

**COURSE STRUCTURE  
& DETAILED SYLLABUS  
(R19 Regulation)  
For  
Bachelor of Technology  
I, II, III & IV B. Tech. (CSE)  
(Applicable for Batches Admitted from 2019-2020)**

**Department of  
COMPUTER SCIENCE & ENGINEERING  
(Applicable for Batches Admitted from 2019-2020)**



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA  
VIZIANAGARAM - 535003, Andhra Pradesh, India**

**Department of Computer Science and Engineering**  
**University College of Engineering Vizianagaram**  
**R19 Course Structure**  
**Programme: B.Tech (Computer Science and Engineering)**

<b>I YEAR I SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>Theory</b>					
1	HS1101	Communicative English		3	0	0	3
2	BS1101	Calculus		3	0	0	3
3	BS1103	Applied Physics		3	0	0	3
4	ES1101	Essentials of Electrical & Electronics Engineering		3	0	0	3
5	ES1101	Fundamentals of Computer Science		3	0	0	3
		<b>Labs</b>					
6	HS1102	English Communication Skills Lab		0	0	3	1.5
7	BS1104	Applied Physics Lab		0	0	3	1.5
8	BS1105	Applied Physics Virtual Lab		0	0	2	0
9	ES1104	IT Workshop		0	0	2	1
10	ES1105	Essentials of Electrical & Electronics Engineering Lab		0	0	3	1.5
		<b>Mandatory Courses</b>					
11	MC1101	Professional Ethics & Human Values		3	0	0	0
<b>Total</b>				18	0	13	20.5

<b>I YEAR II SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>Theory</b>					
1	BS1201	Linear Algebra and Numerical Methods		3	0	0	3
2	ES1202	Digital Logic Design		3	0	0	3
3	BS1202	Applied Chemistry		3	0	0	3
4	ES1201	Problem Solving and Programming using C		3	0	0	3
5	ES1203	Engineering Drawing		1	0	3	2.5
		<b>Labs</b>					
6	HS1201	Advanced Communication Skills Lab		0	0	3	1.5
7	BS1203	Applied Chemistry Lab		0	0	3	1.5
8	ES1203	Problem Solving and Programming using C Lab		0	0	3	1.5
9	PR1201	Engineering Exploration Project - Design Thinking (15 Hrs per Sem.)		0	0	0	0.5
		<b>Mandatory Courses</b>					
10	MC1201	Constitution of India		3	0	0	0
11	MC1202	Physical Fitness Activities/Yoga		2	0	0	0
<b>Total</b>				18	0	12	19.5

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<b>II YEAR I SEMESTER</b>							
S.No	Course Code	Courses	PO's	L	T	P	C
		<b>Theory</b>					
1	BS2101	Discrete Mathematical Structures		3	0	0	3
2	CS2102	Principles of Programming Languages		3	0	0	3
3	ES2101	Python Programming		2	1	0	3
4	CS2103	Data Structures		3	0	0	3
5	CS2104	Computer Organization and Architecture		3	0	0	3
6	HS2101	Managerial Economics and Financial Accountancy		3	0	0	3
		<b>Labs</b>					
7	ES2102	Python Programming Lab		0	0	2	1
8	CS2105	Data Structures Lab		0	0	3	1.5
		<b>Mandatory Courses</b>					
9	MC2101	Essence of Indian Traditional Knowledge		3	0	0	0
10	MC2101	IPR & Patents		3	0	0	0
11	MC2102	Employability Skills-I		3	0	0	0
<b>Total</b>				26	01	06	20.5

<b>II YEAR II SEMESTER</b>							
S.No	Course Code	Courses	PO's	L	T	P	C
		<b>Theory</b>					
1	BS2202	Probability & Statistics		3	0	0	3
2	CS2201	Object Oriented Programming		2	1	0	3
3	CS2202	Operating Systems		3	0	0	3
4	CS2203	Data Base Management Systems		3	0	0	3
5	CS2204	Formal Languages and Automata Theory		3	0	0	3
		<b>Lab</b>					
6	CS2205	Java Programming Lab		0	0	3	1.5
7	CS2206	Operating Systems Lab		0	0	3	1.5
8	CS2207	Data Base Management Systems Lab		0	0	3	1.5
		<b>Mandatory Courses</b>					
9	MC2201	Professional Ethics & Human Values		3	0	0	0
10	MC2202	Environmental Science		3	0	0	0
<b>Total</b>				20	01	09	19.5

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<b>III YEAR I SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CS3101	Design and Analysis of Algorithms		3	0	0	3
2	CS3102	Computer Networks		3	0	0	3
3	CS3103	Compiler Design		3	0	0	3
4	CS3104	Data Warehousing and Data Mining		3	0	0	3
5	PE3101	<b>Professional Elective-I</b> 1.Computer Graphics 2.Functional Programming 3.NoSql Data Bases 4.Advanced Data Structures 5.Advanced Computer Architecture 6. Mean Stack Technologies		3	0	0	3
6	CS3105	Computer Networks Lab		0	0	3	1.5
7	CS3106	Data Mining Lab		0	0	3	1.5
8	CS3107	Compiler Design Lab		0	0	2	1
9	MC3101	Employability Skills-II		3	0	0	0
10	PR3101	Socially Relevant Projects (15Hrs/Sem)		0	0	0	0.5
<b>Total</b>				15	0	08	19.5

<b>III YEAR II SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CS3201	Web Essentials & Services		3	0	0	3
2	CS3201	Artificial Intelligence		3	0	0	3
3	CS3203	Software Engineering		3	0	0	3
4	HS3201	Management and Organizational Behavior		3	0	0	3
5	PE3201	<b>Professional Elective-II *</b> (MOOCS Using /NPTEL/SWAYAM) Duration:12 Weeks Minimum		3	0	0	3
6	OE3201	<b>Open Elective-I</b> (Inter Disciplinary)		3	0	0	3
7	CS3204	Web Essentials and Services Lab		0	0	3	1.5
8	CS3207	AI Tools & Techniques Lab		0	0	3	1.5
9	PR3201	Industrial Training/Internship/ Research Projects in National Laboratories/Academic Institutions		0	0	0	1.5
<b>Total</b>				18	00	06	22.5

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<b>IV YEAR I SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CS4101	Cryptography and Network Security		3	0	0	3
2	CS4102	UML & Design Patterns		3	0	0	3
3	CS4103	Machine Learning		3	0	0	3
4	OE4101	<b>Open Elective-II</b> (Inter Disciplinary)		3	0	0	3
5	PE4101	<b>Professional Elective-III</b> 1.Mobile Computing 2.Data Science 3.Computer Vision 4.Internet of Things 5.Software Project Management 6. Program Analysis		3	0	0	3
6	PE4102	<b>Professional Elective-IV</b> 1.Software Testing Methodologies 2.Parallel Computing 3.Social Networks & Semantic Web 4.Ad-hoc and Sensor Networks 5.CyberSecurity & Forensics 6. Devops		3	0	0	3
7	CS4104	UML Lab		0	0	3	1.5
8	PR4101	Project-I		0	0	0	1.5
<b>Total</b>				18	0	03	21

<b>IV YEAR II SEMESTER</b>							
<b>S.No</b>	<b>Course Code</b>	<b>Courses</b>	<b>PO's</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	CS4201	Cloud Computing		3	0	0	3
2	OE4201	<b>Open Elective-III</b> (Inter Disciplinary)		3	0	0	3
3	PE4201	<b>Professional Elective-V</b> 1.Deep Learning 2. Big Data Analytics 3.Natural Language Processing 4.Block Chain Technologies 5.Distributed Systems 6. Quantum Computing		3	0	0	3
4	PR4201	Project-II		0	0	15	8
<b>Total</b>				09	00	00	17

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**Programme: B.Tech (Computer Science and Engineering)**

**Open Electives to be offered by CSE for Other Branches:**

<p><b>Open Elective I:</b></p> <ol style="list-style-type: none"><li>1. Data Structures</li><li>2. C++ Programming</li><li>3. Computer Organization</li><li>4. Python Programming</li><li>5. Scripting Languages</li><li>6. Program Analysis</li></ol>	<p><b>Open Elective II:</b></p> <ol style="list-style-type: none"><li>1. Operating Systems</li><li>2. Computer Networks</li><li>3. Image Processing</li><li>4. UNIX &amp; Shell Programming</li><li>5. Fundamentals of Cloud Computing</li><li>6. Fundamentals of Information Security</li></ol>
<p><b>Open Elective III:</b></p> <ol style="list-style-type: none"><li>1. Big Data Analytics</li><li>2. Block Chain Technologies</li><li>3. Cyber Security</li><li>4. Web services</li><li>5. Quantum Computing</li><li>6. Mean Stack Technologies</li><li>7. Devops</li></ol>	

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**Open Electives to be offered by other Departments for Computer Science & Engineering:**

<p><b>Civil Engineering</b></p> <ol style="list-style-type: none"> <li>1. Environmental Pollution and Control</li> <li>2. Disaster Management</li> <li>3. Industrial Water &amp; Waste Management</li> <li>4. Environmental and Industrial Hygiene</li> </ol>	<p><b>Mechanical Engineering</b></p> <ol style="list-style-type: none"> <li>1. Industrial Robotics</li> </ol>
<p><b>Electrical and Electronics Engineering</b></p> <ol style="list-style-type: none"> <li>1. Control Systems</li> <li>2. Power Electronics</li> <li>3. Electric Drives</li> <li>4. Renewable Energy Sources</li> <li>5. Smart Grids</li> <li>6. Programmable Logic Controller and Applications</li> <li>7. Power Systems for Data Centers</li> <li>8. Hybrid Electrical Vehicles</li> </ol>	<p><b>Electronics &amp; Communication Engineering</b></p> <ol style="list-style-type: none"> <li>1. Information Theory and Coding</li> <li>2. VLSI Design</li> <li>3. Signals &amp; Systems</li> <li>4. Digital Signal Processing</li> <li>5. Electro Magnetic Interface/ Electro Magnetic Compatibility</li> <li>6. Wireless Communication Networks</li> </ol>
<p><b>Information Technology</b></p> <p><b>Open Elective I:</b></p> <ol style="list-style-type: none"> <li>1. Java Programming</li> <li>2. Database Management Systems</li> <li>3. Computer Graphics</li> <li>4. Principle of Software Engineering</li> <li>5. Web Technologies</li> </ol> <p><b>Open Elective II:</b></p> <ol style="list-style-type: none"> <li>1. Soft Computing</li> <li>2. Machine Learning</li> <li>3. AI Tools &amp; Techniques</li> <li>4. Pattern Recognition</li> <li>5. Mobile Application Development</li> </ol> <p><b>Open Elective III:</b></p> <ol style="list-style-type: none"> <li>1. Data Science</li> <li>2. Internet of Everything</li> <li>3. Sensor Networks</li> <li>4. R programming</li> <li>5. Digital Marketing &amp; Multimedia</li> </ol>	



## B. Tech (Computer Science and Engineering) - R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-I Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- Analyze the asymptotic performance of algorithms
- Write rigorous correctness proofs for algorithms
- Demonstrate a familiarity with major algorithms and data structures
- Apply important algorithmic design paradigms and methods of analysis
- Synthesize efficient algorithms in common engineering design situations

### UNIT - I:

**Introduction:** What is an Algorithm, Algorithm Specification, Pseudo code Conventions Recursive Algorithm, Performance Analysis, Space Complexity, Time Complexity, Amortized Complexity, Amortized Complexity, Asymptotic Notation, Practical Complexities' Performance Measurement.

### UNIT - II:

**Decrease-and-Conquer:** Insertion Sort Algorithms for Generating Combinatorial Objects Decrease-by-a-Constant-Factor Algorithms Variable-Size-Decrease Algorithms

**Dived and Conquer:** Merge Sort, Quick Sort, Multiplication of Large Integers and Strassen's Matrix Multiplication

**Transform and conquer:** Pre-sorting Balanced Search Trees, Heaps and Heap sort

### UNIT - III:

**The Greedy Method:** The General Method, Knapsack Problem, Job Sequencing with Deadlines Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, An Optimal Randomized Algorithm, Optimal Merge Patterns, Single Source Shortest Paths.

### UNIT - IV:

**Dynamic Programming:** The General Method Multistage graph ,All - Pairs Shortest Paths, , String Edition, 0/1 Knapsack, Reliability Design, optimal binary search trees.

### UNIT - V:

**Backtracking:** The General Method, The S-Queens Problem, Sum of Subsets, Graph Coloring Hamiltonian Cycles

**Branch and Bound:** The Method, Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack problem, LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson problem.



**Course Outcomes:**

The students should be able to:

- i. Argue the correctness of algorithms using inductive proofs and invariants, Analyze worst-case running times of algorithms testing asymptotic analysis
- ii. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms
- iii. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ these paradigm Synthesize greedy algorithms and analyse them.
- iv. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms, and analyze them
- v. Describe the Backtracking and branch and bound paradigms and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize Backtracking and branch and bound algorithms, and analyse them

**Text Books:**

- i. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press
- ii. Introduction to the design and analysis of Algorithms Anany Levitin pearson ,3rd edition
- iii. Introduction to Algorithms Thomas H Cormen PHI Learning

**Reference Books:**

- i. The Design and Analysis of Computer Algorithms, Alfred V Aho John E Hopcroft Jeffrey D Ullman
- ii. Algorithm Design, Jon Kleinberg, Pearson
- iii. Algorithms, by Dasgupta, Papadimitrou and Vazirani, McGraw-Hill Education, 2006.



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University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

III Year I Semester		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>COMPUTER NETWORKS</b>					

### Course Objectives:

The main objectives are

- i. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- ii. Study data link layer concepts, design issues, and protocols
- iii. Gain core knowledge of Network layer routing protocols and IP addressing
- iv. Study Session layer design issues, Transport layer services, and protocols
- v. Acquire knowledge of Application layer and Presentation layer paradigms and protocols

### UNIT- I:

**Introduction:** History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN, circuit switched, packet switched, message switched, extranet, intranet, Internet, wired, wireless).

### UNIT –II:

**Physical layer:** Line encoding, block encoding, scrambling, modulation demodulation (both analog and digital), errors in transmission, multiplexing (FDM, TDM, WDM, OFDM, DSSS), Different types of transmission media.

**Data Link Layer services:** framing, error control, flow control, medium access control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat. MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

### UNIT –III:

**Local Area Network Technology:** Token Ring. Error detection (Parity, CRC), Ethernet, Fast Ethernet, Gigabit Ethernet, Personal Area Network: Bluetooth and Wireless Communications Standard: Wi-Fi (802.11) and Wi-MAX.

### UNIT –IV:

**Network layer:** Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Sub netting, Super netting, Classless addressing, Network Address Translation.

### UNIT –V:

**Transport layer:** UDP, TCP. Connection establishment and termination, sliding window, flow and congestion control, timers, retransmission, TCP extensions, Queuing theory, Single and multiple server queuing models, Little's formula. Application Layer. Network Application services and protocols including e-mail, www, DNS, SMTP, IMAP, FTP, TFTP, Telnet, BOOTP, HTTP, IPSec, Firewalls.

**Course Outcomes:**

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

- i. Illustrate the OSI and TCP/IP reference model
- ii. Analyze MAC layer protocols and LAN technologies
- iii. Design applications using internet protocols
- iv. Implement routing and congestion control
- v. Acquire knowledge about Transport and Application layer Protocols

**Text Books:**

- i. Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013
- ii. Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

**Reference Books:**

- i. Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
- ii. Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
- iii. Data and Computer Communications , William Stallings , Pearson , 8th Edition, 2007

**E-Resources:**

- i. <https://nptel.ac.in/courses/106/105/106105183/>



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-I Semester		L	T	P	C
		3	0	0	3
<b>COMPILER DESIGN</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. The phases of a compiler
- ii. Design of lexical analyzers, Syntax analyzers, Intermediate code generators
- iii. Usage of Lex/Bison tools in writing compilers
- iv. Different optimizations and analyses required to do those optimizations
- v. Issues in the code generation, code generation generation algorithms

### UNIT - I:

#### Introduction and Lexical Analysis

Language Processors, the structure of a compiler, the science of building a compiler, phases of a compiler. Lexical Analysis: The role of the lexical analyzer, Identifying tokens, Transition diagrams for recognizing tokens, Input buffering, The lexical analyzer generator Lex, Finite automata, Conversion from regular expressions to automata, design of a lexical analyzer generator, Optimization of DFA-based pattern matchers.

### UNIT - II:

#### Syntax Analysis

Introduction, Context-Free Grammars, BNF(Backus-Naur Form), EBNF(Extended Backus-Naur Form). Preprocessing of grammars: left recursion elimination, left factoring. Top-Down Parsing: Recursive-descent parsers, LL(1) parsers. Bottom-Up parsing: Introduction to LR parsers, Simple LR, Canonical LR, Lookahead LR. Extending parsers to handle ambiguous grammars, Parser generators Yacc/Bison.

### UNIT – III:

#### Syntax-Directed Translation, Semantic Analysis, Intermediate Code Generation

Syntax-Directed Definitions, Evaluation orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate code generation: Variants of Syntax trees, Three-address code, Types and declarations, Type checking, Control flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

### UNIT - IV:

#### Code Optimization, Run-time Environment

Run-Time Environments: Storage organization, Activation record, Stack allocation, Access to nonlocal data on the stack, Heap management, Introduction to garbage collection, Introduction to trace-based collection. Machine-Independent optimizations: The principal sources of optimization, Basic blocks and flow graphs, Introduction to data-flow analysis, Foundations of data-flow analysis, Constant propagation.

## **UNIT - V: Target Code Generation**

Code Generation: Issues in the design of a Code Generator, The target language, Addresses in the target code, A simple code generator.

Machine-dependent Optimizations: Peephole optimization, Register allocation and assignment, Dynamic Programming code generation.

### **Course Outcomes:**

The students should be able to:

- i. Understand the basics of language processing and implement lexical analyzer for any language
- ii. Understand the different types of parsing and implement parser for any language
- iii. Understand the different intermediate code representations and use Syntax directed definitions to design a intermediate code generators for any language construct.
- iv. Understand the basics of data flow analysis, optimizations, and run time environment required for handling recursive procedures
- v. Understand the issues in the code generation and code generation algorithms.

### **Text Books:**

- i. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.
- ii. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

### **Reference Books:**

- i. Modern Compiler Implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
- ii. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
- iii. lex & yacc, 2nd Edition by John Levine, Doug Brown, Tony Mason

### **E-resources:**

- i. <https://www.edx.org/course/compilers>
- ii. <https://nptel.ac.in/courses/106/108/106108113/>



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III Year-I Semester		L	T	P	C
		3	0	0	3
<b>DATA WAREHOUSING AND DATA MINING</b>					

### Course Objectives:

Students undergoing this course are expected to:

- i. Understand the concepts of Data Ware housing and Data Mining
- ii. Understand various data mining functionalities and Extract knowledge using data mining techniques
- iii. Characterize the kinds of patterns that can be discovered by classification, clustering and association rule mining.
- iv. Master data mining techniques in various applications like social, scientific and environmental context.
- v. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

### UNIT –I: Data Mining Systems and Knowledge Discovery Process:

**Data Warehouse and OLAP Technology:** An Overview- What Is a Data Warehouse. A Multidimensional Data Model - Need for Online Analytical Processing - OLTP V/s OLAP -OLAP Operations in Multidimensional Data Model. Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

**Need and Usage of Data Mining Technologies** - Overview of Knowledge Discovery Process from Databases–What Motivated Data Mining - Why Is It Important - Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Are All of the Patterns Interesting Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major Issues in Data Mining.

### UNIT–II: Data Preprocessing:

**Data Exploration:** Data Objects and attribute types -Statistical description of data- Descriptive Data Summarization-Data Visualization - Data similarity and dissimilarity measures.

**Data Pre-processing:** Why Pre-process the Data -Data Cleaning-Data Integration-Data Reduction- Data Transformation and Data Discretization.

### UNIT–III: Classification:

Basic issues regarding classification and predication - General Approach to solving a classification problem- Decision Tree Classification, Attribute Selection Measures, Tree Pruning-Bayesian Classification – Rule Based Classification – Support Vector Machines.

**Classification Model Evaluation and Selection** - Accuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap, Comparing Classifier performance using ROC Curves.

#### **UNIT–IV: Mining Frequent Patterns and Association Rules:**

Basic Concepts-Problem Definition- Market Basket Analysis- Frequent Itemsets- Closed Itemsets and Association Rules - Frequent Pattern Mining - Efficient and Scalable Frequent Itemset Mining Methods- the Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation - Generating Association Rules from Frequent Itemsets - A pattern growth approach for mining Frequent Itemsets- FP-Growth Algorithm

#### **UNIT V: Cluster Analysis:**

Basics and Importance of Cluster Analysis- Clustering techniques- Different Types of Clusters- Partitioning Methods (K-Means, K Medoids) -Strengths and Weaknesses. Hierarchical Methods (Agglomerative, Divisive) - Density-Based Methods (DBSCAN, OPTICS)-

#### **Course Outcomes:**

After completion of the course, students should be able to:

- i. Understand Data Warehouse fundamentals, Data Mining concepts, principles and its functionalities
- ii. Pre process the data using various Data Pre processing Techniques for mining applications
- iii. Design and deploy appropriate classification techniques to solve real world problems and further be able to assess the strengths and weaknesses of various methods and algorithms to analyze their behavior.
- iv. Demonstrate Association analysis techniques for generating association rules from data.
- v. Use different Clustering techniques to cluster data and Cluster the high dimensional data for better organization of the data

#### **Text Books:**

- i. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
- ii. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

#### **References:**

- i. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
- ii. Data Mining :VikramPudi and P. Radha Krishna, Oxford.
- iii. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
- iv. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

#### **E-resources:**

- i. [http://onlinecourses.nptel.ac.in/noc18\\_cs14/preview](http://onlinecourses.nptel.ac.in/noc18_cs14/preview) (NPTEL course by Prof.Pabitra Mitra)
- ii. [http://onlinecourses.nptel.ac.in/noc17\\_mg24/preview](http://onlinecourses.nptel.ac.in/noc17_mg24/preview) (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran)
- iii. [http://www.saedsayad.com/data\\_mining\\_map.htm](http://www.saedsayad.com/data_mining_map.htm)



## B. Tech (Computer Science & Engineering)- R19 Syllabus

### University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-I Semester	Professional Elective - I	L	T	P	C
		3	0	0	3
COMPUTER GRAPHICS					

#### Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To learn Creation, Management and Transmission of Multimedia objects.

#### UNIT-I:

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

**2D Primitives:** Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

#### UNIT-II:

**3D Concepts:** Parallel and Perspective projections - Three dimensional object representations – Polygons, Curved lines, Splines, Quadric Surfaces, - Visualization of data sets - 3D transformations – Viewing -Visible surface identification.

#### UNIT-III:

**Illumination and Shading:** Background, simple lighting model, shading models, intensity representation, color models, texture synthesis

#### UNIT-IV:

##### Graphics Hardware and Software:

Graphics programming using OpenGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes.

**Rendering:** Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program, Creating shaded objects.

#### UNIT V:

**Fractals:** Fractals and Self similarity, Peano curves, Creating image by iterated functions, Mandelbrot sets, Julia Sets, Random Fractals

**Overview of Ray Tracing:** Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.



**Course Outcomes:**

- i. To learned various algorithms for drawing objects in 2D transformations like line, circle and ellipse.
- ii. Apply projections and visible surface detection techniques for display of 3D scene on 2D screen.
- iii. Able to select particular color model for lighting and shading of objects.
- iv. To get an idea about the structure of OpenGL graphic software.
- v. Able to create image using fractals and iterated functions

**Text Books:**

- i. Donald Hearn, Pauline Baker, Computer Graphics – C Version, Pearson Education.
- ii. F.S. Hill, Computer Graphics using OpenGL, Pearson Education.

**Reference Books:**

- i. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics Principles and practice in C, Pearson Education.



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-I Semester	Professional Elective - I	L	T	P	C
		3	0	0	3
FUNCTIONAL PROGRAMMING					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- basics of functional programming
- basic constructs of haskell.
- Lazy evaluation feature of haskell programs execution.

### UNIT - I:

Introduction to functional programming, Haskell starting out: first function, lists, tuples

### UNIT - II:

Types and Typeclasses: Type variables, Syntax in functions: Pattern matching, case expressions, Making own types and type classes

### UNIT - III:

Recursive functions: Think recursively, List comprehensions, Lazy evaluation.

### UNIT - IV:

Higher order functions: curried functions, function composition, Modules

### UNIT - V:

Input and output, monoids

### Course Outcomes:

The students should be able to:

- Understand the basics of haskell
- Write basic functions and understand how haskell compiler infer types of variables
- Write recursive programs and reasoning programs using lazy evaluation
- Understand the higher order functions
- Understand implementation of side effects in functional programming

### Text Books:

- Learn you a haskell for a great good a beginner's guide, Miron lipovaca

### Reference Books:

- Programming in Haskell, 2nd Edition, Graham hutton

### E-resources:

- <https://nptel.ac.in/courses/106/106/106106137/>
- [https://wiki.haskell.org/H-99: Ninety-Nine Haskell Problems](https://wiki.haskell.org/H-99:_Ninety-Nine_Haskell_Problems)
- <https://www.haskell.org/downloads/>



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III Year-I Semester	Professional Elective - I	L	T	P	C
		3	0	0	3
NOSQL DATA BASES					

#### Course Objectives:

The objective of this course is to

- Explore the emergence, requirements and benefits of a NoSQL database.
- Understand the basic architecture and data models of a NoSQL database (key-value stores, document databases, column-family stores, graph databases).

#### UNIT-I:

##### Introduction and Basic Concepts:

Overview, and History of NoSQL Databases, Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points, Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases.

#### UNIT-II:

##### NoSQL Key/Value databases using MongoDB:

**Document** Databases, What Is a Document Database? Features, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

#### UNIT-III:

##### Column- oriented NoSQL databases using Apache HBASE:

Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use.

**UNIT-IV:****NoSQL Key/Value databases using Riak:**

Key-Value Databases, What Is a Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, When Not to Use, Relationships among Data, Multioperation Transactions, Query by Data, Operations by Sets.

**UNIT-V:****Graph NoSQL databases using Neo4:**

NoSQL database development tools and programming languages, Graph Databases, What Is a Graph Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use.

**Course Outcomes:**

On completion of this course, the students will be able to

- i. Differentiate between various non-relational (NoSQL) database.
- ii. Create Document-oriented NoSQL databases using Mongo DB.
- iii. Create Column-oriented NoSQL databases using Apache HBASE.
- iv. Create NoSQL Key/Value databases using Riak.
- v. Create Graph NoSQL databases using Neo4.

**Text Books:**

- i. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pramod J. Sadalage, Martin Fowler, Pearson Education, 2013.
- ii. Shashank Tiwari. Professional NoSQL. John Wiley and Sons. ISBN: 978-0-470-94224-6.

**Reference Books:**

- i. A Guide to Modern Databases and the NoSQL Movement Edition, Redmond, E. & Wilson
- ii. Redmond, E. & Wilson, J. (2012). Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement (1<sup>st</sup> Ed.). Raleigh, NC: The Pragmatic Programmers, LLC.
- iii. Dan Sullivan. NoSQL for Mere Mortals. Addison-Wesley Professional. 2015.
- iv. Guy Harrison. Next-Generation Databases. Apress. 2016.



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year II Semester	Professional Elective-I	L	T	P	C
		3	0	0	3
<b>ADVANCED DATA STRUCTURES</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Data Structures for Integers and Hashing.
- ii. How to work with strings and patterns.
- iii. Balanced search trees and their complexity analysis.
- iv. Advanced heap trees for search operations and priority queues.

### UNIT - I:

#### Data Structures for Integers and Hashing:

Binary Trie, Xfast Trie, Yfast Trie, persistence, Bloom filters, Skip lists, Disjoint sets, Gap buffer.

### UNIT - II:

#### Data structures for strings:

Tries and Compressed Tries, Dictionaries Allowing Errors in Queries, Suffix Trees, Suffix Arrays.

### UNIT - III:

#### Advanced Search trees

Balanced Search Trees , Height-Balanced Trees , Weight-Balanced Trees , (a, b)- and B-Trees ,Red-Black Trees and Trees of Almost Optimal Height , Top-Down Rebalancing for Red-Black Trees ,Trees with Constant Update Time at a Known Location ,Finger Trees and Level Linking , Trees with Partial Rebuilding: Amortized Analysis ,Splay Trees: Adaptive Data Structures.

### UNIT - IV:

#### Tree Structures for Sets of Intervals

Interval Trees, Segment Trees , Trees for the Union of Intervals , Trees for Sums of Weighted Intervals,Trees for Interval-Restricted Maximum Sum Queries,Orthogonal Range Trees,Higher-Dimensional Segment Trees, Other Systems of Building Blocks, Range-Counting and the Semigroup Model, kd-Trees and Related Structures.

### UNIT - V:

#### Advanced Heaps :

Balanced Search Trees as Heaps, Array-Based Heaps, Heap-Ordered Trees and Half- Ordered Trees,Leftist Heaps , Skew Heaps ,BinomialHeaps, Changing Keys in Heaps,Fibonacci Heaps ,Heaps of Optimal Complexity , Double-Ended Heap Structures and Multidimensional Heaps.

**Course Outcomes:**

The students should be able to:

- i. Learn and understand advanced list structures.
- ii. Learn to use different data structures for string processing and pattern matching related tasks.
- iii. Learn and analyse different balanced search trees and their applications.
- iv. Learn and analyse tree Structures for Sets of Intervals.
- v. Understands the significance of Heaps in searching and other applications.

**Text Books:**

- i. Pat Morin, Open Data Structures(in C++), Edition 0.1 Gβ
- ii. Peter Brass, Advanced Data Structures, Cambridge University Press
- iii. M.A. Weiss, Data Structures and Algorithms Analysis in C++, Benjamin/Cummins, Redwood City, California, USA, 1994.

**Reference Books:**

- i. A.V. Aho, J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms, Addison Wesley, Reading Massachusetts, USA, 1983.
- ii. Donald Knuth. The Art of Computer Programming: Fundamental Algorithms, Third Edition. Addison-Wesley, 1997. ISBN 0-201-89683-4
- iii. Donald Knuth. The Art of Computer Programming Volume 3: Sorting and Searching, Third Edition. Addison-Wesley, 1997. ISBN 0-201-89685-0.
- iv. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms, Third Edition. MIT Press and PHI, 2010.
- v. Samet, Hanan, Foundations of multidimensional and metric data structures. Morgan Kaufmann, 2006, ISBN 978-0-12-369446-1.
- vi. Dinesh Mehta and Sartaj Sahni Handbook of Data Structures and Applications, Chapman and Hall/CRC Press, 2007.



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**University College of Engineering Vizianagaram**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>III Year – I Semester</b>	<b>Professional Elective-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ADVANCED COMPUTER ARCHITECTURE</b>					

**Course Objectives:**

- i.To understand the concept of Parallel Processing and its applications.
- ii. Implement the Hardware for Arithmetic Operations.
- iii.Analyze the performance of different scalar Computers.
- iv.To learn the Pipelining Concept for a given set of Instructions.
- v.Distinguish the performance of pipelining and non-pipelining environment in a processor.

**UNIT -I:**

**Fundamentals of Computer Design:** Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl's law. **Instruction Set Principles and Examples:** Introduction, Classifying instruction set- Memory addressing- type and size of operands, Operations in the instruction set.

**UNIT –II:**

**Pipelines:** Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties. **Memory Hierarchy Design:** Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

**UNIT -III:**

**Instruction Level Parallelism the Hardware Approach:** Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- Hardware based speculation.

**UNIT -IV:**

**ILP Software:** Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software. **The Processor:** Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, **Data Hazards:** Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

## **UNIT –V:**

**Multi Processors and Thread level Parallelism-** Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization, **Inter Connection and Networks:** Introduction, Interconnection network media, Practical issues in interconnecting networks, Static and Dynamic Networks, Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Chordal ring, Completely connected network, Cube connected cycles, Torus, K-ary-n cube, Barrel shifter, Single stage interconnection network, Multistage Interconnection Networks, Control Structure, Node degree, Diameter, Bisection width, Symmetric, Functionality, Network Latency, Bandwidth, Scalability, Cluster, Designing of clusters.

**Intel Architecture:** Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

### **Course Outcomes:**

After the completion of the course, student will be able to

- i. Understand the types of computers, and new trends and developments in computer architecture.
- ii. Develop pipelining, instruction set architectures, memory addressing.
- iii. Apply ILP using dynamic scheduling, multiple issue, and speculation.
- iv. Analyze the various techniques to enhance a processors ability to exploit Instruction-levelparallelism (ILP), and its challenges.
- v. Determine the importance of multithreading by using ILP and supporting thread-level parallelism (TLP).

### **Text Books:**

- i. Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5<sup>th</sup> edition, MK.
- ii. Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc GrawHill.
- iii. John L. Hennessy, David A. Patterson – Computer Architecture: A Quantitative Approach, 3rd Edition, An Imprint of Elsevier.

### **Reference Books:**

- i. Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
- ii. Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson.
- iii. Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs., MC Graw Hill.
- iv. Introduction to Parallel Computing, 2nd Edition, Pearson Education by Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar.

### **E-Resources:**

- i. <https://nptel.ac.in/courses/106/105/106105163/>





## B. Tech (Computer Science and Engineering) - R19 Syllabus

University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

III Year – I Semester	Professional Elective-I	L	T	P	C
		3	0	0	3
<b>MEAN STACK TECHNOLOGIES</b>					

### Course Objectives:

From the course the student will learn

- i. Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- ii. Writing optimized front end code HTML and JavaScript
- iii. Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- iv. Design and implementation of Robust and Scalable Front End Applications

### UNIT –I:

**Introduction to Web:** Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

### UNIT- II:

**JavaScript:** The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, \$eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

### UNIT –III:

**Node.js:** Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

### UNIT –IV:

**RESTful Web Services:** Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

### UNIT –V:

**Mongo DB:** Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

**Course Outcomes:**

After the completion of the course, student will be able to

- i. Enumerate the Basic Concepts of Web & Markup Languages
- ii. Develop web Applications using Scripting Languages & Frameworks
- iii. Make use of Express JS and Node JS frameworks
- iv. Illustrate the uses of web services concepts like restful, react js
- v. Apply Deployment Techniques & Working with cloud platform

**Text Books:**

- i. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
- ii. Web Technologies, Uttam K Roy, Oxford
- iii. Pro Mean Stack Development, ELadElrom, Apress
- iv. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
- v. JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
- vi. Web Hosting for Dummies, Peter Pollock, John Wiley Brand

**Reference Books:**

- i. Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
- ii. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
- iii. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
- iv. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
- v. Express.JS Guide, The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

**e-Resources:**

- i. <http://www.upriss.org.uk/perl/PerlCourse.html>



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year I Semester		L	T	P	C
		0	0	3	1.5
<b>COMPUTER NETWORKS LAB</b>					

### Course Objectives:

- i. Understand and apply different network commands
- ii. Analyze different networking functions and features for implementing optimal solutions  
Apply different networking concepts for implementing network solution
- iii. Implement different network protocols

### Experiments:

- 1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
- 2) Write a C program to develop a DNS client server to resolve the given hostname.
- 3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16 and CRC-CCIP.
- 4) Implement Dijkstra's algorithm to compute the Shortest path in a graph.
- 5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table at each node using distance vector routing algorithm
- 6) Take an example subnet of hosts. Obtain broadcast tree for it.
- 7) Write a client-server application for chat using UDP
- 8) Implement programs using raw sockets (like packet capturing and filtering)
- 9) Write a C program to perform sliding window protocol.
- 10) Get the MAC or Physical address of the system using Address Resolution Protocol.
- 11) Simulate the Implementing Routing Protocols using border gateway protocol(BGP)
- 12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.

- 13) Install Wireshark Tool on PC and use it to:
  - a) Capture network traffic
  - b) Determine default gateway address of your network
  - c) Examine frame format and contents of Ethernet frames
  - d) Filter and examine only ICMP traffic
  - e) Run various network services like ping, ssh, dns ..etc and examine the traffic captured by Wireshark
- 14) Simulate a three nodes point-to-point network with duplex links between them. Set the queue size vary the bandwidth and find the number of packets dropped.
- 15) Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.
- 16) Simulate the transmission of ping message over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
- 17) Simulate an Ethernet LAN using N-nodes (6-10), change error rate and data rate and compare the throughput.
- 18) Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and plot congestion window for different source/destination.

\* ns2/ns3/CISCO Packet Tracer/OPNET/any other network simulator may be used for simulation experiments.

#### **Course Outcomes:**

- i. Apply the basics of Physical layer in real time applications
- ii. Apply data link layer concepts, design issues, and protocols
- iii. Apply Network layer routing protocols and IP addressing
- iv. Implement the functions of Application layer and Presentation layer paradigms and Protocols



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III Year-I Semester		L	T	P	C
		0	0	3	1.5
<b>DATA MINING LAB</b>					

### Course Objectives:

- i. Practical exposure on implementation of well known data mining tasks and their effective use in discovering interesting hidden patterns from large datasets.
- ii . Exposure to real time data sets for analysis and prediction.
- iii. Focus is on the main process of data mining such as data preparation, classification, clustering, association analysis, and pattern evaluation

**Software Requirements:** WEKA Tool and R Programming/Python Programming

### LIST OF EXPERIMENTS:

1. Study of WEKA tool and applying data mining techniques on following data sets in ARFF or CSV file Format
2. Implementation / Usage of WEKA for classification of datasets such as customer's data, weather forecasting data, agricultural data etc.
3. Experiment to summarize and visualization of various datasets.
4. Experiment to demonstrate various data pre-processing techniques
5. Experiment to select prominent feature subsets of various datasets.
6. Experiment to Evaluate Information Gain of an attribute in the student database
7. Demonstration of classification rule process using j48 decision tree algorithm
8. Demonstration of classification rule process using ID3 decision tree algorithm
9. Experiment to predict the class using the Bayesian classification
10. Experiment to predict the class using the k-Nearest Neighbour classification
11. Experiment to implement weight & bias updating using the Back Propagation Neural Network
12. Demonstration of clustering process using k-means algorithm
13. Demonstration of mining frequent patterns using Apriori algorithm
14. Demonstration of mining frequent patterns using FP-Growth algorithm
15. Experiment to compare the performance of various data mining algorithms on the give data base.

**Course Outcomes:** After undergoing the course students will be able to:

- i. Create summary statistics for the given datasets.
- ii. Analyze various datasets and perform Data Pre-processing.
- iii. Apply various data mining algorithms on the give data set to select the appropriate one.
- iv. Develop skills and apply data mining tools for solving practical problems.
- v. Handling a small data mining project for a given practical domain.



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III Year-I Semester		L	T	P	C
		0	0	2	1
<b>COMPILER DESIGN LAB</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Implementation of a compiler for a basic language
- ii. Lex/Yacc specifications for designing frontend of a compiler
- iii. MIPS instruction set

### List of experiments

1. Check the output of different compilers gcc, g++, clang, clang++, javac, python etc by running respective language programs with different flags. (purpose to understand preprocessor, optimizations, linker)
2. The Language called TinyCStr is described as follows
  - a) Every TinyCStr program has one or more functions and syntax of function declaration and function definition is similar to C, one function must be main.
  - b) Every TinyCStr function has zero or statements
  - c) The possible statements are declaration, assignment, conditional statements (if,else, for, while) except switch.
  - d) TinyCStr supports primitive data types of C and a string data type
    - i. Implement a lexical analyser for TinyCStr using flex/lex
    - ii. Implement a parser for TinyCStr using bison/yacc and generate AST(Abstract Syntax Tree)
    - iii. Generate a 3-address code from the AST
    - iv. Generate MIPS instructions from 3-address code and run it on SPIM simulator
3. Write a program illustrating code optimization techniques:
  - i) Constant folding
  - ii) Copy propagation
  - iii) Common subexpression elimination
  - iv) Loop unrolling
  - v) Dead code elimination

### Course Outcomes:

The students should be able to:

- i. Understand the different phases of compilation and the working of compilers like gcc, clang etc
- ii. Implement lexical analyzer for any language
- iii. Implement parser for any language
- iv. Implement 3-address code generator for simple programming constructs
- v. Implement MIPS code generator by considering simple programming constructs

**Text Books:**

- i. flex & bison by John Levine Released August 2009 Publisher(s): O'Reilly Media, Inc.
- ii. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.

**Reference Books:**

- i. LLVM Cookbook, Mayur pandey

**E-resources:**

- i. <https://llvm.org/>
- ii. <https://gcc.gnu.org/>
- iii. [https://www.dsi.unive.it/~gasparetto/materials/MIPS\\_Instruction\\_Set.pdf](https://www.dsi.unive.it/~gasparetto/materials/MIPS_Instruction_Set.pdf)



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III Year-I Semester		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>EMPLOYABILITY SKILLS-II</b>					

### Course Objectives:

The main of this course is

- i. To learn how to make effective presentations and impressive interviews
- ii. To learn skills for discussing and resolving problems on the work site
- iii. To assess and improve personal grooming
- iv. To promote safety awareness including rules and procedures on the work site
- v. To develop and practice self management skills for the work site

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

#### UNIT –I:

- Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
- Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.

#### UNIT -II:

- Etiquette and Manners – Social and Business.
- Time Management – Concept, Essentials, Tips.
- Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

#### UNIT –III:

- Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
- Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.

#### UNIT -IV:

- Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress
- Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills.



## **UNIT –V:**

- Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

### **Course Outcomes:**

By the end of this course, the student

- Make presentations effectively with appropriate body language
- Recite the corporate etiquette, time management and Personality Development
- Be composed with Decision making and conflict management skills
- Apply their core competencies to succeed in professional and personal life
- Understand the importance of Emotional Intelligence

### **Reference Books:**

- Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
- English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-I Semester		L	T	P	C
		0	0	0	0.5
<b>SOCIALLY RELEVANT PROJECTS</b>					



## B. Tech (Computer Science and Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-II Semester		L	T	P	C
		3	0	0	3
WEB ESSENTIALS & SERVICES					

### Course Objectives:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

### UNIT-I:

#### HTML, CSS

Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5

**CSS:** Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution

### UNIT-II:

**Java script** The Basic of Java script: Objects, Primitives Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions

**DHTML:** Positioning Moving and Changing Elements.

### UNIT-III:

**XML:** Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches

**AJAX A New Approach:** Introduction to AJAX, Integrating PHP and AJAX.

### UNIT-IV:

**PHP Programming:** Introducing PHP: Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

### UNIT-V:

**Web Services:** JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client- Describing Web Services: WSDL- Representing Data Types: XML Schema- Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

**Course Outcomes:**

The students should be able to:

- i. Analyze a web page and Create web pages using XHTML and Cascading Styles sheets.
- ii. Build dynamic web pages.
- iii. Write simple client-side scripts using AJAX .
- iv. Build web applications using PHP.
- v. Describe a java web services.

**Text Books:**

- i. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
- ii. Web Technologies, Uttam K Roy, Oxford
- iii. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrell, Gosselin, Zak, Karparhi, MacIntyre, Morrissey, Cengage
- iv. Web Services An Introduction, B.V.Kumar, S.V. Subrahmanya

**Reference Books:**

- i. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, O'Reilly ( 2006)
- ii. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, O'Reilly (2012)
- iii. Web Technologies, HTML < JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
- iv. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning 5. <http://www.upriss.org.uk/perl/PerlCourse.html>



## B. Tech (Computer Science & Engineering)- R19 Syllabus

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III Year-II Semester</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ARTIFICIAL INTELLIGENCE</b>					

**Course Objectives:**

- i. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- ii. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- iii. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

**UNIT- I:**

**Introduction:** history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

**UNIT -II:**

**Problem solving:** state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A\*, constraint satisfaction.  
 Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

**UNIT –III:**

**Logic concepts:** Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

**UNIT -IV:**

**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.  
 Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

**UNIT –V:**

**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems  
 Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, dempster-shafer theory ,Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

**Course Outcomes:**

- i. Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- ii. Apply the language/framework of different AI methods for a given problem
- iii. Implement basic AI algorithms- standard search algorithms or dynamic programming
- iv. Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports
- v. Design Expert Systems using fuzzy logic theory

**Text Books:**

- i. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
- ii. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

**Reference Books:**

- i. Artificial Intelligence- Deepak Khemani, TMH, 2013
- ii. Introduction to Artificial Intelligence, Patterson, PHI
- iii. Artificial intelligence, structures and Strategies for Complex problem solving, - George F Luger, 5thed, PEA

**e-Resources:**

- i. <https://nptel.ac.in/courses/106/105/106105077/>
- ii. <http://aima.cs.berkeley.edu/>



## B.Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-II Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

### Course Objectives:

- The objectives of this course is to acquire knowledge on the
- To understand the software life cycle models.
  - To understand the software requirements and SRS document.
  - To understand the importance of modeling and modeling languages.
  - To design and develop correct and robust software products.

### UNIT – I:

**Software and Software Engineering:** The Nature of Software, The Unique Nature of WebApps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

**Process Models:** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

### UNIT - II:

**Requirements Analysis And Specification:** Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

**Software Design:** Overview of the Design Process, How to Characterize of a Design, Cohesion and Coupling, Layered Arrangement of Modules, Approaches to Software Design

### UNIT – III:

**Function-Oriented Software Design:** Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

**User Interface Design:** Characteristics of Good User Interface, Basic Concepts, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

### UNIT - IV:

**Coding And Testing:** Coding, Code Review, Software Documentation, Testing, Unit Testing, Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

## **UNIT - V:**

**Software Reliability And Quality Management:** Software Reliability, Statistical Testing, Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

**Software Maintenance:** Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management.

**Software Reuse:** what can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level

### **Course Outcomes**

- i. Define and develop a software project from requirement gathering to implementation.
- ii. Obtain knowledge about principles and practices of software engineering.
- iii. Focus on the fundamentals of modelling a software project.
- iv. Obtain basic knowledge of coding
- v. Obtain knowledge about estimation maintenance and reuse of software systems.

### **Text Books:**

- i. Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition McGrawHill International Edition.
- ii. Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.
- iii. Software Engineering, Ian Sommerville, Ninth edition, Pearson education

### **Reference Books:**

- i. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
- ii. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
- iii. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
- iv. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.





## B. Tech (Computer Science and Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year-II Semester		L	T	P	C
		3	0	0	3
MANAGEMENT AND ORGANIZATIONAL BEHAVIOUR					

### Course Objectives:

- To familiarize with the process of management and to provide basic insight into select contemporary management practices
- To provide conceptual knowledge on functional management Human resource management, strategic management and Organizational Behavior.

### Unit –I:

**Introduction:** Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

### Unit -II:

**Functional Management:** Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

### Unit –III:

**Strategic Management:** Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking, Balanced Score Card and other Contemporary Business Strategies.

**Unit -IV:**

**Individual Behavior:** Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow’s Theory of Human Needs, Douglas McGregor’s Theory X and Theory Y, Herzberg’s Two-Factor Theory of Motivation,

**Unit –V:**

**Group Dynamics:** Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

**Course Outcomes:**

- i. After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- ii. Will familiarize with the concepts of functional management and strategic management.

**Reference Books:**

- i. Subba Rao P., *Organizational Behaviour*, Himalaya Publishing House. Mumbai.
- ii. Fred Luthans *Organizational Behaviour*, TMH, New Delhi.
- iii. Robins, Stephen P., *Fundamentals of Management*, Pearson, India.
- iv. Kotler Philip & Keller Kevin Lane: *Marketing Mangement 12/e*, PHI, 2007
- v. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
- vi. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.



## **B. Tech (Computer Science and Engineering)- R19 Syllabus**

**University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>III Year-II Semester</b>	<b>Professional Elective - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MOOCs using -NPTEL/SWAYAM</b>					



## B. Tech (Computer Science & Engineering) - R19 Syllabus

University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

III Year-II Semester		L	T	P	C
		0	0	3	2
<b>WEB ESSENTIALS AND SERVICES LAB</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. To acquire knowledge of XHTML, Java Script and XML to develop web applications.
- ii. Ability to develop dynamic web content using Java Servlets and JSP.
- iii. To understand JDBC connections and Java Mail API.
- iv. To understand the design and development process of a complete web application.

### List of experiments

1. Design the following static web pages required for an online book store web site.

1) HOME PAGE:

The static home page must contain three frames.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "MCA" the catalogue for MCABooks should be displayed in the Right frame.

Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.


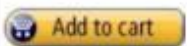

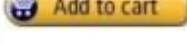

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			

2) login page

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	<p>Login : <input type="text" value="11a51f0003"/></p> <p>Password: <input type="password" value="*****"/></p> <p style="text-align: center;"> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </p>			

3) CATALOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA		Book : XML Bible Author : Winston Publication : Wiely	\$ 40.5	
MBA				
BCA		Book : AI Author : S.Russel Publication : Princeton hall	\$ 63	
		Book : Java 2 Author : Watson Publication : BPB publications	\$ 35.5	
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam	\$ 50	

#### 4. REGISTRATION PAGE:

Create a “registration form “with the following fields

- 1) Name (Text field)
- 2) Password (password field)
- 3) E-mail id (text field)
- 4) Phone number (text field)
- 5) Sex (radio button)
- 6) Date of birth (3 select boxes)
- 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
- 8) Address (text area)

5. Design a web page using CSS (Cascading Style Sheets) which includes the following:

- 1) Use different font, styles:

In the style definition you define how each selector should work (font, color etc.).

Then, in the body of your pages, you refer to these selectors to activate the styles

6. Write an XML file which will display the Book information which includes the following:

- 1) Title of the book
- 2) Author Name
- 3) ISBN number
- 4) Publisher name

5) Edition

6) Price

Write a Document Type Definition (DTD) to validate the above XML file.

7. Example PHP program for cotactus page.

8. User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.

1. Create a Cookie and add these four user id's and passwords to this Cookie.

2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ".

Use init-parameters to do this.

9. Example PHP program for registering users of a website and login.

10. Install a database(Mysql or Oracle).

Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form).

Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2)

11. Write a PHP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database ( similar to week8 instead of cookies).

12.Create tables in the database which contain the details of items (books in our case like Book name , Price, Quantity, Amount ) of each category. Modify your catalogue page (week 2)in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP

13.HTTP is a stateless protocol. Session is required to maintain the state. The user may add some items to cart from the catalog page. He can check the cart page for the selected items. He may visit the catalogue again and select some more items. Here our interest is the selected items should be added to the old cart rather than a new cart. Multiple users can do the same thing at a time(i.e., from different systems in the LAN using the ip-address instead of local host). This can be achieved through the use of sessions. Every user will have his own session which will be created after his successful login to the website. When the user logs out his session should get invalidated (by using the method session. Invalidate ).

Modify your catalogue and cart PHP pages to achieve the above mentioned functionality using sessions.

14. case study 1: Implement web application using PHP and MySql.

15. case study 2: Implement web application using PHP and Oracle.

**Course Outcomes:**

The students should be able to:

- 1) Students will be able to develop static web sites using XHTML and Java Scripts
- 2) To implement XML and XSLT for web applications
- 3) To develop JDBC connections
- 4) Develop Dynamic web application using Php and Oracle.
- 5) To implement a complete Dynamic web application

**TEXT BOOKS:**

1. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, MacIntyre, Morrissey, Cengage

**REFERENCE BOOKS:**

1. Ruby on Rails Up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly ( 2006)
2. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012)
3. Web Technologies, HTML< JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
5. <http://www.upriss.org.uk/perl/PerlCourse.html>



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

III Year II Semester		L	T	P	C
		0	0	3	1.5
AI TOOLS AND TECHNIQUES LAB					

### Course Objectives:

This course is introduced to

- Learn the fundamentals of most widely used Python packages NumPy, Pandas and Matplotlib, and then apply them to Data Analysis and Data Visualization projects.
- To introduce the fundamental techniques and principles of Neural Networks
- Teach students the leading trends and systems in natural language processing

### List Of Experiments:

- Numpy:** Illustrate the concepts multi-dimensional arrays and matrices, along with a large library of high-level mathematical functions to operate on these arrays using numpy
- Pandas:** Visualize New York Motor Vehicle Crash Data Using Python, Pandas, and Matplotlib.

### Datasets Details:

<https://data.ny.gov/Transportation/Motor-Vehicle-Crashes-Case-Information-Three-Year-4/e8ky-4vqe>

<https://data.ny.gov/Transportation/Motor-Vehicle-Crashes-Individual-Information-Three/ir4y-sesj>

<https://data.ny.gov/Transportation/Motor-Vehicle-Crashes-Violation-Information-Three-/abfj-y7uq>

<https://data.ny.gov/Transportation/Motor-Vehicle-Crashes-Vehicle-Information-Three-Ye/xe9x-a24f>

- Tensor-Flow:** Learn simple data curation by creating a pickle with formatted datasets for training, development and testing in Tensor Flow and develop visualizations in tensor board.
- Create convolutional neural networks in TensorFlow.
- Image recognition** (or image classification) : identifying images and categorizing them in one of several predefined distinct classes using neural network models.
- OpenCV:** Develop an online writing Whiteboard with minimal features for online classes
- Keras:** Recognize handwritten digits from MNIST using Keras
- Scikit-learn :** Write a Python program using Scikit-learn to split the iris dataset into 70% train data and 30% test data. Out of total 150 records, the training set will contain 120 records and the test set contains 30 of those records. Print both datasets
- Design a perceptron classifier to classify handwritten numerical digits (0-9). Implement using scikit or Weka.
- NLP:** Program to illustrate the concepts sentence segmentation, word tokenization, stemming and lemmatization, Hidden markov model(HMM) for Parts of speech (PoS) Tagging



**Course Outcomes:** Upon the successful completion of this course, students will be able to

- i. Apply the tools of AI in the field of Engineering.
- ii. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- iii. design and implement solutions to classification, regression, and clustering problems
- iv. Implement deep learning algorithms and solve real-world problems
- v. Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars, clustering and unsupervised methods

**References:**

- i. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012
- ii. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education
- iii. Chris Albon : Machine Learning with Python Cookbook , O'Reilly Media, Inc.2018

**Web Resources:**

- i. [https://scikit-learn.org/stable//\\_downloads/scikit-learn-docs.pdf](https://scikit-learn.org/stable//_downloads/scikit-learn-docs.pdf)
- ii. [docs.python.org > library](https://docs.python.org/library)
- iii. <https://opencv.org/>
- iv. <https://matplotlib.org/>



## B. Tech (Computer Science and Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

		L	T	P	C
III Year-II Semester		0	0	0	1.5
<b>Industrial Training / Internship/Research Projects in National Laboratories/Academic Institutions</b>					



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-I Semester		L	T	P	C
		3	0	0	3
<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>					

### Course Objective:

This course aims at training students to master the:

- i. The concepts of classical encryption techniques and concepts of finite fields and number theory
- ii. Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- iii. Design issues and working principles of various authentication protocols and PKI standards
- iv. Various secure communication standards including Kerberos, IPsec, SSL/TLS, S/MIME and PGP

### UNIT- I:

**Introduction to Security:** Security Attacks, Security Services, Security Mechanisms, Fundamental Security Design Principles, Attack Surfaces and Attack Trees, a Model for Network Security

**Mathematics of Cryptography:** Algebraic Structures (Groups, Rings, Fields and Galois Fields), Divisibility and the Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms

### UNIT- II:

**Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography

**Block Ciphers:** Traditional Block Cipher Structure, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles, Advanced Encryption Standard, AES Structure, AES Transformation Functions, AES Key Expansion, Multiple Encryption and Triple DES, Block Cipher Modes of Operation

### UNIT- III:

**Public-Key Cryptography:** Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie- Hellman Key Exchange, Elgamal Cryptographic System, Elliptic Curve Cryptography

**Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions, Requirements and Security, Secure Hash Algorithm (SHA)

**Message Authentication Codes:** Requirements for Message Authentication Codes, HMAC, CMAC

### UNIT- IV:

**Digital Signatures:** Digital Signatures, Elgamal Digital Signature Scheme, Schnorr Digital Signature Scheme, NIST Digital Signature Algorithm, Elliptic Curve Digital Signature Algorithm

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure

**User Authentication:** Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos, Remote User-Authentication Using Asymmetric Encryption:

**UNIT -V:**

**Transport-Level Security:** Web Security Considerations, Transport Layer Security, Secure Shell (SSH)

**Electronic Mail Security:** S/MIME, Pretty Good Privacy

**IP Security:** IP Security Overview, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange

**Course Outcomes:**

Upon completion of the course, it is expected that student will be able to:

- i. Identify information security goals and acquire fundamental knowledge on the concepts of finite fields and number theory
- ii. Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- iii. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- iv. Apply different digital signature algorithms to achieve authentication and create secure applications
- v. Apply network security basics, analyze different attacks on networks and evaluate the performance of security protocols like SSL, IPSec, and PGP

**Text Book:**

- i. Cryptography and Network Security, William Stallings, 8th Edition, Pearson Education

**Reference Books:**

- i. Cryptography, Network Security and Cyber Laws, Bernard L. Menezes, Ravinder Kumar, Cengage Learning.
- ii. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyaya, 3rd Edition, Mc-GrawHill.
- iii. Network Security Illustrated, Jason Albanese, Wes Sonnenreich, McGraw Hill.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

IV Year-I Semester		L	T	P	C
		3	0	0	3
<b>UML &amp; DESIGN PATTERNS</b>					

### Course Objectives:

- i. Introducing the Unified Process and showing how UML can be used within the process.
- ii. Presenting a comparison of the major UML tools for industrial-strength development.
- iii. Demonstration of patterns related to object-oriented design.
- iv. Describe the design patterns that are common in software applications.
- v. Analyze a software development problem and express it.

### UNIT-I:

**Introduction to UML:** Why we Model, Importance of modeling, Principles of modeling, Object-oriented modeling, Conceptual model of the UML, Architecture, Software Development Life Cycle.

**Structural Modeling:** Classes, Relationships, Common Mechanisms, and Diagrams, Advanced classes, advanced relationships, Object diagrams: Common modeling techniques.

### UNIT-II:

**Basic Behavioral Modeling:** Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams, Common modeling techniques for Interaction diagrams, Use case diagrams and Activity diagrams.

**Advanced Behavioral Modeling:** Events and Signals, State machines, Processes and Threads, Time and Space, State chart diagrams with Common modeling techniques.

**Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams. Common modeling techniques for Component and Deployment diagrams. Case Study: The Unified Library application.

### UNIT-III:

**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-IV:

**Creational Patterns:** Abstract Factory, Builder, Factory Method, Prototype, Singleton.

**Structural Pattern:** Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

### UNIT-V:

**Behavioral Patterns:** Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, What to expect from Design Patterns.

**Course Outcomes:**

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

- i. Ability to find solutions to the complex problems using UML approach.
- ii. Understand design principles of behavioral modeling and architectural modeling.
- iii. Distinguish between different categories of design patterns.
- iv. Analyze and Apply appropriate patterns for design of given problem.
- v. Design and Develop the software using Pattern Oriented Architectures.

**Text Books:**

- i. “The Unified Modeling Language User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.
- ii. Design Patterns by Erich Gamma, Pearson Education.
- iii. “Object- Oriented Analysis And Design with Applications”, Grady BOOCH, RobertA. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, KelliaHouston, 3rd edition, 2013, PEARSON.

**Reference Books:**

- i. “The Unified modeling language Reference manual”, James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley.
- ii. “Object-oriented analysis and design with the Unified process”, John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning.
- iii. Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.
- iv. Java Enterprise Design Patterns Vol-III By Mark Grand Wiley Dream Tech.
- v. “Head first object-oriented analysis and design”, Brett D. McLaughlin, Gary Pollice, Dave West, O’Reilly.
- vi. “Object-oriented analysis and design using UML”, Mahesh P. Matha, PHI.

**E-Resources:**

- i. <https://nptel.ac.in/courses/106/105/106105224/>
- ii. [https://www.tutorialspoint.com/design\\_pattern/design\\_pattern\\_quick\\_guide.htm](https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.htm)



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IV Year-I Semester		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MACHINE LEARNING</b>					

### Course Objectives:

The objective of this course is to

- i. Introduce students to the basic concepts and techniques of Machine Learning.
- ii. Provide understanding of techniques, mathematical concepts, and algorithms used in machine learning to facilitate further study in this area.
- iii. Provide understanding of the limitations of various machine learning algorithms and the way to evaluate performance of machine learning algorithms.

### 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.

### UNIT –II:

#### Decision Tree Learning:

Introduction, Decision Tree Representation, Decision tree learning algorithm, Inductive bias, Issues in Decision tree learning.

#### Evaluation Hypotheses:

Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

### UNIT –III:

#### Artificial Neural Networks:

Introduction, Neural network representation, Appropriate problems for Neural Network Learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

#### **UNIT –IV:**

##### **Bayesian Learning:**

Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.

**Computational Learning Theory** – Sample Complexity for Finite, Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning.

#### **UNIT –V:**

**Instance-Based Learning** – k-Nearest Neighbor Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.

**Genetic Algorithms** – an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithm.

**Reinforcement Learning** - The Learning Task, Q Learning.

#### **Course Outcomes:**

On completion of this course, the students will be able to

- i. Recognize the characteristics of machine learning that make it useful to real-world problems.
- ii. Design decision tree to solve classification problems.
- iii. Design neural network to solve classification and function approximation problems.
- iv. Comprehend probabilistic methods for learning.
- v. Build optimal classifiers using genetic algorithms.

#### **Text Books:**

- i. Tom.M.Mitchell, Machine Learning, McGraw Hill International Edition

#### **Reference Books:**

- i. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006
- ii. Duda, Hart and Stork, "Pattern Classification" (2nd ed.), Wiley Interscience, 2000
- iii. EthernAlpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India, 2005.
- iv. Elements of Statistical Learning, T. Hastie, R. Tibshirani and J. Friedman, Springer, 2001.
- v. Machine Learning: A Probabilistic Perspective, K. Murphy, MIT Press, 2012.

#### **Online Resources:**

- i. AndrewNg, "MachineLearning", StanfordUniversity <https://www.coursera.org/learn/machine-learning/home/info>
- ii. Sudeshna Sarkar, "Introduction to Machine Learning", IIT Kharagpur. <https://nptel.ac.in/courses/106105152/1>
- iii. Prof. BalaramanRavindran, "Introduction to Machine Learning", IIT Madras. <https://nptel.ac.in/courses/106106139/1>





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<b>IV Year-I Semester</b>	<b>Professional Elective-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MOBILE COMPUTING</b>					

### Course Objectives:

- i. To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- ii. To understand the typical mobile networking infrastructure through a popular GSM protocol
- iii. To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- iv. To understand the database issues in mobile environments & data delivery models.
- v. To understand the ad hoc networks and related concepts.
- vi. To understand the platforms and protocols used in mobile environment.

### UNIT-I:

**Introduction:** Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications, Architecture, Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

**GSM and Other Networks:** Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, Wireless Medium Access Control, 3G and 4G communication networks.

### UNIT-II:

**Mobile Network Layer:** IP: IPV4 and IPV6 and Mobile IP Network Layers, Packet Delivery Agent Discovery, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

**Introduction to Mobile Adhoc network:** fixed infrastructure architecture, MANET infrastructure

Architecture, MANET: properties, spectrum, applications, Security in Ad-hoc network, Wireless sensor networks, sensor network applications.

### UNIT-III:

**Mobile Transport Layer:** Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

**Database Issues:** Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

### UNIT-IV:

**Data Dissemination and Synchronization:** Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization: Introduction, Software, and Protocols.

**UNIT -V:**

**File Systems:**Coda, Little work, Ficus, Mio-NFS and Rover

**Protocols and Platforms for Mobile Computing:** WAP, Bluetooth, XML, J2ME, Java Card, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

**Course Outcomes:**

- i. Understand the fundamentals of wireless communications.
- ii. Able to develop new ad hoc network applications or algorithms or protocols.
- iii. To solve various issues arises while transferring data from one device to another in the network.
- iv. To know different data delivery methods and synchronization protocols .
- v. Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts.

**Text Books:**

- i. Jochen Schiller, “Mobile Communications”, Addison-Wesley.
- ii. Raj Kamal, “Mobile Computing”, Oxford University Press.

**Reference Books:**

- i. Asoke K Talukder and Roopa R Yavagal, Mobile Computing, Tata-McGraw-Hill.
- ii. “Principles of Mobile Computing,”, UWE Hansmann, LotharMerk, Martin S. Nocklous, Thomas Stober, Springer.



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		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>DATA SCIENCE</b>					

### Course Objectives:

- i. Introduce PYTHON and R as a programming language
- ii. Introduce the mathematical foundations required for data science
- iii. Introduce the first level data science algorithms
- iv. Introduce a data analytics problem solving framework
- v. Introduce a practical capstone case study

### UNIT –I:

#### Programming for Data Science:

**Python Programming for Data Science:** Writing functions, logic, control flow , aswell as common data analysis libraries like NumPy and pandas

**R Programming for Data Science:** Data Structures for Data Science

**SQL programming:** Querying databases using joins, aggregations, and subqueries

**Comfortable with using the Terminal:** version control in Git, and using GitHub

### UNIT –II:

#### Probability and Statistics:

**Descriptive Statistics:** Calculating measures of center and spread, estimation distributions

**Inferential Statistics:** Sampling distributions, hypothesis testing

**Probability:** Probability theory, conditional probability

### UNIT –III:

**Data wrangling:** Accessing database, CSV, and JSON data, Data cleaning and transformations using pandas and Sklearn, Data visualization with matplotlib, exploratory data analysis and visualization ,Explanatory data visualizations and dashboards

### UNIT –IV:

#### Machine Learning

Feature Engineering, Supervised Learning: Regression, classification, decision trees, random forest, Unsupervised Learning: PCA, Clustering

## **UNIT –V:**

### **Applications (Capstone Project)**

Data Science Applications on Banking Domain, Telecommunication Domain, Healthcare Domain and Airline Domains.

**Case Study 1:** Predicting Bank-Loan Defaults with Logistic Regression Model Business Problem: To predict the probability of the bank-loan default.

Business Solution: To build the logistic regression model

**Case Study 2:** Predicting Customer Churn with Decision Tree Model Business Problem: To predict the probability of the customer churn.

Business Solution: To build the Decision tree model.

**Case Study 3:** Predicting Probability of Malignant and Benign Breast Cancer with Random Forest Model Business Problem: To predict the probability of malignant and benign breast cancer.

Business Solution: To build the Random Forest Model.

**Case Study 4:** Predicting Flight Delays with Multiple Linear Regression Model Business Problem: To predict the flight arrival delays.

Business Solution: To build the multiple linear regression model.

### **Course Outcomes:**

As a graduate of this program, you will be able to:

- i. Describe and Use Python and SQL to access and analyze data from several different data sources. Develop R codes for data science solutions .
- ii. Use principles of statistics and probability to design and execute A/B tests and recommendation engines to assist businesses in making data-automated decisions.
- iii. Apply and Access various data repositories and data cleaning and transformation and visualization methods to assist businesses in making data-automated decisions.
- iv. Apply Feature Engineering techniques , Machine Learning Tools and Techniques
- v. Construct use cases to validate approach and identify modifications required (Creating)

### **Text Books:**

- i. Elements of Statistical Learning, Machine Learning: A Probabilistic Perspective, Python Machine Learning
- ii. INTRODUCTION TO LINEAR ALGEBRA - BY GILBERT STRANG
- iii. APPLIED STATISTICS AND PROBABILITY FOR ENGINEERS – BY DOUGLAS MONTGOMERY
- iv. Deepti Gupta,” Applied Analytics through Case Studies Using SAS and R”, Asia-Pacific Holdings Private Limited,2018

### **Reference Books:**

- i. Deborah Nolan, Duncan Temple Lang,“Data Science in R: A Case Studies Approach to Computational Reasoning and Problem Solving”, CRC Press,2015
- ii. Kerrie Mengersen,PierrePudlo,Christian Robert P.,” Case Studies in Applied Bayesian DataScience”, Springer International Publishing,2020.
- iii. Danish Haroon,”Python Machine Learning Case Studies”, Apress,2017
- iv. Peter Haber,ThomasLampoltshammer, Manfred Mayr “Data Science – Analytics and Applications”, Springer Vieweg,2019.

### **E-Resources:**

- i. <https://link.springer.com/content/pdf/bfm%3A978-1-4842-3525-6%2F1.pdf>
- ii. Data Science for Engineers : By Prof. Raghunathan Rengasamy& Prof. Shankar Narasimhan IIT Madras
- iii. <https://www.coursera.org/learn/case-studies-business-analytics-accenture>
- iv. <https://intellipaat.com/data-scientist-course-training/>
- v. <http://www.millionlights.university/datascience>



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-I Semester	Professional Elective-III	L	T	P	C
		3	0	0	3
COMPUTER VISION					

### Course Objectives:

- To understand the Fundamental Concepts Related to Multi-Dimensional Signal Processing.
- To understand Feature Extraction algorithms.
- To understand Visual Geometric Modeling and Stochastic Optimization.

### UNIT - I:

Image Formation and Description: Fundamental steps of image processing, the image model and Image acquisition, Sampling and quantization, Relationship between pixels. Sampling & Quantization, Elements of Digital Image Processing Systems. Image Transforms: Digital Image Transforms - Fourier Transform, Extension to 2D. Properties of Fourier transformations.

### UNIT -II:

**Image Enhancements:** Histogram Equalization, Image Smoothing, Image Sharpening, Edge Detection.

**Segmentation:** Active contours, Split and merge, Mean shift and mode finding, Normalized cuts. Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation.

### UNIT -III:

**Structure from motion:** Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, constrained structure and motion Dense motion estimation: Translational alignment, parametric motion, Spline based motion, Optical flow, Layered motion.

### UNIT -IV:

**Recognition:** Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

### UNIT -V:

**3D Reconstruction:** Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction.

**Course Outcomes:**

After completion of the course, students will be able to

- i. To develop algorithms and techniques to analyze and interpret the visible world around us.
- ii. To implement boundary tracking techniques.
- iii. To analyze Patterns in images
- iv. To apply in the field of Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.
- v. To explore and contribute to research and further developments in the field of computer vision.

**Text Books:**

- i. R. C. Gonzalez and R. E. Woods “Digital Image Processing” , Fourth Edition, Addison Wesley 2018,
- ii. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
- iii. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

**References:**

- i. “Pattern Recognition: Statistical. Structural and Neural Approaches”; Robert J. Schalkoff; John Wiley and Sons; 1992.
- ii. “Computer Vision: A Modern Approach”; D. A. Forsyth and J. Ponce; Pearson Education; 2003.
- iii. "Multiple View geometry". R. Hartley and A. "Zisserman. 2002 Cambridge university Press".
- iv. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
- v. K. Fukunaga; "Introduction to Statistical Pattern Recognition", Second Edition, Academic Press, Morgan Kaufmann, 1990.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

IV Year-I Semester	Professional Elective-III	L	T	P	C
		3	0	0	3
<b>INTERNET OF THINGS</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. What IoT is and how it works today and to Understand the Architectural Overview of IoT
- ii. To Understand the IoT Reference Architecture and RealWorld Design Constraints
- iii. To Understand the various IoT Protocols.
- iv. To understand and program IoT devices.

### UNIT - I: Introduction to IOT

Understanding IoT fundamentals, IOT Architecture and protocols, Various Platforms for IoT, Real time Examples of IoT , Overview of IoT components and IoT Communication Technologies ,Challenges in IOT.

### UNIT - II: Arduino Simulation Environment

Arduino Uno Architecture, Setup the IDE, Writing Arduino Software, ArduinoLibraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino , Interfacing Arduino with LCD.

#### Sensor & Actuators with Arduino

Overview of Sensors working, Analog and Digital Sensors,Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino,Interfacing of Actuators with Arduino.Interfacing of Relay Switch and Servo Motor with Arduino.

### UNIT - III: Raspberry Pi Programming

Installing and **Configuring** the Raspberry Pi,Getting Started with the Raspberry Pi,Using the Pi as a Media Centre, Productivity Machine and Web Server,Remote access to the Raspberry Pi. Preparing

#### Raspberry Pi for IoT Projects.

Creating the Sensor Projects,Creating the actuator Projects, Creating a IoT controller, creating a camera and working with HTTP protocol.

### UNIT - IV: Basic Networking with ESP8266 WiFi module

Basics of Wireless Networking ,Introduction to ESP8266 Wi-Fi Module ,Various Wi-Fi library , Web server- introduction, installation, configuration ,Posting sensor(s) data to web server .IoT Protocols ,M2M vs. IOT Communication Protocols.

### UNIT - V: Cloud Platforms for IOT

Virtualization concepts and Cloud Architecture , Cloud computing, benefits ,Cloud services -- SaaS, PaaS, IaaS , Cloud providers & offerings ,Study of IOT Cloud platforms , ThingSpeak API and MQTT , interfacing ESP8266 with Web services

**Course Outcomes:**

The students should be able to:

- i. Recognize the factors that contributed to the emergence of IoT
- ii. Design and program IoT devices like Microcontrollers, sensors and actuators.
- iii. Use real IoT protocols for communication.
- iv. Define the infrastructure for supporting IoT deployment.
- v. Design an IoT device to work with a Cloud Computing infrastructure and Transfer IoT data to the cloud and in between cloud providers.

**Text Books:**

- i. Simon Monk, Programming Arduino: Getting Started with Sketches, Second Edition McGraw- Hill Education
- ii. Peter Waher, Learning Internet of Things, Packt publishing.
- iii. Ovidiu Vermesan, Peter Friess, IoT-From Research and Innovation to Market deployment, River Publishers

**Reference Books:**

- i. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
- ii. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
- iii. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.





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**University College of Engineering Vizianagaram**  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>IV Year-I Semester</b>	<b>Professional Elective-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SOFTWARE PROJECT MANAGEMENT</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. To study how to plan and manage projects at each stage of the software development life cycle (SDLC)
- ii. To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
- iii. To understand successful software projects that support organization's strategic goals.

### UNIT-I:

**Conventional Software Management:** The Waterfall Model, Conventional Software Management Performance.

**Evolution Of Software Economics:** Software Economics, Pragmatic Software Cost Estimation.

**Improving Software Economics:** Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation through Software Economics.

### UNIT-II:

**The Old Way and the New:** The Principles of Conventional Software Engineering, The Principles of Modern Software Management, Transitioning to an Iterative Process.

**Life Cycle Phases:** Engineering and Production Stages, Inception Phase, Elaboration Phase, Construction Phase, Transition Phase.

### UNIT-III:

**Model Based Software Architectures:** A Management Perspective, A Technical Perspective.

**Workflows of the Process:** Software Process Workflows, Iteration Workflows.

**Iterative Process Planning:** Work Breakdown Structures, Planning Guidelines, The Cost and Schedule Estimating Process, The Iteration Planning Process.

### UNIT-IV:

**Project Organization and Responsibilities:** Line-Of-Business Organizations, Project Organizations, Evolution of Organizations.

**Project Control and Process Instrumentation:** The Seven Core Metrics, Management Indicators, Quality Indicators Modern Project Profiles. The COCOMO Cost Estimation Model: COCOMO.

### UNIT-V:

**Effort Estimation and Scheduling:** Effort Estimation, Scheduling.

**Quality Planning:** Quality Concepts, Quantitative Quality Management Planning. RISK MANAGEMENT: Risk Assessment, Risk Control.

**Course Outcomes:**

The students should be able to:

- i. Estimate overall cost of a software project.
- ii. Explain software development process.
- iii. Distinguish workflows of process.
- iv. Design project organization structure & analyze quality.
- v. Estimate effort and schedule needed for project.

**Textbooks:**

- i. Walker Royce, “Software Project Management – A UnifiedFramework”, 1stEdition, Pearson Education, 2002.
- ii. PankajJalote, “Software Project Management in Practice”, 1stEdition, Pearson Education, 2005.
- iii. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill.

**References:**

- i. Bob Hughes, “Mike Cotterell, Rajib Mall, Software ProjectManagement”, 5thEdition, McGraw-Hill Higher Education, 2011.
- ii. Joel Henry, “Software Project Management”, 1st Edition, Pearson Education, 2006.
- iii. Norman E. Fenton, Shari Lawrence Pfleeger, “Software Metrics: A Rigorous and Practical Approach “, 1st Edition, PWS Publishing Company, 1997



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### JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-I Semester	Professional Elective-III	L	T	P	C
		3	0	0	3
<b>PROGRAM ANALYSIS</b>					

#### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Classical data flow analysis and its use
- ii. Pointer analysis and applications of pointer analysis
- iii. Static single assignment form and its application in compiler design

#### UNIT - I:

**Data Flow Analysis:** Available expressions analysis, Live variables analysis, Reaching definitions analysis, Anticipable expressions analysis, A taxonomy of data flow analysis, Iterative and worklist based data flow analysis

#### UNIT - II:

**Theoretical Abstractions in Data Flow Analysis:** Lattice, flow functions, monotone frameworks, confluence operators, MFP(Maximal Fixed Point)/MOP(Meet Over Paths) solution

#### UNIT - III:

Introduction to interprocedural data flow analysis, Call graph, Functional Approach, Call Strings base method, Value context based interprocedural analysis

#### UNIT - IV:

##### Pointer analysis:

Introduction, issues in different languages Flow insensitive: Anderson's and Steensgard's approaches  
Flow sensitive pointer analysis, context-insensitive vs context sensitive pointer analysis, Generalized Points-to Graph(GPG) based points-to analysis

#### UNIT - V:

##### Static Single Assignment Form (SSA):

Definition of SSA, Standard SSA construction and destruction algorithms, sparse data flow analysis.

#### Course Outcomes:

The students should be able to:

- i. Apply data flow analysis techniques to calculate various properties of small programs
- ii. Understand the mathematical ideas used in data flow analysis techniques
- iii. Apply data flow analysis techniques to calculate various properties of small programs with more than one function
- iv. Understanding pointer analysis and its applications
- v. Construct static single assignment form for any program

**Text Books:**

- i. Data Flow Analysis: Theory and Practice, Khedker, Sanyal, Karkare, CRC Press 2009.
- ii. Advanced Compiler Design and Implementation, Muchnick, Morgan Kaufmann 1997.

**Reference Books:**

- i. Principles of Program Analysis: Nielson, Nielson, Hankin, Springer 2004
- ii. Compilers: Principles, Techniques and Tools (2nd Edition), Aho, Lam, Sethi, Ullman, Addison Wesley 2006.

**E-resources:**

- i. SSA-based compiler Design, <http://ssabook.gforge.inria.fr/latest/book.pdf>
- ii. Generalized Points-to Graphs: A Precise and Scalable Abstraction for Points-to Analysis, <https://dl.acm.org/doi/abs/10.1145/3382092>



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-I Semester	Professional Elective-IV	L	T	P	C
		3	0	0	3
<b>SOFTWARE TESTING METHODOLOGIES</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Describe the principles and procedures for designing test cases.
- ii. Provide supports to debugging methods.
- iii. Acts as the reference for software testing techniques and strategies.

### 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 Flows Testing:** Transaction Flows, Transaction Flow Testing Techniques.

**Dataflow Testing:** Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow 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.

**Syntax Testing:** Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips.

**Based Testing:** Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

### UNIT-IV:

**State, State Graphs And Transition Testing:** State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

#### Graph Matrices and Application:

Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

### UNIT-V:

**Software Testing Tools:** Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, Selenium About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

**Course Outcomes:**

The students should be able to:

- i. Define Software testing terminology and methodology
- ii. Discuss and Classify various testing techniques for conducting different types of software testing
- iii. Apply different software testing techniques.
- iv. Construct test cases by understanding test suite management and software quality management.
- v. Demonstrate modern software testing tools and testing of Object Oriented Software and Web based software

**Text Books:**

- i. Software testing techniques – Boris Beizer, Dreamtech, second edition.
- ii. Software Testing- Yogesh Singh, Cambridge

**Reference Books:**

- i. The Craft of software testing - Brian Marick, Pearson Education.
- ii. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
- iii. Software Testing, N.Chauhan, Oxford University Press.
- iv. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
- v. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
- vi. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
- vii. Win Runner in simple steps by Hakeem Shittu, Genixpress, 2007.
- viii. Foundations of Software Testing, D.Graham& Others, Cengage Learning.



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IV Year – I Semester	Professional Elective-IV	L	T	P	C
		3	0	0	3
<b>PARALLEL COMPUTING</b>					

### Course Objective:

- i. Demonstrate an understanding of concepts, algorithms, and design principles underlying parallel computing,
- ii. Develop algorithm design and implementation skills
- iii. Gain practical experience in programming large scale parallel machines.

### UNIT -I:

**Introduction to Parallel Computing:** Scope of Parallel Computing, Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-Processor Mapping and Mapping Techniques.

**History:** Introduction, Modern Scientific Method, Evolution of Super computing, Modern Parallel Computers, Seeking Concurrency, Data Clustering, Programming Parallel Computers.

**Parallel Architectures:** Introduction, Interconnection Networks, Processor Arrays, Multiprocessors, Multi computers, Flynn's Taxonomy.

### UNIT -II:

**Parallel Algorithm Design:** Introduction, The Task/Channel Model, Foster's Design Methodology, Boundary Value Problem, Finding the Maximum, The n-Body Problem, Adding Data Input. **Message-Passing Programming:** Introduction, The Message-Passing Model, The Message-Passing Interface, Circuit Satisfiability, Introducing Collective Communication, Benchmarking Parallel Performance. **Basic Communication Operations:** One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations.

### UNIT -III:

**The Sieve of Eratosthenes:** Introduction, Sequential Algorithm, Sources of Parallelism, Data Decomposition options, Developing the Parallel Algorithm, Analysis of Parallel Sieve Algorithm, Documenting the Parallel Program, Benchmarking, Improvements. **Performance Analysis:** Introduction, Speedup and Efficiency, Amdahl's Law, Gustafson-Barsis's Law, The Karp-Flatt Metric, The Iso-efficiency Metric.

#### **UNIT -IV:**

**Matrix Multiplication:** Introduction, Sequential Matrix Multiplication, Row wise Block-Striped Parallel Algorithm, Cannon's Algorithm, Solving Linear Systems, Back Substitution, Gaussian Elimination, Iterative Methods, **Sorting:** Introduction, Quick sort, A Parallel Quick sort Algorithm, Hyper Quick sort Algorithm, Parallel Sorting by Regular Sampling.

#### **UNIT -V:**

**Shared-Memory Programming:** Introduction, The Shared-Memory Model, Parallel for Loops, Declaring Private Variables, Critical section, Reductions, Performance Improvements, More General Data Parallelism, Functional Parallelism. **Combining MPI and OpenMP:** Introduction, Conjugate Gradient Method, Jacobi Method. **Analytical Modelling of Parallel Programs:** Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, The Effect of Granularity on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs, Other Scalability Metrics.

#### **Course Outcomes:**

After the completion of the course, student will be able to

- i. Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.
- ii. Develop an efficient parallel algorithm to solve it.
- iii. Apply and Analyze a parallel algorithm time complexity as a function of the problem size and number of processors.
- iv. Analyze parallel code performance, determine computational bottlenecks, and optimize the performance of the code.
- v. Implement parallel algorithm using MPI, OpenMP, pthreads, or a combination of MPI and OpenMP.

#### **Text Books:**

- i. Parallel Programming in C with MPI and OpenMP Michael J, Quinn Oregon State University.
- ii. Introduction to parallel computing by Ananth Grama, Anshul Gupta, Gorge Karypis, Vipin Kumar, Pearson.

#### **Reference books:**

- i. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things 1st Edition, Kai Hwang , Jack Dongarra, Geoffrey C. Fox.
- ii. Programming Massively Parallel Processors by D.Kirk and W. Hwu.

#### **E-Resources:**

- i. <https://nptel.ac.in/courses/106/102/106102114/>





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IV Year-I Semester	Professional Elective-IV	L	T	P	C
		3	0	0	3
<b>SOCIAL NETWORKS &amp; SEMANTIC WEB</b>					

### Course objectives:

This course will enable students to

- i. Explain the fundamentals of Semantic Web technologies.
- ii. Implementation of semantic web applications and the architectures of social networking
- iii. Social network performance analysis

### Unit -I:

Web Intelligence Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

### Unit- II:

Knowledge Representation for the Semantic Web Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

### Unit- III:

Ontology Engineering, Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

### Unit -IV:

Semantic Web Applications, Services and Technology Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

### Unit -V:

Social Network Analysis and semantic web What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

## **Course Outcomes**

The students should be able to:

- i. Demonstrate the semantic web technologies like RDF Ontology and others
- ii. Learn the various semantic web applications
- iii. Identify the architectures and challenges in building social networks
- iv. Analyze the performance of social networks using electronic sources
- v. Learn and build Semantic web Applications

## **Text Books:**

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

## **Reference Books:**

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group).
3. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly.



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IV Year-I Semester	Professional Elective-IV	L	T	P	C
		3	0	0	3
<b>AD-HOC AND SENSOR NETWORKS</b>					

### Course Objectives:

- i. To learn about the issues and challenges in the design of wireless ad hoc networks.
- ii. To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- iv. To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- iv. To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

### UNIT-I:

#### Routing:

Cellular and Ad hoc wireless networks, Issues of MAC layer and Routing, Proactive, Reactive and Hybrid Routing protocols, Multicast Routing, Tree based and Mesh based protocols, Multicast with Quality of Service Provision

### UNIT-II:

#### Quality of Service:

Real-time traffic support , Issues and challenges in providing QoS , Classification of QoS Solutions ,MAC layer classifications ,QoS Aware Routing Protocols ,Ticket based and Predictive location based QoS Routing Protocols

### UNIT-III:

#### Energy Management Ad Hoc Networks:

Need for Energy Management, Classification of Energy Management Schemes, Battery Management and Transmission Power Management Schemes, Network Layer and Data Link Layer Solutions, System power Management schemes

### UNIT-IV:

#### Mesh Networks:

Necessity for Mesh Networks, MAC enhancements, IEEE 802.11s Architecture, Opportunistic Routing,  
Self Configuration and Auto Configuration, Capacity Models, Fairness, Heterogeneous Mesh Networks, Vehicular Mesh Networks

### UNIT -V:

#### Sensor Networks:

Introduction –,Sensor Network architecture , Data Dissemination ,Data Gathering ,MAC Protocols for sensor Networks, Location discovery, Quality of Sensor Networks ,Evolving Standards ,Other Issues, Recent trends in Infrastructure less Networks

**Course Outcomes:**

- i. Know the basics of Ad hoc networks and Wireless Sensor Networks.
- ii. Identify the issues and challenges in providing QoS.
- iii. To know how the resources are managed in the network.
- iv. To get an idea about various types of mesh networks.
- v. Specify and identify deficiencies in existing wireless protocols for MAC layer and Network layer, and then go on to formulate new and better protocols.

**Text Books:**

- i. C.Siva Ram Murthy and B.S.Manoj, Ad Hoc Wireless Networks – Architectures and Protocols, Pearson Education.
- ii. Holger Karl, Andreas Willing, Protocols and Architectures for Wireless Sensor Networks, John Wiley and Sons, Inc.

**Reference Books:**

- i. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, Ad Hoc Mobile Wireless Networks, Auerbach Publications.
- ii. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal, Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition), World Scientific Publishing.
- iii. Walteneus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons.



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IV Year I Semester	Professional Elective - IV	L	T	P	C
		3	0	0	3

**CYBER SECURITY & FORENSICS**

### Course Objectives:

- i. Able to identify security risks and take preventive steps
- ii. To understand the forensics fundamentals
- iii. To understand the evidence capturing process
- iv. To understand the preservation of digital evidence

### UNIT –I:

**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

### UNIT –II:

**Tools and Methods :** Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

### UNIT –III:

**Cyber Crime Investigation:** Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

### UNIT –IV:

**Computer Forensics and Investigations:** Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

### UNIT –V:

**Cyber Crime Legal Perspectives:** Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and

**Course Outcomes:**

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

- i. Enumerate the computer forensics fundamentals
- ii. Describe the types of computer forensics technology
- iii. Analyze various computer forensics systems
- iv. Illustrate the methods for data recovery, evidence collection and data seizure
- v. Identify the Role of CERT-In Security

**Text Books:**

- i. Sunit Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY, 2011.
- ii. Nelson Phillips and Enfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.

**Reference Books:**

- i. Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hacking and Network Defence”, Cengage, 2019.
- ii. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
- iii. Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar “Cyber Security and Cyber Laws”, Cengage, 2018.

**E-Resources:**

- i. CERT-In Guidelines- <http://www.cert-in.org.in/>
- ii. <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks> [ Online Course]
- iii. <https://computersecurity.stanford.edu/free-online-videos> [ Free Online Videos]
- iv. Nikolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, <https://ocw.mit.edu>. License: [Creative Commons BY-NC-SA](https://creativecommons.org/licenses/by-nc-sa/4.0/).



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year I Semester	Professional Elective - IV	L	T	P	C
		3	0	0	3
<b>DEVOPS</b>					

### Course Objectives:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance.

### UNIT- I:

Phases of Software Development life cycle. Values and principles of agile software development.

### UNIT –II:

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

### UNIT –III:

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes.

### UNIT –IV:

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices

### UNIT -V:

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

### Course Outcomes:

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

- i. Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- ii. Describe DevOps & DevSecOps methodologies and their key concepts
- iii. Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- iv. Set up complete private infrastructure using version control systems and CI/CD tools
- v. Know about DevOps maturity model.

**Text Books:**

- i. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
- ii. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

**Reference Books:**

- i. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
- ii. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
- iii. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
- iv. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and





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<b>IV Year – I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>UML LAB</b>				

**Course Objectives:**

- i. Construct UML diagrams for static view and dynamic view of the system.
- ii. Know the practical issues of the different Object-oriented analysis and design concepts.
- iii. Carry out the analysis and design of a system in an object-oriented way.
- iv. Apply forward and reverse engineering of a software system.
- v. Inculcate the art of object-oriented software analysis design.

**LAB EXPERIMENTS:**

The UML diagrams should be drawn for the following case studies:

**Experiment 1:** College Information System

**Experiment 2:** Traffic Monitoring/Controlling System

**Experiment 3:** ATM Application

**Experiment 4:** Airline Reservation System

**Experiment 5:** Vacation Tracking System

**Experiment 6:** Inventory Management System

**Experiment 7:** Online Book Shopping

**Experiment 8:** POS System

**Course Outcomes:**

After the completion of the course, student will be able to

- i. Understand the syntax of different UML diagrams. Sketch a Modeling with UML by Deploying Structural Modeling, Behavioral Modeling, Architectural Modeling.
- ii. Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships.
- iii. Show the role and function of each UML model in developing object-oriented software.
- iv. Analyze and design a software system in an object oriented style using various tools .

**Text Books:**

- i. “The Unified Modeling Language User Guide”, Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.
- ii. Design Patterns by Erich Gamma, Pearson Education.
- iii. “Object- Oriented Analysis And Design with Applications”, Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013, PEARSON.

**Reference Books:**

- i. “The Unified modeling language Reference manual”, James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley.
- ii. “Object-oriented analysis and design with the Unified process”, John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning.
- iii. Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.
- iv. Java Enterprise Design Patterns Vol-III By Mark Grand Wiley Dream Tech.
- v. “Head first object-oriented analysis and design”, Brett D. McLaughlin, Gary Pollice, Dave West, O’Reilly.
- vi. “Object-oriented analysis and design using UML”, Mahesh P. Matha, PHI.

**E-Resources:**

- i. <https://nptel.ac.in/courses/106/105/106105224/>
- ii. [https://www.tutorialspoint.com/design\\_pattern/design\\_pattern\\_quick\\_guide.htm](https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.htm)



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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year I Semester		L	T	P	C
		0	0	0	1.5
<b>PROJECT - I</b>					



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IV Year-II Semester		L	T	P	C
		3	0	0	3
CLOUD COMPUTING					

### Course Objective:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

### UNIT-I:

**Introduction:** Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

### UNIT-II:

**Cloud Enabling Technologies:** Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

### UNIT-III:

**Cloud Architecture, Services And Storage:** Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

### UNIT-IV:

**Resource Management And Security In Cloud:** Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

### UNIT-V:

**Cloud Technologies And Advancements:** Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

**Course Outcomes:**

Upon completion of the course, it is expected that student will be able to:

- i. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- ii. Learn the key and enabling technologies that help in the development of cloud.
- iii. Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- iv. Explain the core issues of cloud computing such as resource management and security.
- v. Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

**Text Book:**

- i. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan Kaufmann Publishers.
- ii. Cloud Computing: Implementation, Management and Security, Rittinghouse, John W., and James F. Ransome, CRC Press.

**Reference Books:**

- i. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Tata Mcgraw Hill.
- ii. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGraw Hill.
- iii. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly.



## B. Tech (COMPUTER SCIENCE AND ENGINEERING)- R19 Syllabus

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IV Year-I Semester		L	T	P	C
		3	0	0	3
<b>DEEP LEARNING</b>					

### Course Objectives:

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

- i. Learn deep learning methods for working with sequential data,
- ii. Learn deep recurrent and memory networks,
- iii. Learn deep Turing machines,
- iv. Apply such deep learning mechanisms to various learning problems.
- v. Know the open issues in deep learning, and have a grasp of the current research directions.

### UNIT I:

**Introduction:** Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

**Feed forward neural network:** Artificial Neural Network, activation function, multi-layer neural network.

### UNIT II:

**Training Neural Network:** Risk minimization, loss function, back propagation, regularization, model selection, and optimization.

**Conditional Random Fields:** Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

### UNIT III:

**Deep Learning:** Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

### UNIT IV:

**Probabilistic Neural Network:** Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

**Sequence Modeling:** LSTM, Gated RNNs & Deep Generative Models

### UNIT V:

**Applications:** Object recognition, sparse coding, computer vision, natural language processing.

**Introduction to Deep Learning Tools:** Caffe, Theano, Torch.

**Course Outcomes:**

After the completion of the course, student will be able to

- i. Demonstrate the basic concepts fundamental learning techniques and layers.
- ii. Discuss the Neural Network training, various random models.
- iii. Explain different types of deep learning network models.
- iv. Classify the Probabilistic Neural Networks and Sequence model neural networks.
- v. Implement tools on Deep Learning techniques.

**Text Books:**

- i. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016..
- ii. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

**Reference Books:**

- i. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
- ii. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
- iii. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.



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IV Year-II Semester	Professional Elective - V	L	T	P	C
		3	0	0	3
<b>BIG DATA ANALYTICS</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Necessity of Big data analysis and challenges in Big data analysis
- ii. Descriptive, Predictive, Real time analysis of big data
- iii. Programming tools PIG & HIVE in Hadoop ecosystem

**UNIT - I: Introduction:** Introduction to big data: Introduction to Big Data platform, Challenges of conventional systems, Intelligent data analysis, Nature of data, Analytic processes and tools, Analysis vs Reporting.

**UNIT - II: Stream Processing:** Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

**UNIT - III: Introduction to Hadoop:** Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

**UNIT - IV: Frameworks and Applications:** Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

**UNIT - V: Predictive Analytics and Visualizations:** Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application



**Course Outcomes:**

The students should be able to:

- i. Understand and Illustrate characteristics of big data and big data challenges in different domains including social media, transportation, finance and medicine
- ii. Demonstrate stream processing on real time applications
- iii. Do Big data processing using Map reduce on Hadoop
- iv. Do Big data processing using PIG scripts and HiveQL queries
- v. Understand Predictive analysis of big data.

**Text Books:**

- i. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition, 2015.
- ii. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
- iii. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012

**Reference Books:**

- i. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley& sons, 2012.
- ii. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, “Harness the Power of Big Data:The IBM Big Data Platform”, Tata McGraw Hill Publications, 2012.
- iii. Arshdeep Bahga and Vijay Madiseti, “Big Data Science & Analytics: A Hands On Approach “, VPT, 2016.
- iv. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons, 2014.

**E-resources:**

- i. <https://www.edx.org/course/big-data-fundamentals>
- ii. <https://hadoop.apache.org/>
- iii. <https://pig.apache.org/>
- iv. <https://hive.apache.org/>



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-II Semester	Professional Elective - V	L	T	P	C
		3	0	0	3
NATURAL LANGUAGE PROCESSING					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- Design and implementation of NLP systems
- Different ways of modeling natural languages
- Applications of Natural language processing

### UNIT - I:

#### Finding the Structure of Words:

Words and Their Components, Issues and Challenges, Morphological Models

#### Finding the Structure of Documents:

Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

### UNIT - II:

#### Syntax Analysis:

Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

### UNIT - III:

#### Semantic Parsing:

Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

### UNIT - IV:

Predicate-Argument Structure, Meaning Representation Systems, Software.

#### Discourse Processing:

Cohesion, Reference Resolution, Discourse Cohesion and Structure

### UNIT - V:

#### Language Modeling:

Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross lingual Language Modeling

**Course Outcomes:**

The students should be able to:

- i. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- ii. Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- iii. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- iv. Able to design, implement, and analyze NLP algorithms
- v. Able to design different language modeling Techniques.

**Text Books:**

- i. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
- ii. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

**Reference Books:**

- i. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications



## B. Tech (Computer Science & Engineering)- R19 Syllabus

**University College of Engineering Vizianagaram**  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>IV Year-II Semester</b>	<b>Professional Elective - V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>BLOCK CHAIN TECHNOLOGIES</b>					

### Course Objective:

- i. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.
- ii. To understand the structure of a Blockchain and why/when it is better than a simple distributed database
- iii. To make students understand the technological underpinnings of Blockchain operations as distributed data structures and decision making systems.
- iv. To understand a “smart” contract and its legal implications.

### UNIT-I:

**Introduction:** History and basics, Types of Blockchain, Consensus, CAP Theorem.

**Cryptographic Hash Functions:** Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

### UNIT-II:

**Decentralization:** Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

### UNIT-III:

**Bitcoin:** Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

### UNIT-IV:

**Ethereum:** Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.

### UNIT-V:

**Hyperledger:** Introduction, Hyperledger Projects, Protocol, Architecture, Hyperledger Fabric, Sawtooth Lake, Corda.

**Challenges and Opportunities:** Scalability, Privacy, Blockchain for IoT, Emerging trends

## **Course Outcomes**

Upon completion of the course, it is expected that student will be able to:

- i. Define and explain the fundamentals of Blockchain.
- ii. Understand decentralization and the role of Blockchain in it.
- iii. Understand and analyze Bitcoin Cryptocurrency and underlying Blockchain network.
- iv. Understand Ethereum currency and platform, and develop applications using Solidity.
- v. Understand Hyperledger project and its components; critically analyze the challenges and future opportunities in Blockchain technology.

## **Text Book:**

- i. Mastering Blockchain, Imran Bashir, Second Edition, Packt Publishing.

## **Reference Books:**

- i. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas Antonopoulos, O'Reilly.
- ii. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.
- iii. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, Andreas M. O'Reilly.
- iv. Blockchain Technology: Cryptocurrency and Applications, S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
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IV Year-II Semester	Professional Elective - V	L	T	P	C
		3	0	0	3
<b>DISTRIBUTED SYSTEMS</b>					

### Course Objectives:

- i. To understand the foundations of distributed systems.
- ii. To learn issues related to clock Synchronization, the need for global state and remote invocation in distributed systems.
- iii. To learn distributed mutual exclusion and deadlock detection algorithms.
- iv. To learn the characteristics of peer-to-peer, distributed shared memory systems and security.
- v. To understand the significance of agreement, distributed transactions, fault tolerance and recovery protocols in Distributed Systems.

### UNIT- I:

**Characterization of Distributed Systems:** Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges, Relation to Computer system Components, Motivation, Relation to Parallel Systems, Message-Passing systems versus Shared Memory systems, Primitives for Distributed Communication, Synchronous versus Asynchronous executions, Design issues and Challenges. **A model of Distributed Computations:** A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of Process Communications. **Logical Time:** A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

### UNIT –II:

**Message Ordering and Group Communication:** Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order.

**Global state and Snapshot Recording Algorithms:** Introduction, System model and definitions, Snapshot algorithms for FIFO channels. **Remote Invocation:** Introduction, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI.

### UNIT- III:

**Distributed Mutual Exclusion Algorithms:** Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki-Kasami's broadcast algorithm. **Deadlock Detection in Distributed Systems:** Introduction, System model, Preliminaries, Models of deadlocks, Knapp's Classification, Algorithms for the Single Resource Model, the AND model and the OR model.

#### **UNIT -IV:**

**Peer-to-Peer Computing and Overlay Graphs:** Introduction, Data indexing and overlays, Chord distributed hash table, Content addressable networks, Tapestry.  
**Distributed Shared Memory:** Abstraction and advantages, Memory consistency models, Shared Memory Mutual Exclusion.

**Security:** Introduction, Overview of Security Techniques, Cryptographic Algorithms, Digital Signatures, Cryptography Pragmatics.

#### **UNIT –V:**

**Distributed Transactions:** Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions. **Check Pointing and Rollback Recovery:** Introduction, Background and definitions, Issues in Failure recovery, Checkpoint-based recovery, Log-based rollback recovery, coordinated check pointing algorithm, Algorithms for asynchronous and synchronous check pointing and recovery. **Consensus and Agreement Algorithms:** Problem definition, Overview of results, Agreement in a Failure-Free system (synchronous or asynchronous).

#### **Course Outcomes:**

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

- i. Understand the foundations and issues of distributed systems.
- ii. Illustrate the various synchronization issues, global state and remote invocation for distributed systems.
- iii. Develop the Mutual Exclusion and Deadlock detection algorithms in distributed systems.
- iv. Apply the features of peer-to-peer, distributed shared memory systems and security.
- v. Analyze the distributed transactions, agreement protocols and fault tolerance mechanisms in distributed systems.

#### **Text Books:**

- i Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.
- i Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, 5<sup>th</sup> Edition, Pearson Education, 2012.

#### **Reference Books:**

- i. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
- ii. Advanced concepts in operating systems. Mukesh Singhal and Niranjana G. Shivaratri, McGraw-Hill, 1994.
- iii. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.

#### **E-Resources:**

- i. <https://nptel.ac.in/courses/106/106/106106168/>



## B. Tech (Computer Science and Engineering) - R19 Syllabus

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		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>QUANTUM COMPUTING</b>					

### Course Objectives:

- i. This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

### UNIT- I:

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

### UNIT -II:

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.

### UNIT -III:

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

### UNIT -IV:

Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.

### UNIT -V:

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.



**Course Outcomes:**

By the end of this course, the student is able to

- i. Analyze the behaviour of basic quantum algorithms
- ii. Implement simple quantum algorithms and information channels in the quantum circuit model
- iii. Simulate a simple quantum error-correcting code
- iv. Prove basic facts about quantum information channels
- v. Know about Quantum Computing Models

**Text Books:**

- i. Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia “Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O’Reilly.
- ii. Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
- iii. V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.



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University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

IV Year-II Semester		L	T	P	C
		0	0	15	8
<b>PROJECT - II</b>					



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - I		L	T	P	C
		3	0	0	3
<b>DATA STRUCTURES</b>					

### Course Objectives:

- Solve problems using data structures such as linear lists, stacks, queues, hash tables.
- To understand concepts about searching and sorting techniques.
- Be familiar with non-linear data structures such as Trees, Search Trees, Threaded trees, and Graphs.
- Solve problems using data structures such as Efficient Search Structures.

### UNIT-I: Linear Data Structures:

**Linked Lists:** Linear List, Ordered and Unordered Lists, Singly Linked List, Doubly Linked List, Circular Linked List Implementations and List Applications.

**Stacks:** Stacks using Arrays and Linked List, Applications of Stacks.

**Queues:** Queues using Arrays and Linked List, Circular Queues, DeQueues, Applications of Queues.

### UNIT-II: Searching and Sorting:

Linear Search, Binary Search, Fibonacci Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort.

Dictionaries: Indexing, Hashing, and Hash Functions, Collision Resolution - Separate Chaining, Open Addressing, Hashing with Buckets.

### UNIT-III: Trees:

Trees: Basic Terminology, Applications, Types of Trees, Tree Representations, Binary Tree Traversals, Threaded Binary Trees.

Priority queues: MinVMax Heaps, Binomial Queues.

### UNIT-IV: Efficient Search Structures

BSTs: Binary Search Tree, Skewed Trees, BST implementation and its Applications.

AVL, B, B+ Trees: Self-Balanced Trees, Height of an AVL Trees, AVL Tree Rotations and M-Way Search Trees.

### UNIT-V: Graphs

Introduction to Graphs, Basic Terminology, and Types, Applications, Connectivity, Shortest Paths: Single-Source Shortest Path Problem, Transitive Closure, All Pairs Shortest Path Problem, Spanning

Trees: Prim's Algorithm and Kruskal's Algorithm.

**Course Outcomes:**

- i. Distinguish between Linear and Non-Linear Data structures. Apply advanced data structure strategies for exploring complex data structures.
- ii. Compare and contrast various Sorting and searching techniques in the area of Performance.
- iii. Exploring basic non-linear data structures and their applications
- iv. Incorporate data structures into applications such as Binary Search Trees, Heaps.
- v. Implement Graphs and applications and compare their Performance and trade-offs.

**Text Books:**

- i. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
- ii. Data Structures & Algorithms, Alfred V Aho, John E Hopcraft, Jeffery D Ullman, Pearson Education. Ltd., First Edition.
- iii. Fundamentals of Data Structures in C, S.Sahni, Second Edition, Universities Press, Pvt. Ltd.

**Reference Books:**

- i. Data Structures and Algorithms using C by R. S. Salari, Fifth Edition, KHANNA Publishing.
- ii. Datastructures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
- iii. Data Structures and Algorithms Made Easy: Second Edition: Data Structure and
- iv. Algorithm c Puzzles, Narasimha Karumanchi, Fifth Edition, Career Monk.
- v. Data Structures Using C, Reema Thareja, Second Edition, Oxford.
- vi. Problem-solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

Open Elective - I		L	T	P	C
		3	0	0	3
<b>C++ PROGRAMMING</b>					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. Understand the basic concept of C++ Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- ii. Acquire knowledge about the basic concepts of writing a programs using OOP principles.
- iii. Role of Inheritance and polymorphism.
- iv. Use of Templates and Exception handling.
- v. Role of Standard Template Library in writing Generic programs.

### UNIT-I: Introduction to C++

Difference between C and C++ - Evolution of C++ - The Object Oriented Technology- Disadvantage of Conventional Programming- Key Concepts of Object Oriented Programming- Advantage of OOP- Object Oriented Language.

#### Classes and Objects & Constructors and Destructor

Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function-Overloading Member Function- Nested class, Constructors and Destructors,Introduction- Constructors and Destructor- Characteristics of Constructor and Destructor-Application with Constructor- Constructor with Arguments (parameterized Constructor-Destructors- Anonymous Objects.

### UNIT-II: Operator Overloading and Type Conversion & Inheritance

The Keyword Operator- Overloading Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes- Object as a Class Member- Abstract Classes- Advantages of Inheritance-Disadvantages of Inheritance.

### UNIT-III: Pointers & Binding Polymorphisms and Virtual Functions

Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer- Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction- Binding in C++- Virtual Functions- Rules for Virtual Function- Virtual Destructor.

### UNIT-IV: Generic Programming with Templates & Exception Handling

Generic Programming with Templates, Need for Templates- Definition of class Templates- Normal Function Templates- Over Loading of Template Function-Bubble Sort Using Function Templates- Difference Between Templates and Macros- Linked Lists with Templates, Exception Handling- Principles of Exception Handling- The Keywords try throw and catch- Multiple Catch Statements –Specifying Exceptions.

## **UNIT-V: Overview of Standard Template Library**

Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers- Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps.

### **Course Outcomes:**

The students should be able to:

- i. Understand the basic terminology used in Object oriented programming and learn to use basic C++ language constructs.
- ii. Write, compile and debug programs in C++ language. Use different features of C++.
- iii. Design programs involving /Implementing Polymorphism and Inheritance.
- iv. Design and implement Generic programs using C++ templates.
- v. Learn and Use Standard Template Library (STL).

### **Text Books:**

- i. A First Book of C++, Gary Bronson, Cengage Learning.
- ii. The Complete Reference C++, Herbert Schildt, TMH.
- iii. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

### **Reference Books:**

- i. Object Oriented Programming C++, Joyce Farrell, Cengage.
- ii. C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - I	L	T	P	C
	3	0	0	3
<b>COMPUTER ORGANIZATION</b>				

### Course Objectives:

- i. Gives a view of computer system from user's perspective, representation of data.
- ii. Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- iii. Describes the means of interaction devices with CPU, their characteristics, modes.
- iv. Description of different parameters of a memory system, organization and mapping of various types of memories.
- v. Illustration of data paths and control flow for sequencing in CPUs, Microprogramming of control unit of CPU.

### UNIT -I:

**Basic Structure of Computers:** Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

**Data Representation:** Data types, Complements, Fixed Point Representation, Floating – Point Representation, Other Binary Codes, Error Detection codes.

### UNIT -II:

#### Machine Instruction and Programs:

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.

### UNIT -III:

**Type of Instructions:** Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations.

**Input/output Organization:** Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB).

#### **UNIT -IV:**

**The Memory Systems:** Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING

**Secondary Storage:** Magnetic Hard Disks, Optical Disks.

#### **UNIT -V:**

**Processing Unit:** Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching a Word from Memory, Execution of Complete Instruction, Hardwired Control,

**Micro programmed Control:** Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next – Address Field.

#### **Course Outcomes:**

- i. Understand the architecture of modern computer.
- ii. Able to calculate the effective address of an operand by addressing modes.
- iii. Apply different instruction types.
- iv. Determine the importance of memory management system of computer.
- v. Design the roles and functions of processing unit and micro programmed control.

#### **Text Books:**

- i. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
- ii. Computer Architecture and Organization, John P. Hayes, 4<sup>th</sup> Edition, McGraw Hill.

#### **Reference Books:**

- i. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
- ii. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
- iii. Fundamentals of Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
- iv. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy.
- vi. J.P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

#### **E-Resources:**

- i. <https://nptel.ac.in/courses/106/106/106106092/>
- ii. <https://nptel.ac.in/courses/106/105/106105163/>





## B. Tech (COMPUTER SCIENCE AND ENGINEERING)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - I		L	T	P	C
		4	0	0	3
<b>PYTHON PROGRAMMING</b>					

### Course Objectives:

- i. Introduction to Scripting Language
- ii. Exposure to various problems solving approaches of computer science

### UNIT-I: Introduction to Python

Features and History of Python, Print and Input functions, variables, keywords, comments  
Types: Numerical Types (int, float, complex), Strings, Boolean, Type Conversion Operators:  
Arithmetic, Relational, Logical, Bitwise, Assignment, Identity, Membership

### UNIT-II: Control Flow and Functions

Indentation, if-elif-else, while, for, break, continue, pass, else-with loops  
Functions: Introduction, Required Arguments, Default Arguments, Keyword Arguments,  
Variable Number of Arguments, Variable Scope and Lifetime, global variables, Lambda  
Functions, Command Line Arguments

### UNIT-III: Object Oriented Programming

Classes and Objects, built-in class methods and attributes, 'self', constructor, destructor,  
inheritance, data hiding, overriding methods and overloading operators

### UNIT-IV: Data Structures, Files and Exception Handling

Lists, Nested Lists, List Comprehensions, Tuples and Sequences, Sets, Dictionaries  
File I/O: opening, closing, reading and writing Handling Exceptions, Multiple Except Blocks,  
Multiple Exceptions in a Single Block, Except Block Without Exception, The else Clause,  
Raising Exceptions, Built-in and User-defined Exceptions, The finally Block

### UNIT-V: Modules, Packages and Standard Library

Introduction modules, import and from-import, Packages in Python, used defined modules and  
packages, PIP.The Python Standard Library: numeric and mathematical modules, string  
processing, date & time, calendar, operating system, web browser

**GUI and Graphics:**

GUI design with tkinter: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menu, Menubutton, Message, Radiobutton, Scale, Scrollbar, Text Graphics with turtle: Motion Control, Pen, Colour, Fill, multiple turtles, reset and clear

**Course Outcomes:**

- i. Understand the basic fundamentals of scripting language and its learning environment.
- ii. Acquire the knowledge of data types, operators and control structures.
- iii. Understand Object oriented concepts and apply the concepts of data structures to real world data.
- iv. Apply the concept of modularity and implement different packages to solve complex problems. Understand Object oriented concepts and handle different errors through exceptions.
- v. Develop multithreaded application using standard libraries.

**Text/Reference Books:****Text Books:**

- i. Python Programming using problem solving approach, Reema Thareja, Oxford University Press.
- ii. Learning Python, Mark Lutz, O’Rielly
- iii. Programming Python, Fourth Edition, Mark Lutz, O’Reilly Media.

**Reference Books:**

- i. Introduction to Computation and Programming Using Python with Application to Understanding, John V. Guttag, PHI.
- ii. Think Python: How to think like a Computer Scientist, Allen Downey, Green Tea Press
- iii. Head First Python: A Brain-Friendly Guide, Second Edition, Paul Barry, O’Reilly
- iv. The Python Standard Library, Python 3.6.5 documentation (Web Resource).  
<https://docs.python.org/3/library/>



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Open Elective - I		L	T	P	C
		3	0	0	3
<b>SCRIPTING LANGUAGES</b>					

### Course Objectives:

- i. Introduces scripting languages such as Perl, Ruby, PHP and TCL.
- ii. Design, code, and test applications using scripting languages.
- iii. An ability to create PHP scripts to store and manipulate user data.

### UNIT-I:

**Introduction:** Ruby, Rails, the structure and Execution of Ruby Programs, Package Management with RUBYGEMS.

**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:

#### 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-III:

#### 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.

**PHP Basics :** PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

### UNIT-IV:

**Advanced PHP Programming:** PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package and Building Web sites for the World.

**UNIT -V:**

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

**Course Outcomes:**

- i. Acquire programming skills in RUBY scripting language.
- ii. Ability to create and run scripts using PERL.
- iii. To gain some fluency programming in Perl and PHP and related languages.
- iv. To improve knowledge of advanced concepts in PHP.
- v. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.

**Text Books:**

- i. The World of Scripting Languages, David Barron, Wiley Publications.
- ii. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
- iii. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech)

**Reference Books:**

- i. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
- ii. Perl by Example, E.Quigley, Pearson Education.
- iii. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - I		L	T	P	C
		3	0	0	3
PROGRAM ANALYSIS					

### Course Objectives:

The objectives of this course is to acquire knowledge on the

- Classical data flow analysis and its use
- Pointer analysis and applications of pointer analysis
- Static single assignment form and its application in compiler design

### UNIT - I:

**Data Flow Analysis:** Available expressions analysis, Live variables analysis, Reaching definitions analysis, Anticipable expressions analysis, A taxonomy of data flow analysis, Iterative and worklist based data flow analysis

### UNIT - II:

**Theoretical Abstractions in Data Flow Analysis:** Lattice, flow functions, monotone frameworks, confluence operators, MFP (Maximal Fixed Point)/MOP (Meet over Paths) solution

### UNIT - III:

Introduction to inter procedural data flow analysis, Call graph, Functional Approach, Call Strings base method, Value context based inter procedural analysis

### UNIT - IV:

**Pointer analysis:** Introduction, issues in different languages Flow insensitive: Anderson's and Steensgard's approaches  
Flow sensitive pointer analysis, context-insensitive vs context sensitive pointer analysis, Generalized Points-to Graph (GPG) based points-to analysis

### UNIT - V:

#### Static Single Assignment Form(SSA):

Definition of SSA, Standard SSA construction and destruction algorithms, sparse data flow analysis.

### Course Outcomes:

The students should be able to:

- Apply data flow analysis techniques to calculate various properties of small programs
- Understand the mathematical ideas used in data flow analysis techniques
- Apply data flow analysis techniques to calculate various properties of small programs with more than one function
- Understanding pointer analysis and its applications
- Construct static single assignment form for any program

**Text Books:**

- i. Data Flow Analysis: Theory and Practice, Khedker, Sanyal, Karkare, CRC Press 2009.
- ii. Advanced Compiler Design and Implementation, Muchnick, Morgan Kaufmann 1997.

**Reference Books:**

- i. Principles of Program Analysis: Nielson, Nielson, Hankin, Springer 2004
- ii. Compilers: Principles, Techniques and Tools (2nd Edition), Aho, Lam, Sethi, Ullman, Addison Wesley 2006.

**E-resources:**

- i. SSA-based compiler Design, <http://ssabook.gforge.inria.fr/latest/book.pdf>
- ii. Generalized Points-to Graphs: A Precise and Scalable Abstraction for Points-to Analysis, <https://dl.acm.org/doi/abs/10.1145/3382092>



## B. Tech (Computer Science and Engineering) - R19 Syllabus

### University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - II		L	T	P	C
	<b>OPERATING SYSTEMS</b>	3	0	0	3

#### Course Objectives:

- Provide knowledge about the services rendered by operating systems.
- Present detail discussion on processes, threads and scheduling algorithms.
- Expose the student with different techniques of process synchronization and handling deadlocks.
- Discuss various file-system implementation issues and memory management techniques.  
Learn mass storage management.

#### UNIT-I: Operating Systems Overview:

**Introduction:** what is an operating system, Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types, Operating System Generation.

#### UNIT-II: Process Management:

**Process concept:** Process Concept, Process Scheduling, Operations on Processes, Inter process Communication.

**Multithreaded Programming:** Overview, Multithreading models, Threading Issues.

**Process scheduling:** Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

#### UNIT-III: Synchronization:

**Process Synchronization:** The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples.

**Principles of deadlock** – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

#### UNIT-IV: Memory Management:

**Memory Management strategies:** Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

**Virtual Memory Management:** Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

**UNIT-V: File system Interface-**

The concept of a file, Access Methods, Directory and Disk structure, File system mounting.

**File System implementation:** File system structure, allocation methods, free-space management.

**Mass-storage structure:** Overview of Mass-storage structure, Disk scheduling, Device drivers.

**Course Outcomes:**

- i. Understand the importance of operating systems and different types of system calls.
- ii. Analyze the communication between processes and various process scheduling algorithms.
- iii. Understand the process synchronization, different ways for deadlocks handling.
- iv. Analyze various memory mapping techniques and different page replacement methods.
- v. Evaluate various file allocation and disk scheduling algorithms.

**Text Books:**

- i. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
- ii. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems).

**References:**

- i. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
- ii. Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
- iii. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.
- iv. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.





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Open Elective - II		L	T	P	C
		3	0	0	3
<b>COMPUTER NETWORKS</b>					

### Course Objectives:

- i. To introduce the fundamental various types of computer networks.
- ii. To understand state-of-the-art in network protocols, architectures, and applications.
- iii. To explore the various layers of OSI Model.
- iv. To introduce UDP and TCP Models.

### UNIT-I:

**Introduction:** Network Hardware and software Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

**Physical Layer:** Guided Transmission Media, Digital Modulation and Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing.

### UNIT-II:

**The Data Link Layer** - Design Issues, Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols, Sliding Window Protocols.

**Channel allocation methods:** TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard 802 for LANS – Ethernet, Token Bus, Token ring, Bridges and IEEE 802.11 and 802.16. Data link layer switching, virtual LANs.

### UNIT-III:

**Network layer Routing Algorithms:** Design Issues, Routing Algorithms-Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention policies, Choke packets, Load shedding, and Jitter Control.

**Internet Working :** Tunnelling, internetworking, Fragmentation, Network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP, IPV6.

### UNIT IV:

**The Transport Layer:** Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to end protocols: UDP, Real Time Transport Protocol.

**The Internet Transport Protocol: TCP-** reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call.

## **UNIT – V:**

**Application Layer:** WWW and HTTP: Architecture- Client (Browser), Server, Uniform Resource Locator HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication, HTTP Generic Message Format, HTTP Request Message Format, HTTP Response Message Format.

**The Domain Name System:** The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery.

### **Course Outcomes:**

The students are able to

- i. Understand OSI and TCP/IP reference models with an emphasis to Physical Layer, Data Link Layer and Network Layer.
- ii. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes. Analyze MAC layer protocols and LAN technologies.
- iii. Solve problems related to Flow control, Error control, Congestion control and Network Routing.
- iv. Design and compute subnet masks and addresses for networking requirements.
- v. Understand how internet works,

### **Text Books:**

- i. Data Communications and Networks – Behrouz A. Forouzan, Third Edition TMH.
- ii. Computer Networks, 5ed, David Patterson, Elsevier
- iii. Computer Networks: Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
- iv. Computer Networks, Mayank Dave, CENGAGE

### **References:**

- i. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010
- ii. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education
- iii. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
- iv. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson
- v. The TCP/IP Guide, by Charles M. Kozierok, Free online Resource,  
<http://www.tcpipguide.com/free/index.htm>



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Open Elective - II		L	T	P	C
		3	0	0	3

**IMAGE PROCESSING**

### Course Objectives:

- i. To become familiar with digital image fundamentals
- ii. To get exposed to simple image enhancement techniques in Spatial and Frequency domain
- iii. To learn concepts of degradation function and restoration techniques
- iv. To study the image segmentation and representation techniques
- v. To become familiar with image compression and recognition methods

### UNIT- I:

Digital Image Fundamentals: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels.

### UNIT -II:

Image Enhancement: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering.

### UNIT –III:

Image Restoration: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

### UNIT -IV:

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

### UNIT –V:

Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

**Course Outcomes:**

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

- i. Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms
- ii. Operate on images using the techniques of smoothing, sharpening and enhancement.
- iii. Use the restoration concepts and filtering techniques
- iv. Illustrate the basics of segmentation
- v. Understand Image Compression and Recognition techniques

**Text Books:**

- i. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.
- ii. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

**Reference Books:**

- i. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
- ii. D.E. Dudgeon and R.M. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 1990.
- iii. William K. Pratt, Digital Image Processing, John Wiley, New York, 2002.



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**University College of Engineering Vizianagaram**  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>Open Elective-II</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIX &amp; SHELL PROGRAMMING</b>					

### Course Objectives:

- i. Written technical communication and effective use of concepts and terminology.
- ii. Facility with UNIX command syntax and semantics.
- iii. Ability to read and understand specifications, scripts and programs.
- iv. Individual capability in problem solving using the tools presented within the class. Students will demonstrate a mastery of the course materials and concepts within in class discussions.

**UNIT – I: Introduction to unix**-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

**UNIT - II: Using the Shell**-Command Line Structure-Meta characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs, Branching Control Structures-Loop Control Structures.

### UNIT – III:

The File system –The Basics of Files-What’s in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

**UNIT – IV:** Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

The Process-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control. BasicNetworking commands : ping,telnet,netstat,hostname,finger,ifconfig,traceboot

**UNIT - V:** The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The \$? Variable knowing the exit Status-More about the Set Command-The Exit Command-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

**Course Outcomes:**

- i.** Understand the architecture and features of Unix operating system and distinguish it from other operating system .
- ii.** Analyse a given problem and apply requisite facets of Shell programming in order to devise a shell script to solve the problem
- iii.** Apply Unix commands for File handling mechanism and illustrate the changing of File permissions and ownership.
- iv.** Able to understand the importance of Filters and their need in unix operating system
- v.** Develop various tasks by using Shell Scripting

**Text Books:**

- i. Unix and shell programming by **B.M. Harwani**, OXFORD university press.
- ii. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
- iii. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.
- iv. Unix Network Programming by **Richards Stevens**

**Reference Books:**

- i. Understanding The Linux Kernel(O'Reilly) by **Daniel P. Bovet, Marco Cesati**
- ii. Design of UNIX Operating System by **Maurice J. Bach**
- iii. Advanced Programming in the UNIX Environment by **Richards Stevens**



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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective-II		L	T	P	C
		3	0	0	3
<b>FUNDAMENTALS OF CLOUD COMPUTING</b>					

### Course Objective:

Cloud Computing is a large scale distributed computing paradigm which has become a driving force for information technology over the past several years. This course introduce cloud computing technology to undergraduate engineering students, so they can learn, apply and use this technology in their future careers.

### 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, Nano computing..

### UNIT-II:

**Cloud Computing Fundamentals:** Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud Computing, Cloud Computing is a Service, Cloud Computing is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

### UNIT-III:

**Cloud Computing Architecture and Management:** Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud Application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

### UNIT-IV:

**Cloud Service Models:** Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

### UNIT-V:

**Cloud Providers and Applications:** EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rackspace, VMware, Manjra soft, Aneka Platform.

## **Course Outcomes**

Upon completion of the course, it is expected that student will be able to:

- i. Understand and analyze different computing paradigms
- ii. Understand the basics of cloud computing and different cloud deployment models.
- iii. Understand different cloud implementation and management strategies.
- iv. Understand and evaluate different cloud service models.
- v. Identify, analyze and use different cloud services/applications/tools available from key cloud providers.

## **Text Book:**

- i. Essentials of Cloud Computing, K. Chandrasekhran, CRC press.

## **Reference Books:**

- i. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley.
- ii. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier.
- iii. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly.





## B. Tech (Computer Science and Engineering) - R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

OPEN ELECTIVE- II		L	T	P	C
		3	0	0	3
<b>FUNDAMENTALS OF INFORMATION SECURITY</b>					

### Course Objective:

The objective of this course is to introduce information security concepts to undergraduate engineering students, so they can defend their personal and organizational information from probable security attacks and incidents.

### UNIT-I:

**Introduction to Security:** Challenges of Securing Information, Definition of Information Security, Attackers, Attacks and Defences.

**Systems Threats and Risks:** Software-Based Attacks, Hardware-Based Attacks, Attacks on Virtualized Systems, Hardening the Operating System, Preventing Attacks that Target the Web Browser, Hardening Web Servers, Protecting Systems from Communications-Based Attacks, Applying Software Security Applications.

### UNIT-II:

**Network Vulnerabilities and Attacks:** Network Vulnerabilities, Categories of Attacks, Methods of Network Attacks.

**Network Defences:** Crafting a Secure Network, Applying Network Security Devices, Host and Network Intrusion Prevention Systems (HIPS/NIPS), Protocol Analyzers, Internet Content Filters, Integrated Network Security Hardware.

### UNIT-III:

**Access Control:** Access Control Models and Practices, Logical Access Control Methods, Physical Access Control.

**Authentication:** Definition of Authentication, Authentication Credentials, Extended Authentication Protocols, Remote Authentication and Security.

### UNIT-IV:

**Vulnerability Assessment:** Risk Management, Assessment, and Mitigation, Identifying Vulnerabilities.

**Security Audit:** Privilege Auditing, Usage Auditing, Monitoring Methodologies and Tools.

### UNIT-V:

**Cryptography:** Introduction to Cryptography, Cryptographic Algorithms, Using Cryptography on Files and Disks, Digital Certificates, Public Key Infrastructure, Key Management.

## **Course Outcomes**

Upon completion of the course, it is expected that student will be able to:

- i. Understand the basics and need for information security
- ii. Identify, analyze, and evaluate infrastructure and network vulnerabilities.
- iii. Understand and analyze different access control and authentication methods.
- iv. Identify and assess current and anticipated security risks and vulnerabilities with vulnerability assessment and auditing methods.
- v. Learn the fundamentals of cryptography and how cryptography serves as the central language of information security..

## **Text Book:**

Security+ Guide to Network Security Fundamentals, Third Edition, Mark Ciampa,  
Cengage Learning.

## **Reference Books:**

- i. Principles of Information Security, Michael E. Whitman and Herbert J. Mattord,  
Cengage Learning.
- ii. Information Security: The Complete Reference, Rhodes-Ousley, Mark, Second Edition,  
McGraw-Hill.
- iii. Information Security: Principles and Practices, Mark S. Merkow, Jim Breithaupt, 2nd  
Edition, Pearson Education



## B. Tech (Computer Science & Engineering)- R19 Syllabus

University College of Engineering Vizianagaram  
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

Open Elective - III		L	T	P	C
		3	0	0	3

**BIG DATA ANALYTICS**

### COURSE OBJECTIVES:

- i. Understand the Big Data Platform and its Use cases
- ii. Provide an overview of Apache Hadoop
- iii. Provide HDFS Concepts and Interfacing with HDFS
- iv. Understand Map Reduce Jobs
- v. Provide hands on Hadoop Eco System
- vi. Apply analytics on Structured, Unstructured Data.

**Pre- requisites :** Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

### UNIT -I : INTRODUCTION TO BIG DATA AND HADOOP:

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

### UNIT-II: Working with Big Data

Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

### UNIT-III: Map Reduce

Writing MapReduce Programs: Anatomy of a Map Reduce Job Run ,A Weather Dataset,  
Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner

### UNIT-IV: Pig

#### Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

## **UNIT-V:**

### **Applying Structure to Hadoop Data with Hive**

Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

### **Course Outcomes:**

The students will be able to:

- i. Identify Big Data and its Business Implications.
- ii. List the components of Hadoop and Hadoop Eco-System
- iii. Access and Process Data on Distributed File System and Manage Job Execution in Hadoop Environment
- iv. Develop Big Data Solutions using Hadoop Eco System
- v. Develop Big Data Solutions using Hadoop Eco System

### **Text Books:**

- i. Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
- ii. Seema Acharya, Subhasini Chellappan, “Big Data Analytics” Wiley 2015. References
- iii. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

### **Reference Books:**

- i. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
- ii. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
- iii. Anand Rajaraman and Jeffrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
- iv. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- v. Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007
- vi. Pete Warden, “Big Data Glossary”, O’Reily, 2011.
- vii. Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
- viii. ArvindSathi, “BigDataAnalytics: Disruptive Technologies for Changing the Game”, MC Press, 2012
- ix. Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.



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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

OPEN ELECTIVE-III		L	T	P	C
		3	0	0	3
<b>BLOCKCHAIN TECHNOLOGY</b>					

### Course Objectives:

- i. To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.
- ii. To understand the structure of a Blockchain and why/when it is better than a simple distributed database
- iii. To make students understand the technological underpinnings of Blockchain operations as distributed data structures and decision making systems.
- iv. To understand a “smart” contract and its legal implications.

### UNIT-I:

**Introduction:** History and basics, Types of Blockchain, Consensus, CAP Theorem.

**Cryptographic Hash Functions:** Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

### UNIT-II:

**Decentralization:** Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

### UNIT-III:

**Bitcoin:** Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

### UNIT-IV:

**Ethereum:** Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.

### UNIT-V:

**Hyperledger:** Introduction, Hyperledger Projects, Protocol, Architecture, Hyperledger Fabric, Sawtooth Lake, Corda.

**Challenges and Opportunities:** Scalability, Privacy, Blockchain for IoT, Emerging trends

**Course Outcomes:**

Upon completion of the course, it is expected that student will be able to:

- i. Define and explain the fundamentals of Blockchain.
- ii. Understand decentralization and the role of Blockchain in it.
- iii. Understand and analyze Bitcoin Cryptocurrency and underlying Blockchain network.
- iv. Understand Ethereum currency and platform, and develop applications using Solidity.
- v. Understand Hyperledger project and its components; critically analyze the challenges and future opportunities in Blockchain technology.

**Text Book:**

- i. Mastering Blockchain, Imran Bashir, Second Edition, Packt Publishing.

**Reference Books:**

- i. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas Antonopoulos, O'Reilly.
- ii. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.
- iii. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, Andreas M. O'Reilly.
- iv. Blockchain Technology: Cryptocurrency and Applications, S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, Oxford University Press.



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University College of Engineering Vizianagaram  
**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

<b>Open Elective - III</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>CYBER SECURITY</b>					

### Course Objectives:

In this course, the student will learn about the essential building blocks and basic concepts around cyber security such as Confidentiality, Integrity, Availability, Authentication, Authorization, Vulnerability, Threat & Risk and so on.

### UNIT –I:

**Introduction:** Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography.

**Programs and Programming:** Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

### UNIT –II:

**Web Security:** User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

**Operating Systems Security:** Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

### UNIT -III:

**Network Security:** Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management .

**Cloud Computing and Security:** Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

### UNIT- IV:

**Privacy:** Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

**Management and Incidents:** Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

### UNIT –V:

**Legal Issues and Ethics:** Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

**Course Outcomes:**

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

- i. Illustrate the broad set of technical, social & political aspects of Cyber Security and
- ii. security management methods to maintain security protection
- iii. Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
- iv. Illustrate the nature of secure software development and operating systems
- v. Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions

**Text Books:**

- 1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
- 2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

**Reference Books:**

- 1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
- 2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.





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Open Elective - III		L	T	P	C
		3	0	0	3
WEB SERVICES					

### Course Objective:

To understand the concept of XML and to implement Web services using XML based standards

### UNIT-I:

**INTRODUCTION TO HTML5:** New HTML5 Form input Types, Introduction to Cascading Style Sheets: Part 1: Inline Styles, Embedded Style Sheets, Conflicting Styles, and Linking External Style Sheets (Text Book: 1)

**JAVA SCRIPT:** Introduction to scripting, Control Structures-I, Control Structures-II, Functions, Arrays, Objects. (Text Book: 1).

### UNIT-II :

**XML:** Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM): Objects and Collections (Text Book : 1).

### UNIT-III:

**JDBC AND SERVLETS: DATABASE ACCESS:** Overview of JDBC, JDBC Drivers, Connecting to a Database, theStatement Interfaces, Result Sets, Using Metadata (Text Book: 3)

**SERVLETS:** The Life Cycle of a Servlet, Using Tomcat for Servlet Development, A Simple Servlet, The Servlet API, The javax.servlet Package , Reading Servlet Parameters, The javax.servlet.http Package, Handling HTTP Requests and Responses, Cookies, Session Tracking. (Text Book : 2).

### UNIT-IV: JSP:

JSP Overview, How JSP Works , A Basic Example, JSP Syntax and Semantics: The JSP Development Model, Components of a JSP Page: Directives, Comments, Expressions, Scriptlets, Declarations, implicit objects, Standard Actions, Tag Extensions, A Complete Example (Text Book: 3).

Expressions, Scriptlets, Expression and Scriptlet Handling by the JSP Container, Implicit Objects and the JSP Environment, Initialization Parameters, Request Dispatching: Anatomy of Request Processing, include Directive, The Action, Forwarding Requests, RequestDispatcherObject (Text Book:3).

## **UNIT-V: PHP:**

Introduction, Simple PHP Program, Converting Between Data Types, Arithmetic Operators, Initializing and Manipulating Arrays, String Comparisons, String Processing with Regular Expressions, Form Processing and Business Logic, Reading from a Database (Text Book: 1)

**AJAX:** Traditional Web Applications vs. Ajax Applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax, Ajax Example Using the XML, HttpRequest Object, Using XML and the DOM. (Reference Book: 6)

**Course Outcomes:** At the end of the Course, the Student will be able to:

- i. Describe and explain the relationship among HTML, XHTML, CSS, JavaScript, XML and other web technologies.
- ii. Create and publish advanced HTML pages with the help of frames, scripting languages, and CSS.
- iii. Understand and use JavaScript variables, control structures, functions, arrays, and objects. Understand and develop XML Technologies such as XML Schemas, XSLT.
- iv. Understand and develop Server-Side Programming using Servlets and JSP's.
- v. Develop web pages using AJAX and PHP

### **Text Books:**

- i. Dietel and Dietel : “Internet and World Wide Web – How to Program”, 5th Edition, PHI/Pearson Education, 2011
- ii. Herbert Schildt, “The complete Reference Java 2”, 9th Edition, TMH, 2014.
- iii. Phil Hanna: “The Complete Reference JSP”, 2nd Edition, TMH, 2008.

### **References:**

- i. Hans Bergsten : “Java Server Pages”, 3rdEdition, O’Reillypublication, 2008.
- ii. Raj Kamal, “Internet & Web technologies”, 8th Edition, Tata McGraw-Hill, 2007.
- iii. Chris Bates, “Web Programming, building internet applications”, 2ndEdition, WILEY, Dreamtech, 2008.
- iv. Xavier. C, “Web technology and design”, 1stEdition, New Age International, 2011.
- v. Marty Hall and Larry Brown, “Core servlets and java Server pages volume 1: core technologies”, 2nd Edition, Pearson Education, 2007.
- vi. Thomas A Powel, “The Complete Reference: AJAX”, 1st Edition, Tata McGraw Hill, 2008.

### **Web References:**

- i. [www.w3schools.com](http://www.w3schools.com)
- ii. [www.tutorialspoint.com](http://www.tutorialspoint.com)



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Open Elective - III		L	T	P	C
		3	0	0	3
<b>QUANTUM COMPUTING</b>					

### Course Objectives:

□□ This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

### UNIT -I:

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

### UNIT -II:

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.

### UNIT -III:

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

### UNIT -IV:

Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.

### UNIT -V:

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

**Course Outcomes:**

By the end of this course, the student is able to

- i. Analyze the behaviour of basic quantum algorithms
- ii. Implement simple quantum algorithms and information channels in the quantum circuit model
- iii. Simulate a simple quantum error-correcting code
- iv. Prove basic facts about quantum information channels
- v. Know about Quantum Computing Models

**Text Books:**

- i. Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia “Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O’Reilly.
- ii. Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
- iii. V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.



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<b>Open Elective - III</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>MEAN STACK TECHNOLOGIES</b>					

### Course Objectives:

From the course the student will learn

- i. Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- ii. Writing optimized front end code HTML and JavaScript
- iii. Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- iv. Design and implementation of Robust and Scalable Front End Applications

### UNIT- I:

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

### UNIT -II:

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, \$eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

### UNIT –III:

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

### UNIT -IV:

RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

### UNIT –V:

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

**Course Outcomes:**

After the completion of the course, student will be able to

- i. Enumerate the Basic Concepts of Web & Markup Languages
- ii. Develop web Applications using Scripting Languages & Frameworks
- iii. Make use of Express JS and Node JS frameworks
- iv. Illustrate the uses of web services concepts like restful, react js
- v. Apply Deployment Techniques & Working with cloud platform

**Text Books:**

- i. Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
- ii. Web Technologies, Uttam K Roy, Oxford
- iii. Pro Mean Stack Development, Elad Elrom, Apress
- iv. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
- v. JavaScript & jQuery the missing manual, David Sawyer McFarland, O'Reilly
- vi. Web Hosting for Dummies, Peter Pollock, John Wiley Brand

**Reference Books:**

- i. Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
- ii. Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
- iii. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
- iv. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
- v. Express.JS Guide, The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

**e-Resources:**

- i. <http://www.upriss.org.uk/perl/PerlCourse.html>



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Open Elective - III		L	T	P	C
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<b>DEVOPS</b>					

### Course Objectives:

- i. DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance.

### UNIT -I:

Phases of Software Development life cycle. Values and principles of agile software development.

### UNIT -II:

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

### UNIT -III:

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes.

### UNIT -IV:

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices

### UNIT -V:

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

### Course Outcomes:

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

- i. Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- ii. Describe DevOps & DevSecOps methodologies and their key concepts
- iii. Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- iv. Set up complete private infrastructure using version control systems and CI/CD tools
- v. Know about DevOps maturity model.

**Text Books:**

- i. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
- ii. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

**Reference Books:**

- i. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
- ii. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
- iii. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
- iv. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and