parallel computing, Distributed computing, cluster computing, Grid computing, cloud computing, Bio computing, Mobile computing, Quantum computing, optical computing and Nano computing.

UNIT-II:

Cloud computing fundamentals: Motivation for cloud computing with AWS as a case study, 5 essential characteristics: on demand services like Amazon LEX, Amazon Lambda, Amazon VPC—including subnets, route tables, and security groups, Elastic resource pooling using Amazon Elastic Compute Cloud (EC2) as example, Rapid elasticity using Amazon EBS, Amazon EFS, Amazon S3, overview of Docker CLI commands cloud deployment using Docker.

UNIT-III:

Cloud computing Architecture and Management: Managing the cloud and managing the cloud infrastructure using AWS cloud Front, Managing Identity and Access (IAM), Migrating Application to cloud, Phases of cloud migration, Approaches for Cloud Migration.

UNIT-IV:

Cloud service models: Infrastructure as service, characteristics of IaaS, Suitability of IaaS, pros and cons of IaaS, summary of IaaS Providers, Platform as a Service with examples of with example of Amazon DynamoDB, characteristics of PaaS, Suitability of PaaS, pros and cons of PaaS, summary of PaaS Providers, software as service, characteristics of SaaS, Suitability of SaaS, pros and cons of SaaS, summary of SaaS Providers.

UNIT-V:

Governance and Billing: Organizational readiness and change management in the cloud age, Data Security in the cloud, legal issues in cloud computing .managing AWS billing –Free tier,Pay-per-Use,Create a budget alert to keep track your AWS bill ,alternative cloud providers.

TEXT BOOKS:

1. Cloud Computing, Theory and Practice 2nd Edition, Dan Marinescu, MK Elsevier publisher, 2019.
2. Learn AWS Serverless Computing: A beginner's guide to using AWS Lambda, Amazon API Gateway, and services from Amazon Web Services by Scott Patterson.
3. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud– by Mark Wilkins, Kindle E Textbook, 1st edition, 2019.
4. Microsoft Azure for Dummies by Timothy L. Warner, Wiley publications, 1st Edition, 2021.

REFERENCE BOOKS:

Cloud computing principles and paradigms by Rajkumar Buyya, Wiley Publication, 1st Edition, 2013.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

COMPETITIVE PROGRAMMING (23CS602PC)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CC402PC – Data Structures.
2. 23CC307PC– Object Oriented Programming through Java Lab.
3. 23CC502PC- Design and Analysis of Algorithm

Course Objectives: The course will help to

1. Understand the sliding window and two pointer approach problems.
2. Understand bit manipulation operations
3. Recognize the various forms of trees and their interconnected components.
4. Understand graph applications and topological sort
5. Recognize disjoint set union and its applications.

Course Outcomes: The student will be able to

1. Outline and solve different array applications.
2. Implement bit manipulation for compression, encryption, optimization
3. Illustrate different types of trees and tries applications.
4. Demonstrate graph applications and use topological sort in applications.
5. Construct different applications of disjoint sets.

UNIT-I:

Sliding Window – Introduction- Applications – Naive Approach, Diet Plan Performance, Distinct Numbers in Each Subarray, Kth Smallest Subarray Sum, Maximum of all subarrays of size k.

Two Pointer Approach -Introduction –Palindrome Linked List, Find the Closest pair from two sorted arrays, Valid Word Abbreviation.

UNIT-II:

Bit Manipulation: Introduction, Bit wise Operations- AND, OR, XOR and NOT, Bit-Shift Operations-left shift and right shift , Applications: Counting Bits, Palindrome Permutation, Remove All Ones with Row and Column Flips, Encode Number, Swapping numbers, Find the Non Repeated Elements in an Array, Minimum Bit Flips to Convert Number, Longest Nice Subarray .

UNIT-III:

Tree Algorithms: Fenwick Tree, Segment Tree – Applications- Range Sum Queries, Reap – Applications – Kth Largest Element in an Array.

Trie: Introduction, Suffix Tree, Applications: Index Pairs of a String, Longest word with all prefixes, Top k frequent words.

UNIT-IV:

Graphs Algorithms: Connected Components in a graph, Finding Bridges in a Graph and Finding Articulation Point in a Graph, Maximum Flow Algorithms, Lowest Common Ancestor.

Topological Sort: Introduction, Applications: Parallel Courses, Course Schedule.

UNIT-V:

Disjoint Set Union: Disjoint set and its operations, Union Find Algorithm, Applications: Lexicographically Smallest Equivalent String, Number of Distinct Islands, Number of Connected Components in an Undirected Graph.

TEXT BOOKS:

1. Guide to Competitive Programming, Antti Laaksonen, Springer, 2nd edition, 2020.
2. Competitive Programming 3, Steven Halim, Felix Halim, lulu publishers, 2013.
3. Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein, MIT Press, 4th edition, 2022.
4. The Algorithm Design Manual, Steven S. Skiena, Springer Verlag London Limited, 3rd Edition 2020.

REFERENCE BOOKS:

1. Algorithms, by Robert Sedgewick and Kevin Wayne, Addison Wesley, 4th Edition, 2011
2. An Introduction to the Analysis of Algorithms, Robert Sedgewick and Philippe Flajolet, Addison Wesley, 2nd edition, 2013.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

CYBER SECURITY (23CS611PE)

(Professional Elective – II)

L	T	P	C
3	0	0	3

Prerequisites/Co requisites:

23CS504PC –Computer Networks.

Course Objectives: Upon successful completion, students will be able to:

1. Understand fundamental cybersecurity concepts, including threats, vulnerabilities, attacks, and defense mechanisms.
2. Analyze the legal and ethical dimensions of cyberspace and cybercrime.
3. Evaluate and implement security measures for various systems, including mobile and wireless devices, organizational networks, and cloud environments.
4. Apply forensic techniques to investigate cybercrime incidents. Assess and mitigate cybersecurity risks in different domains.
5. Understand and apply emerging technologies in cybersecurity.

Course Outcomes: Students will be able to:

1. Identify and classify different types of cyber threats and vulnerabilities.
2. Design and implement security policies and procedures for organizations. Conduct forensic analysis of digital evidence.
3. Develop secure solutions for mobile and wireless platforms.
4. Evaluate and deploy security tools and technologies.
5. Analyze and address emerging cybersecurity challenges.

Unit I:

Foundations of Cybersecurity: Core Concepts: CIA Triad, Assets, Threats, Vulnerabilities, Risk Management, Security Architecture: Layers of Security (Physical, Network, Host, Application, Data) Attack Spectrum and Taxonomy: Malware, Phishing, Denial-of-Service, Man-in-the-Middle, SQL Injection, Cross-Site Scripting Defense Mechanisms: Firewalls, Intrusion Detection Systems, Anti-virus Software, Encryption, Access Control Security Models: Bell-LaPadula, Biba Internet Governance: Challenges and Constraints Introduction to AI and its role in Cybersecurity (both offensive and defensive). How AI can be used for threat detection, vulnerability analysis, and incident response.

Unit II:

Cyber Law, Forensics, and Incident Response : Cyber Law and Regulations: International and National Laws, Data Protection Regulations (GDPR, CCPA), Intellectual Property Rights

Cyber Forensics: Digital Evidence Acquisition, Preservation, Analysis, and Presentation, Forensics Analysis of Email and Network Traffic, Digital Forensics Lifecycle Incident Response: Incident Handling Process, Containment, Eradication, Recovery, Post- Incident Analysis ,Special Techniques: Forensic Auditing, Anti-forensics Discuss the legal and ethical implications of using AI in cybersecurity, particularly concerning bias, privacy, and accountability. Introduce the concept of adversarial attacks against AI systems.

Explore the use of AI in digital forensics for automating evidence analysis.

Unit III:

Securing Mobile and Wireless Systems : Mobile and Wireless Security Challenges: Platform Vulnerabilities, App Security, Data Leakage, BYOD policies
Attacks on Mobile Devices: Smishing, Malware, Bluetooth Hacking, Wireless Network Attacks
Security Measures: Mobile Device Management, Authentication, Encryption, Secure Configurations
IoT Security: Vulnerabilities and Security Challenges of IoT devices, Secure IoT architectures Discuss the security implications of AI-powered mobile applications and IoT devices.

Unit IV:

Organizational Cybersecurity and Cyber Terrorism: Organizational Security Policies and Procedures: Security Audits, Risk Assessments, Data Loss Prevention
Web Application Security: OWASP Top 10 Vulnerabilities, Secure Development Practices Social Media and Web Application Security: Risks and Challenges, Best Practices Cybercrime and Cyber Terrorism: Types, Social Computing Security: Risks and Challenges, Best Practices Intellectual Property in Cyberspace: Copyright, Trademark, Patent Motives, Impacts, Countermeasures Explore the use of AI for threat intelligence and security monitoring in organizational protection settings. Discuss the security challenges posed by LLMs used for social engineering and phishing attacks and how to mitigate them.

Unit V:

Data Privacy and Emerging Technologies : Data Privacy Concepts: Anonymization, Pseudonymization, Data Minimization, Privacy Policies ,Data Privacy Attacks: Data Breaches, Surveillance, Tracking, Data Profiling Privacy in Different Domains: Medical, Financial, Educational Security and Privacy of LLMs. Other Emerging Technologies in Cybersecurity:
Cloud Security: Secure Cloud Architectures, Access Control, Data Encryption o Blockchain and
Cybersecurity: Secure Data Storage, Identity Management
Quantum Computing and Cybersecurity: Post-quantum cryptography, Security implications

TEXTBOOKS:

1. Nina Godbole and Sunit Belpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives," Wiley.
2. B. B. Gupta, D.P. Agrawal, Haoxiang Wang, "Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives," CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard, and Ryan Otson, "Cyber Security Essentials," CRC Press.
2. Chwan-Hwa(John) Wu, J. David Irwin, "Introduction to Cyber Security," CRC Press.
3. Mark Stamp,Corrado Aaron Visaggio, "Artificial Intelligence for Cybersecurity" Singer Nature Link



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

AUGMENTED REALITY and VIRTUAL REALITY (23CS612PE)

(Professional Elective-II)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

23CC402PC - Data Structures

Course Objectives: The course will help to

1. Gain the knowledge of historical and modern overviews and perspectives on virtual reality.
2. Learn the fundamentals of sensation, perception, and perceptual training.
3. Have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
4. Learn the Evaluation of virtual reality from the lens of design.
5. Learn the technology of augmented reality and implement it to have practical knowledge.

Course Outcomes: The student will be able to

1. Explain the core concepts, differences, and applications of AR and VR.
2. Identify key hardware, software, and development tools used in AR/VR.
3. Design and build AR/VR experiences using industry-standard platforms.
4. Apply tracking, rendering, and interaction methods for immersive experiences.
5. Evaluate limitations, research trends, and future advancements in AR/VR.

UNIT – I:

Introduction to AR, VR, and MR: Definition and differences between AR, VR, and Mixed Reality (MR), Historical evolution of AR/VR technologies, Applications of AR/VR in gaming, education, healthcare, retail, and industry, Overview of AR/VR hardware (HMDs, controllers, sensors, etc.)

UNIT – II:

AR/VR Hardware, Software, and Development Tools: Display technologies: HMDs, CAVEs, and AR glasses, Input devices: Controllers, gloves, and motion trackers, Sensors: Accelerometers, gyroscopes, and depth sensors, Overview of AR/VR software platforms (Unity, Unreal Engine, ARKit, ARCore, etc.), AR/VR SDKs: ARKit, ARCore, OpenVR, and SteamVR, Scripting and programming for AR/VR applications, 3D modeling and asset creation for AR/VR.

UNIT – III:

Tracking, Rendering, and Optimization: Tracking methods: Marker-based, markerless, and SLAM (Simultaneous Localization and Mapping), Rendering techniques: Real-time 3D rendering, shading, and lighting, spatial audio and haptic feedback in AR/VR, Optimization techniques for AR/VR applications.

UNIT – IV:

Interaction and User Experience in AR/VR: User interface (UI) and user experience (UX) design for AR/VR, Interaction techniques: Gesture recognition, gaze-based interaction, and voice commands, Multi-user collaboration in AR/VR environments, Ethical and social implications of AR/VR.

UNIT – V:

Challenges, Future Trends, and Research in AR/VR: Challenges in AR/VR: Latency, motion sickness, and hardware limitations, Emerging trends: WebXR, 5G-enabled AR/VR, and AI integration, Research areas in AR/VR: Haptic technology, brain-computer interfaces, and photorealistic rendering.

TEXT BOOKS:

1. Augmented Reality: Principles and Practice by Dieter Schmalstieg and Tobias Hollerer.
2. Virtual Reality Technology"** by Grigore C. Burdea and Philippe Coiffet
3. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile"** by Tony Parisi
4. Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, ARKit, ARCore, and Vuforia"** by Jonathan Linowes and Krystian Babilinski

REFERENCES:

5. Unity in Action: Multiplatform Game Development in C#""* by Joe Hocking
6. Understanding Virtual Reality: Interface, Application, and Design""* by William R. Sherman and Alan B. Craig
7. Computer Vision: Algorithms and Applications""* by Richard Szeliski
8. Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages""* by Tony Parisi



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Course Syllabus (KR23)

MOBILE APPLICATION DEVELOPMENT (23CS613PE)

(Professional Elective-II)

L	T	P	C
3	0	0	3

Prerequisite/ Corequisites:

1. 23CC403PC - Operating Systems
2. 23CC402PC – Data Structures

Course Objectives: The course will help to

1. Understand the fundamentals of Android operating systems.
2. Develop software with reasonable complexity on mobile platform.
3. Demonstrate the ability to deploy software to mobile devices.
4. Understand persistent data management and directory Shared Preferences.
5. Explore API for SMS, Email.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Understanding android operating system and its components
2. Understanding and design of User Interface with the support of persistent data management
3. Creating and displaying notifications
4. Analyze the directory Shared Preferences
5. Develop the API for SMS, Email.

UNIT-I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, best practices in Android programming, Android tools.

Android application components: Android Manifest file, Externalizing resources like values, Themes, Layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes.

Android Application Lifecycle: Activities, Activity lifecycle, Activity states, monitoring state changes.

UNIT-II

Android User Interface: Measurements - Device and pixel density independent measuring units, Layouts - Linear, Relative, Grid and Table Layouts.

User Interface (UI) Components: Editable and non-editable Text Views, Buttons, Radio and

Toggle Buttons, Checkboxes, Spinners, Dialog and pickers.

Event Handling: Handling clicks or changes of various UI components.

Fragments: Creating fragments, Lifecycle of fragments, Fragment states, adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT-III

Intents and Broadcasts: Intent - Using intents to launch Activities, explicitly starting new Activity, Implicit Intents, passing data to Intents, getting results from Activities, Native Actions, using Intent to dial a number or to send SMS.

Broadcast Receivers: Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity.

Notifications: Creating and Displaying notifications, Displaying Toasts

UNIT-IV

Persistent Storage: Files - Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences - Creating shared preferences, saving and retrieving data using Shared Preference.

UNIT-V

Database: Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

Alarms - Creating and using alarms.

Using Internet Resources: Connecting to internet resource, using download manager Location Based Services - Finding Current Location and showing location on the Map, updating location.

TEXT BOOKS:

1. Professional Android 4 Application Development- Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers-James C Sheusi ,Cengage Learning, 2013.

REFERENCE BOOK:

1. Beginning Android 4 Application Development-Wiley India (Wrox), Wei-Meng Lee, 2013ser.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Course Syllabus (KR23)

PARALLEL PROGRAMMING (23CS621PE)

(Professional Elective – III)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

1. 23CS103ES – Programming for Problem Solving
2. 23CC403PC – Operating Systems

Course Objectives: The course will help to

1. Understand the foundational concepts of parallel computing.
2. Learn programming styles that promote efficient vectorization on CPUs.
3. Develop proficiency in CUDA programming by implementing a fundamental parallel algorithm.
4. Establish a foundational understanding of memory management in CUDA programming.
5. Gain understanding of Kernel Execution Model in CUDA on GPU.

Course Outcomes: The student will be able to

1. Acquire the ability to implement parallel algorithms.
2. Implement a coding style that enhances the potential for successful vectorization.
3. Gain hands-on experience in writing a simple CUDA program and comprehend the organization of threads.
4. Explore effective strategies for utilizing memory to enhance computational efficiency.
5. Analyze & Implement parallelism using kernel execution Environment.

UNIT-I:

Introduction To Parallel Computing: Basics, fundamental laws, Categorizing parallel approaches, Parallel strategies and Parallel speedup versus comparative speedups.

Performance limits and profiling: Application's potential performance limits, determine your hardware capabilities, characterizing your application.

Parallel algorithms and patterns: Algorithm analysis for parallel computing applications, Performance models versus algorithmic complexity, Parallel algorithms, Prefix sum, Parallel global sum.

UNIT- II:

Parallel Programming on CPU: Vectorizations overview, Hardware trends for vectorization, Vectorization methods, Programming style for better vectorization.

MPI: The basics for an MPI program, The send and receive commands for process-to-process communication Collective communication, Data parallel examples, Advanced MPI functionality to simplify code and enable optimizations.

UNIT- III:

GPU Architecture and CUDA Introduction: The CPU, GPU system as an accelerated computational platform, The GPU and the thread engine, Characteristics of GPU memory spaces ,The PCI bus- CPU to GPU data transfer overhead, multi-GPU platforms and MPI, Potential benefits of GPU accelerated platforms.

Introduction to CUDA Programming: The history of high-performance computing – Technical requirements,

Introduction to CUDA Programming: The history of high-performance computing – Technical requirements, Hello World from CUDA, Thread hierarchy, Vector addition using CUDA, Error reporting in CUDA, Data type support in CUDA.

UNIT- IV:

Parallel Programming on CUDA: CUDA Memory Management-NVIDIA Visual Profiler, Global memory/device memory, Shared memory, Read only data/cache, Registers in GPU, Pinned memory, Unified memory, GPU memory evolution.

CUDA Thread Programming: CUDA threads, blocks and the GPU, CUDA occupancy, Understanding parallel reduction, Identifying the application's performance limiter.

UNIT- V:

Kernel Execution Model and Optimization Strategies: Kernel execution with CUDA streams, Pipelining the GPU execution, The CUDA callback function, CUDA streams with priority, Kernel execution time estimation using CUDA events, CUDA dynamic parallelism, Grid level cooperative groups, Multi -Process Service.

Parallel Programming Patterns in CUDA: Prefix sum (scan), Compact and split, Quick sort in CUDA using dynamic parallelism, Radix sort.

TEXT BOOKS:

1. Parallel and High-Performance Computing, Robert (Bob) Robey and Yuliana (Yulie) Zamora, Manning Publications, 2021.
2. Learn CUDA Programming: A beginner's guide to GPU programming and parallel computing with CUDA 10.x and C/C++, Jaegeun Han, Bharat Kumar Sharma, Packt Publications, 2019.

REFERENCE BOOK:

1. Programming Massively Parallel Processors: A Hands-on Approach, Third Edition, David B. Kirk, Wen, meiW. Hwu, Morgan Kaufmann Publishers In, 2016



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

DISTRIBUTED DATABASES (23CS622PE)

(Professional Elective-III)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

23CC302PC – Data Base Management System

Course Objectives: The course will help to

1. To enrich the previous knowledge of database systems.
2. To expose the need for distributed database technology in order to confront with the deficiencies of the centralized database systems.
3. To Introduce basic principles and implementation techniques of distributed database systems.
4. To Equip students with principles and knowledge of parallel and object-oriented databases.

Course Outcomes: The student will be able to

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object-oriented database system and related development.

UNIT - I

Introduction: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.

Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture.

Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

UNIT - II Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.

UNIT - III Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT - IV Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. **Parallel Database Systems:** Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

UNIT - V Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query

Processing. Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS.

TEXT BOOKS:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOK:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition

B. Tech. in COMPUTER SCIENCE AND ENGINEERING**III Year II Semester Course Syllabus (KR23)****DESIGN PATTERNS (23CS623PE)****(Professional Elective – III)**

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites:

- 1.23CC501PC – Software Engineering
- 2.23CC305PC – OOP through Java

Course Objectives: The course will help to

1. Understand the concept of design patterns
2. Comprehend the use of design patterns in designing an interface
3. Recognize various creational patterns
4. Interpret various structural patterns
5. Elucidate different behavioral patterns

Course Outcomes: The student will be able to

1. Identify software designs that are scalable and easily maintainable
2. Examine and apply creational design patterns to class instantiation in software.
3. Use structural design patterns to improve the composition of classes and objects.
4. Use behavioral patterns to improve object organization and communication.
5. For effective code packaging, use refactoring to assemble the functions

UNIT-I:

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT- II:

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

UNIT- III:

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton. Intent, Motivation, Applicability, Structure, Participants, Collaboration, Consequences, Implementation, Sample code, Known Uses, Related Patterns of above-mentioned Creational Patterns, Discussion of Creational Patterns.

UNIT- IV:

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy Intent, Motivation, Applicability, Structure, Participants, Collaboration, Consequences, Implementation, Sample Code, Known Uses, Related Patterns of abovementioned Structural Patterns, Discussion of Structural Patterns.

UNIT- V:

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor. Intent, Motivation, Applicability, Structure, Participants, Collaboration, Consequences, Implementation, Sample Code, Known Uses, Related Patterns of above mentioned Behavioral Patterns, Discussion of Behavioral Patterns.

TEXT BOOKS:

1. Design Patterns, Erich Gamma, Pearson Education, 2015

REFERENCE BOOK:

1. Pattern's in Java, Vol-I, Mark Grand, Wiley Dream Tech, 2002.
2. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech, 1999.
3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech, 2002.
4. Head First Design Patterns, Eric Freeman, O'reilly publications, 2004.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

COMPETITIVE PROGRAMMING LAB (23CS603PC)

L	T	P	C
0	0	2	1

Pre-requisites/ Co-requisites:

1. 23CC307PC–OOP through Java Lab
2. 23CS602PC – Competitive Programming

Course Objectives: The course will help to

1. Understand Sliding Window applications.
2. Understand Bit Manipulation problems.
3. Understand different types of trees and applications.
4. Know how to work with graph algorithms.
5. Solve problems with disjoint sets.

Course Outcomes: The student will be able to

1. Design and implement solutions for arrays.
2. Design and implement solutions for different trees.
3. Design solutions for graph applications.
4. Design solutions for compression techniques.
5. Design solutions for disjoint set applications.

Software to be used: The students can use any OS with Java latest version.

List of Programs:

1. Write a java program to find Subarrays with K Different Integers
2. Write a java program to find shortest sub array with sum at least K
3. Develop a java program to implement Fenwick Tree
4. Write a java program to implement a segment tree with its operations
5. Write a java program to implement treap with its operations
6. Develop a java program to find a permutation of the vertices (**topological order**) which corresponds to the order defined by all edges of the graph.
7. Write a java program to find all the articulation points of a graph.
8. Write a java program to check whether the permutation of a string forms a palindrome
9. Write a java program to return all index pairs [i,j] given a text string and words (a list of strings), so that the substring text[i]..text[j] is in the list of words.
10. Develop a java program to find the lowest common ancestor of a binary tree.
11. Write a java program to find the Longest Increasing Path in a Matrix.
12. Develop a java program to find the Lexicographically smallest equivalent string

TEXTBOOKS:

1. Guide to Competitive Programming, Antti Laaksonen, Springer, 2nd edition, 2020.
2. Competitive Programming 3, Steven Halim, Felix Halim, lulu publishers, 2013.
3. Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein, MIT Press, 4th edition, 2022.
4. The Algorithm Design Manual, Steven S. Skiena, Springer Verlag London Limited, 3rd Edition 2020.

REFERENCE BOOKS:

1. Algorithms, by Robert Sedgewick and Kevin Wayne, Addison Wesley, 4th Edition, 2011
2. An Introduction to the Analysis of Algorithms, Robert Sedgewick and Philippe Flajolet, Addison Wesley, 2nd edition, 2013.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Course Syllabus (KR23)

CLOUD COMPUTING LAB (23CC604PC)

Common to CSE, IT and CSE(AI&ML)

L	T	P	C
0	0	2	1

Prerequisites/Co requisites:

1. 23CS206ES-Python Programming Laboratory
2. 23CC501PC -Software Engineering.

Course Objectives: The course will help to

1. Understand the working definition of the AWS Cloud.
2. Learn performance of various services and configurations.
3. Become familiar with Amazon's storage offerings.
4. Understand AWS identity and Access Management (IAM)enable to manage user access.
5. Learn the skills in managing NoSQL databases using Amazon DynamoDB.

Course Outcomes: The student will be able to

1. Acquire skills, to configure an AWS account, initiate an EC2 instance, and ensure secure connections.
2. Monitor and optimize the performance and costs associated with various services.
3. Develop the ability to navigate Amazon's storage offerings effectively.
4. Gain practical experience as AWS IAM users, focusing on essential AWS services.
5. Acquire practical abilities to handle NoSQL databases effectively by learning how to use Amazon DynamoDB.

List of Experiments:

1. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.
2. Create your First AWS S3 Bucket and Upload Content to Bucket and Manage their Access and Create Static Website using AWS S3
3. Create and configure storage services and upload files and objects using Amazon EBS, Amazon EFS and Amazon S3
4. Design and implement a secure AWS infrastructure where an EC2 instance has access to an s3 bucket using IAM role.
5. Set up a CloudFront distribution to facilitate the seamless uploading of static web content from an s3 bucket.

containerization and configure inbound rules for proper accessibility.

7. Create a Platform as a Service (PaaS) application on AWS Elastic Beanstalk
8. Create serverless event-driven architectures on Lambda to run backend ML application integrated with frontend React component.
9. Launch a relational database on NoSQL database using Amazon Dynamo DB
10. Create loosely coupled services with Amazon SQS and Amazon SNS to process data received from the applications.
11. Design and implement an Amazon chatbot using natural language processing (NLP) or conversational AI techniques by using Amazon LEX.

TEXT BOOKS:

1. Learn AWS Server less Computing: A beginner's guide to using AWS Lambda, Amazon API Gateway, and services from Amazon Web Services - by Scott Patterson,2019.
2. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud - by Mark Wilkins,2019
3. Microsoft Azure For Dummies 1st Edition - by Timothy L. Warner,2020

REFERENCE BOOKS:

1. Essentials of Cloud Computing – K. Chandrasekharan,2014.
2. Cloud computing principles and paradigms by Rajkumar Buyya,2013.



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Course Syllabus (KR23)

CYBER SECURITY LAB (23CS631PE)

(Professional Elective -II)

L	T	P	C
0	0	2	1

Prerequisites/Co requisites:

23CS504PC –Computer Networks.

Course Objectives: The course will help to

1. Gain in-depth knowledge of web application security threats, including SQL Injection, XSS, CSRF, and security misconfigurations.
2. Learn to identify, exploit, and mitigate vulnerabilities using security tools such as WebGoat, Juice Shop, and Burp Suite.
3. Analyze weaknesses in authentication, session management, and access control to prevent unauthorized access.
4. Develop skills to test API security flaws and execute MITM attacks and modify sensitive data.
5. Learn best practices for securing web applications by addressing common security vulnerabilities.

Course Outcomes: The student will be able to

1. Successfully detect and exploit SQLi and XSS vulnerabilities to extract data and manipulate web pages.
2. Demonstrate the ability to exploit broken authentication mechanisms and hijack user sessions.
3. Conduct CSRF attacks to manipulate user actions and control mechanisms to gain unauthorized access.
4. Assess API vulnerabilities, test for rate-limiting bypass, IDOR flaws, and exploit improper authentication.
5. Apply security best practices to prevent attacks like session management, and access control policies.

List of Experiments:

1. SQL Injection (SQLi)

Tool: WebGoat / Juice Shop / Burp Suite

Objective: Exploit SQL injection vulnerabilities to retrieve unauthorized data from a database.

Tasks: Identify SQLi vulnerabilities, bypass authentication, and extract user details.

2. Cross-Site Scripting (XSS)

Tool: WebGoat / Juice Shop

Objective: Understand and execute reflected, stored, and DOM-based XSS attacks.

Tasks: Inject malicious scripts, steal cookies, and execute JavaScript on victim browsers.

3. Broken Authentication and Session Management

Tool: Juice Shop / Burp Suite

Objective: Exploit weak authentication mechanisms and hijack sessions.

Tasks: Capture and modify session cookies, brute force login credentials, and exploit session fixation.

4. Cross-Site Request Forgery (CSRF)

Tool: WebGoat / Burp Suite

Objective: Perform CSRF attacks to manipulate user actions without consent.

Tasks: Create a forged request to perform unintended actions on behalf of the victim.

5. Security Misconfiguration

Tool: Juice Shop

Objective: Identify and exploit misconfigurations in security settings.

Tasks: Access unintended admin functionalities, find sensitive information leaks, and exploit debug mode vulnerabilities.

6. Broken Access Control

Tool: WebGoat / Juice Shop

Objective: Bypass access control mechanisms to access restricted pages or APIs.

Tasks: Escalate privileges, access unauthorized resources, and test improper role-based access control (RBAC).

7. Man-in-the-Middle (MITM) Attack Using Burp Suite

Tool: Burp Suite

Objective: Intercept and modify HTTP requests and responses.

Tasks: Capture credentials, manipulate API requests, and tamper with application logic.

8. API Security Testing

Tool: Burp Suite / Juice Shop

Objective: Identify and exploit API vulnerabilities like improper authentication, rate-limiting bypass, and injection flaws.

Tasks: Perform fuzzing on API endpoints, check for IDOR vulnerabilities, and exploit weak authentication mechanisms.

TEXTBOOKS:

1. Nina Godbole and Sunit Belpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives," Wiley.
2. B. B. Gupta, D.P. Agrawal, Haoxiang Wang, "Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives," CRC Press.

REFERENCE BOOKS:

1. James Graham, Richard Howard, and Ryan Otson, "Cyber Security Essentials," CRC Press.
2. Chwan-Hwa(John) Wu, J. David Irwin, "Introduction to Cyber Security," CRC Press.
3. Mark Stamp, Corrado Aaron Visaggio, "Artificial Intelligence for Cybersecurity" Singer Nature Link



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B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

AUGMENTED REALITY and VIRTUAL REALITY LAB (23CS632PE)

(Professional Elective-II)

L	T	P	C
0	0	2	1

Pre-requisites/ Co-requisites:

23CC402PC - Data Structures

Course Objectives: The course will help to

1. Configure and utilize Unity or Unreal Engine for AR/VR application development.
2. Create immersive virtual and augmented reality environments with user interaction.
3. Utilize ARKit, ARCore, and Vuforia for marker-based AR and SLAM-based tracking.
4. Integrate spatial audio, haptic feedback, and hand gesture recognition using Leap Motion or Kinect.
5. Develop and optimize AR/VR experiences for mobile, desktop, and web browsers using WebXR.

Course Outcomes: The student will be able to

1. Configure Unity or Unreal Engine and use ARKit, ARCore, or Vuforia for AR/VR development.
2. Develop engaging virtual environments with user interactions and real-world integration.
3. Design AR applications with marker recognition and SLAM-based spatial tracking.
4. Apply spatial audio, haptic feedback, and hand gesture controls to enhance user experience.
5. Build AR/VR applications accessible across different platforms, including mobile and WebXR.

List of Experiments:

1. Setting up AR/VR development environment (Unity/Unreal Engine)
2. Creating a basic VR scene with interaction
3. Developing a marker-based AR application using ARKit/ARCore
4. Use Vuforia or ARKit/ARCore to display virtual objects on recognized markers.
5. Implementing SLAM-based tracking in AR
6. Designing a multi-user VR environment
7. Integrating spatial audio and haptic feedback in AR/VR
8. Develop a VR experience with hand gestures using Leap Motion or Kinect.
9. Create a simple VR scene accessible via a web browser using WebXR.

TEXT BOOKS:

1. Augmented Reality: Principles and Practice by Dieter Schmalstieg and Tobias Hollerer.
2. Virtual Reality Technology** by Grigore C. Burdea and Philippe Coiffet
3. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile** by Tony Parisi
4. Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, ARKit, ARCore, and Vuforia** by Jonathan Linowes and Krystian Babilinski

REFERENCES:

1. Unity in Action: Multiplatform Game Development in C#** by Joe Hocking
2. Understanding Virtual Reality: Interface, Application, and Design** by William R. Sherman and Alan B. Craig
3. Computer Vision: Algorithms and Applications** by Richard Szeliski
4. Programming 3D Applications with HTML5 and WebGL: 3D Animation and Visualization for Web Pages** by Tony Parisi



B. Tech. in COMPUTER SCIENCE AND ENGINEERING
III Year II Semester Course Syllabus (KR23)
MOBILE APPLICATION DEVELOPMENT LAB (23CS633PE)
(Professional Elective-II)

L	T	P	C
0	0	2	1

Prerequisites: Nil

Course Objectives: The course will help to

1. Learn how to develop Applications in android environment.
2. Understand the layout Management and Multi layout definition techniques
3. Learn how to develop user interface applications.
4. Demonstrate the push notifications for incoming messages
5. Analyse and integrate the applications to the Android marketplace

Course Outcomes: After learning the concepts of this course, the student is able to

1. Apply OOPC to develop Mobile Applications.
2. Apply Layout Management and Multi layout definition techniques to create adaptable User Interface
3. Develop user interface for mobile Application using widgets with event handling.
4. Design push notifications for incoming messages
5. Deploy applications to the Android marketplace for distribution.

List of Experiments:

1. Create an Android application that shows
 - a. Hello + name of the user and run it on an emulator.
 - b. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.Create a screen that has input boxes for User Name, Password, and Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use
 - (a) Linear Layout
 - (b) Relative Layout
 - (c) Grid Layout or Table Layout.
2. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button Use Fragment transactions and Rotation event listener.
3. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
4. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
5. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

6. Create a user registration application that stores the user details in a database table.
7. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
8. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
9. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
10. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
11. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
12. Create an application that shows the given URL (from a text field) in a browser.

SOFTWARE:

The students will use Android Studio to do the list of programs.

TEXT BOOKS:

1. Professional Android 4 Application Development, .Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

REFERENCES BOOK:

1. Beginning Android 4 Application Development, Wiley India (Wrox), Wei-Meng Lee, 2013ser.



KESHAV MEMORIAL INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTE)



Accredited by NBA & NAAC, Approved by AICTE, Affiliated to JNTUH, Hyderabad

B. Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Syllabus (KR23)

ROBOTIC PROCESS AUTOMATION (23CS601OE)

(Open Elective – I)

L	T	P	C
3	0	0	3

Pre-requisites/ Co-requisites: Nil

Course Objectives: The course will help to

1. Introduce the concepts of Robotic system, its components and instrumentation and control related to robotics.
2. Understand RPA and identify the fundamental capabilities, benefits, and risks of RPA
3. Understand Intelligent Automation and its impact on the transformation of business.
4. Apply the technologies and best practices used to enable process automation.
5. Describe how to expand the benefits of RPA by combining it with artificial intelligence and other emerging technologies.

Course Outcomes: The student will be able to

1. Describe RPA, where it can be applied and how it's implemented.
2. Identify and understand Web Control Room and Client Introduction
3. Understand how to handle various devices and the workload
4. Understand Bot creators, Web recorders and task editors
5. Identify areas where Intelligent Automation is applicable and formulate its value (quantify and qualify).

UNIT – I:

Introduction to Robotic Process Automation & Bot Creation: Introduction to RPA, flavors of RPA, History of RPA, Use cases, Automation Anywhere Enterprise Platform, RPA Advanced features, RPA capabilities, Ways to create Bots.

UNIT – II:

Web Control Room and Client Introduction: Features Panel, Dashboard -Home, Bots, Devices, Audit, Workload, Insights, Features Panel, Activity -View Tasks in Progress and Scheduled Tasks, Bots-View Bots Uploaded and Credentials.

UNIT – III:

Devices (View Development and Runtime Clients and Device Pools): Workload-Queues and SLA Calculator, Audit Log-View Activities Logged which are associated with Web CR, Administration -Configure Settings, Users, Roles, License and Migration, Demo of Exposed API's, Conclusion, Client introduction and Conclusion.

UNIT – IV:

Bot Creator Introduction: Recorders, Smart Recorders, Web Recorders, Screen Recorders, Task Editor, Variables, Command Library, Loop Command, Excel Command, Database Command, String Operation Command, XML Command.

UNIT – V:

Terminal Emulator Command: PDF Integration Command-FTP Command, PGP Command, Object Cloning Command, Error Handling Command, Manage Windows Control Command, Workflow Designer, Report Designer.

TEXT BOOKS:

Learning Robotic Process Automation, Alok Mani Tripathi, Packt Publishing, 2018.

REFERENCE BOOKS:

Robotic Process Automation A Complete Guide, Gerardus Blokdyk, 5StarCooks, 2020.



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B.Tech. in COMPUTER SCIENCE AND ENGINEERING

III Year II Semester Course Syllabus (KR23)

INTELLECTUAL PROPERTY RIGHTS (*23MC606HSM)

L	T	P	C
3	0	0	0

Prerequisite/ Co-requisite: Nil

Course Objectives: The course will help to

1. recognize the importance of IP and to educate the pupils on basic concepts of Intellectual Property Rights.
2. identify the significance of practice and procedure of Patents.
3. make the students to understand the statutory provisions of different forms of IPRs in simple forms.
4. learn the procedure of obtaining Patents, Copyrights, Trade Marks & Industrial Design
5. enable the students to keep their IP rights alive.

Course Outcomes: After learning the concepts of this course, the student is able to

1. Distinguish and explain various forms of IPR s.
2. Identify criteria's to fit one's own intellectual work in particular form of IPRs.
3. Apply statutory provisions to protect particular form of IPRs.
4. Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial Design etc.
5. Identify procedure to protect different forms of IPRs national and internationally.

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing company ltd