

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE

III YEAR I SEMESTER

S.No.	Course Code	Course Title	Categ	L	T	P	Credits
1.	22CS3111	Design and Analysis of Algorithms	PC	3	0	0	3
2.	22CS3112	Computer Networks	PC	3	0	0	3
3.	22CS3113	Web Technologies	PC	3	0	0	3
	Professional Elective - I			3	0	0	3
4.	22CS3171	Computer Graphics	PE				
5.	22CS3172	Advanced Computer Architecture	PE				
6.	22IT3172	Data Analytics	PE				
7.	22AM3173	Image Processing	PE				
	Professional Elective - II			3	0	0	3
8.	22IT3173	Distributed Systems	PE				
9.	22CS3175	Information Retrieval Systems	PE				
10.	22CS3176	Data Mining	PE				
11.	22CS3177	Software Process& Project Management	PE				
12.	22CS3151	Computer Networks &UML Lab	PC	0	0	3	1.5
13.	22CS3152	Web Technologies Lab	PC	0	0	3	1.5
14.	22CS3153	Skill Development Course (UI-Design FLUTTER)	PC	0	0	2	1
15.	22HS3151	Advanced English Communication Skills Lab	HS	0	0	2	1
16.	22MC0005	Intellectual Property Rights	MC	3	0	0	0
		Total		18	0	10	20

III YEAR II SEMESTER

S.No.	Course Code	CourseTitle	Category	L	T	P	Credits
1.	22CS3211	Machine Learning	PC	3	0	0	3
2.	22CS3212	Formal Languages and Automata Theory	PC	3	0	0	3
3.	22CS3213	DevOps	PC	3	0	0	3
	Professional Elective – III			3	0	0	3
4.	22CS3271	Scripting Languages	PE				
5.	22CS3272	Internet of Things	PE				
6.	22CS3273	Artificial Intelligence	PE				
7.	22CS3274	Software Testing Methodologies	PE				
		Open Elective - I	OE	3	0	0	3
8.	22CS3251	Machine Learning lab	PC	0	0	3	1.5
9.	22CS3252	DevOps Lab	PC	0	0	3	1.5
10.	22CS3281	Industrial Oriented Mini Project	PW	0	0	4	2
11.	22MC0006	Environmental Science	MC	3	0	0	0
		Total		18	0	10	20

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students Only.

III B.Tech (Semester-I)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3111-DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites:

- A course on “Programming for problem solving”
- A course on “Data Structures”

Course Objectives:

- To analyse performance of algorithms
- To understand and choose the appropriate algorithm design technique for a specified application
- To solve problems using algorithm design techniques such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.
- To analyse the impact of algorithm design techniques on each application solved
- To introduce and understand P and NP classes

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

- Analyse the different algorithm design techniques for a given problem.
- Design algorithms for various computing problems.
- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze the limitations of algorithms.
- Explain about coping with the limitations of algorithms.

UNIT - I

Notation of an Algorithm: Fundamentals of Algorithmic Problem Solving, Fundamentals of the Analysis of Algorithm Efficiency–Order Notations and its properties, Mathematical analysis for Recursive -Towers of Hanoi and Non-recursive algorithms

Divide and conquer- General method-Control abstraction, Solving Recurrence Relation using Substitution method and Master’s Theorem, applications - Binary search, Merge sort, Quick sort, Strassen’s Matrix Multiplication, Finding Maximum and Minimum element.

UNIT - II

Greedy Method- General method-Control abstraction, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT - III

Dynamic Programming: General Method, applications-Multi Stage Graphs, Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.

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Backtracking: General method-Control abstraction, applications-The 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT-V

Branch and Bound: General Method-Control abstraction, applications-15-Puzzle Problem - LC search, 0/1 Knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution, Travelling sales person problem.

NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, NP – Hard and NP- Complete classes, Cook’s theorem- proof of reduction.

TEXT BOOKS:

1. Ellis Horowitz, SatrajSahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers
2. M.T. Goodrich, Robert Tamassia, Algorithm design: Foundations, Analysis and Internet examples, Wiley student Edn, John Wiley & sons.
3. Parag Himanshu Dave, Himanshu Bhalchandra Dave, Design and Analysis algorithms Pearson Publication.

REFERENCES:

1. Allen Weiss, Data structures and Algorithm Analysis in C++, 2nd Edn, Pearson Education
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3112-COMPUTER NETWORKS

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites:

- A course on “C Programming”
- A course on “Data Structures”

Course Objectives:

- To introduce various types of networks
- To Study data link layer concepts, design issues, and protocols.
- Familiarize the working mechanism of network layer
- Understanding of transport layer concepts and protocol design
- To explore the concepts of DNS, Email, WWW and various network protocols

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

- Understand the fundamentals of computer networks, their types, transmission modes, and different reference models.
- Apply error-free transmission of data and analyze data collision with various protocols
- Able to apply various routing and congestion control algorithms over a network.
- Understand the concepts of TCP and UDP, congestion control, QOS.
- Apply the different types of protocols in application layer.

UNIT - I

Introduction: Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT - II

Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols

UNIT – III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical Routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet (IPv4 and IPv6).

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Transport Layer: Transport Services, Elements of Transport protocols, Congestion Control, Connection management, TCP and UDP protocols.

UNIT – V

Application Layer –Domain name system, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOKS:

1. Computer Networks - Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

REFERENCE BOOK:

1. An Engineering Approach to Computer Networks-S. Keshav, 2 nd Edition, Pearson Education.
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3113 WEB TECHNOLOGIES

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites :

- A Course on “ Object oriented programming through Java”

Course Objectives:

- To introduce Client-side scripting with HTML and java script
- To introduce Server-side programming with java servlets
- To introduce Server-side programming with JSP
- To introduce Struts framework
- To introduce PHP language for Server side scripting

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

- Understand basics of HTML, CSS, Design and Development of Web pages Pages (using Validations) with Java Script
- Develop Server-side Applications with Servlets (Sessions and Cookies)
- Create JSP pages with Database Server
- Create application development using struts
- Understand Server-side Scripting with PHP language

UNIT -I**HTML Common tags-** List, Tables, images,frames,divisions,forms; Cascading Style sheets;**XML:** Introduction to XML, Defining XML tags, their attributes and values, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.**UNIT –II****Client-side Scripting:** Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.**UNIT -III****Introduction to Servlets:** Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC.**UNIT -IV****Introduction to JSP:**

The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Session tracking in JSP, connecting to database in JSP. Struts framework, application development using struts.

UNIT-V**Introduction to PHP:**Declaring variables, data types, arrays, strings, operators, expressions,

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

TEXT BOOKS

1. Web Technologies, Uttam K Roy, Oxford University Press
2. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech
3. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
4. Java Server Pages –Hans Bergsten, SPD O'Reilly

REFERENCES:

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley DreamTech.
2. Java Server Pages –Hans Bergsten, SPD O'Reilly
3. Java Script, D. Flanagan, O'Reilly, SPD.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming World Wide Web, R. W. Sebesta, Fourth Edition, Pearson.
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3171- COMPUTER GRAPHICS

(Professional Elective- I)

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites:

- A Course on “Programming for problem solving”
- A Course on “Data Structures ”

Course Objectives

- To make students understand about the fundamental concepts of computer graphics and explore line , circle drawing algorithms
- To make students understand about 2D, 3D geometrical transformations
- To make students understand about line & polygon clipping
- To make students understand about polygon rendering methods
- To make students understand about computer animation

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

- Be able to implement techniques for efficiently rendering straight line , circle & ellipse
- Acquire familiarity with the relevant mathematics of computer graphics : translation, scaling, rotation.
- Be able to design applications that display graphic images to given specifications.
- Implement 3-D geometric transformation and 3-D viewing.
- Apply Computer animation.

UNIT- I

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

Output primitives: Points and lines, line drawing algorithms (Bresenham’s and DDA Algorithm), midpoint circle and ellipse algorithms.

Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms

UNIT-II

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland algorithms, Sutherland – Hodgeman polygon clipping algorithm.

UNIT-III

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3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Basic illumination models, polygon rendering methods.

UNIT-IV

3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications, morphing.

Visible surface detection methods:

Classification, back-face detection, depth-buffer, BSP-tree methods and area sub-division methods.

TEXTBOOKS:

1. Computer Graphics *C version*", Donald Hearn and M. Pauline Baker, Pearson Education
2. Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

REFERENCES:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Spring

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3172-ADVANCED COMPUTER ARCHITECTURE

(Professional Elective - I)

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites:

- A course on “Computer Organization”.

Course Objectives

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems.
- To understand the functions of Bus Cache.
- To study and analyze fundamental issues in architecture design and their impact on performance.

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

- Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors.
- Bus Cache functions and Shared Memory functions.
- Various principals of Scalability Performance.

UNIT- I

Theory of Parallelism: Parallel computer models, The State of Computing, Multiprocessors and Multi computers, Multi vector 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, Shared Memory 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 Multicomputer, Multiprocessor system interconnects, cache coherence and synchronization mechanism, Three Generations of

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Multicomputer, Message-passing Mechanisms, Multi-vector and SIMD computers, Vector Processing Principals, Multi-vector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

UNIT - V

Scalable: Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principles of Multithreading, Fine-Grain Multicomputer, Scalable and multi threaded Architectures, Dataflow and hybrid Architectures.

TEXT BOOK:

1. Advanced Computer Architecture Second Edition, Kai Hwang, Tata McGraw Hill Publishers.
2. John L. Hennessy & David A. Patterson Morgan Kufmann, "Computer Architecture A Quantitative Approach", 3rd Edition, An Imprint of Elsevier, 2011

REFERENCE BOOKS:

1. Computer Architecture, Fourth edition, J. L. Hennessy and D.A. Patterson. ELSEVIER.
2. Andrew S. Tanenbaum, Structured Computer Organization, Prentice Hall, 6th edition, 2012, ISBN: 978-0132916523.
3. C. Hamacher, Z. Vranesic and S. Zaky, Computer Organization, McGraw-Hill, 5th edition, 2002, ISBN: 0072320869.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22IT3172-DATA ANALYTICS

(Professional Elective - I)

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisites

- Data Base Management Systems
- Computer Oriented Statistical Methods

Course Objectives

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis.
- To develop problem solving abilities using Mathematics.
- To apply algorithmic strategies while solving problems.
- To understand the various search methods and visualization techniques

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

- Identify the various sources of Big Data.
- Understand big data technologies and the impact of data analytics for business decisions and strategy.
- Apply and analyze various regression techniques.
- Outline various Time series methods to discover interesting patterns
- To carry out standard data visualization and formal inference procedures

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, Exploratory data analysis, Data pre-processing, Missing Values - Outlier Detection and Treatment.

UNIT- II

Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of data and variables, Data Modeling Techniques, Introduction to HADOOP: Big Data, HDFS, Apache Hadoop, MapReduce.

UNIT - III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, Modeling Process – Training model – Validating model – Predicting new observations. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

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Object Segmentation: Regression Vs Segmentation-Supervised and Unsupervised Learning, Tree Building – Regression, Classification, over fitting, Pruning and Complexity.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Data Serialization, Data Extraction and Analyze for prediction

UNIT - V

Data Visualization: Introduction to Data Visualization, Data visualization options, Data visualization Techniques, Filters – Dashboard development tools.

TEXT BOOKS:

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

REFERENCES:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira.
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.
4. Michael Minelli, Michele Chambers, AmbigaDhiraj ,—Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends, John Wiley & Sons, 2013.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22AM3173: IMAGE PROCESSING
(Professional Elective – I)

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

Pre-requisites:

- A course on “Linear algebra”.
- A course on “Probability theory”.
- A course on “Computational Mathematics”.
- A course on “Computer Oriented Statistical Methods”.

Course Objectives:

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts
- Provides the knowledge of image acquisition, sampling and quantization.
- Pre-processing and enhancement.
- Image restoration, and segmentation.
- Knowledge of different image compression techniques

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

- Understand the theoretical and mathematical foundations of Digital Image Processing.
- Explain different image acquisition, sampling and quantization methods.
- Perform Preprocessing and image enhancement operations on given images.
- Apply different Image restoration, and segmentation techniques
- Perform different image compression techniques.

UNIT - I

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT - II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT - III

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

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Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT - V

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/Pearson Education, 2nd Ed, 2004.
2. Fundamentals of Digital Image Processing: A. K. Jain, PHI.

REFERENCE BOOKS:

1. Digital Image Processing using MATLAB: RafaelC.Gonzalez, RichardE.Woods, Steven L.Eddins: Pearson Education India, 2004.
2. Digital Image Processing: William Pratt, JohnWiley, 3rd Edition, 2004.
3. Image Processing, Analysis and Machine Vision, Second Edition, MilanSonka, aclav Hlavac and Roger Boyle, Cengage learning.

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22IT3173: DISTRIBUTED SYSTEMS

(Professional Elective - II)

III Year B.Tech. CSE I -Sem

L T P C

3 0 0 3

Prerequisites:

- A course on “Operating Systems”
- A course on “Computer Organization & Architecture”

Course Objectives:

- Understand the basic concepts of Distributed system and sharing of resources in a distributed manner
- Familiarize the basics of Distributed systems
- Demonstrate the concepts of IPC, group communication and RPC
- Describe the theoretical concepts, namely, virtual time, agreement and consensus protocols
- Understand the concepts of Transaction in Distributed Environment, Concurrency control, Deadlocks and Error recovery

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

- Characterize the Distributed Systems
- Know the support of Operating System like Operating system architecture, Protection, Communication and Invocation and architecture of file service.
- Understand peer to peer systems and applications with case studies.
- Understand Transactions and Concurrency control.
- Understand Security issues like Transactions with replicated data.

UNIT - I

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models - Introduction, Architectural and Fundamental models, Networking and Internetworking, Inter - process Communication, Distributed objects and Remote Invocation - Introduction, Communication between distributed objects, RPC, Events and notifications, Case study - Java RMI.

UNIT - II

Operating System Support - Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems - Introduction, File Service architecture.

UNIT - III

Peer to Peer Systems - Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies - Squirrel, OceanStore.
Time and Global States - Introduction, Clocks, events and Process states, Synchronizing

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physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

UNIT - IV

Transactions and Concurrency control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.

Distributed Transactions- Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT - V

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, and Consistency models.

TEXT BOOKS:

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, 4th Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman & Hall/ CRC, Taylor & Francis Group, 2010.

REFERENCE BOOKS:

1. Distributed Systems - Principles and Paradigms, A.S. Tannenbaum and M.V. Steen, Pearson Education.
2. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010.

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22CS3175-INFORMATION RETRIEVAL SYSTEMS

(Professional Elective- II)

III Year B.Tech. I- Sem

L	T	P	C
3	0	0	3

Prerequisites:

- A course on “Data Structures”

Course Objectives

- Demonstrate genesis and diversity of information retrieval situations for text and hyper media
- Describe hands-on experience store, and retrieve information from www us in semantic approaches
- Demonstrate the usage of different data/file structures in building computational search engines
- Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia
- Analyze ranked retrieval of a very large number of documents with hyperlinks between them

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

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks
- Design an Information Retrieval System for web search tasks
- Implement clustering algorithms like hierarchical agglomerative clustering and k-means algorithm

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages Document and Term Clustering:

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Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware, Text Search Systems Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCES

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

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22CS3176 DATA MINING

(Professional Elective - II)

B.Tech III year I Sem**L T P C****3 0 0 3****Pre-Requisites:**

- A course on “Data base Management Systems”
- Knowledge of probability and statistics

Course Objectives:

- Learn data mining concepts understand association rules mining
- Discuss classification algorithms learn how data is grouped using clustering techniques
- To develop the abilities of critical analysis to data mining systems and applications
- To implement practical and theoretical understanding of the technologies for data mining
- To understand the strengths and limitations of various data mining models

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

- Ability to perform the preprocessing of data and apply mining techniques on it.
- Ability to identify the association rules in large data sets.
- Ability to perform classification and clustering in large data sets.
- Ability to solve real world problems in business and scientific information using data mining
- Ability to classify web pages, extracting knowledge from the web

UNIT-I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems–Data mining Task primitives– Major issues in Data Mining–Data Preprocessing Techniques.

UNIT-II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining.

UNIT-III

Classification: Classification and Prediction – Basic concepts–Decision tree induction– Bayesian classification, Rule–based classification, Lazy learner.

UNIT-IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis

Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**UNIT-V**

Advanced Concepts: Basic concepts in Mining data streams—Mining Time-series data—Mining sequence patterns in Transactional databases— Mining Object– Spatial– Multimedia– Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

TEXT BOOKS:

1. Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
3. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing

REFERENCE BOOKS:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Data Mining Principles & Applications – T.V Suresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.
3. Data Mining, Vikram Pudi, P Radha Krishna, Oxford University Press

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3177-SOFTWARE PROCESS & PROJECT MANAGEMENT

(Professional Elective - II)

B.Tech III year I Sem

L T P C

3 0 0 3

Prerequisite:

- A course on “Software Engineering”

Course Objectives:

- To acquire knowledge on software process management
- To understand software economics
- To understand major and minor milestones, work break down structure
- To understand seven core metrics and quality indicators
- To understand design and develop software product using conventional and modern principles of software project management

Course Outcomes:

- Gain knowledge of phases in the life cycle of software development, project organization, and project control and process instrumentation
- Gain Knowledge of software economics and artifacts
- Analyse the major and minor milestones, artifacts and metrics from management and technical perspective
- Gain Knowledge of seven core metrics and quality indicators
- Gain Knowledge of next generation software economics

UNIT - I

Software Process Maturity Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process. Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT - II

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT - III

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown

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structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT - IV

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT - V

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCE BOOKS:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
2. Process Improvement essentials, James R. Persse, O'Reilly, 2006
3. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
4. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
5. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
6. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
7. Agile Project Management, Jim Highsmith, Pearson education, 2004.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
22CS3151-COMPUTER NETWORKS & UNIFIED MODELING
LANGUAGE LAB

B.Tech III year I Sem**L T P C****0 0 3 1.5****Prerequisites:**

- A course on “Programming for problem solving”
- A course on “Data Structures”

Course Objectives

- To understand the working principle of various communication protocols.
- To analyse the traffic flow and the contents of protocol frames
- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development
- Understanding of transport layer concepts and protocol design
- To explore the concepts of DNS, Email, WWW and various network protocols

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

- Implement data link layer framing methods , analyse error detection and error correction codes
- Implement and analyse routing and congestion issues in network design
- Ability to translate end-user requirements into system and software requirements specification document.
- Ability to create dataflow diagrams.
- Ability to create software application design using UML Diagrams

List of Experiments:

1. Implement the data link layer framing methods such as character, 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. Implement Dijkstra’s algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Write a program for congestion control using Leaky bucket algorithm.
8. Write a program for frame sorting technique used in buffers.
9. Programs for IP address conversion function
10. Write a client-server application for chat using UDP
11. Wire shark

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12. Packet Capture Using Wire shark
13. Starting Wire shark
14. Viewing Captured Traffic
15. Analysis and Statistics & Filters

Tools:

1. Use smart draw for data flow diagrams
2. Rational Rose or Star UML for UML diagrams

LIST OF EXPERIMENTS:

Do the following exercises for projects given in the list of sample projects

1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Draw level 0, level 1, and level 2 dataflow diagrams
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.

Performing functional testing and create simple testing report for the below Sample Projects:

1. Hospital management system
2. Online mobile recharge portal
3. Online Exam Registration
4. Stock Maintenance System
5. E-ticketing for Travel system
6. Credit Card Processing
7. E-book management System.
8. Online Recruitment system

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22CS3152: WEB TECHNOLOGIES LAB

B.Tech III year I Sem

L T P C

0 0 3 1.5

Prerequisites:

- A Course on “ Object oriented programming through Java”

Course Objectives:

- To enable the student to program web applications using HTML, JavaScript
- To enable the student to program web applications using Servlets, JSP
- To enable the student to program web applications using struts application
- To enable the student to program web applications using PHP
- To introduce PHP language for Server side scripting

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

- Simple Applications with Technologies like HTML, JavaScript
- Use Tomcat Server to Develop Servlet Applications and connect to Database
- Develop JSP Applications using Tomcat Server and connect to Database
- Develop Applications using struts
- Design web application using PHP

List of Experiments

1. Develop HTML page to demonstrate
 - Lists
 - Tables (row span and col span)
 - Cascading Style Sheets
 - Divisions
 - Frames
 - Embedding Images
2. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the Properties of the font of the capital (color, bold and font size).
3. Write a JavaScript program to validate the registration form contents with the following Rules (Use RegExp Object)
 - a) Username Must starts with Uppercase followed by set of lowercase letters or digits.
 - b) Password must contain only uppercase letters and length must be in between 8 to12.
 - c) Phone number contains 10 digits.
 - d) E-mail must follow some predefined format (example@domain.com)

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4. Create an XML document that contains 10 users information. Write a Java program, which takes User Id as input and returns the user details by taking the user information from the XML document using DOM Parser and SAX parser
5. Install the following on the local machine
 - a) Apache Tomcat Web Server
 - b) Install MySQL/Oracle (if not installed)
 - c) Install PHP and configure it to work with Apache web server and MySQL
6. a) Write a Servlet program to read the parameters from user interface and display
 - a. Same on the browser.
 - b. Write a Servlet program to read initialization parameters using ServletConfig and Servlet Context object
7. Write Servlet programs to work with the following session tracking technique.
 - a) Http Session b) Cookies c) URL rewriting d) Hidden Form controls
8. Develop a dynamic web page which contains Registration and Login Forms using servlet with Oracle/MySQL database. Validate the login page.
9. Write a JSP program to read the parameters from user interface and display
 - a) The same on the browser
10. Write a JSP Program to work session tracking techniques.
11. Develop a dynamic web page which contains Registration and Login Forms using JSP with Oracle/MySQL database. Validate the login page.
12. PHP script to
 - a) Find the length of a string.
 - b) Count no of words in a string.
 - c) Reverse a string.
 - d) Search for a specific string.
13. Write a PHP script that reads data from one file and write into another file.
14. Develop a dynamic web page which contains Registration and Login Forms in PHP with MySQL/Oracle database. Validate the login page.
15. Create and Run struts application and validate it using struts components.

TEXT BOOKS:

1. WEB TECHNOLOGIES: A Computer Science Perspective, Jeffrey C. Jackson, Pearson Education

REFERENCES:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. J2EE: The complete Reference By James Keogh, McGraw-Hill
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming, Thomson
4. Paul Dietel and Harvey Deitel, "Java How to Program", Prentice Hall of India, 8th Edition
5. Web technologies, Black Book, Dreamtech press

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3153- SKILL DEVELOPMENT COURSE - UI DESIGN-FLUTTER

B.Tech. III Year I Sem.

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Course Objectives:

- Learns to Implement Flutter Widgets and Layouts
- Understands Responsive UI Design and with Navigation in Flutter
- Knowledge on Widgets and customize widgets for specific UI elements, Themes
- Understand to include animation apart from fetching data

Course Outcomes:

- Implements Flutter Widgets and Layouts
- Responsive UI Design and with Navigation in Flutter
- Create custom widgets for specific UI elements and also Apply styling using themes and custom styles.
- Design a form with various input fields, along with validation and error handling
- Fetches data and write code for unit Test for UI components and also animation

List of Experiments: Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
b) Implement navigation with named routes.
2. a) Learn about stateful and stateless widgets.
b) Implement state management using set State and Provider.
3. a) Create custom widgets for specific UI elements.
b) Apply styling using themes and custom styles.
4. a) Design a form with various input fields.
c) Implement form validation and error handling.

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5. a) Add animations to UI elements using Flutter's animation framework.
b) Experiment with different types of animations (fade, slide, etc.).
6. a) Fetch data from a REST API.
b) Display the fetched data in a meaningful way in the UI.
7. a) Write unit tests for UI components.
b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development..

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22HS3151: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year I Sem.

L T P C

0 0 2 1

Course Objectives:

This lab focuses on using Multi-media instruction as well as stimulating peer group activities for language development to meet the following targets:

- To improve students fluency in spoken English.
- To enable them to listen to English spoken at normal conversational speed.
- To help students develop their vocabulary.
- To read and comprehend texts in different contexts.
- To communicate their ideas relevantly and coherently in writing.

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

- Acquire vocabulary and Grammar and use them contextually.
- Listen and speak effectively, and present themselves effectively.
- Develop proficiency in academic reading and writing.
- Communicate confidently in formal and informal contexts.
- Increase their job opportunities.

The following course activities will be conducted as part of the *Advanced English Communication Skills (AECS) Lab*:

UNIT I

Vocabulary and Grammar: Vocabulary Building – Word Formation: Prefixes and Suffixes - Synonyms, and Antonyms, One-word Substitutes, Idioms, Phrases, Collocations, and Compound Words.

Grammar – Articles, Prepositions, Tenses, Subject-Verb Agreement, Voice and Speech-Spotting Errors - Correction of Sentences,

UNIT II

Advanced Reading Comprehension: Argumentative Analysis of (with reference to) GRE, TOEFL, IELTS – Jumbled Sentences and Sentence Completion.

UNIT III

Writing Skills– Structure and Different Types of Writings – Argumentative Writing – Letter Writing - Resume Writing - Technical Report Writing

Creating and Using LinkedIn Profile - Netiquette - Statement of Purpose (SOP) - Letter of Recommendation

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**UNIT IV**

Presentation Skills -_Oral Presentations (Group/Individual) and Written Presentations – PPTs/ Posters (Virtual/Offline) – Projects, Reports and Assignments - Introducing Oneself Virtually (Making a Video on Oneself and Analyzing it critically).

UNIT V

Group Dynamics & Interviews: Group Discussion - Dos and Don'ts - Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Debate: Concept and Process - Difference between Group Discussions and Debates- Rubrics of Evaluation - Interviews and Types of Interviews - Pre-interview Planning, Opening Strategies, Answering Strategies - Introducing Self - Oral Interviews (face-to-face) –Virtual Interviews - Mock Interviews - Handling Technical Glitches.

REFERENCES

1. Kumar, Sanjay and Pushp Lata. *English for Effective Communication*, Oxford University Press, 2015.
2. Konal, Nira. *English Language Laboratories- A Comprehensive Manual*, PHI Learning Pvt. Ltd. 2011.
3. *The Official Guide to the GRE General Test*. Tamil Nadu: McGra Hills Education (India) 3rd Edition, 2017.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
22MC0005: INTELLECTUAL PROPERTY RIGHTS

III B.Tech I Semester

L	T	P	C
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Course Objectives:

- To know the concept of intellectual property
- To study about trade marks
- To study about law of copyrights and law of patents.
- To impart the knowledge on trade secrets
- To know new developments in IPR laws at national and international level.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Distinguish and Explain various forms of IPRs
- Identify criteria to fit one's own intellectual work in particular form of IPRs
- Apply statutory provisions to protect particular form of IPRs.
- Explain about trade secrets
- Appraise new developments in IPR laws at national and international level

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 COPYRIGHTS: Fundamental of copyright law, originality of material, rights of reproduction rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright 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 misappropriation: 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; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

TEXT BOOK:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOK:

1. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

II B.Tech (Semester-II)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3211-MACHINE LEARNING

B.Tech III year II Sem

L T P C

3 0 0 3

Prerequisites:

- A Course on “Data Analytics”
- A Course on “Computer oriented Statistical methods”

Course Objectives

- Define Machine Learning and understand the basic theory underlying machine learning.
- Understand the basic concepts of learning and decision trees.
- Understand neural networks and Bayesian techniques for problems appear in machine learning
- Understand the instance based learning and reinforced learning
- Perform statistical analysis of machine learning techniques

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

- Illustrate the learning techniques and investigate concept learning
- Apply the characteristics of decision tree to solve associated problems
- Use and Apply Ensemble and Un-Supervised Learning Techniques.
- Apply effectively neural networks for appropriate applications
- Evaluate hypothesis and investigate instant based learning and reinforced learning

UNIT-I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias, Gradient Descent Algorithm and its variants.

UNIT-II

Supervised Learning- Regression: Linear-Simple, Multiple, Logistic Regression. Classification- Naive Bayes Classifier, k-NN classifier, Support Vector Machines -Linear, Non Linear Ensemble Techniques I-Decision Trees-ID3(Iterative Dichotomiser3), CART(Classification and Regression Tree)

UNIT-III

Ensemble Techniques II- C4.5, CHAID (Chi-Square Automatic Interaction Detection), Random Forest Algorithm Unsupervised Learning-Clustering: Measures of distance, k-means, Gaussian Mixture Model Clustering, Hierarchical Learning- Divisive, Agglomerative Clustering

UNIT-IV

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multi layer networks and the back-propagation algorithm.

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Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

UNIT - V

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms. Reinforcement Learning – Introduction, the learning task, Q-learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.
2. Introduction to Machine Learning with Python, Author – Andreas C. Müller, Sara h Guido, Edition – First Edition, Publisher – O'Reilly Media, Inc.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.
2. Mathematics for Machine learning, Author – Marc Peter Deisenroth, Edition –First Edition, Publisher – Cambridge University Press.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3212 FORMAL LANGUAGES AND AUTOMATA THEORY

B.Tech III year II Sem

L T P C

3 0 0 3

Prerequisites:

- A Course on “Data Structures”
- A Course on “Discrete Mathematics”

Course Objectives

- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- Classify machines by their power to recognize languages.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undesirability

Course Outcomes

- Understand the concept of abstract machines and their power to recognize the languages.
- Employ finite state machines for modeling and solving computing problems.
- Design context free grammars for formal languages.
- Design the Turing Machine for REL
- Distinguish between decidability and un-decidability.

UNIT - I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with ϵ -transitions to NFA without ϵ -transitions. Conversion of NFA to DFA, Moore and Mealy machines

UNIT - II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Pumping Lemma for Regular Languages, Statement of the pumping lemma, and Applications of the Pumping Lemma. Closure Properties of Regular Languages: Closure properties of Regular languages, Decision, Properties of Regular Languages, Equivalence and Minimization of Automata.

UNIT - III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees,

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Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state, Acceptance by empty stack, Deterministic Pushdown Automata. From CFG to PDA, From PDA to CFG.

UNIT - IV

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating ϵ -Productions. Chomsky Normal form Greibach Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications

Closure Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine.

UNIT - V

Types of Turing machine: Turing machines and halting

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Un-decidable Problems, Counter machines.

TEXT BOOKS:

1. Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekar, 2nd edition, PHI.

REFERENCE BOOKS:

1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Textbook on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.
5. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3213-DevOps

B.Tech. III Year II Sem.

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3	0	0	3

Pre-Requisites:

- A Course on Software Engineering
- A Course on Software Project Management

Course Objectives:

- Understand the skill sets and high-functioning teams involved in Agile, DevOps and related
- Methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.
- Collaborate and adopt DevOps in real-time projects
- Understand different project management and integration tools.

Course Outcomes:

- Understand the various components of DevOps environment.
- Identify Software development models and architectures of DevOps
- Use different project management and integration tools.
- Select an appropriate testing tool and deployment model for project.
- Assess various DevOps practices

UNIT-I**Introduction to DevOps:**

Introduction, Agile development model, DevOps and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, identifying bottlenecks.

UNIT-II**Software development models and DevOps:**

DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Micro services and the data tier, DevOps, architecture, and resilience.

UNIT-III**Introduction to project management:**

The need for source code control, the history of source code management, Roles and code, source code management system and migrations, shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT-IV**Integrating the system:**

Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and

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build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT-V

Testing Tools and Deployment: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development. Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker.

TEXT BOOKS:

1. Joakim Verona., Practical DevOps, Packt Publishing, 2016.

REFERENCE BOOKS:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3271-SCRIPTING LANGUAGES

(Professional Elective –III)

III Year B.Tech. II- Sem**L T P C****3 0 0 3****Prerequisites:**

- A course on “Computer Programming and Data Structures”
- A course on “Object Oriented Programming Concepts”

Course Objectives: This course will enable students to

- Learn the basics of Ruby
- Understand the embedding Ruby to other languages
- Learn the language PERL
- To gain in-depth knowledge of programming features of Perl.
- To Learn TCL and Tk.

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

- Develop Ruby programs and CGI scripts
- To implement the design of programs by embedding Ruby to other Languages.
- To write and apply Perl scripts.
- Create internet applications using PERL.
- Write programs using TCL and Tk

UNIT - I

Introduction: Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBY GEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Web servers, SOAP and web services.

Ruby Tk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interpreter

UNIT - III

Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - IV

Advanced perl : Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**UNIT – V**

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pragmatic Programmers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J. Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3272: INTERNET OF THINGS

(Professional Elective – III)

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Pre-Requisites:

- A Course on “Computer organization”
- A Course on “Computer Networks”

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

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

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Identify the applications of IoT in Industry.
- Understand various Case Studies

UNIT - I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates
Domain Specific IoTs – Home automation, Environment, Agriculture, Health and Lifestyle

UNIT - II

IoT and M2M – M2M, Difference between IoT and M2M, SDN and NFV for IoT, IoT System Management with NETCOZF, YANG- Need for IoT system Management, Simple Network management protocol, Network operator requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

UNIT - III

IoT Systems – Logical design using Python-Introduction to Python – Python Data types & Data structures, Control flow, Functions, Modules, Packaging, File handling, Data/Time operations, Classes, Exception, Python packages of Interest for IoT

UNIT - IV

IoT Physical Devices and Endpoints - Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry PI with Python, Other IoT devices.

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IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs, WAMP-AutoBahn for IoT, Xively Cloud for IoT, Python web application framework –Django, Designing a RESTful web API

UNIT V

Case studies- Home Automation, Environment-weather monitoring-weather reporting- air pollution monitoring, Agriculture.

TEXT BOOK:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

REFERENCE BOOK:

1. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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22CS3273- ARTIFICIAL INTELLIGENCE
(Professional Elective – III)**B.Tech. III Year II Sem.****L T P C**
3 0 0 3**Prerequisites:**

- A Course on “C Programming”
- A Course on “Data Structures”

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities
- Reference using First order logic and describe knowledge representation
- To learn different knowledge representation techniques
- To understand the applications of AI, namely game playing, theorem proving, and machine learning

Course Outcomes:

- Understand search strategies and intelligent agents
- Understand different adversarial search techniques
- Apply propositional logic, predicate logic for knowledge representation
- Apply AI techniques to solve problems of game playing, and machine learning
- Infer in Uncertain domains using probabilistic learning models

UNIT - I

Introduction to AI, Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

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Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT - IV

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information. Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT - V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, the Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOK:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

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22CS3274-SOFTWARE TESTING METHODOLOGIES

(Professional Elective –III)

III Year B.Tech. II- Sem

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Prerequisites

- A course on “Software Engineering”.

Course Objectives

- To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
- To develop skills in performing manual testing.
- To develop skills in software test automation and management using latest tools.
- To gain the knowledge to perform manual testing .
- To understand the usage of tools for automation

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

- Acquire knowledge on testing phases and consequences of bugs.
- Acquire skills to perform various testing techniques.
- Acquire knowledge on logic based testing and regular expressions.
- Demonstrate the test planning and management.
- Ability to develop skills in software test automation and management using latest tools.

UNIT - I

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT - II

Transaction Flow Testing: transaction flows, transaction flow testing techniques.

Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.

Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT - III

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.

Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

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State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

UNIT - V

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like Jmeter/selenium/soapUI/Catalon).

TEXT BOOKS:

1. Software Testing techniques - Baris Beizer, Dreamtech, second edition.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

REFERENCE BOOKS:

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

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22CS3251-MACHINE LEARNING LAB

III Year B.Tech. II- Sem

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Prerequisites:

- A Course on “Data Analytics”
- A Course on “Computer oriented Statistical methods”

Course Objectives

- Define Machine Learning and understand the basic theory underlying machine learning.
- Understand the basic concepts of learning and decision trees.
- Understand neural networks and Bayesian techniques for problems appear in machine learning
- Understand the instance based learning and reinforced learning
- Perform statistical analysis of machine learning techniques

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

- Illustrate the learning techniques and investigate concept learning
- Apply the characteristics of decision tree to solve associated problems
- Use and Apply Ensemble and Un-Supervised Learning Techniques.
- Apply effectively neural networks for appropriate applications
- Evaluate hypothesis and investigate instant based learning and reinforced learning

List of Experiments

1. Write a python program to compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation
2. Study of Python Basic Libraries such as Statistics, Math, Numpy and Scipy
3. Study of Python Libraries for ML application such as Pandas and Matplotlib
4. Write a Python program to implement Simple Linear Regression
5. Implementation of Multiple Linear Regression for House Price Prediction using sklearn
6. Implementation of Decision tree using sklearn and its parameter tuning
7. Implementation of KNN using sklearn
8. Implementation of Logistic Regression using sklearn
9. Implementation of K-Means Clustering
10. Performance analysis of Classification Algorithms on a specific dataset (Mini Project)

TEXT BOOK:

1. Machine Learning – Tom M. Mitchell, - MGH.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

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22CS3252-DevOps Lab

III Year B.Tech. II- Sem

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Pre-Requisites:

- A Course on Software Engineering
- A Course on Software Project Management

Course Objectives:

- Understand the skill sets and high-functioning teams involved in Agile, DevOps and related
- Methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.
- Collaborate and adopt DevOps in real-time projects
- Understand different project management and integration tools.

Course Outcomes:

- Understand the various components of DevOps environment.
- Identify Software development models and architectures of DevOps
- Use different project management and integration tools.
- Select an appropriate testing tool and deployment model for project.
- Assess various DevOps practices

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN- 10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

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REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.
2. The Devops Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations; by Gene Kim (Author), Patrick Debois (Author), Professor John Willis (Author), Jez Humble (Author), John Allspaw

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22CS3281-INDUSTRIAL ORIENTED MINI PROJECT

III Year B.Tech. II- Sem

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

22MC0006 ENVIRONMENTAL SCIENCE

III Year B.Tech. II- Sem

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Course Objectives

Develop ability to

- Identify the importance of ecosystem and its functions.
- Understand the natural resources and their usage in day to day life.
- Understand the concept of bio-diversity, its values and conservation.
- Be aware of the causes of different types of pollution and its control.
- Understand various environmental impacts, requirement of various policies and legislations towards environmental sustainability.

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

- Explain ecosystem and its functions namely, food chain, ecological pyramids etc.
- Acquire knowledge about different types of natural resources such as land, water, minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.
- Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.
- Explain different types of pollution, its control and impact on global environment.
- Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

UNIT-I

ECOSYSTEMS: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnifications, Field visits.

UNIT-II

NATURAL RESOURCES: Classification of Resources: Living and Non-Living resources, water resources; use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy Resources-renewable and non-renewable.

UNIT-III

BIODIVERSITY AND BIOTIC RESOURCES: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**UNIT-IV**

ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies. Global Environmental Issues and Global Efforts: Green House Gases And its effect, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

UNIT-V

ENVIRONMENTAL POLICY, LEGISLATION & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economic aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, University
2. Grants Commission.
3. R. Rajagopalan, Environmental Studies, Oxford University Press.

REFERENCES:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.