VISION	MISSION
To be recognized for excellent engineering, developing global leaders both in educational and research in the domain of computer science and wireless engineering.	1. To create self-learning environment by facilitating leadership qualities, team spirit and ethical responsibilities. 2. To improve department-industry collaboration, interaction with professional society through technical knowledge and internship program. 3. To promote research and development with current techniques through well qualified resources in the area of computer science and wireless engineering.

B. Tech.

In

Computer Science and Engineering

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Program: B. Tech. in Computer Science & Engineering
7th Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit	Teaching Mode
				L	T	P	CA	MSE	ESE	Total		
1	ESC	CS7T001	Data Science	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
2	ESC	CS7T002	Cyber Security & Cryptography	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
3	OEC	CS7O003	Open Elective -3	3	1	0	20	20	60	100	4	PPT, Board, Chalk,
4	PEC	CS7TE04	Elective-IV	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
5	PEC	CS7TE05	Elective -V	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
6	PCC	CS7L006	Data Science using R(Lab)	0	0	2	60	0	40	100	1	PC, PPT
7	PCC	CS7L007	Cyber Security & Cryptography (Lab)	0	0	2	60	0	40	100	1	PC, PPT
8	PROJECT	CS7P008	Project Phase I	0	0	6	50	0	50	100	3	PC, PPT
9	MC	CS7T009	Research Methodology	2	0	0	15	10	25	50	Audit	PPT, Board, Chalk,
				17	**1**	**10**	**285**	**110**	**415**	**850**	**21**	

Elective IV

Course Code	Name of Subject
CS7TE04A	Semantic Web
CS7TE04B	Big Data Analytic Technique
CS7TE04C	Digital Image Processing
CS7TE04D	Randomized Algorithms

Elective V

Course Code	Name of Subject
CS7TE05A	Natural Language Processsing
CS7TE05B	Advanced Computer Vision
CS7TE05C	AI In Wireless Communication
CS7TE05D	Biomedical Informatics

Open Elective-3: PHP Development

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7T001	Data Science	3	0	0	3

Prerequisites for the course	
1.	Basics Knowledge of data structure and algorithm.
2.	Understand sorting, searching and hashing algorithms.

Prior Reading Material/useful links	
1	https://www.google.co.in/books/edition/What_Is_Data_Science/-OQ2q5JqOdEC?hl=en&gbpv=1&dq=Data+Science&printsec=frontcover
2	https://www.google.co.in/books/edition/Data_Science_for_Business/4ZctAAAAQBAJ?hl=en&gbpv=1&dq=Data+Science&printsec=frontcover
3	https://www.google.co.in/books/edition/Getting_Started_with_Data_Science/b4YxCwAAQBAJ?hl=en&gbpv=1&dq=Data+Science&printsec=frontcover

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students shall be able to implement abstract data types for linear data structures.
2	CO2	Students shall be able to apply the different linear and non-linear data structures toproblem solutions.
3	CO3	Students shall be able to critically analyze the various sorting algorithms.
4	CO4	Ability to program data structures and use them in implementations of abstractdata types.
5	CO5	Ability to estimate the algorithmic complexity of simple, non-recursiveprograms

Syllabus:

Course Contents		Hours
Unit I	**Complexity Analysis:** Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space complexity of algorithms ,Order Notation (O, Θ, Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm	8

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Unit II	**Linear Data Structure:** Arrays, Introduction to Arrays, Definition, One Dimensional Array and Multidimensional Arrays, Stacks and Queues: Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.	7
Unit III	**Non-Linear Data Structure:** Linked Lists and Trees Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, and Circular Doubly Linked List. Trees:- Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree. Graphs: - Introduction, Representation to Graphs, Graph Traversals Shortest Path Algorithms.	7
Unit IV	**Introduction to Divide and Conquer, Searching and Sorting:** Searching, Types of Searching, Sorting, Types of sorting like quick sort, bubble sort, merge sort, Quick sort ,insertion sort ,selection sort, radix sort, bucket sort counting sort. Hashing: Hash Function, Types of Hash Functions, Strassen'sMatrix Multiplication Greedy Methods, Fractional Knapsack Problem, Huffman Coding, Minimum Spanning Tree – Kruskal's and Prim's Algorithm,	7
Unit V	**Introduction to Dynamic Programming**, Elements of Dynamic Programming, Multistage Graphs, Traveling Salesman Problem, Floyd-Warshall algorithm. Introduction to Backtracking, Backtracking Strategies, Search & Traversal Techniques – BFS, DFS, Tower of Hanoi Problem, State Space Tree, Branch & Bound, FIFO Branch & Bound.	7

Text Books	
1.	Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,1997.
2.	ReemaThareja, ―Data Structures Using C, Second Edition , Oxford University Press,2011
3.	Ellis Horowitz, SartajSahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

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Reference Books	
1.	Stephen G. Kochan, ―Programming in C‖, 3rd edition, Pearson Education.
2.	Aho, Hopcroft and Ullman, ―Data Structures and Algorithms‖,
3.	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
4.	Cyber Security Cryptography and Machine Learning Fourth International Symposium, CSCML 2020, Be'er Sheva, Israel, July 2–3, 2020, Springer International Publishing.

Useful Links	
1.	http://nptel.ac.in/courses/106105031/lecture by Dr. Debdeep Mukhopadhyay IIT Kharagpur
2.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system engineering-spring-2009/video-lectures/ lecture by Prof. Robert Morris and Prof. Samuel Madden MIT.
3.	https://www.google.co.in/books/edition/Applied_Cryptography_and_Network_Securit/srsyEAAAQBAJ?hl=en&gbpv=1&dq=cyber+security+%26+cryptography+notes&printsec=frontcover
4.	https://www.google.co.in/books/edition/Applied_Cryptography_and_Network_Securit/OrBI6J5wHewC?hl=en&gbpv=1&dq=cyber+security+%26+cryptography+notes&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7T002	Cyber Security & Cryptography	3	1	0	4

Prerequisites for the course	
1.	Basics Knowledge of Cyber Security.
2.	Understand various Authentication algorithms

Prior Reading Material/useful links	
1.	https://blog.rsisecurity.com/what-is-cryptography-in-cyber-security/
2.	https://www.tutorialspoint.com/what-is-the-difference-between-cryptography-and-cyber-security
3.	https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf

Course Outcomes:

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MISSION

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Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand basic concepts of Cyber security.
2	CO2	Student will able to Apply security principles to system design and Symmetric Encryption algorithms to provide confidentiality
3	CO3	Student will able to Compare and apply various authentication Techniques and different cryptographic operations of public key cryptography.
4	CO4	Student will able to Evaluate and Communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities.
5	CO5	Student will able to Select and apply appropriate Intrusion detection and prevention techniques and to examine various security algorithms to Interpret security incidents

Syllabus:

Course Contents		Hours
Unit I	**Introduction to Cyber Security:** Overview of cyber security , Internet Governance-Challenges and constraints,Cyber threats:-Cyber Warfare-Cyber Crime-Cyber terrorism ,Cyber Espionage, Need for comprehensive cyber security policy, need for nodal authority, Cyber security regulations, Roles of international law.	7
Unit II	**Cryptography and Block Ciphers principles:** Introduction, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, Substitution and Transposition techniques, Symmetric and Asymmetric key cryptography, Steganography, Cryptographic independent dimensions. Cryptanalytic attack and brute force attack, Symmetric key Ciphers: Block Cipher principles, DES.	7
Unit III	**Public Key Cryptosystems and Authentication Requirements:** Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, introductory idea of Elliptic curve cryptography. Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512) Message authentication codes: Authentication requirements, Digital signature	7
Unit IV	**Key Management, Distribution and Cyber Security Vulnerabilities** Distribution of Public Keys, Kerberos, X.509 Authentication Service, PGP, SSL, IPSEC. Cyber Security Vulnerabilities-Overview,	7

	vulnerabilities in software, System administration, Complex Network Architectures, Weak Authentication, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Ethical Hacking.	
Unit V	**Securing Web Application Services, Servers and cyber forensics:** Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Security Considerations, Challenges, Intrusion detection and Prevention Techniques, System Integrity Validation, Honey pots, password management. Introduction to Cyber Forensics.	8

Text Books	
1.	William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI.
2.	Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.
3.	J. Katz and Y. Lindell, Introduction to Modern Cryptography, CRC press, 2008.
4.	Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Reference Books	
1.	Golreich O, Foundations of Cryptography, Vol.1.2, Cambridge University Press, 2004
2.	Menezes, et.al, Handbook of Applied Cryptography, CRC Press, 2004.
3.	Introduction to Cryptography and Network Security By Behrouz A. Forouzan · 2008, McGraw-Hill Higher Education
4.	Cyber Security Cryptography and Machine Learning Fourth International Symposium, CSCML 2020, Be'er Sheva, Israel, July 2–3, 2020, Springer International Publishing.

Useful Links	
1.	http://nptel.ac.in/courses/106105031/lecture by Dr. Debdeep Mukhopadhyay IIT Kharagpur
2.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system_engineering-spring-2009/video-lectures/ lecture by Prof. Robert Morris and Prof. Samuel Madden MIT.
3.	https://www.google.co.in/books/edition/Applied_Cryptography_and_Network_Secur

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	it/srsyEAAAQBAJ?hl=en&gbpv=1&dq=cyber+security+%26+cryptography+notes&printsec=frontcover
4.	https://www.google.co.in/books/edition/Applied_Cryptography_and_Network_Securit/OrBI6J5wHewC?hl=en&gbpv=1&dq=cyber+security+%26+cryptography+notes&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7O003	PHP Development	3	1	0	4
Prerequisites for the course						
1.	https://www.tutorialspoint.com/php/php_tutorial.pdf					
2.	https://www.w3schools.com/php/					
3.	https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT4.pdf					

Prior Reading Material/useful links	
1.	Study command line arguments from PHP scripts.
2.	Basics of JavaScript Language programming.
3.	Introduction to Computer programming such as datatypes, statement.

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Accessing command line arguments from PHP scripts
2	CO2	Student will able to Generating web pages dynamically using PHP
3	CO3	Student will able to Retrieving Web Pages manipulating from data
4	CO4	Student will able to Regular Expression with PHP to make strong validation Exception Handling
5	CO5	Student will able to Integrating database content to generate dynamic Web pages

Syllabus:

Course Contents		Hours
Unit I	Introduction to PHP: Web Architecture, Overview of PHP Platform,	8

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	Why we use, Some of PHP's strengths , Some of Availability across multiple platforms , Comparing PHP with other Web scripting languages or technology , PHP delimiters , Variable initialization with PHP, PHP Data types , PHP Constants , PHP Operators.	
Unit II	PHP Statement: If else , If else if else, Nested If , Switch Case , Jump Statements (Break , Continue , Exit) , For loop, While loop , Do while loop , Nested Loop , How to use an important programming construct: arrays , Numerically Indexed arrays ,Non-Numerically Indexed arrays (Associative Array) Multidimensional arrays , Array sorting .	7
Unit III	Introducing ARRAY, Functions, How to use an important programming construct: arrays Numerically Indexed arrays Non- Numerically Indexed arrays (Associative Array) Multidimensional arrays, Introducing Functions, Defining functions, using parameters, Understanding scope , Returning values Call By Value & Call By reference, Using Require() and include().	7
Unit IV	FORMS IN PHP: PHP FORM handling, PHP FORM Validation, FORM Required, FORM URL/Email, File uploading Concepts, Multiple File Upload , Multiple File Upload , Downloading file from server using header.	7
Unit V	State Management Session, Cookie, Query String, Understanding Basic Session Functionality, Starting a Session, Registering Session variables, Using Session Variables, Destroying the variables and Session, What is a Cookie, Setting Cookies with PHP, Using Cookies with Sessions, Deleting Cookies, Implementing Query String, Hidden Fields.	7

Text Books	
1.	Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Bob Kaehms, Ric McGredy, Nathan Torkington, Paula M. Ferguson · 2002
2.	PHP and MySQL Web Development By Luke Welling, Laura Thomson · 2008
3.	PHP Essentials By Neil Smyth · 2010
4.	Modern PHP New Features and Good Practices By Josh Lockhart · 2015

Reference Books	
1.	Core PHP Programming, By Leon Atkinson, Zeev Suraski · 2004
2.	PHP and MySQL Web Development, Second Edition, By Luke Welling, Laura Thomson · 2003
3.	PHP and MySQL Web Development: A Beginner's Guide, By Marty Matthews · 2014
4.	RESTful PHP Web Services, Learn the Basic Architectural Concepts and Steps Through Examples of Consuming and Creating RESTful Web Services in PHP

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	By Samisa Abeysinghe · 2008

Useful Links	
1.	https://assets.ctfassets.net/nkydfjx48olf/5qFMF3mvitLMahX67i7iOb/028229996c13cbc27a0538f055a41b46/php_cookbook.pdf
2.	https://iare.ac.in/sites/default/files/lecture_notes/IARE_WT_NOTES.pdf
3.	https://www.geeksforgeeks.org/php-tutorials/
4.	https://ecomputernotes.com/php

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE04A	Semantic Web	3	0	0	3

Prerequisites for the course	
1.	Study fundamentals of Semantic Web technologies.
2.	Creating structured web documents in XML

Prior Reading Material/useful links	
1.	https://www.techtarget.com/searchcio/definition/Semantic-Web
2.	https://www.analyticssteps.com/blogs/what-semantic-web-working-importance-and-applications
3.	https://www.techtarget.com/searchcio/definition/Semantic-Web

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand the fundamentals of Semantic web
2	CO2	Student will able to Creating structured web documents in XML
3	CO3	Student will able to Apply ontology engineering to various problems.
4	CO4	Student will able to Understand Semantic Web query languages (SPARQL)
5	CO5	Student will able to Program semantic applications with Java and Jena API.

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Syllabus:

Course Contents		Hours
Unit I	**Semantic Web Vision**: Todays' web, Examples of semantic web from today's web, Semantic web technologies, layered approach Structured web documents in XML: The XML language, Structuring, Namespaces, Querying and Addressing XML documents, Processing	7
Unit II	**Describing Web Resources:** Introduction, RDF: Basic Ideas,RDF: XML-Based Syntax,RDF serialization, RDF Schema: Basic Ideas,RDF Schema: The Language ,RDF and RDF Schema	7
Unit III	**Logic and Inference Rules:** Introduction, Monotonic Rules syntax, semantics & examples, Nonmonotonic rules – syntax & examples, Encoding in XML.	7
Unit IV	**Ontology Engineering**: Introduction, Manual construction of Ontology, Reusing existing ontology, using Semi-automatic methods, Knowledge semantic web architecture	7
Unit V	**SPARQL, Ontology Language**: SPARQL simple Graph Patterns, Complex Graph Patterns, Group Patterns, Queries with Data Values, Filters OWL Formal Semantics. SchemaWeb Ontology Language: Introduction, OWL language, Examples, OWL in OWL, Future extensions.	8

Text Books	
1.	A Semantic web Primer: Grigoris Antoniou and Frank Van Hermelen , MIT Press
2.	Semantic Web programming, John Hebler et.el, Wiley
3.	Foundations of Semantic Web Technologies, Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, CRC Press
4.	Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, "The Semantic Web: A Guide to the Futureof XML, Web Services, and Knowledge Management", Fourth Edition, Wiley Publishing, 2003.

Reference Books	
1.	John Davies, Rudi Studer, and Paul Warren John, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley and Son's, 2006.
2.	John Davies, Dieter Fensel and Frank Van Harmelen, "Towards the Semantic Web: Ontology- Driven Knowledge Management", John Wiley and Sons, 2003.
3.	Semantic Web and education By Vladan Devedzic · 2006

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4.	Semantic Web Technologies for E-learning, Darina Dicheva, Jim E. Greer, Riichiro Mizoguchi, IOS Press

Useful Links	
1.	https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/SEMANTIC%20WEB&SOCIAL%20NETWORKS.pdf
2.	https://www.google.co.in/books/edition/Semantic_Web_Engineering_in_the_Knowledg/ipN-3GWuQXgC?hl=en&gbpv=1&dq=semantic+web+course+objectives&printsec=frontcover
3.	https://www.google.co.in/books/edition/Semantic_Web_Services/wglTWr-uS3UC?hl=en&gbpv=1&dq=semantic+web+course+objectives&printsec=frontcover
4.	https://www.google.co.in/books/edition/Social_Networks_and_the_Semantic_Web/giOwMTn2PNYC?hl=en&gbpv=1&dq=semantic+web+course+objectives&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE04B	Big Data Analytic Technique	3	0	0	3

Prerequisites for the course	
1.	Understand the key issues in big data management
2.	Study the tools and techniques required in handling large amounts of datasets.

Prior Reading Material/useful links	
1.	https://mrcet.com/downloads/digital_notes/CSE/IV%20Year/(R17A0528%20)%20Big%20Data%20Analytics%20Digital%20notes.pdf
2.	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SIT1606.pdf
3.	https://www.getsmarter.com/blog/career-advice/big-data-analysis-techniques/

Course Objectives

1.	To provide an overview of an exciting growing field of big data analytics.
2.	To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map-Reduce.
3.	To teach the fundamental techniques and principles in achieving big data analytics

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	with scalability and streaming capability.
4.	To enable students to have skills that will help them to solve complex real-world problems in for decision support.
5.	To make students comfortable with tools and techniques required in handling large amounts of datasets.

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2	CO2	Student will able to Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
3	CO3	Student will able to Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
4	CO4	Student will able to Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.
5	CO5	Student will able to Develop Big Data Solutions using Hadoop Eco System

Syllabus:

Course Contents		Hours
Unit I	**Introduction to Big Data:** Introduction to Big Introduction to Big Data, Big Data characteristics, types From 0-3 Data of Big Data, Traditional vs. Big Data business approach, Ref. Case Study of Big Data Solutions.	7
Unit II	**Introduction to Hadoop** : What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Physical Architecture; Hadoop limitations.	7
Unit III	**NoSQL:** What is NoSQL? NoSQL business drivers;NoSQL case studies; NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns; Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; analyzing big data with a shared-nothing architecture; choosing distribution models: master-slave versus peer-to-peer; four ways that NoSQL systems handle big data problems	7

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Unit IV	**Map Reduce and the New Software:** Distributed File Systems: Physical Organization of Compute Nodes, Large-Scale File-System Organization. MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce, Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step.	8
Unit V	**Finding Similar Item:** Applications of Near-Neighbor Search, Jaccard Similarity of Sets, Similarity of Documents, Collaborative Filtering as a Similar-Sets Problem .	7

Text Books	
1.	Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press,
2.	Dan McCreary and Ann Kelly "Making Sense of NoSQL" – A guide for managers and the rest of us, Manning Press.
3.	Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press.
4.	Bill Franks , "Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics", Wiley

Reference Books	
1.	Chuck Lam, "Hadoop in Action", Dreamtech Press
2.	Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", Wiley India
3.	Paul Zikopoulos, Chris Eaton, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data', McGraw Hill Education.
4.	Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley India.

Useful Links	
1.	https://www.aalimec.ac.in/wpcontent/uploads/2019/09/MC5502_BDA_UNIT_I_NOTES.pdf
2.	https://www.youtube.com/watch?v=pkPdhznqEI4
3.	https://www.iare.ac.in/sites/default/files/NEW%20LECHURE%20NOTES.pdf
4.	https://www.google.co.in/books/edition/Developing_Analytic_Talent/tp46AwAAQB

VISION	MISSION
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	AJ?hl=en&gbpv=1&dq=big+data+analytics+techniques+COURSE+OUTCOMES&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE04C	Digital Image Processing	3	0	0	3

Prerequisites for the course

1.	Study the fundamental concepts of a digital image processing system.
2.	Categorize various compression techniques.

Prior Reading Material/useful links	
1.	https://www.geeksforgeeks.org/digital-image-processing-basics/
2.	https://www.tutorialspoint.com/dip/index.htm
3.	https://www.javatpoint.com/digital-image-processing-tutorial

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Review the fundamental concepts of a digital image processing system.
2	CO2	Student will able to Analyze images in the frequency domain using various transforms
3	CO3	Student will able to Evaluate the techniques for image enhancement and image restoration.
4	CO4	Student will able to Categorize various compression techniques.
5	CO5	Student will able to Interpret Image compression standards.

Syllabus:

Course Contents		Hours
Unit I	Introduction to Digital Image Processing: Fundamentals of Elements of Digital Image, Image As Data, Pixels, Components Of Digital Image, Types Of Image Representation, Measures Of Image, Neighbors of pixel adjacency connectivity, regions and boundaries, Distance measures,, Application Of Digital Image Processing.	7
Unit II	Matlab Basics: Introduction to Data Types, Operators, Matrices, File, I/O, Image Processing Toolbox	7
Unit III	Image Enhancement Techniques: In spatial domain: Basic gray level	7

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	transformations, Histogram processing, using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.	
Unit IV	Image Filtering Techniques: Low Pass Filters – Smoothing, High Pass Filters - Edge Detection, Sharpening; Image Restoration: Noise Models, Model of Image Degradation/Restoration Process, Noise Reduction, Inverse Filtering, M Minimum Mean Square Error (Weiner) Filtering.	8
Unit V	Colour Image processing: Colour fundamentals, Colour models, Representation of Color in Images, Colour transformation, Smoothing and Sharpening, Colour segmentation. Image Morphology: Different Morphological Algorithm, Morphological Measures	7

Text Books	
1.	Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education, Third Edition, 2008.
2.	Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002. Gonzalez & Woods - Digital Image Processing Using Matlab
3.	Bhabatosh Chanda and Dwijesh Majumder - Digital Image Processing
4.	Kenneth R. Castleman, Digital Image Processing, Pearson, 2006

Reference Books	
1.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
2.	William K. Pratt, Digital Image Processing' , John Wiley, New York, 2002
3.	Milan Sonka etaI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.
4.	D. E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.

Useful Links	
1.	https://www.bharathuniv.ac.in/colleges1/downloads/courseware_ece/course_outcome/core_electives_3/BEC007%20CO%20DIGITAL%20IMAGE%20PROCESSING.pdf
2.	https://www.cis.rit.edu/class/simg712-90/notes/12-Basic_Principles_DIP.pdf
3.	https://www.google.co.in/books/edition/Image_Processing/smBw4xvfrIC?hl=en&gbpv=1&dq=What+is+the+basic+principle+of+digital+image+processing%3F&printsec=frontcover

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4.	https://www.google.co.in/books/edition/Principles_of_Digital_Image_Processing/FILBBAAAQBAJ?hl=en&gbpv=1&dq=What+is+the+basic+principle+of+digital+image+processing%3F&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE04D	Randomized Algorithms	3	0	0	3

Prerequisites for the course	
1.	Understand the principles of random signals.
2.	Study the basics of Design and Analysis of Algorithm.

Prior Reading Material/useful links	
1.	https://www.geeksforgeeks.org/randomized-algorithms/
2.	https://ocw.mit.edu/courses/6-856j-randomized-algorithms-fall-2002/
3.	http://theory.stanford.edu/people/pragh/amstalk.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students have the basics of probability, events and random experiments.
2	CO2	They can analyze that the random variable is always a numerical quantity.
3	CO3	Students can use the multiple random variables and relate through examples to real problems.
4	CO4	Students can have the concept of random processes in both deterministic and non deterministic types.
5	CO5	Students can Use the Power density spectrum and its properties and the types of noise

Syllabus:

Course Contents		Hours
Unit I	**Introduction to Randomized Algorithms:** Review of Basic Probability, Polynomial Identity Testing, Schwartz - Zippel Lemma, Reduction from Perfect Bipartite Matching to PIT, Randomized Quick sort, Markov,	7

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	Chebyshev, and Chernoff bounds, Tossing coins, coupon collector problem, birthday paradox, Balls and bins, Two point sampling.	
Unit II	**Randomized rounding:** Multi-commodity flow, Introduction to Markov chain, randomized algorithm for 2SAT, stationary distribution, Irreducible and aperiodic Markov chain, fundamental theorem of Markov chain (statement only), coupling and Random walk	7
Unit III	**Metropolis Algorithm**: Mixing time of Random Walk on Cycles, Proof of the fundamental Theorem of Markov chains, Finishing proof of the fundamental Theorem of Markov chains, hitting time, commute time, cover time, Monte Carlo Method, FPRAS for DNF Counting, FPRAS for Independent Set Counting using Monte Carlo Method	7
Unit IV	**Introduction to Probabilistic Methods:** Probabilistic method of expectation, alteration; Lovasz Local Lemma and its application, Method of Conditional Expectation for De-randomization, Overview of path coupling.	7
Unit V	**Introduction to Universal Hash Family**: Perfect Hashing, Cuckoo Hashing, Bloom Filter, Count Min Sketch, Construction of Universal Hash Family, Locality Sensitive Hashing (LSH), Nearest Neighbor Search (NNS), Point Location in Equal Balls (PLEB), Johnson Lindenstrauss Lemma Sub-Gaussian Random Variables	8

Text Books	
1.	Randomized Algorithms: Rajeev Motwani, Prabhakar Raghavan, Cambridge University Press.
2.	Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis by Eli Upfal and Michael Mitzenmacher
3.	Computational Geometry: Algorithms and Applications, by Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars, 3rd edition, Springer-Verlag, 2008.
4.	Algorithmic and Analysis Techniques in Property Testing, by Dana Ron. Found. Trends Theor. Comput. Sci. 5, 2 (February 2010), 73-205.

Reference Books	
1.	Randomized Algorithms, By Rajeev Motwani · 2001, Cambridge University Press
2.	Probability and Computing Randomized Algorithms and Probabilistic Analysis By Michael Mitzenmacher, Eli Upfal · 2005
3.	Towards Dynamic Randomized Algorithms in Computational Geometry By Monique Teillaud · 1993
4.	Probability and Computing Randomization and Probabilistic Techniques in Algorithms and Data Analysis By Michael Mitzenmacher, Eli Upfal · 2017

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Useful Links	
1.	https://www.google.co.in/books/edition/Randomized_Algorithms/QKVY4mDivBEC?hl=en&gbpv=1&dq=Randomized+Algorithms&printsec=frontcover
2.	https://www.google.co.in/books/edition/Randomized_Algorithms_for_Analysis_and_C/KyGmPavw7OMC?hl=en&gbpv=1&dq=Randomized+Algorithms&printsec=frontcover
3.	https://www.google.co.in/books/edition/Design_and_Analysis_of_Randomized_Algori/XARmmrB86UEC?hl=en&gbpv=1&dq=Randomized+Algorithms&printsec=frontcover
4.	https://www.google.co.in/books/edition/Randomized_Algorithms_in_Automatic_Contr/sK0qBAAAQBAJ?hl=en&gbpv=1&dq=Randomized+Algorithms&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE05A	Natural Language Processing	3	0	0	3

Prerequisites for the course	
1.	Basics of Neural Networks and Machine Learning and Process.
2.	Study the Character Encoding, Word Segmentation, Sentence Segmentation.

Prior Reading Material/useful links	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_natural_language_processing.htm
2.	https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf
3.	https://www.geeksforgeeks.org/introduction-to-natural-language-processing/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Apply the principles and Process of Human Languages such as English and other Indian Languages using computers.
2	CO2	Student will able to Realize semantics and pragmatics of English language for text processing.

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3	CO3	Student will able to Create CORPUS linguistics based on digestive approach (Text Corpus method)
4	CO4	Student will able to Check a current methods for statistical approaches to machine translation.
5	CO5	Student will able to Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language.

Syllabus:

Course Contents		Hours
Unit I	Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is DifficultParts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory : Entropy, perplexity, The relation to language, Cross entropy.	7
Unit II	Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis. Inflectional and Derivation Morphology, Morphological analysis and generation using Finite State Automata and Finite State transducer.	7
Unit III	N gram models, Smoothing, Part of speech tagging, Hidden Markov models, Viterbi algorithm, Forward - backward algorithm, EM training, Models for Named Entity Recognition, Neural Language Models - Recurrent Neural Networks and Long Short term Memory networks	7
Unit IV	Methodological Preliminaries, Supervised Disambiguation: Bayesian classification, An informationtheoretic approach, Dictionary-Based Disambiguation: Disambiguation based on sense, Thesaurusbased disambiguation, Disambiguation based on translations in a second-language corpus.	7
Unit V	Markov Model: Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation. The Information Sources in Tagging: Markov model taggers, Viterbi algorithm, Applying HMMs to POS tagging, Applications of Tagging	8

Text Books	
1.	Christopher D. Manning and Hinrich Schutze, " Foundations of Natural Language Processing" , 6 th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
2.	Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009.
3.	NitinIndurkhya, Fred J. Damerau "Handbook of Natural Language Processing",

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	Second Edition, CRC Press, 2010.
4.	James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012..

Reference Books	
1.	Chris Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MITPress Cambridge, MA, 2003.
2.	Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.
3.	Neural Network Methods in Natural Language Processing By Yoav Goldberg · 2017
4.	Deep Learning for Natural Language Processing Develop Deep Learning Models for your Natural Language Problems By Jason Brownlee · 2017

Useful Links	
1.	https://www.google.co.in/books/edition/Introduction_to_Natural_Language_Process/72yuDwAAQBAJ?hl=en&gbpv=1&dq=natural+language+processing+Course+Objectives&printsec=frontcover
2.	https://www.cs.mcgill.ca/~jcheung/teaching/fall-2015/comp599/comp599-outline.pdf
3.	https://luddy.iupui.edu/courses/info-b443/
4.	https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE05B	Advanced Computer Vision	3	0	0	3
Prerequisites for the course						
1.	Understanding on detailed models of image formation.					
2.	Examine various clustering algorithms					

Prior Reading Material/useful links	
1.	https://www.studocu.com/in/document/amrita-vishwa-vidyapeetham/computer-vision/computer-vision-lecture-notes-all/23202964
2.	http://eecs.northwestern.edu/~yingwu/teaching/EECS432/Notes/vision.pdf
3.	https://www.mccormick.northwestern.edu/electrical-computer/academics/courses/descriptions/432.html

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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Appreciate the detailed models of image formation.
2	CO2	Student will able to Analyse the techniques for image feature detection and matching.
3	CO3	Student will able to Apply various algorithms for pattern recognition.
4	CO4	Student will able to Examine various clustering algorithms.
5	CO5	Student will able to Analyze structural pattern recognition and feature extraction techniques

Syllabus:

Course Contents		Hours
Unit I	Image formation and Image model- Components of a vision system- Cameras- camera model and camera calibration- Radiometry- Light in space- Light in surface - Sources, shadows and shading.	7
Unit II	Multiple images-The Geometry of multiple views- Stereopsis- Affine structure from motion- Elements of Affine Geometry Affine structure and motion from two images- Affine structure and motion from multiple images- From Affine to Euclidean images.	7
Unit III	High level vision- Geometric methods- Model based vision- Obtaining hypothesis by pose consistency, pose clustering and using Invariants, Verification.	7
Unit IV	Introduction to pattern and classification, supervised and unsupervised learning, Clustering Vs classification, Bayesian Decision Theory- Minimum error rate classification Classifiers, discriminant functions, decision surfaces- The normal density and discriminant-functions for the Normal density.	8
Unit V	Linear discriminant based classifiers and tree classifiers Linear discriminant function based classifiers- Perceptron- Minimum Mean Squared Error (MME) method, Support Vector machine, Decision Trees: CART, ID3.	7

Text Books	
1.	Bernd Jahne and Horst HauBecker, Computer vision and Applications, Academic press, 2000.
2.	David A. Forsyth & Jean Ponce, Computer vision – A Modern Approach, Prentice

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	Hall, 2002.
3.	C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4.	R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, John Wiley, 2001.

Reference Books	
1.	Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, 2004.
2.	S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.
3.	Computer Vision and Image Processing Fundamentals and Applications By Manas Kamal Bhuyan · 2019
4.	Advanced Topics in Computer Vision, 2013, Springer London

Useful Links	
1.	https://www.google.co.in/books/edition/Concise_Computer_Vision/ZCu8BAAAQBAJ?hl=en&gbpv=1&dq=advanced+computer+vision+notes&printsec=frontcover
2.	https://www.studocu.com/in/document/amrita-vishwa-vidyapeetham/computer-vision/computer-vision-lecture-notes-all/23202964
3.	https://faculty.ucmerced.edu/mcarreira-perpinan/teaching/ee589/lecture-notes.pdf
4.	http://vision.stanford.edu/teaching/cs131_fall1718/files/cs131-class-notes.pdf

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE05C	AI In Wireless Communication	3	0	0	3

Prerequisites for the course	
1.	Basics of AI as applied to Wireless communication.
2.	Study the principles of AI.

Prior Reading Material/useful links	
1.	https://spectrum.ieee.org/ai-for-wireless
2.	https://www.hindawi.com/journals/wcmc/si/862756/
3.	https://www.rohde-schwarz.com/in/knowledge-center/webinars/artificial-intelligence-in-future-wireless-communication-register_255346.html

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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Identify and describe the various components used in Cognitive Radio
2	CO2	Student will able to Interpret various Cognitive Radio Networks
3	CO3	Student will able to Produce optimized solution in wireless communication for using Artificial Intelligence
4	CO4	Student will able to Analyze the implications of applying AI systems to organizations and future of work.
5	CO5	Student will able to Implement AI frameworks and platforms to improve business, organizational, and technology outcomes.

Syllabus:

Course Contents		Hours
Unit I	Fundamentals of Artificial Intelligence Introduction, A.I. Representation, Non-AI &AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation	8
Unit II	Artificial Intelligence In Wireless Communications Introduction to Cognitive Radio - Cognitive Radio Design - Cognitive Engine Design Component Descriptions, Artificial Intelligence Techniques	7
Unit III	Introduction to generic wireless channels, databases, feature extraction, classification and decision. Artificial Intelligence (AI) in the digital era and the role of network intelligence in mobile applications (APPs), digital assistants and autonomous vehicles.	7
Unit IV	Introduction to 5G (Network of networks) covering devices, systems, things/machines and big data. Overview of technology enablers in 5G architecture, system Design and framework for the 5G edge supporting massive IoT devices/cyber physical systems.	7
Unit V	Introduction to the trends in Machine Learning (ML) and Analytics in the 5G network management and evolution to Zero-Touch Networks (ZTN) framework. Application of ML (supervised learning, unsupervised learning and reinforcement learning) in the 5G ZTN including principle of 5G user analytics at the cell site, cell edge and core network.	7

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Text Books	
1.	Thomas W. Rondeau, Charles W. Bostian, "Artificial Intelligence in Wireless Communications", Artech house, 2009.
2.	Elaine Rich and Kevin Knight: "Artificial Intelligence." Tata McGraw Hill
3.	Stuart Russell & Peter Norvig : "Artificial Intelligence : A ModernApproach", Pearson Education, 2nd Edition.
4.	Erik Dhalman et al., "5G NR: The next generation wireless access network technology", 2018

Reference Books	
1.	Ivan Bratko : "Prolog Programming For Artificial Intelligence" , 2nd Edition Addison Wesley, 1440.
2.	Eugene, Charniak, Drew Mcdermott: "Introduction to Artificial Intelligence.", Addison Wesley
3.	Patterson: ―Introduction to AI and Expert Systems‖, PHI
4.	Devaki Chandramouli et al., "5G for the Connected World", Wiley, 2019 Evaluation

Useful Links	
1.	https://www.google.co.in/books/edition/Wireless_Communication_with_Artificial_I/1119EAAAQBAJ?hl=en&gbpv=1&dq=AI+In+Wireless+Communication&printsec=frontcover
2.	https://www.google.co.in/books/edition/Artificial_Intelligent_Techniques_for_Wi/_VJhEAAAQBAJ?hl=en&gbpv=1&dq=AI+In+Wireless+Communication&printsec=frontcover
3.	https://ptu.ac.in/wp-content/uploads/2020/10/6-12 18M_Tech_ECE__WIRELESS_COMMUNICATION.pdf
4.	https://www.iare.ac.in/?q=courses/electronics-and-communication-engineering-autonomous/open-elective-%E2%80%93-i

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7TE05D	Biomedical Informatics	3	0	0	3
Prerequisites for the course						
1.	Understand fundamental characteristics of data, information, and knowledge in the Health Informatics domain.					
2.	Understand basic principles of knowledge management systems in biomedicine.					

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Prior Reading Material/useful links	
1.	https://www.ohsu.edu/school-of-medicine/medical-informatics-and-clinical-epidemiology/what-biomedical-informatics
2.	https://openhealthinformatics.org/wp-content/uploads/2020/03/INM337-S1-Introduction-to-Health-Informatics.pdf
3.	https://www.studocu.com/en-us/document/ohio-university/health-informatics/lecture-notes-lecture-week-1-introduction-to-health-informatics-goes-through-an-overview-about-what-we-will-be-learning-for-the-semester-49-slides-w-study-topics-at-the-end/815269

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand fundamental characteristics of data, information, and knowledge in the Health Informatics domain.
2	CO2	Student will able to familiar with common algorithms for health applications and IT components in representative clinical processes.
3	CO3	Student will able to Develop understanding of population health and precision medicine.
4	CO4	Student will able to Understand basic principles of knowledge management systems in biomedicine.
5	CO5	Student will able to Develop understanding of various aspects of Health Information Technology standards

Syllabus:

Course Contents		Hours
Unit I	**Clinical informatics:** Nursing (nursing informatics), dentistry (dental informatics), pathology (pathology informatics), Health information management (HIM), Health Information Analysis.	7
Unit II	**Bioinformatics:** Domain-based definitions, Concept-oriented definitions, domain oriented definitions, formulating a definition of informatics based on data, information and knowledge, bioinformatics vs. biomedical informatics.	7
Unit III	**Imaging informatics:** PACS systems, biological science, clinical	7

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	services, science, medical / biomedical engineering ,cognitive science , applications.	
Unit IV	**Consumer health informatics:** Consumer health Informatics, Patient-Focused Informatics, Health Literacy, Various types and application of Consumer health Informatics, Consumer Education, Sharing and distribution of the content of EHRs and personal health data between professionals,Component of consumer health informatics	8
Unit V	**Bio Health informatics –**Introduction to health informatics and its significance Definitions and key concepts in health informatics Background disciplines, historical overview, and future challenges.	7

Text Books	
1.	Principles of Biomedical Informatics By Ira Kalet · 2013
2.	Ledley RS, Lusted LB. Reasoning foundation of medical diagnosis. *Science.* 1959;130(3366):9–21. [PubMed] [Google Scholar]
3.	Collen MF. Health care information systems: a personal historic review; Proceedings of ACM conference on History of medical informatics; Bethesda, MD: Association for Computing Machinery. 1987.
4.	Biomedical Informatics, Computer Applications in Health Care and Biomedicine, By Edward H. Shortliffe · 2006

Reference Books	
1.	Biomedical Informatics, Computer Applications in Health Care and Biomedicine, 2021
2.	Biomedical Informatics, Computer Applications in Health Care and Biomedicine, 2013
3.	Biomedical Informatics, Discovering Knowledge in Big Data By Andreas Holzinger · 2014
4.	Methods in Biomedical Informatics, A Pragmatic Approach, 2013

Useful Links	
1.	https://www.google.co.in/books/edition/Unifying_the_Applications_and_Foundation/3RW3DAAAQBAJ?hl=en&gbpv=1&dq=Biomedical+Informatics&printsec=frontcover
2.	https://www.google.co.in/books/edition/Biomedical_Informatics/2GbdCgAAQBAJ?hl=en&gbpv=1&dq=Biomedical+Informatics&printsec=frontcover
3.	https://www.google.co.in/books/edition/Medical_Informatics/ku0ubWDKFZgC?hl=en&gbpv=1&dq=Biomedical+Informatics&printsec=frontcover

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4.	https://www.google.co.in/books/edition/Public_Health_and_Informatics/81A2EAAAQBAJ?hl=en&gbpv=1&dq=Biomedical+Informatics&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7L006	Data Science using R(Lab)	0	0	2	2

Prerequisites for the course	
1.	Study critical R programming concepts.
2.	Analyse data and generate reports based on the data.

Prior Reading Material/useful links	
1.	https://www.simplilearn.com/learn-data-science-with-r-basics-skillup
2.	https://cdlsiet.ac.in/wp-content/uploads/2023/03/R-Language-Lab-Manual-lab-1.pdf
3.	https://crd230.github.io/lab1.html

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Show the installation of R Programming Environment.
2	CO2	Student will able to Utilize and R Data types for developing programs.
3	CO3	Student will able to Make use of different R Data Structures.
4	CO4	Student will able to Develop programming logic using R Packages.
5	CO5	Student will able to Analyze the datasets using R programming capabilities.

List of Practical's:

Course Contents		Hours
1	**1. RAS CALCULATOR APPLICATION** a. Using with and without R objects on console b. Using mathematical functions on console c. Write an R script, to create R objects for calculator application and save in a specified location in disk	2

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2	**DESCRIPTIVE STATISTICS IN R** a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets. b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.	2
3	**READING AND WRITING DIFFERENT TYPES OF DATASETS** a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. b. Reading Excel data sheet in R.	2
4	**VISUALIZATIONS** a. Find the data distributions using box and scatter plot. b. Find the outliers using plot. c. Plot the histogram, bar chart and pie chart on sample data.	2
5	**REGRESSION MODEL** Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).	2
6	**MULTIPLE REGRESSION MODEL** Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.	2
7	Create a data set and do statistical analysis on the data using R.	2
8	Implement different data structures in R (Vectors, Lists, Data Frames)	2
9	Implement data frames in R. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	2
10	Create a data set and do statistical analysis on the data using R.	2

Text Books	
1.	Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012
2.	Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2 nd Edition, Pearson Education, 2018.
3.	S. R. Mani Sekhar and T. V. Suresh Kumar, Programming with R,1 st Edition,, CENGAGE, 2017.
4.	Data Science and Machine Learning, Mathematical and Statistical Methods, By Dirk P. Kroese, Zdravko Botev, Thomas Taimre, Radislav Vaisman · 2019

Reference Books	
1.	Process Mining, Data Science in Action, By Wil van der Aalst · 2016

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2.	R for Data Science, Import, Tidy, Transform, Visualize, and Model Data, By Hadley Wickham, Garrett Grolemund · 2016
3.	R and Data Mining, Examples and Case Studies, By Yanchang Zhao · 2012
4.	Foundations of Data Science, By Avrim Blum, John Hopcroft, Ravindran Kannan · 2020

Useful Links	
1.	http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/
2.	http://www.ats.ucla.edu/stat/r/dae/rreg.htm
3.	http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html
4.	http://www.ats.ucla.edu/stat/r/data/binary.csv

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7L007	Cyber Security & Cryptography(Lab)	0	0	2	3

Prerequisites for the course	
1.	Study the basics of Cyber Security & Cryptography.
2.	Understand various applications of cryptography and security issues.

Prior Reading Material/useful links	
1.	https://cse29-iiith.vlabs.ac.in/
2.	http://www.anuraghyd.ac.in/cse/wp-content/uploads/sites/10/NS-CRYPTO-LAB-Final11.pdf
3.	https://sriindu.ac.in/wp-content/uploads/2023/02/R18CSE41L1-Crytography-Network-Security-Lab.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.
2	CO2	Student will able to Examine various Security algorithms.
3	CO3	Student will able to Know the methods of conventional encryption
4	CO4	Student will able to Understand various applications of

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		cryptography and security issues practically.
5	CO5	Student will able to Understand the concepts of public key encryption and number theory. CO3:

List of Practical's:

	Course Contents	Hours
1	Study of steps to protect your personal computer system by creating User Accounts with Passwords and types of User Accounts for safety and security	2
2	Study the steps to protect a Microsoft Word Document of different version with different operating system.	2
3	Study the steps to remove Passwords from Microsoft Word	2
4	Study various methods of protecting and securing databases.	2
5	Study "How to make strong passwords" and "passwords cracking techniques"	2
6	Implement RSA Algorithm using HTML and JavaScript	2
7	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.	2
8	Calculate the message digest of a text using the SHA-1 algorithm	2
9	Implement the SIGNATURE SCHEME - Digital Signature Standard	2
10	Apply DES algorithm for practical applications	2

Text Books	
1.	The Network Security Test Lab, A Step-by-Step Guide, By Michael Gregg · 2015
2.	Introduction to Cryptography and Network Security, By Behrouz A. Forouzan · 2008
3.	Lab Manual to Accompany Access Control, Authentication, and Public Key Infrastructure, By Bill Ballad, Tricia Ballad, Erin K. Banks · 2011
4.	Lab Manual for Security+ Guide to Network Security Fundamentals, By Mark Ciampa · 2015

Reference Books	
1.	Introduction to Computer and Network Security, Navigating Shades of Gray By Richard R. Brooks · 2013
2.	Hands-On Information Security Lab Manual By Michael E. Whitman, Herbert J. Mattord · 2010
3.	Cryptography and Steganography. A Multilayer Data Security Approach By Jagdish Chandra Patni, Hitesh Kumar Sharma · 2021
4.	Fundamentals of Cryptography Introducing Mathematical and Algorithmic

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	Foundations, By Duncan Buell · 2021

Useful Links	
1.	https://sriindu.ac.in/wp-content/uploads/2023/02/R18CSE41L1-Crytography-Network-Security-Lab.pdf
2.	https://www.csa.iisc.ac.in/~cris/about.html
3.	https://www.vvitengineering.com/lab/odd/CS6711-Security-Lab-Manual.pdf
4.	https://www.gvpce.ac.in/syllabi/MTech15-16/cyber-security/nsclab.pdf

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7P008	Project Phase I	0	0	6	3
Prerequisites for the course						
1.	Study the new technologies or improving existing ones.					
2.	Develop new computational models or simulations that help advance their research.					

Prior Reading Material/useful links	
1.	https://www.youtube.com/watch?v=p8e5ZEpRmx0
2.	https://www.youtube.com/watch?v=if_z7pMA85g
3.	https://www.youtube.com/watch?v=V5yv5TNpiLE

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to creation of new technologies or innovations.
2	CO2	Students will able to address complex problems or challenges
3	CO3	Students will able to develop new computational models or simulations that help advance their research.
4	CO4	Students will able to create new products or services that can be commercialized.
5	CO5	Students will able to impact various aspects of society, from improving productivity and efficiency to enhancing user experience and addressing social challenges.

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The project should enable the students to combine the theoretical and practical concepts studied in his/her academics. The project work should enable the students to exhibit their ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

Project work

The project work is an implementation of learned technology. The knowledge gained by studying various subjects separately supposed to utilize as a single task. A group of 03/04 students will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipments, data, tools etc. should be arranged.

Project Activity

The project groups should interact with guide, who in turn advises the group to carry various activities regarding project work on individual and group basis. The group should discuss the progress every week in the project hours and follow further advice of the guide to continue progress. Guide should closely monitor the work and help the students from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

Phase I

1) Submission of project/problem abstract containing problem in brief, requirements, broad area, applications, approximate expenditure if required etc.
2) Problem definition in detail.
3) Literature survey.
4) Requirement analysis.
5) System analysis (Draw DFD up to level 2, at least).
6) System design, Coding/Implementation (20 to 30%).

Text Books	
1.	Planning and Implementing Your Final Year Project — with Success! By Mikael Berndtsson, Jörgen Hansson, B. Olsson, Björn Lundell · 2013
2.	Computer Science Project Work Principles and Pragmatics By Sally Fincher, Marian

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	Petre, Martyn Clark · 2001
3.	Thesis Projects, A Guide for Students in Computer Science and Information Systems By Mikael Berndtsson · 2008

Reference Books	
1.	SOFTWARE ENGINEERING PROJECT MANAGEMENT By Bill Brykczynski, Richard D. Stutz · 2006
2.	Software Engineering Body of Knowledge By IEEE Computer Society · 2014
3.	Quality Software Project Management By Robert T. Futrell · 2002

Useful Links	
1.	https://www.google.co.in/books/edition/Project_Summaries/0ggTG_ya8acC?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&pg=PA78&printsec=frontcover
2.	https://www.google.co.in/books/edition/Real_World_Software_Projects_for_Compute/X6seEAAAQBAJ?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&printsec=frontcover
3.	https://www.logicraysacademy.com/blog/final-year-projects-for-cse/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	CS7T009	Research Methodology	2	0	0	Audit
Prerequisites for the course						
1.	Understand and use basic data analysis techniques.					
2.	Study the basic data collection methods with emphasis on secondary and survey research.					

Prior Reading Material/useful links	
1.	https://mrcet.com/downloads/digital_notes/CSE/Mtech/I%20Year/RESEARCH%20METHODLOGY.pdf
2.	https://ccsuniversity.ac.in/bridgelibrary/pdf/MPhil%20Stats%20Research%20Methodology-Part1.pdf
3.	https://www.drnishikantjha.com/papersCollection/Research%20Methodology%20.pdf

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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to Identify a research problem stated in a study
2	CO2	Students will able to Obtain skills to identify a business problem/ need, translate it into a research question, and design an appropriate way to answer it.
3	CO3	Students will able to Develop skills to design a research project and collect data.
4	CO4	Students will able to Develop skills to critically evaluate the quality of other researchers' findings and the process used to obtain them.
5	CO5	Students will able to Identify the overall process of designing a research study from its inception to its report.

Syllabus:

Course Contents		Hours
Unit I	Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research, Review of literatures: Primary source, Secondary source, Identifying gap areas from literature review, Searching e- resources, using search engines, Searching data base.	7
Unit II	Types of Research; Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.	7
Unit III	Research Sampling and Design: Sampling of data: Concept of sampling, Probability sampling techniques , Non probability sampling techniques , Sampling error, Research Design: Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design,	7
Unit IV	Methods, Collection and Analysis of Data: Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation, Application of computer in research data analysis.	8
Unit V	Presentation of Research: Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Indexing of journal and research output, Report writing steps in report writing, layout of report writing, reference and	7

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	bibliography.	

Text Books	
1.	Research Methodology, Methods and Techniques by C.R Kothari, 2nd Edition.
2.	Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes. 4.
3.	The Science of Education Research, Eurasia Publishing House, New Delhi by George J. (1964),
4.	Advanced focus Group Research, Sage Publication, India Ltd, New Delhi by Fern Edward F. (2001)

Reference Books	
1.	Research Methodology in Management, Himalaya Publishing House, New Delhi by Michael V.P.
2.	Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
3.	Research Methodology, A Handbook for Beginners, By Pagadala Suganda Devi · 2017
4.	Research Methodology, A Step-by-Step Guide for Beginners, By Ranjit Kumar · 2010

Useful Links	
1.	https://bbamantra.com/research-methodology/
2.	https://www.iare.ac.in/sites/default/files/IARE_RM_Lecture%20Notes.pdf
3.	https://prog.lmu.edu.ng/colleges_CMS/document/books/EIE%20510%20LECTURE%20NOTES%20first.pdf
4.	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBAX1023.pdf

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Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS7T001	Data Science	Prof. Sujata Helonde
2	CS7T002	Cyber Security & Cryptography	Prof. Swati Raut
3	CS7O003	Open Elective -3	-
4	CS7TE04A	Elective-IV (Semantic Web)	Prof. Pankaj Wankhede
5	CS7TE04B	Elective –IV (Big Data Analytic Technique)	Prof. Dipali Pethe
6	CS7TE05C	Elective-V (AI In Wireless Communication)	Prof. Anuja Ghasad
7	CS7TE05D	Elective –V (Biomedical Informatics)	Prof. Achal Wani
8	CS7L006	Data Science using R(Lab)	Prof. Sujata Helonde
9	CS7L007	Cyber Security & Cryptography (Lab)	Prof. Pankaj Wankhede
10	CS7P008	Project Phase I	Prof. Kiran Bode
11	CS7T009	Research Methodology	Prof. Swati Raut

Prof. Anuja Ghasad,
Secretary BOS, CSE,
JDCOEM, Nagpur

Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur

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Program: B. Tech. in Computer Science & Engineering

8th Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit	Teaching Mode
				L	T	P	CA	MSE	ESE	Total		
1	PEC	CS8TE06	Elective –VI	3	0	0	20	20	60	100	3	PPT, Board, Chalk
2	OEC	CS8O004	Open Elective -4	3	1	0	20	20	60	100	4	PPT, Board, Chalk
3	PROJECT	CS8P001	Project Phase II	0	0	4	50	0	50	100	3	PPT, PC
				6	**1**	**4**	**90**	**40**	**170**	**300**	**10**	

Elective VI

Course Code	Name of Subject
CS7TE06A	High Performance Computer Architecture
CS7TE06B	Full Stack Development
CS7TE06C	Advanced Software Testing Methodology
CS7TE06D	Advanced Database System

Open Elective-4 : Ethical Hacking

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	CS8TE06	High Performance Computer Architecture	3	0	0	3

Prerequisites for the course	
1.	Computer Architecture Organization
2.	Data structure & Algorithms
3.	Digital Electronics and Microprocessor

Prior Reading Material/useful links	
1.	https://nptel.ac.in/courses/106105033
2.	https://www.cse.iitd.ac.in/~srsarangi/courses/2021/col_718_2021/index.html
3.	https://www.cse.iitd.ac.in/~srsarangi/courses/2021/col_718_2021/index.html

Course Objectives:

1.	Use their learned skills, knowledge and abilities to develop computer architecture.
2.	Apply basic design principles to present ideas, information, products, and services on Architecture
3.	To learn about basic concepts of pipelining and dynamic Scheduling.
4.	To learn objectives and applications of Memory Hierarchies
5.	Apply basic design principles of Parallel and Scalable Architecture

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to develop computer architecture.
2	CO2	Students will know the basic concepts of parallelism
3	CO3	Students will become familiar with pipelining and hazards in pipeline.
4	CO4	Students will come to Instruction Level Parallelism and Dynamic Scheduling
5	CO5	Students will become familiar with memory hierarchies.

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Syllabus:

Course Contents		Hours
Unit I	Theory of Parallelism: Parallel Computer Models, The State of Computing, Multiprocessor and Multicomputer, Multivector and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks.	7
Unit II	Pipelining, Basic concepts, instruction and arithmetic pipelines, hazards in pipeline: structural, data and control hazards, overview of hazard resolution technique, Dynamic instruction scheduling, branch prediction techniques, Pipeline optimization techniques.	7
Unit III	Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Costs with Prediction, Dynamic Scheduling: Algorithm, Data level and Thread Level Parallelism.	7
Unit IV	Memory Hierarchies: Basic concept of hierarchical memory organization, Hierarchical memory technology, main memory, Inclusion, Coherence and locality properties, cache memory design and implementation, Techniques for reducing cache misses, RAID.	7
Unit V	Parallel and Scalable Architecture: Multiprocessors and Multicomputer: Multiprocessor System Interconnect, Cache Coherence and synchronization Mechanism, Multivector and SIMD Computers: Vector Processing Principles, Compound Vector Processing	7

Text Books	
1.	John. Hennessy & David A. Patterson, "Computer Archniecture A quantitative approach", 5th Edition, Morgon Kaufmann Publiations.
2.	Kai Hwang and A. Briggs, "Computer Architecture and parallel Processing", International edition McGraw-Hill.
3	Robert D. Kent, Todd W. Sands "High Performance Computing Systems and Applications" Springer US
4	High Performance Computing Systems and ApplicationsBy Jonathan Schaeffer · 2011Springer US

Reference Books	
1.	Kai Hwang and NareshJotwani, "Advanced Computer Architecture: Parallelism, Scalibility and Programmability" 2nd Edition, THM Publications
2.	David A. Kular and Jasvinder Pal Singh, "Parallel Computer Architecture", Morgan Kaufmann Publications.
3	High Performance Embedded Architectures and CompilersFirst International Conference, HiPEAC 2005, Barcelona, Spain, November 17-18, 2005,
4	Introduction to High Performance Computing for Scientists and Engineers

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	By Georg Hager, Gerhard Wellein · 2010CRC Press

Useful Links	
1.	https://www.youtube.com/watch?v=tawb_aeYQ2g
2.	https://www.google.co.in/books/edition/High_Performance_Datacenter_Networks/hddcAQAAQBAJ?hl=en&gbpv=1&dq=high+performance+computer+architecture+book&printsec=frontcover
3.	https://www.google.co.in/books/edition/High_Performance_Embedded_Architectures/Lc8GCAAAQBAJ?hl=en&gbpv=1&dq=high+performance+computer+architecture+book&printsec=frontcover
4.	https://www.google.co.in/books/edition/High_Performance_Computing_Systems_and_A/hDGZ9cB6zrUC?hl=en&gbpv=1&dq=high+performance+computer+architecture+book&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	CS8TE06B	Full Stack Development	3	0	0	3

Prerequisites for the course	
1.	Web Designing (Lab)
2.	Python Programming(Lab)
3.	Advance Java Programming(LAB)

Prior Reading Material/useful links	
1.	https://www.w3schools.com/whatis/whatis_fullstack.asp
2.	https://www.coursera.org/articles/full-stack-developer
3.	https://www.geeksforgeeks.org/what-is-full-stack-development/

Course Objectives:

1.	Use their learned skills, knowledge and abilities to develop web sites for the internet.
2.	Apply basic design principles to present ideas, information, products, and services on Websites.
3.	Apply basic programming principles to the construction of websites.
4.	Effectively manage website projects using available resources.
5.	Create visualizations in accordance with UI/UX theories.

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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will develop an understanding of the formalistic (aesthetic) aspects of design and visual communication
2	CO2	Students will demonstrate cross-platform (web, mobile, broadcast, print) storytelling skills.
3	CO3	Students will become familiar with graphic design and/or game theory and be able to apply this theory to real world projects.
4	CO4	Students will develop and understanding of information design and usability as it applies to interactive media projects.
5	CO5	Students will utilize coding and software tools to analyze and present data in a professional manner that could be translated to web-based or app-based media.

Syllabus:

Course Contents		Hours
Unit I	**Basic HTML, Advanced HTML** HTML-Introduction, HTML-Basic Formatting Tags, HTML-Grouping Using Div Span, HTML-Lists, HTML-Images , HTML-Hyperlink, HTML-Table, HTML-I frame, HTML-Form, Adding audio, Drag & drop, User location: geo location, Saving,information – local Storage, Saving information–session.	7
Unit II	**CSS** What Is CSS? How to write CSS: syntax, Using style sheets, Using external style sheets, Identitiesand classes, Style entire elements, CSS Comments, Change background colors, Setting backgroundimages, Change text color, Text formatting using CSS, Font Properties, Text Properties, Stylinghyperlinks using CSS, Styling lists using CSS, Setting element width and height, Adding borders,	7
Unit III	**Javascript Basics** JavaScript Essentials, What is JavaScript?, JavaScript: Internal vs. External, JavaScript comments,document.write(); Display info from the browser: alert & confirm, Prompting the user for Information, Programming fundamentals: Variables, Add two sentences together: concatenation,String Manipulation, Comparing variables and values, Programming fundamentals: If...ElseStatements, Else...If Statements, Switch Statements, Functions; JavaScript Events, Selecting HTMLElements using getElementById(), Escaping content, Programming fundamentals: Arrays, ForLoops, While Loops, Breaking Out Of Loops, Skipping A Loop Cycle.	8
Unit IV	***ReactJS***	7

VISION	MISSION
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	Introduction ,Templating using JSX ,Components, State and Props , Lifecycle of Components,State and Props ,Lifecycle of Components ,Rendering List and Portals ,Error Handling ,Routers ,Redux and Redux Saga ,Immutable.js , Service Side Rendering ,Unit Testing , Webpack **.**	
Unit V	**PHP** Overview Of PHP, Basic Scripting and Looping Constructs Conditional Constructs, Modularity through Include Files, PHP Operators, PHP Functions, New Features, Arrays in PHP,Basic OOP in PHP,Writing OOP PHP	7

Text Books	
1.	Web Development for beginners: Learn HTML/CSS/Javascript step by step with this Coding uide, Programming Guide for beginners, Website development, White Belt Mastery, ISBN9781667003771.
2.	The Road to React: Your journey to master React.js in JavaScript (2021 Edition), Kindle Edition.
3.	Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5, Publisher Shroff Publishers & Distributers, ISBN-13 978-9352130153
4.	Full Stack Web Development For BeginnersLearn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP

Reference Books	
1.	**Mastering Html, Css&Javascript Web Publishing , BPB Publications , ISBN-13 978-8183335157**
2.	A Complete Overview On: Web-development, Notion Press, ISBN-13978-1685098407.
3	Full Stack Development with JHipsterBuild Full Stack Applications and Microservices with Spring Boot and Modern JavaScript Frameworks, 2nd EditionBy Deepu K Sasidharan, Sendil Kumar N · 2020
4	Full Stack JavaScript Development With MEANMongoDB, Express, AngularJS, and Node.JSBy Colin J Ihrig, Adam Bretz · 2014

Useful Links	
1.	https://www.google.co.in/books/edition/Hands_On_Full_Stack_Development_with_Go/HHWPDwAAQBAJ?hl=en&gbpv=1&dq=Full+Stack+Development+book&printsec=frontcover
2.	https://www.google.co.in/books/edition/Modern_Full_Stack_Development/XLfZDwAAQBAJ?hl=en&gbpv=1&dq=Full+Stack+Development+book&printsec=frontcover
3.	https://www.youtube.com/watch?v=nu_pCVPKzTk

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4.	https://careerfoundry.com/en/blog/web-development/what-is-a-full-stack-web-developer/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	CS8TE06C	Advance Software Testing Methodology	3	0	0	3

Prerequisites for the course	
1.	Computer Architecture Organization
2.	Advanced Computer Vision
3.	Software Engineering

Prior Reading Material/useful links	
1.	https://www.techtarget.com/whatis/definition/software-testing
2.	https://reqtest.com/testing-blog/advanced-software-testing-techniques/
3.	https://stackify.com/best-software-testing-methods/

Course Objectives:

1.	Ability to understand and use regression testing techniques.
2.	Ability to understand and use mutation testing techniques.
3.	Ability to understand and use automated oracle generation techniques.
4.	Gaining confidence in and providing information about the level of quality.
5.	To make sure that the end result meets the business and user requirements.

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to understand software testing and verification concepts.
2	CO2	Students will able to understand and apply test adequacy measurements.
3	CO3	Students will able to understand and use automated test generation techniques.
4	CO4	Students will able to use various source code or bytecodeanlaysis tools/frameworks.
5	CO5	Students will able to understand and apply automated debugging and

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		repair techniques.

Syllabus:

Course Contents		Hours
Unit I	**Testing Process** Introduction, Test Planning, Monitoring, and Control– Test Analysis, Test Design:- Test Implementation, Test Execution, Evaluating Exit Criteria and Reporting, Test Closure Activities.	7
Unit II	**Test Management in Context** Risk-Based Testing and Other Approaches for Test Prioritization and Effort Allocation, Test Documentation and Other Work Products, Test Estimation, Defining and Using Test Metrics. Business Value of Testing, Distributed, Outsourced, and Insourced Testing, Managing the Application of Industry Standards.	7
Unit III	**Reviews & Defect Management** Introduction Reviews ,vulnerabilities in Management Reviews and Audits, Managing Reviews, Metrics for Reviews, Introduction Defect Management ,The Defect Lifecycle and the Software Development Lifecycle, Defect Report Information, Assessing Process Capability with Defect Report Information.	7
Unit IV	**Improving the Testing Process** Introduction, Test Improvement Process, Improving the Testing Process, Improving the Testing Process with TMMi Improving the Testing Process with TPI Next, Improving the Testing Process with CTP, Improving the Testing Process with STEP	7
Unit V	**Test Tools and Automation Testing Tools :**Introduction, Tool Selection, . Tool Lifecycle, Tool Metrics, Automation testing Tools :-Selenium WebDriver Tools ,QTP/UFT, Load Runner & QC AutoIT, Rest Assured Framework, ,Agile Scrum Methodology, AppiumDriver. Framework TestNG ,POM.	8

Text Books	
1.	Advanced Software Testing - Vol. 2, 2nd Edition, 2nd Edition.
2.	Learning Path Learn Selenium , O'Reilly Media, INC.
3	Guide to Advanced Software TestingBy Anne MetteJonassen Hass · 2008, Artech House
4	Advanced Software Testing - Vol. 2, 2nd EditionGuide to the ISTQB Advanced Certification As an Advanced Test ManagerBy Rex Black · 2014

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Reference Books	
1.	Paul C. Jorgensen, Software Testing: A Craftsman"s Approach, 3rd Edition, CRC Press, 2007.
2.	Boris Beizer, Software Testing Techniques, Dreamtech, 2009
3.	Advanced Software Testing – Vol.1, 2nd EditionGuide to the ISTQB Advanced Certification as an Advanced Test AnalystBy Rex Black · 2015
4.	Advanced Automated Software TestingFrameworks for Refined PracticeBy IzzatAlsmadi · 2012

Useful Links	
1.	https://www.youtube.com/watch?v=6rNgPXz9A9s
2.	https://www.youtube.com/watch?v=SpFY3360Wuc
3.	https://www.softwaretestinghelp.com/software-development-testing-methodologies/
4.	https://stackify.com/best-software-testing-methods/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	CS8TE06D	Advance Database System	3	0	0	3

Prerequisites for the course	
1.	Database Management Systems
2.	Database Management Systems (Lab)

Prior Reading Material/useful links	
1.	https://ecomputernotes.com/database-system/adv-database
2.	https://www.business.rutgers.edu/sites/default/files/documents/phd-syllabus-advanced-database-systems.pdf
3.	https://learn.saylor.org/course/view.php?id=91

Course Objectives:

1.	To explain basic Advance database concepts, applications, data models, features.
2.	To demonstrate the use of NoSQL Database & Types.
3.	To Describe the basics of Advance database and construct queries .
4.	To emphasize the importance of Big Data.
5.	To facilitate students in Advance Database design.

Course Outcomes:

Sr.	Course Outcome	CO statement

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No	number	
1	CO1	Students will able to Apply the basic concepts of Advance Database Systems and Applications.
2	CO2	Students will able to Use of the Advance database and construct queries using SQL in database creation and interaction
3	CO3	Students will able to Describe Apache Cassandra InterfacesAnalyse and techniques of Cassandra Command Line Interface.
4	CO4	Students will able to Apply the basic concepts of Basic operations with MongoDB shell.
5	CO5	Students will able to implement integration of security and recovery in database systems;

Syllabus:

Course Contents		Hours
Unit I	**Introduction to ADBS** Introduction to Advanced Database , Comparision of DBMS & ADBMS, DBMS Advanced Features and Distributes Database (Query Processing and Evaluation, Transaction Management and Recovery, Database Security and Authorisation, Distributed Databases), Types of ADBS (Network database Systems, Object-Oriented Database Systems, Hierarchical Database Systems)	6
Unit II	**NoSQL database concepts** Differentiate SQL and NoSQL databases. Types of NoSQL databases, NoSQL data modeling, Benefits of NoSQL, comparision between SQL and NoSQL database system. Use NoSQL database to solve given queries.NoSQL using MongoDB: Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell,	8
Unit III	**Big Data** Overview of Big Data and NoSQL Database: The 3 Vs. of Big Data, Data Evolution ,Features of Big Data ,Big Data-Use Cases , Big Data Analytics, Traditional Technology vs. Big Data Technology,ApacheHadoop , HDFS, Map Reduce , NoSQL Databases, Approaches to NoSQL Databases-Types	7
Unit IV	**Apache Cassandra** Introduction to Apache Cassandra: Characteristics, History of Cassandra, Features of Cassandra ,When is Cassandra Used ? , Simple Cassandra Program, Cassandra Command Line Interface, Advantages of Cassandra, Limitations of Cassandra.	7
Unit V	**Apache Cassandra Interfaces**	8

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	Cassandra supports Cassandra Query Language or CQL, DDL and DML Statements ,DML Statements – COPY Apache Cassandra Interfaces :Cassandra Interfaces , Cassandra Command Line Interface ,Cqlsh Options ,Cqlsh Commands ,Cqlsh Shell Commands , Querying Cassandra	

Text Books	
1.	Mastering Apache Cassandra - Second Edition by NishantNeeraj (Author)
2.	Henry Korth, Abraham Silberschatz& S. Sudarshan, *Database System Concepts*, McGraw-Hill Publication, 6th Edition, 2011
3.	Learning Apache Cassandra - Second Edition by SandeepYarabarlaReleased April 2017 Publisher(s): Packt Publishing ISBN: 9781787127296
4.	Advanced Database SystemsBy Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T. Snodgrass, V.S. Subrahmanian, Roberto Zicari · 1997

Reference Books	
1.	Mastering Apache Cassandra 3.x: An expert guide to improving database scalability and availability without compromising performance, 3rd Edition
2.	Joel Murach, Murach's Oracle SQL and PL/SQL *for Developers*, Mike Murach&Associates, 2nd Edition, 2014.
3.	Wiederhold, *Database Design*, McGraw-Hill Publication, 2nd Edition, 1983.
4.	Advanced Database Systems, By Nabil R. Adam, Bharat K. Bhargava · 1993, Springer

Useful Links	
1.	https://www.google.co.in/books/edition/Database_Systems_The_Complete_Book/-5mqs4hQIBcC?hl=en&gbpv=1&dq=Advance+Database+System&printsec=frontcover
2.	https://www.youtube.com/watch?v=hKljaVcCMgg
3.	https://www.youtube.com/watch?v=poEfLYH9W2M
4.	https://www.youtube.com/watch?v=m72mt4VN9ik

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	CSE8P002	Major Project	0	0	4	4

Prerequisites for the course	
1.	Mini Project

Prior Reading Material/useful links	
1.	https://www.youtube.com/watch?v=p8e5ZEpRmx0

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2.	https://www.youtube.com/watch?v=if_z7pMA85g
3.	https://www.youtube.com/watch?v=V5yv5TNpiLE

Course Objectives:

1.	To Developing new technologies or improving existing ones
2.	To Solving complex problems
3.	To Enhancing human-computer interaction.
4.	To Advancing scientific research.
5.	To Creating new business opportunities.

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to creation of new technologies or innovations.
2	CO2	Students will able to address complex problems or challenges
3	CO3	Students will able to develop new computational models or simulations that help advance their research.
4	CO4	Students will able to create new products or services that can be commercialized.
5	CO5	Students will able to impact various aspects of society, from improving productivity and efficiency to enhancing user experience and addressing social challenges.

This is continuous work to the project phase I. Every students will have to submit a completed report (3 copies)* of the project work. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II
1. Coding/Implementation.
2. Use cases.
3. Testing/Trouble shooting.
4. Data dictionary/ Documentation.
5. Finalization of project in all respect.
6. *(For guide, Personal copy, Departmental library.)
7. In a presentation, the students should focus to clarify problem definition and analysis of the problem.

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Text Books	
1.	Planning and Implementing Your Final Year Project — with Success!By Mikael Berndtsson, Jörgen Hansson, B. Olsson, BjörnLundell · 2013
2.	Computer Science Project WorkPrinciples and PragmaticsBy Sally Fincher, Marian Petre, Martyn Clark · 2001
3.	Thesis Projects, A Guide for Students in Computer Science and Information Systems By Mikael Berndtsson · 2008

Reference Books	
1.	SOFTWARE ENGINEERING PROJECT MANAGEMENTBy Bill Brykczynski, Richard D. Stutz · 2006
2.	Software Engineering Body of KnowledgeBy IEEE Computer Society · 2014
3.	Quality Software Project ManagementBy Robert T. Futrell · 2002

Useful Links	
1.	https://www.google.co.in/books/edition/Project_Summaries/0ggTG_ya8acC?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&pg=PA78&printsec=frontcover
2.	https://www.google.co.in/books/edition/Real_World_Software_Projects_for_Compute/X6seEAAAQBAJ?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&printsec=frontcover
3.	https://www.logicraysacademy.com/blog/final-year-projects-for-cse/

Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS7TE06A	Elective –VI (High Performance Computer Architecture)	
2	CS7TE06B	Elective –VI (Full Stack Development)	
3	CS7TE06C	Elective –VI (Advanced Software Testing Methodology)	
4	CS7TE06D	Elective –VI (Advanced Database System)	
5	CS8O004	Open Elective -4 (Ethical Hacking)	
6	CS8P001	Project Phase II	

Prof. Anuja Ghasad,
Secretary BOS, CSE,
JDCOEM, Nagpur

Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur

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B. Tech.

In

Computer Science and Engineering

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Program: B. Tech. in Computer Science & Engineering
5th Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit	Teaching Mode
				L	T	P	CA	MSE	ESE	Total		
1	ESC	CS5T001	Internet of Things	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
2	PCC	CS5T002	TCP/IP	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
3	PCC	CS5T003	Design and Analysis of Algorithm	2	1	0	20	20	60	100	3	PPT, Board, Chalk,
4	PCC	CS5O001	Open Elective-1	3	1	0	20	20	60	100	4	PPT, Board, Chalk,
5	PEC	CS5TE01	Elective -I	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
6	ESC	CS5L004	Internet of Things (Lab)	0	0	2	60	0	40	100	1	PC, PPT
7	PCC	CS5L005	TCP/IP(Lab)	0	0	2	60	0	40	100	1	PC, PPT
8	PCC	CS5L006	Design and Analysis of Algorithm (Lab)	0	0	2	60	0	40	100	1	PC, PPT
9	PROJECT	CS5P007	Mini Project	0	0	0	25	0	25	50	1	PC
10	PROJECT	CS5P008	Field Training/ Industrial Visit	0	0	0	30	0	20	50	1	-
11	MC	CS5T009	Innovation and Entrepreneurship Development	2	0	0	15	10	25	50	Audit	PPT, Board, Chalk,
				16	**2**	**6**	**350**	**110**	**490**	**950**	**21**	

Open Elective-1 : OSOS (Open Source Operating System)

Elective-1

Code	Subject
CS5TE01A	Augmented Reality
CS5TE01B	Block Chain
CS5TE01C	3D Printing & Design

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5T001	Internet of Things	3	0	0	03

Prerequisites for the course	
1.	Knowledge of Computer networks, LAN, WAN & MAN
2.	Study of Protocols, Sensors, basics of IoT.

Prior Reading Material/useful links	
1.	https://www.youtube.com/watch?v=6mBO2vqLv38
2.	https://www.internetsociety.org/iot/
3.	https://www.forbes.com/sites/bernardmarr/2021/12/13/the-5-biggest-internet-of-things-iot-trends-in-2022/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Identify the different technology.
2	CO2	Student will able to Apply IoT to different applications.
3	CO3	Student will able to Analysis and evaluate protocols used in IoT
4	CO4	Student will able to Design and develop smart city in IoT
5	CO5	Student will able to Analysis and evaluate the data received through sensors in IoT

Syllabus:

Course Contents		Hours
Unit I	**IoT Introduction:** Origin of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT challenges, Need of IoT ,IoT features, Bulding blocks of IoT , IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, The Core IoT Functional Stack, IoT Data Management and Compute Stack. IoT Things : Sensors and Actuators	07
Unit II	IoT Ecosystem: Three layered architecture, five layer architecture, cloud computing , fog computing, IoT taxonomy. Connectivity Terminology: IoT LAN , IoT WAN, IoT Node, IoT Gateway.	07
Unit III	**IoT Protocols:** IoT Networking protocols : MQTT, SMQTT, CoAP,	07

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	XMPP, AMQP. IoT Communication protocols : IEEE 802.15.4, Zigbee, 6LoWPAN, Wireless HART, Z-Wave, Bluetooth, NFC, RFID.	
Unit IV	**Data Analytics for IoT:** An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IoT Security, Common Challenges in IoT Security, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.	07
Unit V	**Implementation of IoT with Arduino and RaspberryPi:** Introduction to Arduino, Integration of sensors and actuators with Arduino, IDE programming, Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Application of IOT.	08

Text Books	
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education
2.	Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.
3.	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT,2014.

Reference Books	
1.	Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2.	Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devices",by Andrew Minteer
3.	"Internet of Things: Architectures, Protocols and Standards", by Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri

Useful Links	
1.	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
2.	https://builtin.com/internet-things
3.	https://www.simplilearn.com/iot-devices-article

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Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5T002	TCP/IP	3	0	0	03

Prerequisites for the course	
1.	Knowledge of Network Architecture, Protocols, LANS, WANS, Connecting Devices.
2.	Basics of Operating Systems. Study of TCP & UDP Models.

Prior Reading Material/useful links	
1.	https://www.techtarget.com/searchnetworking/definition/TCP-IP
2.	https://www.youtube.com/watch?v=GfaHdjApnhU
3.	https://www.techtarget.com/searchnetworking/definition/TCP

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	To understand the basic concepts of TCP/IP Architecture.
2	CO2	To compare and contrast TCP and UDP in terms of the application that uses them.
3	CO3	To design network-based applications using the socket mechanism.
4	CO4	To work with IPv4 addresses in terms of subnetting and supernetting.
5	CO5	To setup a host and network in terms of IP addressing.

Syllabus:

Course Contents		Hours
Unit I	Network Architecture-Standards, TCP/IP Model Overview, Networking Technologies: LANS, WANS, Connecting Devices. Internetworking concept, Internet Backbones, NAP, ISPs, RFCs and Internet Standards.	07
Unit II	Classful Internet address, CIDR-Subnetting and Supernetting, ARP, RARP, OOTP, DHCP.	07
Unit III	IP Datagram- IP Package- IP forwarding and routing algorithms, computing paths, RIPOSPF, ICMP, IGMP.	07
Unit IV	TCP header, services, Connection establishment and termination, Interactive data flow, Bulk data flow, Flow control and Retransmission, TCP timers, Urgent Data processing, Congestion control, Extension headers.	07
Unit V	Switching technology, MPLS fundamentals, signaling protocols, LDP, IP	07

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	traffic engineering, ECMP, SBR, Routing extensions for traffic engineering, Traffic engineering limitations and future developments.	

Text Books	
1.	TCP/IP Network Administration, Craig Haut, 3rd Edition, Shroff Publications, 2002.
2.	Internetworking with TCP/IP - Principles, Protocols, and Architecture, Douglas E. Comer, 5th edition Volume-1, Prentice Hall, 2006.
3.	The Internet and its Protocols- A Comparative approach, Adrian Farrel, Morgan Kaufmann, 2004. 9
4.	TCP/IP Illustrated - the Protocols, W. Richard Stevens, Volume I, Pearson Education, 2003.
5.	TCP/IP Protocol Suite, Behrouz A. Forouzan, 3rd edition, Tata McGraw Hill, 2006.

Reference Books	
1.	IPv6 Theory, Protocol and Practice, Pete Loshin, 2nd edition, Morgan Kaufmann, 2003.
2.	Internetworking TCP/IP, Comer D.E and Stevens D.L, Volume III, Prentice Hall of India, 1997.

Useful Links	
1.	https://nptel.ac.in/courses/106105183
2.	https://archive.nptel.ac.in/courses/106/105/106105081/
3.	https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5T003	Design and Analysis of Algorithm	2	1	0	3

Prerequisites for the course	
1.	Basic knowledge of Data Structures, their uses & applications.
2.	Study of different algorithms.

Prior Reading Material/useful links	
1.	https://onlinecourses.swayam2.ac.in/cec22_cs13/preview
2.	https://www.youtube.com/watch?v=XqWYatsgwfU

VISION	MISSION
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3.	https://www.youtube.com/watch?v=0IAPZzGSbME

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to understand basic knowledge of computational complexity, approximation and randomized algorithms, selection of the best algorithm to solve a problem.
2	CO2	Student will able to develop efficient algorithms for simple computational tasks.
3	CO3	Student will able to gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.
4	CO4	Student will able to design standard algorithms such as sorting, searching, and problems involving graphs
5	CO5	Student will able to compute complexity measures of algorithms, including recursive algorithms using recurrence relations

Syllabus:

Course Contents		Hours
Unit I	Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space, Order Notation (O, Θ, Ω Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm.	08
Unit II	Introduction to Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Finding median, Closest Pair, Convex Hulls Problem.	08
Unit III	Greedy Methods, Fractional Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree – Kruskal's and Prim's Algorithm, Dijkstra's Shortest Path Algorithm.	06
Unit IV	Introduction to Dynamic Programming, Elements of Dynamic Programming, Multistage Graphs, Traveling Salesman Problem, Matrix-chain multiplication, Optimal Polygon Triangulation, Longest common subsequence, Floyd-Warshall algorithm	06

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Unit V	Introduction to Backtracking, N-Queen Problem, Backtracking Strategies, Search & Traversal Techniques – BFS, DFS, Sum of Subsets, Graph coloring, Hamiltonian Circuit Problem, Efficiency of Algorithms: Polynomial Time & Non-Polynomial Time Algorithms, NP-Complete, NP-Hard.	08

Text Books	
1.	Thomas H. Cormen, Charles E Leiserson, Introduction to Algorithms, PHI Publication, 3rd Edition.
2.	Parag Dave, Himanshu Dave, Design and Analysis of Algorithm, Pearson Education India, 2nd Edition.
3.	S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, India.

Reference Books	
1.	Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition, 1983.
2.	Michel Goodrich, Roberto Tamassia, Algorithm Design - Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006.
3.	George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.

Useful Links	
1.	https://archive.nptel.ac.in/courses/106/101/106101060/
2.	https://nptel.ac.in/courses/106106131
3.	https://www.digimat.in/nptel/courses/video/106106131/L01.html
4.	https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5O001	Open Elective-1 (OSOS (Open Source Operating System)	3	1	0	04

Prerequisites for the course	
1.	Basic knowledge of Operating System & their uses.

Prior Reading Material/useful links

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1.	https://www.zdnet.com/article/what-are-open-source-operating-systems-everything-you-need-to-know/
2.	https://ubuntu.com/desktop
3.	https://edu.gcfglobal.org/en/basic-computer-skills/open-source-vs-closed-source-software/1/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand Linux Architecture, different Linux installation and Linux commands.
2	CO2	Student will able to Effectively use Linux Environment using shell, file system, scripts, filters and program development tools.
3	CO3	Student will able to Perform file I/O management through commands and perform package management, storage management and failure recovery.
4	CO4	Student will able to Create backup and do recovery using tools like Rsync and Bacula .
5	CO5	Student will able to Automate tasks and write simple programs using scripts.

Syllabus:

Course Contents		Hours
Unit I	History of Linux OS, Architecture of Linux OS, Linux Distributions, Installation of Linux OS	08
Unit II	Introduction to terminal, Basic commands, File system, File handling commands, process and process management commands, VI editor.	06
Unit III	Users and Group management- Creation, Updating, Deletion of user and group, Commands – passwd, Shadow, useradd, usermod, userdel, groupadd, groupmod, groupdel.	08
Unit IV	Package Management - Introduction to package manager, function of package manager, Package management commands – rpm, yum.	06
Unit V	Storage management- Types of storages, creating partitions using fdisk command, Logical volume management (LVM), Creating file system, mounting file system. Shell and Shell script.	08

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Text Books	
1.	Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication.
2.	Unix and Shell Programming – B. M. Harwani, OXFORD University Press.

Reference Books	
1.	Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication

Useful Links	
1.	
2.	https://edu.gcfglobal.org/en/basic-computer-skills/open-source-vs-closed-source-software/1/
3.	https://millenniumprize.org/winners/open-source-operating-system/
4.	https://www.indeed.com/career-advice/career-development/open-source-software-definition

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5TE01A**	**Elective –I (Augmented Reality)**	3	0	0	03

Prerequisites for the course	
1.	Basic knowledge & Information of virtual reality.

Prior Reading Material/useful links	
1.	https://www.techtarget.com/whatis/definition/augmented-reality-AR
2.	https://arvr.google.com/ar/
3.	https://www.ptc.com/en/technologies/augmented-reality

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to understand the basic concept and framework of virtual reality
2	CO2	Student will able to understand the technology for multimodal user interaction and perception in VR.
3	CO3	Student will able to Decide & Apply algorithmic strategies to solve a

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		given problem
4	CO4	Student will able to apply VR Tools in real time environment.
5	CO5	Student will able to implement application of AR/VR technology with hands on experience through more informative and practical exploration.

Syllabus:

Course Contents		Hours
Unit I	**Introduction** - VR and AR Fundamentals, Differences between AR/VR Selection of technology AR or VR AR/VR characteristics Hardware and Software for AR/VR introduction. Requirements for VR/AR. Benefits and Applications of AR/VR. AR and VR case study.	08
Unit II	**Fundamentals of Computer Graphics**; Real time rendering technology; Principles of Stereoscopic Display; Software and Hardware Technology on Stereoscopic Display.	06
Unit III	**software technologies** - Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market (Unity and Vuforia based) - Case Studies in AR, VR – Industrial applications, medial AR/VR, education and AR/VR.	08
Unit IV	**Geometric Modeling; Behavior Simulation;** Physically Based Simulation Haptic & Force Interaction in Virtual Reality **Concept of haptic interaction:** Principles of touch feedback and force feedback; Typical structure and principles of touch/force feedback facilities in applications	08
Unit V	**VR Development Tools:** Frameworks of Software Development Tools in VR; Modeling Tools for VR; X3D Standard; Vega, Multi Gen	06

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

Reference Books	
1.	Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces, Theory and Practice, Addison Wesley, USA, 2005.

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2.	Oliver Bimber and Ramesh Raskar, Spatial Augmented Reality: Meging Real and Virtual Worlds, 2005.
3.	Burdea, Grigore C and Philippe Coiffet, Virtual Reality Technology, Wiley Interscience, India

Useful Links	
1.	https://mobidev.biz/blog/augmented-reality-development-guide
2.	https://firsthand.co/professions/augmented-reality-developers/requirements
3.	https://www.coursera.org/learn/augmented-reality
4.	https://www.sciencedirect.com/science/article/pii/S221282711830163X

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5TE01B**	**Elective –I (Blockchain)**	3	0	0	03

Prerequisites for the course	
1.	Basic knowledge of Blockchain Technology with uses & applications.
2.	Basics of Operating Systems, Cryptography and Network Security.

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2.	https://nptel.ac.in/courses/106105235
3.	https://www.ibm.com/topics/blockchain

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand emerging abstract models for Blockchain Technology.
2	CO2	Student will able to Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
3	CO3	Student will able to provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
4	CO4	Student will able to Apply hyper ledger Fabric and Etherum platform to implement the Block chain Application
5	CO5	Student will able to design applications based on blockchain

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		technology for E-Governance, Land Registration, Medical Information Systems, and others

Syllabus:

Course Contents		Hours
Unit I	**Introduction :** Blockchain-History, Myths, Benefits, Limitations and Challenges of Blockchain, Structure of Blocks, Miners, Working of Blockchain, Types of Blockchain, Blockchain as Public Ledgers-Bitcoin, Blockchain 2.0, Smart Contracts, Transactions-Distributed Consensus, The Chain and the Longest Chain -Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain,	09
Unit II	**Blockchain Architecture and Cryptographic:** Crypto Primitives, Permissioned Blockchain, Consensus mechanism ,Cryptographic –Hash Function, Properties of a hash function-pointer and Merkle tree. Public key cryptosystems, private vs public blockchain. Introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases,	07
Unit III	**Bitcoin Consensus:** Introduction to Bitcoin Blockchain, Transactions, Bitcoin limitations, Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake-Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.	06
Unit IV	**Cryptocurrency and Smart Contracts:** Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, IOTA, Namecoin. Legal Aspects Cryptocurrency Exchange, Black Market and Global Economy. Smart Contracts: Definition, DAO, Ricardian contracts, Precompiled contracts.	06
Unit V	**HyperledgerFabric:** Architecture of Hyperledger fabric v1.1- Introduction to hyperledger fabric v1.1, chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, Truffle Design and issue Crypto currency, Mining, DApps, DAO **BlockchainApplications :** Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, Finance, and others	08

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Text Books	
1.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016
2.	Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
3.	Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
4.	Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017

Reference Books	
1.	Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts
2.	Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.
3.	Nakamoto, Satoshi, Bitcoin: A peer-to-peer electronic cash system, Research Paper

Useful Links	
1.	https://blockgeeks.com/guides/what-is-blockchain-technology/
2.	https://www.investopedia.com/terms/b/blockchain.asp
3.	https://nptel.ac.in/courses/106106138
4.	https://nptel.ac.in/courses/106104220

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5TE01C	Elective –I (3D Printing & Design)	3	0	0	03

Prerequisites for the course	
1.	Study of 3D printing technologies.

Prior Reading Material/useful links	
1	https://www.google.co.in/books/edition/Beginning_Design_for_3D_Printing/_YfDCgAAQBAJ?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover
2	https://www.google.co.in/books/edition/3D_Printing_Design/6XQDEAAAQBAJ?hl=en&g

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	bpv=1&dq=3D+Printing+%26+Design&printsec=frontcover
3	https://www.google.co.in/books/edition/3D_Printing_Designs_Fun_and_Functional_P/fwJwDQAAQBAJ?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Understand emerging abstract models for 3D printing technologies.
2	CO2	Student will able to Identify major research challenges and technical gaps existing between Develop CAD models for 3D printing. Import and Export CAD data and generate .stl file
3	CO3	Student will able to Select a specific material for the given application.
4	CO4	Student will able to Apply a 3D printing process for an application.
5	CO5	Student will able to Produce a product using 3D Printing or Additive Manufacturing (AM).

Syllabus:

Course Contents		Hours
Unit I	**3D Printing (Additive Manufacturing):** Introduction, Process, Classifications, Advantages, Additive v/s Conventional Manufacturing processes, Applications.	07
Unit II	**CAD for Additive Manufacturing:** CAD Data formats, Data translation, Data loss, STL format.	05
Unit III	**Additive Manufacturing Techniques**: Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology. Process, Process parameter, Process Selection for various applications. Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools.	08
Unit IV	**Materials:** Polymers, Metals, Non-Metals, Ceramics Process, Process parameter, Process Selection for various applications. Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties. 4.3 Support Materials	08
Unit V	**Additive Manufacturing Equipment:**Process Equipment- Design and process parameters, Governing Bonding Mechanism, Common faults and troubleshooting , Process Design	08

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Text Books	
1.	Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: "Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2.	Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3.	Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
4.	CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.

Reference Books	
1.	J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
2.	L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001.
3.	Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy", InTech, 2012.

Useful Links	
1	https://www.google.co.in/books/edition/Design_for_3D_Printing/29GqCgAAQBAJ?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover
2	https://www.google.co.in/books/edition/Additive_Manufacturing_3D_Printing_Desig/YV3MDwAAQBAJ?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover
3	https://www.google.co.in/books/edition/Simplifying_3D_Printing_with_OpenSCAD/VJxhEAAAQBAJ?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover
4	https://www.google.co.in/books/edition/Practical_3D_Printers/R4qxOQZV9T0C?hl=en&gbpv=1&dq=3D+Printing+%26+Design&printsec=frontcover

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5L004**	**Internet of Things (Lab)**	0	0	2	1

Prerequisites for the course	
1.	Knowledge of the terminology, application, requirements and constraints of IoT development.

Prior Reading Material/useful links

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1	https://vemu.org/uploads/lecture_notes/28_12_2022_411037496.pdf
2	https://www.lnmiit.ac.in/Department/ECE/uploaded_files/Internet_of_Things_Lab_manual.pdf
3	https://mlritm.ac.in/assets/cse/cse_lab_manuals/R19_cse_manuals/IOT%20lab%20Manual.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Identify and adopt knowledge of the terminology, application, requirements and constraints of IoT development.
2	CO2	Student will able to Explain development of hardware and software in real-time environment via advanced automated designing and testing tools.
3	CO3	Student will able to Design and implementation of IoT with advanced microcontroller and interfaces.
4	CO4	Student will able to Testing of complex and critical real world IoT, interfaced to digital hardware in real world situation.
5	CO5	Student will able to Evaluate a real-time. IoT industrial control system using an embedded microcontroller with associated interface and communication devices.

List of Practical's:

	Course Contents	Hours
1	Control a LED with push button using Arduino board.	2
2	Traffic light controller using Arduino.	2
3	Fire alarm system by interfacing Arduino with temperature and gas sensors	2
4	Interfacing 4x4 keypad with Arduino and print on LCD 16x2	2
5	Design password protected door lock system using Arduino.	2
6	Interfacing servo motor with Raspberry-Pi .	2
7	Interfacing stepper motor with Raspberry-Pi	2

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8	Controlling LED using Raspberry-Pi using web server.	2
9	Mini project on home automation.	2
10	Case study on smart city.	2

Text Books	
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 st Edition, Pearson Education
2.	Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017.
3.	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT,2014.

Reference Books	
1.	Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2.	Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devices",by Andrew Minteer
3.	"Internet of Things: Architectures, Protocols and Standards", by Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri

Useful Links	
1.	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT
2.	https://builtin.com/internet-things
3.	https://www.simplilearn.com/iot-devices-article

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5L005**	**TCP/IP (Lab)**	0	0	2	1

Prerequisites for the course	
1.	Knowledge of network-based applications using the socket mechanism.
2	Study of different addresses.

Prior Reading Material/useful links	
1	http://www.sce.carleton.ca/faculty/lambadaris/courses/462/lab/tcpip.pdf

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2	https://www.cs.montana.edu/pearsall/classes/spring2023/476/labs/Lab6.pdf
3	http://www.tcpiplab.net/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to compare and contrast TCP and UDP in terms of the application that uses them.
2	CO2	Student will able to design network-based applications using the socket mechanism.
3	CO3	Student will able to work with IPv4 addresses in terms of subnetting and supernetting.
4	CO4	Student will able to setup a host and network in terms of IP addressing.
5	CO5	Student will able to Understand the various Routing Protocols/Algorithms and Internetworking.

List of Practical's:

Course Contents		Hours
1	To study the of different types of network cables and practically implement the crossed wired cable, straight through cable and roll over cable using clamping tool.	2
2	To study of network devices in detail.	2
3	Connect the computers in local area network (star topology, pear to pear network).	2
4	To study of basic network command and network configuration command.	2
5	To study ipv4 Addressing to give IP addresses of diffrent classes in different network id.	2
6	To study ipv4 subnetting to give ip addresses of diffrent class in given network id at subnet.	2
7	Decode header fields of IP datagram.	2
8	Decode header fields from TCP header.	2
9	To Study implement TCP/IP socket communication.	2
10	To study configure a DNS server/ FTP server.	2

Text Books	
1.	TCP/IP Network Administration, Craig Haut, 3rd Edition, Shroff Publications, 2002.

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2.	Internetworking with TCP/IP - Principles, Protocols, and Architecture, Douglas E. Comer, 5th edition Volume-1, Prentice Hall, 2006.
3.	The Internet and its Protocols- A Comparative approach, Adrian Farrel, Morgan Kaufmann, 2004. 9
4.	TCP/IP Illustrated - the Protocols, W. Richard Stevens, Volume I, Pearson Education, 2003.
5.	TCP/IP Protocol Suite, Behrouz A. Forouzan, 3rd edition, Tata McGraw Hill, 2006.

Reference Books	
1.	IPv6 Theory, Protocol and Practice, Pete Loshin, 2nd edition, Morgan Kaufmann, 2003.
2.	Internetworking TCP/IP, Comer D.E and Stevens D.L, Volume III, Prentice Hall of India, 1997.

Useful Links	
1.	https://nptel.ac.in/courses/106105183
2.	https://archive.nptel.ac.in/courses/106/105/106105081/
3.	https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5L006**	**Python Programming (Lab)**	0	0	2	1

Prerequisites for the course	
1.	Understand the programming and the Python programming language.
2	Acquire programming skills in core Python..

Prior Reading Material/useful links	
1	https://www.w3schools.com/python/python_intro.asp
2	https://www.python.org/
3	https://www.python.org/about/gettingstarted/

Course Outcomes:

Sr. No	Course Outcome number	CO statement

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1	CO1	Student will able to Understand basic understanding of programming and the Python programming language.
2	CO2	Student will able to develop the skill of designing Graphical user Interfaces in Python.
3	CO3	Student will able to Explain basic principles of Python programming language.
4	CO4	Student will able to Implement object oriented concepts.
5	CO5	Student will able to Implement database and GUI applications.

List of Practical's:

	Course Contents	Hours
1	Write a Python program to print all the Even/Odd numbers between 1 and 100.	2
2	Write a Python class to implement pow(x, n).	2
3	Write a recursive function to calculate the sum of numbers from 0 to 10.	2
4	Arrange string characters such that lowercase letters should come first.	2
5	Create a child class Bus that will inherit all of the variables and methods of the Vehicle class.	2
6	Python Program to Remove the ith Occurrence of the Given Word in a List where Words can Repeat.	2
7	Python Program to Remove All Tuples in a List of Tuples with the USN Outside the Given Range.	2
8	Python Program to Count the Occurrences of Each Word in a Given String Sentence.	2
9	Python Program to Count the Frequency of Words Appearing in a String Using a Dictionary.	2
10	Python Program to Map Two Lists into a Dictionary.	2

Text Books	
1.	Python Basics A Practical Introduction to Python 3, By David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler · 2021
2.	The Python Book By Rob Mastrodomenico · 2022
3.	Murach's Python Programming (2nd Edition) Joel Murach, Michael Urban · 2021

Reference Books	
1.	Introduction to Python Programming, Gowrishankar S, Veena A · 2018
2.	Python Tutorial 3.11.3, Guido Van Rossum, Python Development Team · 2023

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	Useful Links
1	https://www.google.co.in/books/edition/The_Python_Book/DjxZEAAAQBAJ?hl=en&gbpv=1&dq=Python+Programming+book+download&printsec=frontcover
2	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjduKfpx-aDAxUusFYBHYF0DssQFnoECA4QAQ&url=https%3A%2F%2Fcfm.ehu.es%2Fricardo%2Fdocs%2Fpython%2FLearning_Python.pdf&usg=AOvVaw1JInPPbUY4RSNi9Cw76uMG&opi=89978449

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	**CS5L007**	**Mini Project**	0	0	2	1

	Prerequisites for the course
1.	Understand the creation of new technologies or innovations.
2	Learning business opportunities.

	Prior Reading Material/useful links
1.	https://www.youtube.com/watch?v=p8e5ZEpRmx0
2.	https://www.youtube.com/watch?v=if_z7pMA85g
3.	https://www.youtube.com/watch?v=V5yv5TNpiLE

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to creation of new technologies or innovations.
2	CO2	Students will able to address complex problems or challenges
3	CO3	Students will able to develop new computational models or simulations that help advance their research.
4	CO4	Students will able to create new products or services that can be commercialized.
5	CO5	Students will able to impact various aspects of society, from improving productivity and efficiency to enhancing user experience and addressing social challenges.

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This is continuous work to the project phase I. Every students will have to submit a completed report (3 copies)* of the project work. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II
1. Coding/Implementation.
2. Use cases.
3. Testing/Trouble shooting.
4. Data dictionary/ Documentation.
5. Finalization of project in all respect.
6. *(For guide, Personal copy, Departmental library.)
7. In a presentation, the students should focus to clarify problem definition and analysis of the problem.

Text Books	
1.	Planning and Implementing Your Final Year Project — with Success! By Mikael Berndtsson, Jörgen Hansson, B. Olsson, Björn Lundell · 2013
2.	Computer Science Project Work Principles and Pragmatics By Sally Fincher, Marian Petre, Martyn Clark · 2001
3.	Thesis Projects, A Guide for Students in Computer Science and Information Systems By Mikael Berndtsson · 2008

Reference Books	
1.	SOFTWARE ENGINEERING PROJECT MANAGEMENT By Bill Brykczynski, Richard D. Stutz · 2006
2.	Software Engineering Body of Knowledge By IEEE Computer Society · 2014
3.	Quality Software Project Management By Robert T. Futrell · 2002

Useful Links	
1.	https://www.google.co.in/books/edition/Project_Summaries/0ggTG_ya8acC?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&pg=PA78&printsec=frontcover
2.	https://www.google.co.in/books/edition/Real_World_Software_Projects_for_Compute/X6seEAAAQBAJ?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&printsec=frontcover
3.	https://www.logicraysacademy.com/blog/final-year-projects-for-cse/

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Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS5L008	Field Training/ Industrial Visit	0	0	2	1

Prerequisites for the course	
1.	Understand the visiting companies shall be relevant and suitable ones to the specialization and academic requirements.
2	Learning Important tool for attracting investment and technology.

Prior Reading Material/useful links	
1.	https://www.quora.com/What-are-some-good-places-for-an-industrial-trip-of-CSE-students
2.	https://www.suas.ac.in/industrial-visit-for-computer-science-and-information-technology-5th-sem-students/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to functional opportunity in different sectors.
2	CO2	Students will able to helps to combine theoretical knowledge with industrial knowledge.
3	CO3	Students will able to provide an insight into the real working environment,
4	CO4	Students will able to get to learn a lot of things that will help in their development and also for the future.
5	CO5	Students will able to acquire and apply fundamental principles of science and engineering.

Industrial visits are an integral part of Engineering and acknowledgement of technology upgrades. The purpose of industrial visits for students is to provide technical knowledge with the technological development in the industry and to understand the gap between theoretical and practical knowledge that could be passed in future.

This experience can help students to provide information regarding the functioning of various industries and associated problems and limitations.

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Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Audit
V	CS5T009	Innovation and Entrepreneurship Development	0	0	0	

Prerequisites for the course	
1.	Basics of Universal Human Value and entrepreneurial behaviour.
2.	Knowledge of the social, ethical and culture and Consumer Affairs

Prior Reading Material/useful links	
1	https://www.google.co.in/books/edition/Entrepreneurship_and_Economic_Developmen/deeFDAAAQBAJ?hl=en&gbpv=1&dq=Innovation+and+Entrepreneurship+Development&printsec=frontcover
2	https://www.google.co.in/books/edition/The_Role_of_Innovation_and_Entrepreneurs/klZYEAAAQBAJ?hl=en&gbpv=1&dq=Innovation+and+Entrepreneurship+Development&printsec=frontcover
3	https://www.google.co.in/books/edition/Innovation_and_Entrepreneurship/OiuDBAAAQBAJ?hl=en&gbpv=1&dq=Innovation+and+Entrepreneurship+Development&printsec=frontcover

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Discuss the attitudes, values, characteristics, behaviour, and processes associated with possessing an entrepreneurial mindset and engaging in successful appropriate entrepreneurial behaviour.
2	CO2	Discuss what is meant by entrepreneurship and innovation from both a theoretical and practical perspective, and the role of the entrepreneur in the new enterprise creation process.
3	CO3	Describe the ways in which entrepreneurs perceive opportunity, manage risk, organise resources and add value.
4	CO4	Develop a plan for implementing entrepreneurial activities in a globalised and competitive environment being responsible for the social, ethical and culture issues.
5	CO5	Critique a plan for implementing entrepreneurial activities in a globalised and competitive environment being mindful of the social, ethical and culture issues.

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Syllabus:

Course Contents		Hours
Unit I	**Innovation** Concept of creativity, innovation, invention, discovery. Methods for development of creativity convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.	06
Unit II	**Entrepreneurship** Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship.	07
Unit III	**Role of Entrepreneurial Bodies** Theory of achievement, motivation, Medelland's. experiment, Women entrepreneurship, Role of SSI, it's advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.	06
Unit IV	**Role of Entrepreneurial Support** Factors governing project selection, Market survey, Preparation of project report. Financial, technical; market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time.	09
Unit V	Entrepreneurial Thermodynamics, Entrepreneurship and Employment, Start-up Case Studies.	06

Text Books	
1.	Entrepreneurship Development, S. S. Khanka, S. Chand Publishers
2.	Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business, Publishers.

Reference Books	
1.	Innovation and Entrepreneurship, Theory, Policy and Practice By Elias G. Carayannis, Elpida T. Samara, Yannis L. Bakouros · 2014
2.	Institutional Reform for Innovation and Entrepreneurship An Agenda for Europe By Niklas Elert, Magnus Henrekson, Mikael Stenkula · 2017
3.	Creativity and Innovation in Entrepreneurship By S S Khanka · 2021

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Useful Links	
1	https://www.google.co.in/books/edition/Creativity_and_Innovation_in_Entrepreneu/f1c7EAAAQBAJ?hl=en&gbpv=1&dq=Innovation+and+Entrepreneurship+Development&printsec=frontcover
2	https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwj14Jaw9L__AhWgU2wGHaLcCNUQFnoECCYQAQ&url=https%3A%2F%2Fwww.dpgpolytechnic.com%2Fdownloads%2Ffiles%2Fn5c419bcb66c09.pdf&usg=AOvVaw3cbsLd-So8C6Pgj0LW3S35

Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS4T001	Formal Language Automata Theory	Dr. Supriya Sawwashere
2	CS4T002	Computer Architecture Organization	Prof. Kiran Bode
3	CS4T003	Java Programming	Prof. Yuvraj Suryawanshi.
4	CS4T004	Computer Network	Prof. Anuja Ghasad
5	CS4T005	Numerical Methods & Discrete Mathematics	Prof. Sana Anjum
6	CS4T006	Database Management Systems	Prof. Mittal Patne
7	CS4L007	JAVA Programming (Lab)	Ms. Gayatri Gawande
8	CS4L008	Computer Networks (Lab)	Prof. Anuja Ghasad
9	CS4L009	Database Management Systems (Lab)	Ms. Jagruti Thakre
10	CS4T010	Consumer Affairs	Prof. Mittal Patne
11	CS4P011	Field Training/ Industrial Visit	Prof. Pankaj Wankhede
12	CS4T012	NPTEL	Prof. Sujata Helond

Prof. Anuja Ghasad,
Secretary BOS, CSE,
JDCOEM, Nagpur

Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur

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Program: B. Tech. in Computer Science & Engineering

6th Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit	Teaching Mode
				L	T	P	CA	MSE	ESE	Total		
1	PCC	CS6T001	Artificial Intelligence & Robotics	3	0	0	20	20	60	100	3	
2	PCC	CS6T002	Neural Networks and Machine Learning	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
3	PEC	CS6TE02	Elective -II	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
4	PEC	CS6TE03	Elective-III	3	0	0	20	20	60	100	3	PPT, Board, Chalk,
5	OEC	CS6O002	Open Elective-2	3	1	0	20	20	60	100	4	PPT, Board, Chalk,
6	PCC	CS6L003	Neural Networks & Machine Learning(Lab)	0	0	2	60	0	40	100	1	PPT, Board, Chalk,
7	PCC	CS6L004	Full Stack Development (Lab)	0	0	2	60	0	40	100	1	PC, PPT
8	PCC	CS6L005	Advance Java Programming (LAB)	0	0	2	60	0	40	100	1	PC, PPT
9	PROJECT	CS6P006	Mini Project	0	0	2	25	0	25	50	1	PC, PPT
10	PROJECT	CS6P007	CRT(Campus Recruitment Training)	0	0	2	50	0	0	50	1	Board, Chalk,
11	PROJECT	CS6P008	Skill Development	0	0	2	15	0	35	50	1	PC, PPT
12	MC	CS6T009	Intellectual Property Rights	2	0	0	15	10	25	50	Audit	PPT, Board, Chalk,
				17	**1**	**12**	**385**	**110**	**505**	**1000**	**22**	

Open Elective-1 : SE (Software Engineering)

Elective-II

Code	Subject
CS6TE02A	Cloud Computing
CS6TE02B	Angular JS
CS6TE02C	Middleware Technologies
CS6TE02D	Human Computing

Elective-III

Code	Subject
CS6TE03A	Brain Machine Interface & Interaction
CS6TE03B	Computer Forensic
CS6TE03C	Deep Learning
CS6TE03D	Quantum Computing

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6T001	**Artificial Intelligence & Robotics**	3	0	0	3

Prerequisites for the course	
1.	Basics of Internet of Things.
2.	Understanding concept of Augmented Reality.
3.	Fundamental of Human Computing.

Prior Reading Material/useful links	
1.	https://sopantalekar.wordpress.com/artificial-intelligence-robotics/
2.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
3.	https://www.javatpoint.com/robotics-and-artificial-intelligence

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Identify and apply suitable Intelligent agents for various AI applications.
2	CO2	Student will be able to Design smart system using different informed search / uninformed search or heuristic approaches.
3	CO3	Student will be able to Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
4	CO4	Student will be able to Apply the suitable algorithms to solve AI problems
5	CO5	Student will be able to Describe robotics in practice

Syllabus:

Course Contents		Hours
Unit I	Artificial Intelligence: Introduction, Typical Applications. State Space Search: Depth Bounded DFS, Depth First Iterative Deepening. Heuristic Search: Heuristic Functions, Best First Search, Hill Climbing, Variable Neighborhood Descent, Beam Search, Tabu Search. Optimal Search: A * algorithm, Iterative Deepening A* , Recursive Best First Search, Pruning the CLOSED and OPEN Lists.	8
Unit II	Problem Decomposition: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space	8

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	Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework For Planning. Constraint Satisfaction : N-Queens, Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies	
Unit III	Knowledge Based Reasoning: Agents, Facets of Knowledge. Logic and Inferences: Formal Logic, Propositional and First Order Logic, Resolution in Propositional and First Order Logic, Deductive Retrieval, Backward Chaining, Second order Logic. Knowledge Representation: Conceptual Dependency, Frames, Semantic nets	8
Unit IV	Natural Language Processing: Introduction, Stages in natural language Processing, Application of NLP in Machine Translation, Information Retrieval and Big Data Information Retrieval. Learning: Supervised, Unsupervised and Reinforcement learning. Artificial Neural Networks (ANNs): Concept, Feed forward and Feedback ANNs, Error Back Propagation, Boltzmann Machine.	6
Unit V	Robotics: Fundamentals, path Planning for Point Robot, Sensing and mapping for Point Robot, Mobile Robot Hardware, Non Visual Sensors like: Contact Sensors, Inertial Sensors, Infrared Sensors, Sonar, Radar, laser Rangefinders, Biological Sensing. Robot System Control: Horizontal and Vertical Decomposition, Hybrid Control Architectures, Middleware, High-Level Control, Human-Robot Interface.	6

Text Books	
1.	Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1
2.	Elaine Rich, Kevin Knight and Nair, "Artificial Intelligence", TMH, ISBN-978-0-07- 008770-5
3.	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003, ISBN :10: 0136042597
4.	Michael Jenkin, Gregory, " Computational Principals of Mobile Robotics", Cambridge University Press, 2010, ISBN : 978-0-52-187157-0

Reference Books	
1.	Nilsson Nils J , "Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4
2.	Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley Publishing Company, ISBN: 0-201-53377-4
3.	Andries P. Engelbrecht-Computational Intelligence: An Introduction, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0

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4.	Artificial Intelligence for Robotics Build Intelligent Robots that Perform Human Tasks Using AI Techniques By Francis X. Govers · 2018

Useful Links	
1.	https://books.google.com/books?id=8EZsDwAAQBAJ&printsec=frontcover&dq=artificial+intelligence+for+robotics+book&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwiSjsixj7j-AhXU-TgGHbGvB5cQ6AF6BAgHEAI
2.	https://www.google.co.in/books/edition/Intelligent_robotics/teHgBwAAQBAJ?hl=en&gbpv=1&dq=artificial+intelligence+for+robotics+book&printsec=frontcover
3.	https://www.google.co.in/books/edition/Introduction_to_AI_Robotics_second_editi/4WyuDwAAQBAJ?hl=en&gbpv=1&dq=artificial+intelligence+for+robotics+book&printsec=frontcover
4.	https://www.google.co.in/books/edition/Artificial_Intelligence_in_Wireless_Robo/JfyGEAAAQBAJ?hl=en&gbpv=1&dq=artificial+intelligence+for+robotics+book&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6T002	**Neural Networks and Machine Learning**	3	0	0	3

Prerequisites for the course	
1.	Basics of Computer Network
2.	Fundamental of Machine Learning & Deep Learning

Prior Reading Material/useful links	
1.	http://neuralnetworksanddeeplearning.com/
2.	https://www.upgrad.com/blog/machine-learning-vs-neural-networks/
3.	https://www.coursera.org/learn/neural-networks-deep-learning

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Understand the mathematical foundations of neural network models
2	CO2	Student will be able to Understand the application areas of

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		neural networks
3	CO3	Student will be able to Understand building blocks of Neural Networks.
4	CO4	Student will be able to Develop neural network models
5	CO5	Student will be able to Design and implement neural network systems to solve real world problems.

Syllabus:

Course Contents		Hours
Unit I	Structure of biological neurons relevant to ANNs. Models of ANNs; Feedforward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner –lake all elarning rule, etc.	7
Unit II	Classification model, Features & Decision regions; training & classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearly seperable classifications. Linearly non-seperable pattern classification, Delta learning rule for multi-perceptron layer, Generalized delta learning rule, Error back-propagation training, learning factors, Examples.	8
Unit III	Linear Association, Basic Concepts of recurrent Auto associative memory: rentrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.	6
Unit IV	Introduction: Well-posed learning problems, Designing a Learning System, Perspectives and Issues in Machine learning, Concept Learning and General-to-specific Ordering: A concept learning task, Concept learning as Search, Finding a maximally specific hypothesis, Version Spaces and Candidate elimination algorithm, Inductive Bias.	8
Unit V	Decision Tree Learning: Decision tree learning algorithm, Hypothesis space search in decision tree Evaluating Hypothesis: Estimating Hypothesis accuracy, Basics of sampling theory, Deriving confidence intervals, Hypothesis testing, comparing learning algorithms.	7

Text Books	
1.	Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing Company, 1995.
2.	Simon Haykin, Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company, 1994.
3.	Sivanandam, S Sumathi, S N Deepa; "Introduction to Neural Networks", 2nd ed.,TATA McGraw HILL : 2005.

VISION	MISSION
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4.	Simon Haykin, "Neural networks A comprehensive foundations", 2nd ed., Pearson Education, 2004.

Reference Books	
1.	Miroslav, Kubat. "An Introduction to Machine Learning", Springer Publishing.
2.	Bishop, C. M., "Pattern Recognition and Machine Learning", Springer Publishing
3.	B Yegnanarayana, "Artificial neural networks", 1st ed., Prentice Hall of India P Ltd, 2005.
4.	Li Min Fu, "Neural networks in Computer intelligence", 1st ed., TMH, 2003

Useful Links	
1.	https://books.google.co.in/books?id=O1AoDwAAQBAJ&printsec=frontcover&dq=neural+networks+and+machine+learning+Course+Outcomes:&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwi77aqqkrj-AhUj7zgGHZTKAtQQ6AF6BAgFEAI
2.	https://www.google.co.in/books/edition/Learning_and_Soft_Computing/W5SAhUqBVYoC?hl=en&gbpv=1&dq=neural+networks+and+machine+learning+Course+Outcomes:&printsec=frontcover
3.	https://www.google.co.in/books/edition/Elements_of_Artificial_Neural_Networks/6d68Y4Wq_R4C?hl=en&gbpv=1&dq=neural+networks+and+machine+learning+Course+Outcomes:&printsec=frontcover
4.	https://www.google.co.in/books/edition/Foundations_of_Machine_Learning_second_e/V2B9DwAAQBAJ?hl=en&gbpv=1&dq=neural+networks+and+machine+learning+Course+Outcomes:&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE02A	**Cloud Computing**	3	0	0	3

Prerequisites for the course	
1.	Basics of Human Computing.
2.	Understand the core concepts of the cloud computing
3.	Study the various cloud programming models

Prior Reading Material/useful links	
1.	https://www.iare.ac.in/sites/default/files/lecture_notes/CC%20LECTURE%20NOTES.pdf
2.	https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0529_CloudComputing_Notes-converted.pdf

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3.	https://www.tutorialspoint.com/cloud_computing/cloud_computing_tutorial.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Understand the core concepts of the cloud computing and its benefits along with its various models and services in cloud computing.
2	CO2	Student will be able to Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
3	CO3	Student will be able to Apply the fundamental concepts in data centers to understand the trade offs in power, efficiency and cost.
4	CO4	Student will be able to Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
5	CO5	Student will be able to Analyze various cloud programming models and apply them to solve problems on the cloud.

Syllabus:

Course Contents		Hours
Unit I	Cloud Computing Fundamental: History of cloud computing, Cloud Computing definition, private, public and hybrid cloud. Applications and characteristics of cloud computing. Types of Cloud Services: IaaS, PaaS, SaaS., Public Cloud Vs Private Clouds.	6
Unit II	Cloud Architecture: Introduction to Architecture, Benefits and challenges, Application availability, performance, security and disaster recovery; future of Cloud Applications. Desktop and Device Management: Introduction- Objectives, Desktop Virtualization- Across Industries Client Desktops, Desktop placement in the cloud Merits Desktop as a Service (DaaS), Desktop Management Watching the four areas Asset Management.	6
Unit III	Virtualization: Introduction to Virtualization, Network virtualization techniques, Virtual Machine (VM), VM Components and process of converting physical to VMs, Cloud Security: Cloud Security Overview, Cloud Security Challenges and Secure Cloud Software Requirements.	6

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	Risks: Risk Management, Privacy and compliance risk. Software-as-a-Service Security, Security Governance, Security Monitoring, Security Architecture Design. Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.	
Unit IV	Cloud Application Development: Service creation environments, Development environments, Amazon, Azure, Google App. Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages. Accessing the Cloud Introduction-Objectives, Platforms Web Application Framework- Web Hosting Services Proprietary Methods, Web Applications APIs in Cloud Computing, Browsers for Cloud Computing Internet Explorer Mozilla Firefox Safari Chrome.	6
Unit V	Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services.	6

Text Books	
1.	Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach [ISBN: 0071626948]
2.	Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010
3.	Rajkumar Buyya, Christian Vecchiola, S.TamaraiSelvi, Mastering Cloud Computing, TMGH,2013.

Reference Books	
1.	GautamShroff, Enterprise Cloud Computing Technology Architecture Applications [ISBN: 978-0521137355]
2.	Ronald L. rutz, Russell Dean Vines, Cloud Security A comprehensive Guide to Secure Cloud Computing, Wiley India, 2010.
3.	ohn W.Rittinghouse and ames F.Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
4.	Kumar Saurabh, Cloud Computing insights into New-Era Infrastructure, Wiley India,2011.

Useful Links	
1.	https://swec.ac.in/documents/cse/cloud%20computing.pdf

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2.	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBS1207.pdf
3.	https://books.google.co.in/books?id=jLNGCPs6rr4C&printsec=frontcover&dq=cloud+computing+notes+pdf&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwjg55LFlLj-AhWE-DgGHfsRBboQ6AF6BAgHEAI
4.	https://www.google.co.in/books/edition/Cloud_Computing/S1NvRRd77rQC?hl=en&gbpv=1&dq=cloud+computing+notes+pdf&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE02B	**Angular JS**	3	0	0	3

Prerequisites for the course	
1.	Basics of Java Programming
2.	Fundamental of AngularJS

Prior Reading Material/useful links	
1.	https://www.w3schools.com/angular/
2.	https://www.tutorialspoint.com/angularjs/index.htm
3.	https://www.javatpoint.com/angularjs-tutorial

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Perform the conversion among different number systems
2	CO2	Student will be able to Design digital components including – decoders, multiplexers, arithmetic circuits.
3	CO3	Student will be able to Design of synchronous sequential circuits.
4	CO4	Student will be able to Illustrate how the different peripherals are interfaced with Microprocessor.
5	CO5	Student will be able to Distinguish and analyze the properties of Microprocessors & Microcontrollers.

Syllabus:

Course Contents		Hours
Unit I	Introduction to AngularJS, AngularJS Expressions: Numbers, Strings, Objects, Arrays, Expressions using {{ }} and ng-bind. Modules:	7

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	Creating a module, adding a controller & directive, myApp.js ,myCtrl.js, Loading library.	
Unit II	Directives: Data Binding, ng-init, ng-repeat, ng-app & ng-model directives, custom directives.2 way binding, Validating User Input, Status, ng-empty, ng-touched, ng-valid, ngpending. Data Binding: Synchronization between model and view. AngularJS Controllers: ng-controller, Controller Methods, External Files. Scope: $scope, understanding the scope, $rootScope.	8
Unit III	Filters: Adding Filters to Expressions, Adding Filters to Directives, The currency Filter, The filter Filter, Filter an Array Based on User Input, Sort an Array Based on User Input, Custom Filters. AngularJS Services: The $http Service, The $timeout Service, The $interval Service, Create Your Own Service. AngularJS AJAX - $http: AngularJS $http, Methods, Properties, JSON. AngularJS Tables: Displaying Data in a Table, Displaying with CSS Style, Display with orderBy Filter, Display with uppercase Filter, Display the Table Index ($index), Using $even and $odd.	8
Unit IV	AngularJS Select Boxes: Creating a Select Box Using ng-options. AngularJS HTML DOM: The ng-disabled Directive, The ng-show Directive, The ng-hide Directive. AngularJS Events: AngularJS Events, Mouse Events, The ng-click Directive, Toggle, True/False, $event Object. AngularJS Forms: Input Controls, Data-Binding, Checkbox, Radiobuttons, Selectbox. AngularJS Form Validation: Required, E-mail, Form State and Input State, CSS Classes, Custom Validation.	7
Unit V	AngularJS API: AngularJS Global API AngularJS and W3.CSS: W3.CSS AngularJS Includes: AngularJS Includes. AngularJS Animations: CSS Transitions, Angular JS Routing AngularJS Application	6

Text Books	
1.	Professional AngularJS By Valeri Karpov, Diego Netto · 2015
2.	AngularJS By Brad Green, Shyam Seshadri · 2013
3.	Ng-book The Complete Book on AngularJS By Ari Lerner · 2013
4.	Angular JS for Beginners Your Guide to Easily Learn Angular JS In 7 Days By I Code Academy · 2020

Reference Books	
1.	AngularJS Author: By Brad Green, Shyam Seshadri · 2013
2.	Beginning AngularJS By Andrew Grant · 2014

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3.	Angular for Dummies, A Comprehensive Beginner's Guide to Angular. Js By Rufus Stewart · 2021
4.	Pro AngularJS By Adam Freeman · 2014

Useful Links	
1.	https://www.w3schools.com/angular/angular_application.asp
2.	https://www.guru99.com/angularjs-tutorial.html
3.	https://www.google.co.in/books/edition/Learn_AngularJS_in_24_Hours/deX8DwAAQBAJ?hl=en&gbpv=1&dq=Angular+JS&printsec=frontcover
4.	https://www.google.co.in/books/edition/Professional_AngularJS/WUM1CAAAQBAJ?hl=en&gbpv=1&dq=Angular+JS&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE02C	**Middleware Technologies**	3	0	0	3

Prerequisites for the course	
1.	Basics of Java Programming
2.	Fundamental of client server computing model
3.	Analysis of RMI and JDBC Connectivity.

Prior Reading Material/useful links	
1.	https://www.ibm.com/in-en/topics/middleware
2.	https://www.talend.com/resources/what-is-middleware/
3.	https://www.talend.com/resources/what-is-middleware/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students are able to Choose appropriate client server computing model for given problem.
2	CO2	Students are able to Design a dynamic remote application with RMI and JDBC Connectivity.
3	CO3	Students are able to Develop client server applications using C#.net
4	CO4	Students are able to Select appropriate language for

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		homogeneous and heterogeneous objects.
5	CO5	Students are able to Develop real time projects by combining CORBA and database interfacing

Syllabus:

Course Contents		Hours
Unit I	Introduction to client server computing: Evolution of corporate computing models from centralized to Distributed computing, client server models. Benefits of client server computing , pitfalls of client server Programming. Advanced Java: Review of Java concept like RMI , and JDBC.	9
Unit II	Introducing C# and the .NET Platform; Understanding .NET Assemblies, Object –Oriented Programming with C#, Callback Interfaces. Building c# applications: Type Reflection, Late Binding, and Data Access with ADO.NET .	7
Unit III	Core CORBA / Java: Two types of Client/ Server invocations-static , dynamic. The static CORBA, first CORBA program, ORBlets with Applets, Dynamic CORBA-The portable count, the dynamic count Existential CORBA: CORBA initialization protocol, CORBA activation services, Introduction to SOA	8
Unit IV	Java Bean Component Model: Events, properties, persistency, Introspection of beans, CORBA Beans. CORBA: Object transaction monitors CORBA OTM's, CORBA OTM's.	6
Unit V	EJB Java Bean Component Model, EJB Architecture, Session Bean, Java Message Service, Message Driven Bean, Entity Bean	6

Text Books	
1.	Client/Server programming with Java and CORBA Robert Orfali and Dan Harkey, John Wiley & Sons , SPD 2nd Edition .
2.	Java programming with CORBA 3rd Edition, G.Brose, A Vogel and K.Duddy, Wiley-dreamtech, India John Wiley and sons.

Reference Books	
1.	Distributed Computing, Principles and applications, M.L.Liu, Pearson Education.
2.	Client/Server Survival Guide 3rd edition Robert Orfali Dan Harkey & Jeri Edwards, John Wiley & Sons 3. C# Preciesely Peter Sestoft and Henrik I . Hansen , Prentice

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	Hall of India.

Useful Links	
1.	https://books.google.com/books?id=wsnBA4aD2h0C&printsec=frontcover&dq=Middleware+Technologies&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwjeyZ2nmbj-AhXypOkKHUgrDqkQ6AF6BAgHEAI
2.	https://www.google.co.in/books/edition/The_Complete_Book_of_Middleware/Gc886KgsdcsC?hl=en&gbpv=1&dq=Middleware+Technologies&printsec=frontcover
3.	https://www.google.co.in/books/edition/Introduction_to_Middleware/AZgnDwAAQBAJ?hl=en&gbpv=1&dq=Middleware+Technologies&printsec=frontcover
4.	https://www.google.co.in/books/edition/Middleware_for_Communications/bh8_0FD3qgQC?hl=en&gbpv=1&dq=Middleware+Technologies&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE02D	**Human Computing**	3	0	0	3

Prerequisites for the course	
1.	Basics of Cloud Computing.
2.	Fundamental of Artificial Intelligence & Robotics.
3.	Understand concept of Neural Networks and Machine Learning.

Prior Reading Material/useful links	
1.	https://en.wikipedia.org/wiki/Human-based_computation
2.	https://www.tutorialspoint.com/human_computer_interface/human_computer_interface_introduction.htm
3.	https://hcjournal.org/index.php/jhc

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students are able to understand the basics of Human Computing Interface.
2	CO2	Students are able to Design Interactive System Models with software life cycle.
3	CO3	Students are able to Develop Cognitive models using Multimedia and WWW.

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4	CO4	Students are able to Select Model Based Design like GOMS family of models.
5	CO5	Students are able to Develop real time projects by Task Modeling and Analysis it.

Syllabus:

Course Contents		Hours
Unit I	**Foundations of HCI**: The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks.	6
Unit II	**Interactive System Design:** Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering.	8
Unit III	**Models and Theories:** Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.	6
Unit IV	**Model Based Design and Evaluation**: Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and HickHyman's law.	6
Unit V	**Guidelines in HCI** Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Cognitive walkthrough. **Task Modeling and Analysis:** Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design.	10

Text Books	
1.	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2.	Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.(UNIT-V)
3.	Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)

Reference Books	
1.	Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human

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	Computer Interaction, Addison-Wesley, 1994.
2.	B.Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).

Useful Links	
1.	https://www.google.co.in/books/edition/Handbook_of_Human_Computation/Lq28BAAAQBAJ?hl=en&gbpv=1&dq=Human+Computing&printsec=frontcover
2.	https://www.google.co.in/books/edition/Artifical_Intelligence_for_Human_Computi/4IlA4RZju2IC?hl=en&gbpv=1&dq=Human+Computing&pg=PR5&printsec=frontcover
3.	https://www.google.co.in/books/edition/The_Practice_of_Crowdsourcing/rq2aDwAAQBAJ?hl=en&gbpv=1&dq=Human+Computing&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE03A	**Brain Machine Interface and Interaction**	3	0	0	3

Prerequisites for the course	
1.	Basic of Cloud Computing.
2.	Fundamental of Artificial Intelligence & Robotics
3.	Understanding concept of Neural Networks and Machine Learning

Prior Reading Material/useful links	
1.	https://www.nature.com/subjects/brain-machine-interface
2.	https://www.frontiersin.org/articles/10.3389/fnsys.2021.578875/full
3.	https://www.sciencedirect.com/science/article/abs/pii/S1364661321000966

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students are able to understand the Comprehend and appreciate the significance and role of this course in the present contemporary world.
2	CO2	Students are able to Analyse Differentiate various concept of BCI.

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3	CO3	Students are able to Apply Allocate functions appropriately to the human and to the machine.
4	CO4	Students are able to Select appropriate for feature extraction methods.
5	CO5	Students are able to Design a system using machine learning algorithms for translation.

Syllabus:

Course Contents		Hours
Unit I	**Hardware/Software Components of BMI:** Introduction, Components and signals, Electrodes, Bio signal amplifier, Real-time processing environment, Motor imagery, P300 spelling device, SSVEP, Accuracies achieved with different BCI principles, Applications-twitter, second life, smart home control with BCI	8
Unit II	Feature Extraction Methods : Time/Space Methods – Fourier Transform, Wavelets, AR, MA, ARMA models, Bandpass filtering, Template matching, Kalman filter, PCA, Laplacian filter – Linear and Non-Linear Features	6
Unit III	Feature Translation Methods : Linear Discriminant Analysis –Nearest neighbours, Support Vector Machines - Regression – Learning Vector Quantization –Gaussian Mixture Modeling – Hidden Markov Modeling – Neural Networks	6
Unit IV	BCI: Based On The Flash Onset And Offset Vep: Introduction- Methods- Peak-to-valley amplitudes in the onset and offset FVEPs, Determination of gazed target, Usability of Transient VEPs in BCIs- VEPs, Availability of transient VEPs, Machine learning approach	8
Unit V	Applications of BCI: Study of BCI Competition III – Dataset I, II, III, IV and V, Functional restoration using Neuroprosthesis - Functional Electrical Stimulation, Visual Feedback and control - External device controllers, Case study: Brain actuated control of mobile Robot. Ethical issues in BCI research.	9

Text Books	
1.	Reza Fazel-Rezai, "Recent Advances in Brain-Computer Interface Systems",Intech Publications, First Edition, 2011.
2.	Theodre Berger W, John k Chapin et all, "Brain computer interfaces, An International assessment of research and developmental trends", Springer, First Edition, 2008.)

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Reference Books	
1.	Jonathan Wolpaw,Elizabeth Winter Wolpaw,'Brain Computer Interfaces: Principles and practice", Edition 1, Oxford University Press, USA, January 2012
2.	Special Issue on Brain Control Interfaces, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol 14, June 2006.
3.	R. Spehlmann, "EEG Primer", Elsevier Biomedical Press, 1981.
4.	Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010

Useful Links	
1.	https://books.google.co.in/books?id=AOWyNvgWkb8C&printsec=frontcover&dq=Brain+Machine+Interface+and+Interaction&hl=en&newbks=1&newbks_redir=1&sa=X&ved=2ahUKEwjg1vG2nrj-AhUs1jgGHT5UC38Q6AF6BAgIEAI
2.	https://www.google.co.in/books/edition/Brain_Computer_Interfaces/BTMRd8KnabcC?hl=en&gbpv=1&dq=Brain+Machine+Interface+and+Interaction&printsec=frontcover
3.	https://www.google.co.in/books/edition/Handbook_of_Research_on_Data_Science_for/QpYuDwAAQBAJ?hl=en&gbpv=1&dq=Brain+Machine+Interface+and+Interaction&printsec=frontcover
4.	https://www.google.co.in/books/edition/Brain_Computer_Interfaces/gu4YswEACAAJ?hl=en

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE03B	**Computer Forensic**	3	0	0	3

Prerequisites for the course	
1.	Basic of Forensic.
2.	Fundamental of Computer Forensics.
3.	Understanding different Forensic Tools and Processing of Electronic Evidence.

Prior Reading Material/useful links

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1.	https://www.geeksforgeeks.org/introduction-of-computer-forensics/
2.	https://mrcet.com/pdf/Lab%20Manuals/IT/R15A0533%20CF.pdf
3.	https://www.stannescet.ac.in/cms/staff/qbank/CSE/Notes/CS6004-CYBER%20FORENSICS-1800235714-CS6004%20UNIT%203.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will explain and properly document the process of digital forensics analysis.
2	CO2	Students will gain an understanding of the tradeoffs and differences between various forensic tools.
3	CO3	Students will be able to describe the representation and organization of data and metadata within modern computer systems.
4	CO4	Students will be able to create disk images, recover deleted files and extract hidden information.
5	CO5	Students will be introduced to the current research in computer forensics. This will encourage them to define research problems and develop effective solutions.

Syllabus:

Course Contents		Hours
Unit I	**Cyber Crime and computer crime:** Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.	8
Unit II	**Cyber Laws:** Security Assurance, Security Laws, IPR , International Standards ,Security Audit , SSE-CMM/COBIT etc.	6
Unit III	**Computer Forensics:** Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.	6
Unit IV	**Forensic Tools and Processing of Electronic Evidence:** Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti	8

VISION	MISSION
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	Forensics and probable counters, retrieving information.	
Unit V	**Process of computer forensics and digital investigations** : Processing of digital evidence, digital images damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.	9

Text Books	
1.	The Third Edition of Internet Cryptography" by Richard E.Smith
2.	Computer Forensics by John R.Vacca

Reference Books	
1.	The Third Edition of Computer Forensics and Cyber Crime: An Introduction by Marjie T.Britz
2.	"Digital Forensics and Cyber Crime" by Joshua I James and Frank Breitinger
3.	"Practical Forensic Imaging" by Bruce Nikkel

Useful Links	
1.	https://www.google.co.in/books/edition/Computer_Forensics_I/8naLPQAACAAJ?hl=en
2.	https://www.google.co.in/books/edition/Digital_Forensics_and_Cyber_Crime/fiDXuEHFLhQC?hl=en&gbpv=1&dq=Computer+Forensic+notes&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE03C	**Deep Learning**	3	0	0	3

Prerequisites for the course	
1.	Basic of Machine Learning.
2.	Fundamental of Deep Learning.
3.	Understanding different Natural Language Processing.

Prior Reading Material/useful links

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1.	https://www.geeksforgeeks.org/introduction-deep-learning/
2.	http://neuralnetworksanddeeplearning.com/
3.	https://www.javatpoint.com/deep-learning

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to understand topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces.
2	CO2	Students will gain an understanding the language and fundamental concepts of artificial neural networks
3	CO3	Students will be able to describe the Troubleshoot and improve deep learning models.
4	CO4	Students will be able to Optimization and Generalization in neural networks.
5	CO5	Students will be Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.

Syllabus:

Course Contents		Hours
Unit I	Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.	8
Unit II	**Deep Learning**: History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow NetworksConvolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.	8
Unit III	**Dimentionality Reduction**: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.	6

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Unit IV	**Optimization and Generalization**: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks-. Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.	9
Unit V	**Case Study and Applications**: Imagenet- Detection-Audio WaveNet- Natural Language Processing Word2Vec - Joint DetectionBioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions	6

Text Books	
1.	Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2.	Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015
3.	Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.

Reference Books	
1.	Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
2.	Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
3.	Pattern Recognition and Machine Learning, Christopher Bishop, 2007

Useful Links	
1.	https://deepai.org/machine-learning-glossary-and-terms/deep-learning
2.	https://journalofbigdata.springeropen.com/articles/10.1186/s40537-021-00444-8

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	CS6TE03D	**Quantum Computing**	3	0	0	3

Prerequisites for the course	
1.	Basic of Quantum Computation.
2.	Fundamental of Cryptography.
3.	Understanding different Quantum Algorithms.

Prior Reading Material/useful links

VISION	MISSION
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1.	https://www.geeksforgeeks.org/introduction-quantum-computing/
2.	https://www.hpe.com/us/en/what-is/quantum-computing.html
3.	https://thequantuminsider.com/introduction-to-quantum-computing/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to understand Quantum Computation.
2	CO2	Students will gain an understanding the Quantum mechanics as applied in Quantum computing.
3	CO3	Students will be able to describe the Troubleshoot and improve deep learning models.
4	CO4	Students will be able to Optimization and Generalization in neural networks.
5	CO5	Students will be Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.

Syllabus:

Course Contents		Hours
Unit I	Introduction to Quantum Computation: Quantum bits, B loch sphere representation of a qubit, multiple qubits.	6
Unit II	Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.	6
Unit III	quantum mechanics, Measurements in bases other than computational basis. 083 Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits.	6
Unit IV	Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states, Quantum teleportation. Quantum Cryptography, no cloning theorem.	6
Unit V	Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search. Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation.	12

VISION	MISSION
To be recognized for excellent engineering, developing global leaders both in educational and research in the domain of computer science and wireless engineering.	1. To create self-learning environment by facilitating leadership qualities, team spirit and ethical responsibilities. 2. To improve department-industry collaboration, interaction with professional society through technical knowledge and internship program. 3. To promote research and development with current techniques through well qualified resources in the area of computer science and wireless engineering.

Text Books	
1.	Nielsen M. A ., Quantum Computation and Quantum Information, Cambridge University Press.2002
2.	Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I : Basic Concepts, Vol I I: Basic Tools an d Special Topics, World Scientific.2004
3.	Pittenger A. O., An Introduction to Quantum Computing Algorithms.2000

Reference Books	
1.	Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2.	Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010
3.	Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

Useful Links	
1.	https://www.reddit.com/r/QuantumComputing/?rdt=35140
2.	https://www.quantum-inspire.com/kbase/introduction-to-quantum-computing/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	**CS6O002**	**Open Elective-2 (Software Engineering)**	3	1	0	4

Prerequisites for the course	
1.	Basic of Software Engineering.
2.	Fundamental of Process Models.
3.	Understanding different Requirements & Design Engineering.

Prior Reading Material/useful links	
1.	https://www.javatpoint.com/software-engineering
2.	https://www.geeksforgeeks.org/software-engineering/
3.	https://www.udemy.com/courses/development/software-engineering/

Course Outcomes:

VISION	MISSION
To be recognized for excellent engineering, developing global leaders both in educational and research in the domain of computer science and wireless engineering.	1. To create self-learning environment by facilitating leadership qualities, team spirit and ethical responsibilities. 2. To improve department-industry collaboration, interaction with professional society through technical knowledge and internship program. 3. To promote research and development with current techniques through well qualified resources in the area of computer science and wireless engineering.

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to decompose the given project in various phases of a lifecycle.
2	CO2	Students will be able to choose appropriate process model depending on the user requirements.
3	CO3	Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
4	CO4	Students will be able to know various processes used in all the phases of the product..
5	CO5	Students can apply the knowledge, techniques, and skills in the development of a software product.

Syllabus:

Course Contents		Hours
Unit I	**Introduction to Software Engineering:** Software Engineering requirement, Need of Software Engineering, Characteristics of good software engineer, Importance of Software Engineering, Software Engineering-a layered technology, A generic view of Process, Process Framework CMM Process Patterns, Process Assessment.	7
Unit II	**Process Models**: Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Unified Process. Agile Process Model	6
Unit III	**Requirements Engineering**: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. **Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. **System models:** Context models, behavioral models, data models, object models, structured methods.	7
Unit IV	**Design Engineering:** Design process and design quality,the design model. **Creating an architectural design:** software architecture, data design, architectural styles and patterns, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.	7
Unit V	Software testing fundamentals, Unit testing, Integrated testing black-box and white-box testing, validation testing, system testing, metrics for source code, metrics for testing, metrics for maintenance. **Risk**	9

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	management: Reactive Vs proactive risk strategies, software risks, risk identification, risk refinement, RMMM, **Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, software reliability.	

Text Books	
1.	"Software Engineering : A Precise Approach" Pankaj Jalote , Wiley India
2.	Software engineering A practitioner's Approach, Roger S Pressman, sixth edition McGraw Hill International Edition.
3.	Software Engineering, Ian Sommerville, seventh edition, Pearson education.

Reference Books	
1.	"System Analysis and Design" Alan Dennis, Wixom, R M Roth – Wiley India
2.	"Software Engineering: Principles and Practice" by Waman S Jawadekar
3.	Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.

Useful Links	
1.	http://nptel.ac.in/downloads/106105087/
2.	http://nptel.ac.in/courses/106101061/
3.	https://www.theforage.com/blog/careers/what-is-software-engineering
4.	https://www.tutorialspoint.com/software_engineering/index.htm

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	**CS6L003**	**Neural Networks & Machine Learning (Lab)**	0	0	2	1

Prerequisites for the course	
1.	Understand the programming and concepts and methods of machine learning.
2	Acquire programming skills in core use of some elementary machine learning techniques.

Prior Reading Material/useful links	
1	https://axon.cs.byu.edu/
2	https://neuralnetlab.com/
3	https://people.iitism.ac.in/~download/lab%20manuals/mathandcomp/Neural%20Networks%20and%20Deep%20Learning%20Practical.pdf

VISION	MISSION
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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to demonstrate knowledge of the machine learning literature.
2	CO2	Student will able to describe how and why machine learning methods work
3	CO3	Student will able to explain relative strengths and weaknesses of different machine learning methods.
4	CO4	Student will able to select and apply appropriate machine learning methods to a selected problem.
5	CO5	Student will able to implement machine learning algorithms on real datasets. To suggest ways to improve results.

List of Practical's:

Course Contents		Hours
1	Introduction study of Neural Networks and Machine Learning	2
2	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.	2
3	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	2
4	Write a program to demonstrate the working of the decision tree based ID algorithm.	2
5	Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	2
6	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same.	2
7	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	2
8	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program.	2

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9	Write the program to Calculate the accuracy, precision, and recall for your data set.	2
10	Write the program to implement machine learning algorithms on real datasets.	2

Text Books	
1.	S. N.Sivanandam and S. N.Deepa, Introduction to neural networks using Matlab, 2016.
2.	Simon Haykin, Neural Networks and Learning Machines, PHI, 2008.

Useful Links	
1	https://ml.informatik.uni-freiburg.de/
2	https://deepakdvallur.weebly.com/machine-learning-laboratory.html
3	https://cse22-iiith.vlabs.ac.in/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	**CS6L004**	**Full Stack Development (Lab)**	0	0	2	1

Prerequisites for the course	
1.	Understand the programming and concepts and methods of JAVA.
2	Use the Java programming language for various programming technologies.

Prior Reading Material/useful links	
1	https://mrcet.com/pdf/Lab%20Manuals/Full%20Stack%20Lab.pdf
2	https://mrcet.com/pdf/Lab%20Manuals/FULL%20STACK%20DEVELOPMENT%20LAB.pdf
3	https://www.researchgate.net/publication/372345794_Full_Stack_Web_Development_with_Hands-On_Lab

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Usage of various front and back end Tools.
2	CO2	Student will able to understand and create applications on their

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		own.
3	CO3	Student will able to Demonstrate and Designing of Websites can be carried out.
4	CO4	Student will able to Develop web based application using suitable client side and server side code.
5	CO5	Student will able to Implement web based application using effective database access.

List of Practical's:

Course Contents		Hours
1	Develop static pages (using Only HTML5) of an online Book store. The pages should resemble: www.flipkart.com the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation.	2
2	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.	2
3	Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box	2
4	Write a program in CSS to show your city with building and moving cars.	2
5	A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello , you are not authorized to visit this site" message, where should be replaced with the entered name. Otherwise it should send "Welcome to this site" message.	2
6	A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary	2
7	A web application takes a name as input and on submit it shows a hello page where is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You Message with the duration of usage (hint: Use session to store name and time).Modify the above program to use an xml file instead of database	2
8	Build the Frontend and Backend of Zomato like website with Express.js,Node.js and MongoDB	2
9	Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.	2
10	Implement Cloud-hosted deployment & project dependency management and bundling tools	2

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Text Books	
1.	Hands-On Full Stack Web Development with Angular 6 and Laravel 5 Become Fluent in Both Frontend and Backend Web Development with Docker, Angular and Laravel By Fernando Monteiro · 2018
2.	Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node By Vasan Subramanian · 2019

Useful Links	
1	https://www.google.co.in/books/edition/Hands_On_Full_Stack_Web_Development_with/9ghnDwAAQBAJ?hl=en&gbpv=1&dq=Full+Stack+Development+(Lab)&printsec=frontcover
2	https://www.google.co.in/books/edition/Pro_MERN_Stack/TayXDwAAQBAJ?hl=en&gbpv=0

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	**CS6L005**	**Advance Java Programming (LAB)**	0	0	2	1

Prerequisites for the course	
1.	Understand the programming and concepts and methods of JAVA.
2	Use the Java programming language for various programming technologies.

Prior Reading Material/useful links	
1	https://www.rgmcet.edu.in/assets/img/departments/CSE/materials/R15/3-1/AJP%20LAB.pdf
2	https://ggnindia.dronacharya.info/CSEIT/Downloads/Labmanuals/Advanced_JAVA_Vth_Sem.pdf
3	https://www.gacwrmd.in/learning/Computer/7MCE1P1-Advanced%20Java%20Programming%20Lab.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Develop software in the Java programming

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		language.
2	CO2	Student will able to understand and create applications on their own.
3	CO3	Student will able to Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.
4	CO4	Student will able to Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem.
5	CO5	Student will able to Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems.

List of Practical's:

	Course Contents	Hours
1	Use JDBC connectivity and create Table, insert and update data.	2
2	Write a program in Java to implement a Client/Server application using RMI.	2
3	Write a Servlet to display "Hello World" on browser.	2
4	Assume that the information regarding the marks for all the subjects of a student in the last exam are available in a database, Develop a Servlet which takes the enrolment number of a student as a request parameter and displays the mark sheet for the student.	2
5	Develop a Servlet which looks for cookies for username and password, and forwards to a home.jsp in case the cookies are valid and forwards to login.jsp, in case the cookies are not found or the cookies are not valid.	2
6	Develop a Servlet to authenticate a user, where the login id and password are available as request parameters. In case the authentication is successful, it should setup a new session and store the user's information in the session before forwarding to home.jsp, which displays the user's information like full name, address, etc.	2
7	Create Servlet file which contains following functions: a) Connect b) Create Database c) Create Table d) Insert Records into respective table e) Update records of particular table of database f) Delete Records from table. g) Delete table and also database	2

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8	User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions. Use following Java Statement interface to implement program: a) Prepared Statement b) Callable statement	2
9	Study and implement Hibernate.	2
10	Study and Implement MVC using Spring Framework.	2

Text Books	
1.	Advanced Java By Anuradha A. Puntambekar · 2020
2.	Java 2: The Complete Reference, Fifth Edition By Herbert Schildt · 2002
	Java 2 (Jdk 5 Ed.) Programming Black Book 2006 Ed.By Steven Holzner · 2005

Useful Links	
1	https://www.atri.edu.in/images/pdf/departments/JAVA%20PROGRAMMING%20%20MANUAL.pdf
2	https://www.arsdcollege.ac.in/wp-content/uploads/2020/05/Programming_in_Java_-_week9.pdf

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	**CS6P006**	**Mini Project**	0	0	2	1

Prerequisites for the course	
1.	Understand the creation of new technologies or innovations.
2	Learning business opportunities.

Prior Reading Material/useful links	
1.	https://www.youtube.com/watch?v=p8e5ZEpRmx0
2.	https://www.youtube.com/watch?v=if_z7pMA85g
3.	https://www.youtube.com/watch?v=V5yv5TNpiLE

Course Outcomes:

VISION	MISSION
To be recognized for excellent engineering, developing global leaders both in educational and research in the domain of computer science and wireless engineering.	1. To create self-learning environment by facilitating leadership qualities, team spirit and ethical responsibilities. 2. To improve department-industry collaboration, interaction with professional society through technical knowledge and internship program. 3. To promote research and development with current techniques through well qualified resources in the area of computer science and wireless engineering.

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to creation of new technologies or innovations.
2	CO2	Students will able to address complex problems or challenges
3	CO3	Students will able to develop new computational models or simulations that help advance their research.
4	CO4	Students will able to create new products or services that can be commercialized.
5	CO5	Students will able to impact various aspects of society, from improving productivity and efficiency to enhancing user experience and addressing social challenges.

This is continuous work to the project phase I. Every students will have to submit a completed report (3 copies)* of the project work. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II
1. Coding/Implementation.
2. Use cases.
3. Testing/Trouble shooting.
4. Data dictionary/ Documentation.
5. Finalization of project in all respect.
6. *(For guide, Personal copy, Departmental library.)
7. In a presentation, the students should focus to clarify problem definition and analysis of the problem.

Text Books	
1.	Planning and Implementing Your Final Year Project — with Success! By Mikael Berndtsson, Jörgen Hansson, B. Olsson, Björn Lundell · 2013
2.	Computer Science Project Work Principles and Pragmatics By Sally Fincher, Marian Petre, Martyn Clark · 2001
3.	Thesis Projects, A Guide for Students in Computer Science and Information Systems By Mikael Berndtsson · 2008

Reference Books	
1.	SOFTWARE ENGINEERING PROJECT MANAGEMENT By Bill

VISION	MISSION
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	Brykczynski, Richard D. Stutz · 2006
2.	Software Engineering Body of Knowledge By IEEE Computer Society · 2014
3.	Quality Software Project Management By Robert T. Futrell · 2002

Useful Links	
1.	https://www.google.co.in/books/edition/Project_Summaries/0ggTG_ya8acC?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&pg=PA78&printsec=frontcover
2.	https://www.google.co.in/books/edition/Real_World_Software_Projects_for_Compute/X6seEAAAQBAJ?hl=en&gbpv=1&dq=major+project+objective+in+computer+science+engineering&printsec=frontcover
3.	https://www.logicraysacademy.com/blog/final-year-projects-for-cse/

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	CS6P007	CRT (Campus Recruitment Training)	0	0	2	1

Prerequisites for the course	
1.	Understand the basic mathematical skills.
2	Learning Important tool using Short-cut method with time management.

Prior Reading Material/useful links	
1.	https://www.geeksforgeeks.org/aptitude-questions-and-answers/
2.	https://www.indiabix.com/aptitude/questions-and-answers/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to Solve the problems easily by using Short-cut method with time management which will be helpful to them to clear the competitive exams for better job opportunity.
2	CO2	Students will able to apply mathematical analysis of data to make connections, draw conclusions and solve problems.
3	CO3	Students will able to learn a series of techniques through practical activities to develop presenting skills and enhance confidence to

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		expand the potential of the individual.
4	CO4	Students will able to produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
5	CO5	Students will able to Demonstrate professional behavior(s) including preparedness, professional attire, and respectful presentation during interviews.

About CRT Training Campus Recruitment training (CRT) at is designed to aid candidates in their preparation for Recruitment through Campuses or outside campuses (i.e On campus or off campus). Students in their final step of graduation looking for placement in reputed organizations can make use of this training to get trained to deliver their best in the selection processes of organizations.

Syllabus:

Course Contents		Hours
PART I	**QUANTITATIVE ABILITY** **1) Unit 1:** Speed Maths Calculation, Number Systems, Ratio & Proportion, Percentage **2) Unit 2:** Profit – Loss & Discount, Simple Interest & Compound Interest, Simple Equation and Age's **3) Unit 3:** Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation – Combination & Probability	09
PART II	**REASONING ABILITY** **1) Unit 1:** Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy **2) Unit 2:** Sitting Arrangement, Puzzles. **3) Unit 3:** Syllogism, Statement course of action, Statement arguments, Statement Assumptions, Miscellaneous Type of	09

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	Reasoning	
PART III	**Employability Skills** **1) Unit 1:** **Presentation Skills:** What is a presentation? Essential characteristics of Good presentation. Preparation of presentation: Identify the purpose, Analyze the audience, Design and organize the information, Medium of presentation and Visual aids Delivering Presentation: rehearsal, body Language, Handling questions, Tips to fight stage fear. **2) Unit 2:** **Job Interview Skills:** Types of interviews, Focus of interview, dress code, importance of body language. Probable interview questions, Telephonic and video interview, Strategies for success at interview. **3) Unit 3:** **Resume Building:** Meaning, Difference among Bio-data, Curriculum vitae and Resume. CV writing tips, The content of Resume, Structure of Resume	06

Text Books	
1.	Prashant Sharma, SOFT SKILLS PERSONALITY DEVELOPMENT FOR LIFE SUCCESS. BPB Publication.
2.	P. D. Chaturvedi & Mukesh Chaturvedi, Business Communication: Concepts, Cases, and Applications 2nd Edition. Pearson Education.
3.	Barun Mitra, Personality Development and Soft Skills. Oxford University Press.
4.	Dr.K.Alex, *Soft Skills Know yourself and Know the World*. S.ChandPublishing, 2014

Reference Books	
1.	R.S Agrawal, Quantitative Aptitude.
2.	Arun Sharma, How to Prepare for Quantitative Aptitude.
3.	R. S Agrawal, Verbal and Non Verbal Reasoning.

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Useful Links	
1	https://www.javatpoint.com/aptitude/quantitative
2	https://www.ambitionbox.com/topics/aptitude/questions-and-answers
3	https://prepinsta.com/learn-aptitude/

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credit
VI	**CS6P008**	**Skill Development**	0	0	2	1

Prerequisites for the course	
1.	Basics courses of Coursera, NPTEL.
2.	Knowledge of the Courses, Specializations and Professional Certificates.

Prior Reading Material/useful links	
1	https://www.skillindiadigital.gov.in/courses
2	https://nptel.ac.in/
3	https://www.coursera.org/en-IN

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to Identifying a person's skills and knowledge gaps.
2	CO2	Student will able to disseminate knowledge on top learning platforms which offering free Skill Development Courses Online.
3	CO3	Student will able to enhance technical and scientific skills.
4	CO4	Student will able to explore many free online courses at MOOCs, i.e. Massive Open Online Course.
5	CO5	Student will able to develop and strengthen skills.

In order to encourage the initiative of Skill India and Made in India, the National Skill Development Corporation offers a wide range of online skill development courses in the country. You can explore many free online courses at MOOCs, i.e. Massive Open Online Course. Here are the top learning platforms offering free Skill Development Courses Online:

- National Skill Development Corporation (NSDC)

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- MOOCs
- Coursera
- Allison
- Skillshare
- eSkill India by NSDC

Program: B.Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Audit
VI	**CS6T009**	**Intellectual Property Rights**	2	0	0	Audit

Prerequisites for the course	
1.	Basics of Universal Human Value and entrepreneurial behaviour.
2.	Knowledge of the social, ethical and culture and Consumer Affairs

Prior Reading Material/useful links	
1	https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm
2	https://byjus.com/free-ias-prep/ipr-in-india-upsc-notes/
3	https://blog.ipleaders.in/all-about-intellectual-property-rights-ipr/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will able to introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2	CO2	Student will able to disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3	CO3	Student will able to describe the knowledge on copyrights and its related rights and registration aspects
4	CO4	Student will able to Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
5	CO5	Student will able to aware about current trends in IPR and Govt. steps in fostering IPR.

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Syllabus:

Course Contents		Hours
Unit I	Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad Function of IPR. Public good, Incentive theory, different forms of IPR , Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.	05
Unit II	Practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad .Introduction to competition Law, Anti-competitive agreements, Abuse of dominance, Regulation of combinations,	05
Unit III	International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.	05
Unit IV	The relationship and Interaction between IPR and competition law The economics of US Anti trust law, IP and competition issues, Technology transfer agreements. The EU experience with IP and Competition Law	05
Unit V	Market allocation, Horizontal agreements, Vertical agreements, licensing issues. Indian Competition Act and IPR protection. Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.	08

Text Books	
1.	Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
2.	Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business, Publishers.

Reference Books	
1.	ubramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights–An Overview. Retrieved from
2.	World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook.
3.	Creativity and Innovation in Entrepreneurship By S S Khanka · 2021

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Useful Links	
1	https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf
2	http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf

Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS6T001	Artificial Intelligence & Robotics	Dr. Ashutosh Lanjewar
2	CS6T002	Neural Networks and Machine Learning	Prof. Dipali Pethe
3	CS6TE02B	Elective –II (Angular JS)	Prof. Achal Wani
4	CS6TE02D	Elective –II (Human Computing)	Prof. Pankaj Wankhede
5	CS6TE03B	Elective –III (Computer Forensic)	Prof. Kiran Bode
6	CS6O002	Open Elective-2 (Software Engineering)	Prof. Anuja Ghasad
7	CS6L003	Neural Networks & Machine Learning(Lab)	Prof. Dipali Pethe
8	CS6L004	Full Stack Development (Lab)	Prof. Neha Nandanwar
9	CS6L005	Advance Java Programming (LAB)	Prof. Kiran Bode
10	CS6P006	Mini Project	Prof. Kiran Bode
11	CS6P007	CRT(Campus Recruitment Training)	TPO
12	CS6P008	Skill Development	Prof. Sujata Helonde
13	CS6T009	Intellectual Property Rights	Prof. Sujata Helonde

Prof. Anuja Ghasad,
Secretary BOS, CSE,
JDCOEM, Nagpur

Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur

JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
(An Autonomous Institute, with NAAC "A" Grade)
Affiliated to DBATU, RTMNU & MSBTE Mumbai
Department of Computer Science & Engineering
"Place to learn, Chance to grow"

VISION	MISSION
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B. Tech.

In

Computer Science and Engineering

VISION

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MISSION

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Program: B. Tech. in Computer Science & Engineering
3rd Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	HSMC	CS3T001	Organizational Behaviour	2	0	0	20	20	60	100	2
2	BSC	CS3T002	Linear Algebra and Transform	2	1	0	20	20	60	100	3
3	ESC	CS3T003	Programming for Problem Solving	3	0	0	20	20	60	100	3
4	HSMC	CS3T004	Universal Human Values(UHV)	2	1	0	20	20	60	100	3
5	PCC	CS3T005	Digital Electronics and Microprocessor	3	0	0	20	20	60	100	3
6	PCC	CS3T006	Data structure & Algorithms	3	0	0	20	20	60	100	3
7	PCC	CS3T007	Operating System	3	0	0	20	20	60	100	3
8	PCC	CS3L008	Digital Electronics and Microprocessor(Lab)	0	0	2	60	0	40	100	1
9	PCC	CS3L009	Data structure and Algorithms(Lab)	0	0	2	60	0	40	100	1
10	PCC	CS3L010	Web Designing (Lab)	0	0	2	60	0	40	100	1
				18	**2**	**6**	**320**	**140**	**540**	**1000**	**23**

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T001	Organizational Behaviour	2	0	0	2

Prerequisites for the course	
1.	Basic of Universal Human Rights in Organization
2.	Communication Skill in Organization

Prior Reading Material/useful links	
1.	https://www.iedunote.com/organizational-behavior
2.	https://thebusinessprofessor.com/en_US/management-leadership-organizational-behavior/organizational-behavior-definition
3.	https://www.javatpoint.com/organizational-behaviour

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to remember various methods and terms used in different organizational behaviour models.
2	CO2	Students will be able to understand Individual as well as Group Behaviour like attitude, perception, motivation, personality, misbehaviour and emotions.
3	CO3	Students will be able to apply the Principles of Organization Behaviour through leadership, Power & Politics.
4	CO4	Students will be able to analyse the dynamics of organizational behaviour and managing change.
5	CO5	Students will be able to evaluate the importance of Advanced Communication tools and Techniques for the decision making Process.

Syllabus:

Course Contents		Hours
Unit I	**Introduction to organization Behaviour** Meaning, Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Models of OB, Impact of technology on organizational behaviour. **Organization Culture:** Meaning and dimensions, Types of organizational cultures.	5
Unit II	**Organizational Design, Change and Innovation** Designing an organizational structure, Division of labour, Delegation of authority, Span of control, Dimensions of structure, Organizational design models, Multinational Structure and Design, Virtual Organizations. **Communication**: The importance of communication, The communication process, Communicating within organizations, Interpersonal	5

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	communication, Multicultural communication, Barriers to effective communication, **Technical Report Writing :** Characteristics of Technical Communication, Types of Technical Documents, Technical Writing Process.	
Unit III	**Personality** Meaning of personality, Nature and Determinants of Personality, Personality Traits - Big Five, Locus of Control, Self-esteem, Type A/ Type B Personality, Risk Taking, Machiavellianism, Self-Monitoring, Personality and OB. **Attitude:** Attributes of personality, Transactional Analysis, Nature and dimensions of attitude, Developing the right attitude, ABC model of Attitude, Managerial Implications of Attitude	5
Unit IV	**Groups and Organizations** Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, five stages of group/team development, **Leadership:** Leadership as a concept and its essence, Leaders versus managers, Blake and Mouton's managerial grid, Hersey and Blanchard's situational leadership, Transactional versus Transformational leadership,	5
Unit V	Power and purpose of motivation, Theories of motivation, Locke's goal setting theory, Vroom's expectancy theory, Porter and Lawler's model, Motivational Techniques **Power and Politics**: The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics, power and politics, **Empowerment and Participation**: The nature of empowerment and participation, How participation works, Programs for participation, Important considerations in participation.	5

Text Books	
1.	Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2.	Govind Daryanani, "Analysis and Synthesis of Filters".
3.	Stephen P. Robbins, Timothy A. Judge, "Organisational Behaviour" Pearson Australia, 2019
4.	S. S. Khanka, "Organisational Behaviour" S. Chand Limited

Reference Books	
1.	Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.
2.	John O' Malley, "Basic Circuit Analysis", Schaum's series.
3.	Van Valkenberg, "Network Analysis", Pearson Education
4.	Organisation Behaviour by Dr. F. C. Sharma, SBPD Publications

Useful Links	
1.	https://www.google.co.in/books/edition/Organizational_Behaviour/6Rj9DwAAQBAJ?hl=en&gbpv=1&dq=organizational+behaviour+book&printsec=frontcover
2.	https://www.youtube.com/watch?v=SheMhZeajyk
3.	https://www.youtube.com/watch?v=aA_ygVI0gB8

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T002	Linear Algebra & Transform	2	1	0	3

Prerequisites for the course	
1.	Basics concept of Laplace Transform such as Inverse Transform, Fourier transform etc
2.	Fundamental Knowledge about complex variables Numerical Linear algebra .

Prior Reading Material/useful links	
1.	https://www.geeksforgeeks.org/matrices/
2.	https://people.umass.edu/~prokofev/P605/complex_functions.pdf

Course Outcomes:

Sr. No	Course Outcome Number	CO statement
1	CO1	Students will be able Describe the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra.
2	CO2	Students will be able to Apply the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra.
3	CO3	Students will be able to Analyse the problem by using the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra.
4	CO4	Students will be able to Evaluate the problem base on the concept of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra.
5	CO5	Students will be able to Create the new concept by using the theory of Laplace Transform, Inverse Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra.

Syllabus:

Course Contents		Hours
Unit I	**Matrices** Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester"s theorem [without proof].	08
Unit II	**Functions of complex variables** Analytic functions; Harmonic functions in Cartesian form; fundamental theorem of algebra; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem.	08

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Unit III	**Fourier transform** Definitions, Fourier transforms; Properties of Fourier transforms; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms; Finite Fourier transform.	07
Unit IV	**Laplace Transform** Definition, conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit step function.	09
Unit V	**Inverse Laplace Transform** Introductory remarks, Inverse transforms of some elementary functions ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of differential equations	08

Text Books	
1.	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2.	Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3.	A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4.	A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Books	
1.	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, NewDelhi.
2.	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd.,Singapore.
3.	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

Useful Links	
1.	https://byjus.com/jee/matrices/
2.	https://betterexplained.com/articles/an-interactive-guide-to-the-fourier-transform/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T003	Programming for Problem Solving	3	0	0	3

Prerequisites for the course	
1.	Basic of C-Language
2.	Introduction to Computer Programming like data types, packages etc.

3.	Introduction to Computer Programming Lab like to translate the algorithms to programs.

Prior Reading Material/useful links	
1.	https://web.chem.ox.ac.uk/fortran/programs.html
2.	https://www.youtube.com/watch?v=r4TgqWbKRtA
3.	https://www.youtube.com/watch?v=8BeXwhljq2g

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student shall be able to learn and understand to formulate simple algorithms for arithmetic and logical problems.
2	CO2	Student shall be able to translate the algorithms to programs (in C language).
3	CO3	Student shall be able to test and execute the programs and correct syntax and logical errors
4	CO4	Student shall be able to implement conditional branching, iteration and recursion.
5	CO5	Student shall be able to decompose a problem into functions and synthesize a complete program.

Syllabus:

Course Contents		Hours
Unit I	Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code	9
Unit II	Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops	7
Unit III	Arrays (1-D, 2-D), Character arrays and Strings, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)	8
Unit IV	Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	9
Unit V	Structures, defining structures and Array of Structures, Pointers, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list.	7

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Text Books	
1.	Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2.	Programming and Problem Solving with C++ By Nell B. Dale, Chip Weems, Mark R. Headington Jones & Bartlett Learning, LLC
3.	Programming and Problem Solving An Introduction to Computer Science By David a Freitag, Independently Published
4.	C Programming with Problem Solving By Jacqueline A. Jones, Keith Harrow, Dreamtech Press.

Reference Books	
1.	C Programming for Problem Solving By Nanjesh Bennur, 1st, C. K. Subbaraya, 2nd, InSc International Publisher
2.	Programming and Problem Solving Through "C" Language By Harsha Priya, R. Ranjeet · 2006, Laxmi Publications Pvt Limited
3.	Programming for Problem Solving (All India) By R.S. Salaria, Khanna Publishing House"

Useful Links	
1.	https://www.google.co.in/books/edition/PROBLEM_SOLVING_WITH_C/ZsZGDwAAQBAJ?hl=en&gbpv=1&dq=Programming+for+Problem+Solving+books&printsec=frontcover
2.	https://www.google.co.in/books/edition/Programming_for_Problem_Solving_All_Indi/LVYNEAAAQBAJ?hl=en&gbpv=1&dq=Programming+for+Problem+Solving+books&printsec=frontcover
3.	https://www.google.co.in/books/edition/Problem_Solving_101/p6FIwG5H4QcC?hl=en&gbpv=1&dq=Programming+for+Problem+Solving+books&printsec=frontcover
4.	https://www.google.co.in/books/edition/Problem_Solving_and_Computer_Programming/ppIaK3jazOcC?hl=en&gbpv=1&dq=Programming+for+Problem+Solving+books&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T004	Universal Human Values(UHV)	2	1	0	3

Prerequisites for the course	
1.	Communication Skill, behaviour, nature in society.
2.	Organization Behaviour, Strengthening of self-reflection etc.

Prior Reading Material/useful links	
1.	https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

2.	https://www.geeksforgeeks.org/human-values-concept-and-importance/
3.	https://www.researchgate.net/publication/320613836_The_importance_and_need_of_universal_human_values_in_engineering_students_life

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to Sensitization of student towards self, family (relationship), society and nature
2	CO2	Students will be able to understand (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
3	CO3	Students will be able to Strengthening of self-reflection.
4	CO4	Students will be able to Development of commitment and courage to act.
5	CO5	Students will be able to Justify the need of this education.

Syllabus:

Course Contents		Hours
Unit I	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education:** Purpose and motivation for the course, recapitulation from Universal Human Values-I. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.	8
Unit II	**Understanding Harmony in the Human Being - Harmony in Myself!:** Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation.	8

	Discuss program for ensuring health vs dealing with disease.	
Unit III	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship:** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives fearlessness (trust) and co-existence as comprehensive Human Goals.	8
Unit IV	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence:** Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.	8
Unit V	**Implications of the above Holistic Understanding of Harmony on Professional Ethics:** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems **Strategy for transition from the present state to Universal Human Order:** At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.	8

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Text Books	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2.	JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4.	The Story of Stuff (Book).

Reference Books	
1.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
2.	Rediscovering India - by Dharampal
3.	Economy of Permanence - J C Kumarappa
4.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

Useful Links	
1.	https://www.google.co.in/books/edition/Human_Values/XhuMFyzdMT8C?hl=en&gbpv=1&dq=Universal+Human+Values&printsec=frontcover
2.	https://www.google.co.in/books/edition/Human_Values_and_Professional_Ethics/CSDzDwAAQBAJ?hl=en&gbpv=1&dq=Universal+Human+Values&printsec=frontcover
3.	https://www.google.co.in/books/edition/Human_Values_in_Education/fxlUhwFmZlAC?hl=en&gbpv=1&dq=Universal+Human+Values&printsec=frontcover
4.	https://www.youtube.com/watch?v=-oHoD5zIE4Q

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3L005	Digital Electronics & Microprocessor	3	0	0	3

Prerequisites for the course	
1.	Basic Electrical and Electronics Engineering like circuits, signals etc.
2.	Synthesis of appropriate combinational and sequential logic circuits.

Prior Reading Material/useful links	
1.	https://www.geeksforgeeks.org/digital-electronics-and-computer-organisation/
2.	https://www.jbiet.edu.in/pdffls/IT-coursematerial/Digital-Logic-Design-and-Computer-Organization.pdf
3.	https://www.javatpoint.com/digital-electronics

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to Define basic logical circuits, Boolean

		algebra, minimization methods, methods for writing Boolean functions, combinational and sequential circuits, flip-flops, digital automaton, and programmable structures.
2	CO2	Students will be able to Describe operation methods of combinational and sequential circuits, similarities and differences of writing the Boolean functions and minimizations.
3	CO3	Students will be able to Pattern recognition for specific circuit realization and error discovery during circuit design process.
4	CO4	Students will be able to Synthesis of appropriate combinational and sequential logic circuits.
5	CO5	Students will be able to Evaluation of own solutions and error discovery.

Syllabus:

Course Contents		Hours
Unit I	**Logic Simplification** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, Number Systems: binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.	8
Unit II	**Combinational Digital Circuits** Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker / generator	7
Unit III	**Sequential circuits and systems** A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K - T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	7
Unit IV	**Fundamentals of Microprocessors** Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bitmicroprocessors (80386). The 8086 Architecture: Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.	9
Unit V	**8086 Instruction Set and Programming** Memory Interfacing. I/O Interfacing. Direct Memory Access. (DMA). Interrupts in 8086. Addressing modes: Introduction, Instruction syntax,	9

	Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction	

Text Books	
1.	R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2.	M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3.	A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4.	Douglas Hall, Microprocessors and Interfacing, McGraw-Hill Publications

Reference Books	
1.	An approach to digital Design: Morris Mano, Pearson Publications.
2.	Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

Useful Links	
1.	https://www.google.co.in/books/edition/DIGITAL_LOGIC_AND_COMPUTER_ORGANIZATION/Xo69qEkv9t4C?hl=en&gbpv=1&dq=Digital+Electronics+%26+Computer+Organization&printsec=frontcover
2.	https://www.google.co.in/books/edition/Digital_Design_and_Computer_Organization/O_L2zgEACAAJ?hl=en

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T006	Data structure & Algorithms	3	0	0	3

Prerequisites for the course	
1.	Basic of C-Language such as abstract data types.
2.	Introduction to Computer Programming data structures and use.

Prior Reading Material/useful links	
1.	https://www.programiz.com/dsa#:~:text=A%20data%20structure%20is%20a,efficient%20and%20optimized%20computer%20programs.
2.	https://www.tutorialspoint.com/data_structures_algorithms/index.htm
3.	https://www.javatpoint.com/data-structure-algorithm

Course Outcomes:

Sr. No	Course Outcome number	CO statement

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1	CO1	Students will be able to implement abstract data types for linear data structures.
2	CO2	Students will be able to apply the different linear and non-linear data structures to problem solutions.
3	CO3	Students will be able to critically analyse the various sorting algorithms.
4	CO4	Students will be able to program data structures and use them in implementations of abstract data types.
5	CO5	Students will be able to estimate the algorithmic complexity of simple, non-recursive programs.

Syllabus:

Course Contents		Hours
Unit I	**Complexity Analysis:** Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.	8
Unit II	**ADT Array-Searching and sorting on arrays:** Linear search, binary search on a sorted array. Bubble sort, Insertion sort, merge sort and analysis; Counting sort, Radix sort, and bucket sort	7
Unit III	**Stacks and Queues:** Abstract data types, sequential and linked implementations, exception handling in classes, representative applications such as parenthesis matching, simulation of queuing systems.	7
Unit IV	**Linked Lists:** Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, exception and iterator classes for lists, doubly linked lists, circular lists.	9
Unit V	**Trees & Graphs** : Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heap sort, Breadth first search and connected components, Depth first search in directed and undirected graphs.	9

Text Books	
1.	Mark Allen Weiss, —Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,1997.
2.	Data Structures And Algorithms By Aho · 1983
3.	Problem Solving with Algorithms and Data Structures Using Python By Bradley N. Miller, David L. Ranum · 2011 Franklin, Beedle & Associates

Reference Books	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2.	Aho, Hopcroft and Ullman,Data Structures and Algorithms‖, Pearson Education,1983.

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3.	Stephen G. Kochan, :Programming in C‖, 3rd edition, Pearson Education.
4.	Ellis Horowitz, SartajSahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C, Second Edition, University Press, 2008

Useful Links	
1.	https://www.google.co.in/books/edition/An_Introduction_to_Data_Structures_and_A/K4vfBwAAQBAJ?hl=en&gbpv=1&dq=Data+structure+%26+Algorithms&printsec=frontcover
2.	https://www.google.co.in/books/edition/Data_Structures_Algorithms_using_C/fCIEEAAAQBAJ?hl=en&gbpv=1&dq=Data+structure+%26+Algorithms&printsec=frontcover
3.	https://www.google.co.in/books/edition/Data_Structures_and_Algorithms_in_C++/q_NxAjqWDGoC?hl=en&gbpv=1&dq=Data+structure+%26+Algorithms&printsec=frontcover
4.	https://www.google.co.in/books/edition/A_Common_Sense_Guide_to_Data_Structures/yA5QDwAAQBAJ?hl=en&gbpv=1&dq=Data+structure+%26+Algorithms&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3T007	Operating System	3	0	0	3

Prerequisites for the course	
1.	Basics of processes, memory and the file system.
2.	Introduction to structure and organization of the file system

Prior Reading Material/useful links	
1.	https://www.tutorialspoint.com/operating_system/os_overview.htm
2.	https://www.tutorialspoint.com/computer_fundamentals/computer_operating_system.htm
3.	https://www.mygreatlearning.com/blog/what-is-operating-system/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to Identify the significance of operating system in computing devices.
2	CO2	Students will be able to Exemplify the communication between application programs and hardware devices through system calls
3	CO3	Students will be able to Compare and illustrate various process scheduling algorithms

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4	CO4	Students will be able to Apply appropriate memory and file management schemes and Illustrate various disk scheduling algorithms.
5	CO5	Students will be able to Understand the need of access control and protection in an operating system

Syllabus:

Course Contents		Hours
Unit I	**Introduction:** Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation, UNIX system introduction and commands.	8
Unit II	**Processes and Threads:** Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Communication in Client – Server Systems, Multithreading Models, Threading Issues. **CPU Scheduling:** Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation, Process Scheduling Models.	9
Unit III	**Process Synchronization and Deadlocks:** Synchronization Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Critical Regions, Monitors, OS Synchronization, Deadlock definition, Prevention, Avoidance, Detection and recovery.	7
Unit IV	**Memory Management: Memory** Management Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Basics of Virtual Memory – Hardware and control structures – Locality of reference, Paging: Principle of operation, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing.	9
Unit V	**File systems and Disk Management:** File concept, Access methods, Disk space management and Allocation methods strategies, Directory structures, Recovery, Log-structured File System, Disk arm scheduling strategies**.**	7

Text Books	
1.	Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
2.	Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4thEdition, 2015
3.	Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, Pearson Education,
4.	D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2ndEdition, 1996.

Reference Books	
1.	Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.

2.	Harvey M. Deitel, An Introduction to Operating Systems, Addison-Wesley Publication, 2nd Edition, 1990.
3.	Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley
4.	M. J. Bach. Design of the Unix Operating System, Prentice Hall of India, 1986.Publication, 2011.

Useful Links	
1.	https://www.google.co.in/books/edition/Introduction_to_Operating_System_Design/KisFwig6YnAC?hl=en&gbpv=1&dq=Operating+System&printsec=frontcover
2.	https://www.google.co.in/books/edition/Operating_System_Concepts/hIdQAAAAMAAJ?hl=en&gbpv=1&bsq=Operating+System&dq=Operating+System&printsec=frontcover
3.	https://www.google.co.in/books/edition/Operating_System/Ad9qKEaVzQIC?hl=en&gbpv=1&dq=Operating+System&printsec=frontcover
4.	https://www.google.co.in/books/edition/Operating_Systems/gSy8qdmf3qEC?hl=en&gbpv=1&dq=Operating+System&printsec=frontcover

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3L008	Digital Electronics and Microprocessor (Lab)	0	0	2	1

Prerequisites for the course	
1.	Introduction to operation of fundamental digital gates.
2.	Basics of 8085, 8086 & 80386 Microprocessors architectures.

Prior Reading Material/useful links	
1.	https://www.rgmcet.edu.in/assets/img/departments/CSE/materials/R19/2-1/Python%20Lab.pdf
2.	https://mrcet.com/pdf/Lab%20Manuals/CSE/(R18A0588)%20Python%20Programming%20%20Lab%20Manual.pdf
3.	https://python-iitk.vlabs.ac.in/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to Describe and explain the operation of fundamental digital gates.
2	CO2	Students will be able to Analyse the operation of medium complexity standard combinational circuits like the encoder, decoder, multiplexer, de-multiplexer, and adder.
3	CO3	Students will be able to Develop Microprocessors in designing

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		real time applications
4	CO4	Students will be able to Use 8085, 8086 & 80386 Microprocessors architectures and its feature
5	CO5	Students will be able to Develop interfacing to real world devices.

List of Practical's

Course Contents		Hours
1	Simplification, realization of Boolean expressions using logic gates/universal gates.	2
2	Realization of half/full adder & half/full subtractors using logic gates.	2
3	Realization of parallel adder/subtractors using 7483 chip, BCD to Excess-3codeconversion & vice versa.	2
4	Realization of binary to gray code conversion & vice versa.	2
5	MUX/DEMUX – use of 74153, 74139 for arithmetic circuits & code converter.	2
6	Realization of one/two bit comparator and study of 7485 magnitude comparator.	2
7	Use of a) Decoder chip to drive LED display & b) Priority encoder.	2
8	Truth table verification of flip-flops: i) JK Master Slave ii) T type iii) D type.	2
9	Realization of 3-bit counters as a sequential circuit & MOD-N counter design(7476, 7490, 74192, 74193).	2
10	Writing& testing of sequence generator.	2
11	Design of FSM: Moore machine, Mealy machine	2

Text Books	
1.	Python for the Lab By Aquiles Carattino · 2020 Lulu.com
2.	Explorations in Computing An Introduction to Computer Science By John S. Conery · 2011 Taylor & Francis
3.	Introduction to Computer Science Using Python A Computational Problem-Solving Focus By Charles Dierbach · 2013 Wiley

Reference Books	
1.	The Absolute Beginner's Guide to Python Programming A Step-by-Step Guide with Examples and Lab Exercises By Kevin Wilson · 2022Apress
2.	Absolute Beginner's Python Programming Full Color Guide with Lab Exercises The Illustrated Guide to Learning Computer Programming By Kevin Wilson · 2022 Elluminet Press

Useful Links	
1.	https://www.google.co.in/books/edition/Python_for_the_Life_Sciences/y5CyDwAAQBAJ?hl=en&gbpv=1&dq=Python+Programming+(Lab)&printsec=frontcover
2.	https://www.mrecacademics.com/DepartmentStudyMaterials/20201223-python%20programming%20lab%20manual.pdf

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3.	https://cdlsiet.ac.in/wp-content/uploads/2022/03/PYTHON-Lab-Manual.pdf
4.	https://www.jnit.org/wp-content/uploads/2020/04/Python-Lab-Manual-converted.pdf

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3L009	Data structure & Algorithms (Lab)	0	0	2	1

Prerequisites for the course	
1.	Basics of Data structure & Algorithms.
2.	Introductory concepts about searching and sorting techniques
3.	Understanding about writing algorithms and step by step approach

Prior Reading Material/useful links	
1.	https://mrcet.com/pdf/Lab%20Manuals/CSE/(R18A0584)%20Data%20Structures%20Lab%20Manual.pdf
2.	https://www.iare.ac.in/sites/default/files/lab1/IARE_DS_Lab_Manual.pdf
3.	https://www.youtube.com/watch?v=_hlEAoR5gzg

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to analyse algorithms and algorithm correctness.
2	CO2	Students will be able to summarize searching and sorting techniques.
3	CO3	Students will be able to describe stack, queue and linked list operation.
4	CO4	Students will be able to have knowledge of tree and graphs concepts.
5	CO5	Students will be able to Develop simple applications using various data structures

List of Practical's:

Course Contents		Hours
1	Write a program to implement stack using arrays.	2
2	Write a program to evaluate a given postfix expression using stacks.	2
3	Write a program to convert a given infix expression to postfix form using stacks.	2
4	Write a program to implement circular queue using arrays.	2
5	Write a program to implement double ended queue (de queue) using arrays.	2
6	Write a program to implement a stack using two queues such that the push operation runs in constant time and the pop operation runs in linear time.	2

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7	Write a program to implement a stack using two queues such that the push operation runs in linear time and the pop operation runs in constant time.	2
8	Write a program to implement a queue using two stacks such that the enqueue operation runs in constant time and dequeue operation runs in linear time.	2
9	Write a program to implement a queue using two stacks such that the enqueue operation runs in linear time and dequeue operation runs in constant time.	2
10	Write programs to implement the following data structures: a. Single linked list b. Double linked list	2
	Implement the following sorting algorithms: a. Insertion sort b. Merge sort c. Quick sort d. Heap sort	

Text Books	
1.	R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2.	M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3.	A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4.	Douglas Hall, Microprocessors and Interfacing, McGraw-Hill Publications

Reference Books	
1.	An approach to digital Design: Morris Mano, Pearson Publications.
2.	Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

Useful Links	
1.	https://www.google.co.in/books/edition/DIGITAL_LOGIC_AND_COMPUTER_ORGANIZATION/Xo69qEkv9t4C?hl=en&gbpv=1&dq=Digital+Electronics+%26+Computer+Organization&printsec=frontcover
2.	https://www.google.co.in/books/edition/Digital_Design_and_Computer_Organization/O_L2zgEACAAJ?hl=en

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	CS3L010	Web Designing (Lab)	0	0	2	2

Prerequisites for the course	
1.	Basics of HTML, CSS, and XML tags
2.	Introduction to Database such as MySQL using Java Servlets, JSP, and PHP

Prior Reading Material/useful links

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1.	https://www.rgmcet.edu.in/assets/img/departments/CSE/materials/R15/3-2/WT%20LAB.pdf
2.	https://www.studocu.com/row/document/comsats-university-islamabad/ict-lab-manual/web-designing-lab-manual-part-a-by-usinghtml/22845316
3.	https://aits-tpt.edu.in/wp-content/uploads/2022/06/Web_Design_MANUAL-min.pdf

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will be able to Develop web pages using HTML, CSS, and XML.
2	CO2	Students will be able to Deploy real world applications using client side and server-side scripting languages.
3	CO3	Students will be able to Design web applications in Net Beans Environment.
4	CO4	Students will be able to Perform the Database Connectivity with MySQL using Java Servlets, JSP, and PHP.
5	CO5	Students will be able to develop a business application.

List of Practical's:

	Course Contents	Hours
1	Designing static web pages using basics and important tags in HTML.	2
2	Designing dynamic web pages using different cascading style sheets.	2
3	Design an XML document to store information about a patient in a hospital. Information contains first name, middle name, last name, aadhar no., age, address etc. Create CSS for the above XML document.	2
4	Write a JavaScript to design a simple calculator to perform various arithmetic operations.	2
5	Programs using Java servlets and JSP.	2
6	Designing web applications using PHP.	2
7	File handling using PHP: Design a page to save the user input details to a text file and display its contents.	2
8	Write a PHP code to display the number of visitors visiting the web page.	2
9	Designing web applications in Net Beans Environment.	2
10	Database Connectivity with MySQL using Java Servlets, JSP, and PHP.	2

Text Books	
1.	The Principles of Beautiful Web Design By Jason Beaird · 2010
2.	Lab Manual for Murach's Html5 and Css3, By Zak Ruvalcaba, Anne Boehm · 2019
3.	Learning XML, By Erik T. Ray · 2009
4.	Learning Web Design A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, By Jennifer Robbins · 2018

Reference Books

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1.	Designing and Implementing a Server Infrastructure Lab Manual By Microsoft Official Academic Course · 2015
2.	Murach's HTML5 and CSS3, By Anne Boehm, Zak Ruvalcaba · 2015
3.	Designing and Developing Web Applications by Using the Microsoft . Net Framework, By MOAC · 2008
4.	Murach's HTML and CSS, By Anne Boehm, Zak Ruvalcaba · 2021

Useful Links	
1.	https://www.iare.ac.in/sites/default/files/lab1/IARE_WT_LAB_MANUAL.pdf
2.	https://www.atri.edu.in/images/pdf/departments/Web%20Technologies%20Lab%20Manual.pdf
3.	https://www.google.co.in/books/edition/Web_Technologies/HIJCYgEACAAJ?hl=en
4.	https://www.youtube.com/watch?v=B-ytMSuwbf8

Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS3T001	Organizational Behaviour	Prof. Mittal Patne
2	CS3T002	Linear Algebra & Transform	Prof. Sana Anjum
3	CS3T003	Programming for Problem Solving	Prof. Achal Wani
4	CS3T004	Universal Human Values	Prof. Shamsa Yasini
5	CS3T005	Digital Electronics &Microprocessor	Prof. Shamsa Yasini
6	CS3T006	Data structure & Algorithms	Prof. Rahul Bambodkar
7	CS3T007	Operating System	Prof. Pankaj Wankhede
8	CS3L008	Digital Electronics & Microprocessor (Lab)	Prof. Shamsa Yasini
9	CS3L009	Data structure &Algorithms(Lab)	Ms. Rashmi Pathan
10	CS3L010	Web Designing (Lab)	Ms. Jagruti Thakre

Prof. Anuja Ghasad,
Secretary BOS, CSE,
JDCOEM, Nagpur

Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur

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Program: B. Tech. in Computer Science & Engineering

4th Semester Computer Science & Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	CS4T001	Formal Language Automata Theory	2	1	0	20	20	60	100	3
2	PCC	CS4T002	Computer Architecture Organization	3	0	0	20	20	60	100	3
3	PCC	CS4T003	Java Programming	3	0	0	20	20	60	100	3
4	PCC	CS4T004	Computer Network	3	0	0	20	20	60	100	3
5	PCC	CS4T005	Database Management Systems	3	0	0	20	20	60	100	3
6	PCC	CS4T006	Numerical Methods and Discrete Mathematics	3	0	0	20	20	60	100	3
7	PCC	CS4L007	JAVA Programming (Lab)	0	0	2	60	0	40	100	1
8	PCC	CS4L008	Computer Networks(Lab)	0	0	2	60	0	40	100	1
9	PCC	CS4L009	Database Management Systems (Lab)	0	0	2	60	0	40	100	1
10	MC	CS4T010	Consumer Affairs	2	0	0	15	10	25	50	Audit
11	PROJECT	CS4P011	Field Training/ Industrial Visit	0	0	0	30	0	20	50	1
12	PCC	CS4T012	NPTEL	0	0	0	25	0	25	50	2
				19	**1**	**6**	**370**	**130**	**550**	**1050**	**24**

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T001**	**FLAT (Formal Language and Automata Theory)**	2	1	0	3

Prerequisites for the course	
1.	None

Prior Reading Material/useful links	
1.	https://nptel.ac.in/courses/106104148
2.	https://onlinecourses.nptel.ac.in/noc23_cs31/preview
3.	https://archive.nptel.ac.in/courses/106/106/106106049/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Define the mathematical principles behind theoretical computer science.
2	CO2	Student will be able to Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and turing machine.
3	CO3	Student will be able to Correlate the different types of automata to real world applications.
4	CO4	Student will be able to Choose and design appropriate automata for the different requirements outlined by theoretical computer science.
5	CO5	Student will be able to Discribe the different computational problems and their associated complexity.

Syllabus:

Course Contents		Hours
Unit I	**Fundamentals:** Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers. **Finite Automata:** Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts of Automata Theory, DFA, NFA, and NFA & epsilon Machine. Conversions and Equivalence: Equivalence between NFA with and without epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output-	**08**

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MISSION

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	Moore and Melay machines	
Unit II	**Regular Languages:** Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regularexpressions, Pumping Lemma for Regular Languages, Applications of the Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages. **Grammar Formalism:** Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms, Right most and leftmost derivation of strings.	**08**
Unit III	**Context Free Grammars:** Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. **Push-Down Automata:** Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of CFL and PDA, inter conversion, Introduction to DCFL and DPDA.	**08**
Unit IV	**Turing Machine:** Definition of Recursive and Recursively Enumerable, Church's Hypothesis , Computable Functions , Methods for Turing Machine Construction, Modifications of the Basic Turing Machine Model, Multiple Tape , Multiple Tracks, Non-determinism, etc. Equivalence of the different TM Models and the Basic TM Model.	**06**
Unit V	**Computability Theory :** Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability, Posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.	**06**

Text Books	
1.	Introduction to Automata Theory Languages and Computation". Hopcroft H. E. and Ullman J. D. Pearson Education.
2.	Introduction to Theory of Computation – Sipser 2nd edition Thomson .
3.	Theoretical Foundations of Computer Science", Shrikant Satarkar, Sachin Agrawal

Reference Books	
1.	Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R.
2.	Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3.	Theory of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley

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	India Pvt. Ltd.

Useful Links	
1.	https://www.digimat.in/nptel/courses/video/106104148/L01.html
2.	https://onlinecourses.nptel.ac.in/noc21_cs83/preview

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T002**	**Computer Architecture Organization**	3		0	**3**

Prerequisites for the course	
1.	Digital Electronics and Microprocessor
2.	Number Systems

Prior Reading Material/useful links	
1.	https://www.youtube.com/watch?v=Ol8D69VKX2k
2.	https://www.youtube.com/watch?v=4TzMyXmzL8M
3.	https://www.youtube.com/watch?v=leWKvuZVUE8

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to define the fundamental organization of a computer system.
2	CO2	Student will be able to Interpret the functional architecture of computing systems.
3	CO3	Student will be able to Explain addressing modes, instruction formats and program control statements.
4	CO4	Student will be able to Distinguish the organization of various parts of a system memory hierarchy.
5	CO5	Student will be able to Describe basic concept of parallel computing and Describe fundamentals concepts of pipeline and vector processing

Syllabus:

Course Contents		Hours
Unit I	**Basic Structure of Computer:** Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Floating-	08

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	Point Numbers and related operations Basic I/O Operations, Stacks, Queues & Subroutines.	
Unit II	**Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Micro-programmed Control, Microinstructions, Micro-program Sequencing, Microinstruction Pre-fetching, Emulation., Booth's Algorithm, Integer Division.	08
Unit III	**I/O Organization:** Accessing I/O Devices, Interrupts, Addressing Modes, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.	08
Unit IV	**Memory Unit:** Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size& Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.	06
Unit V	**Arithmetic:** RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution units, performance considerations.	06

Text Books	
1.	V. Carl Hamacher& S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

Reference Books	
1.	Stallings. W: Computer Organization &Arcitecture, Fifth Edition, Pearson Education.
2.	Tananbaum A. S: Structured Computer Organization, Fifth Edition, Pearson Education

Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc22_cs88/preview
2.	https://nptel.ac.in/courses/106106166

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T003**	**Java Programming**	3	0	0	3

Prerequisites for the course	
1.	Object Oriented Programming
2.	Programming for problem solving

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Prior Reading Material/useful links	
1.	https://www.techtarget.com/searchapparchitecture/definition/object-oriented-programming-OOP
2.	https://www.programiz.com/python-programming/object-oriented-programming
3.	https://www.youtube.com/watch?v=-DP1i2ZU9gk

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Define the fundamental of OOP and Java Programming.
2	CO2	Student will be able to Explain the various Data Types & Syntax.
3	CO3	Student will be able to Understand and implement advanced Java concepts.
4	CO4	Student will be able to Develop Java based Web applications using Servlets and JSP.
5	CO5	Student will be able to Incorporate cutting-edge frameworks in web application development.

Syllabus:

Course Contents		Hours
Unit I	**Basics of OOP:** Abstraction, Inheritance, Encapsulation, Classes, subclasses and super classes, Polymorphism and Overloading, message communication Procedure-Oriented vs. Object-Oriented Programming concept **Introduction to Java Programming :** Basics of Java, Background/History of Java, Java and the Internet, Advantages of Java , Java Virtual Machine & Byte Code , Java Environment Setup, Java Program Structure	**08**
Unit II	**Primitive Data Types :** Integers, Floating Point type, Characters, Booleans , User Defined Data Type , Identifiers & Literals , Declarations of constants & variables , Type Conversion and Casting , Scope of variables & default values of variables declared , Wrapper classes , Comment Syntax , Garbage Collection **Arrays of Primitive Data Types:** Types of Arrays, Creation, concatenation and conversion of a string, Decision & Control Statements, Different Operators	**07**
Unit III	**Class:** Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword Constructor: Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading	**07**
Unit IV	**Basics of Inheritance:** Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, Abstract Class,	**07**

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	Package: Creating package, importing package, access rules for packages, class hiding rules in a package, Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface	
Unit V	**Exception Handling:** Introduction, Built in classes for Exception Handling, Mechanism of Exception Handling in Java, Error Handling Exception Classes. Multithreading : Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in threads	**07**

Text Books	
1.	Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2.	Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3.	Complete Reference J2EE by James Keogh mcgraw publication.

Reference Books	
1.	Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath .
2.	Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.
3.	Spring in Action 3rd edition , Craig walls, Manning Publication.
4.	Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication

Useful Links	
1.	https://www.youtube.com/watch?v=m3jW02Kp6vg
2.	https://www.youtube.com/watch?v=Hkas0ILReoA
3.	https://www.youtube.com/watch?v=2KRp6YJdUkM
4.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T004**	**Computer Network**	3	0	0	3

Prerequisites for the course	
1.	Computer Architecture

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs35/preview
2.	https://www.capectc.org/o/ctc/page/computer-networking-security

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Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Defining, using and implementing Computer Networks and the basic components of a Network system.
2	CO2	Student will be able to Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
3	CO3	Student will be able to Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols.
4	CO4	Student will be able to Estimate the congestion control mechanism to improve quality of service of networking application.
5	CO5	Student will be able to Analyze the features and operations of various application layer protocols such as Http, DNS, Telnet, FTP and SMTP.

Syllabus:

Course Contents		Hours
Unit I	**Data and Signal:** Define data, signal. Time domain and frequency domain representation of signal, bandwidth of a signal and medium, Sources of impairment, Attenuation, distortion, noise, data rate Limits and Nyquist bit rate, FDM and TDM, synchronous and asynchronous TDM.	08
Unit II	**Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, Network Architectures:** Client-Server; Peer to Peer; OSI Model, TCP/IP Model, Topologies, Data Link Layer: Data Link Layer Design Issues: Service provided to network layer Framing, Error Control, Flow Control, Error Detection and Correction, Data Link Control, Multiple Access.	09
Unit III	**Network Layer:** Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms.	07
Unit IV	**Transport Layer:** UDP, TCP, Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.	06
Unit V	**Application Layer:** Application protocols for email, FTP, WEB, DNS. **Advanced Networking:** overview to network management systems; security threats and solutions – Firewalls, Access Control Lists, IPSec, IDS.	06

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Text Books	
1.	Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2.	Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3.	Kurose and Ross, "Computer Networking - A top-down approach", Seventh Edition, Pearson, 2017.
4.	Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011.

Reference Books	
1.	An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2.	Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc21_cs18/preview
2.	https://onlinecourses.nptel.ac.in/noc19_cs75/preview
3.	https://www.bu.edu/online/programs/graduate-programs/computer-information-systems-masters-degree/computer-networks/
4.	https://www.youtube.com/watch?v=DpXwF2VzSJI

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T005**	**Numerical Methods and Discrete Mathematics**	3		0	**3**

Prerequisites for the course	
1.	None

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2.	https://www.digimat.in/nptel/courses/video/106106094/L01.html
3.	https://archive.nptel.ac.in/courses/111/107/111107058/

Course Outcomes:

Sr. No.	Course Outcome number	CO statement
1	CO1	Student will be able to Describe the concept of Numerical & Bisection method
2	CO2	Student will be able to Illustrate the concept of mathematical Expectation by using examples.

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3	CO3	Student will be able to Apply the concept of probability, statistics, logic and concept of set, group theory, graph theory, combinatorics to solve the problem.
4	CO4	Student will be able to Analyze the problem by using the concept of Joint Probability and Random Variable.
5	CO5	Student will be able to Evaluate the problem base on the concept of Group Theory

Syllabus:

Course Contents		Hours
Unit I	**Numerical Methods** Error analysis, Solutions of algebraic and transcendental equations. Bisection method, Newton-Raphson method and their convergences. Solution of system of linear equations by Gauss Seidel method,Gauss elimination method ,Crout's method.	**08**
Unit II	**Mathematical Expectation:** Mathematical Expectation, Variance and standard deviation ,Moments and moment generating function , Characheteristic function, Expectation and Varaince for joint distribuation and covariance, Conditional Expectation , Variance and moments.	**08**
Unit III	**Joint Probability and Random Variable** Joint Distribution of Discerete Random Variable: Joint Probability Function of DRV,Join Distribution Function of DRV ,Marginal Probability Function of DRV, Joint Distribution of Continuous Random Variable: Joint Probability Function of CRV,Join Distribution Function of CRV ,Marginal Probability Function of CRV.	**06**
Unit IV	**Mathematical Logic and set theory** Propositions and Logical Operation, Quantifiers , Conditional Statements and Tautologies, Method of Proof,Principle of Mathematical Induction. Basic concept of set theory, Operations on sets, The power set.	**06**
Unit V	**Introduction to counting: Group Theory** Binary Operations , Properties , Semigroups ,Monoids, subsemigroup, Submonoid, Isomorphism and Homomorphism, Group (only definition and xamples) Subgroups and Homomorphism Cosets and Lagrange's theorem, Normal subgroups.	**08**

Text Books	
1.	Discrete and Combinatorial Mathematics, Ralph P. Grimaldi& B. V. Ramana, 5th Edition, PHI/Pearson education.
2.	"Discrete Mathematical structures", Dr D. S. Chandrashekariah, Prism 2005.
3.	S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7thRevied and Enlarged Edition, 2016.

Reference Books	
1.	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications,

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	NewDelhi.
2.	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd.,Singapore.
3.	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

Useful Links	
1.	https://byjus.com/jee/matrices/
2.	https://betterexplained.com/articles/an-interactive-guide-to-the-fourier-transform/

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T006**	**Database Management Systems**	3	0	0	**3**

Prerequisites for the course	
1.	Discrete Mathematics
2.	Data Structures

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs29/preview
2.	https://www.techtarget.com/searchdatamanagement/definition/database-management-system
3.	https://www.youtube.com/watch?v=c5HAwKX-suM

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to learn and understand fundamentals of database management system.
2	CO2	Student will be able to exhibit the query development knowledge.
3	CO3	Student will be able to learn modeling and normalization of databases.
4	CO4	Student will be able to learn query processing and optimization techniques.
5	CO5	Student will be able to Analyze the File Organization, Indexing and Hashing and exhibit the knowledge of transaction and concurrency control.

Syllabus:

Course Contents	Hours

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Unit I	**Introduction to Database Systems:** Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Evolution of Data Models, Entity-relationship model, Relational integrity constraints, data manipulation operations.	**09**
Unit II	**Relational query languages:** Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Open source and Commercial DBMS – MYSQL,ORACLE, DB2, SQL server.	**07**
Unit III	**Relational database design:** Normalization of Database Tables: Need and Significance, Domain and data dependency, Armstrong's axioms, Normalf orms, Dependency preservation, Lossless design.	**06**
Unit IV	**Query processing:** Evaluation of relational algebra expressions, Query equivalence, Joinstrategies.	**06**
Unit V	**File Organization and Indexing:** Indices, B-trees, hashing. **Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.	**08**

Text Books	
1.	Henry Korth, Abraham Silberschatz& S. Sudarshan, *Database System Concepts*, McGraw-Hill Publication, 6th Edition, 2011.
2.	Bipin Desai, An Introduction to Database System, West Publishing Company, College & School Division, 1990.
3.	RaghuRamakrishnan, Johannes Gehrke, *Database Management Systems*, McGraw-Hill Publication, 3rd Edition, 2003.

Reference Books	
1.	Joel Murach, *Murach's Oracle SQL and PL/SQL for Developers*, Mike Murach& Associates, 2nd Edition, 2014.
2.	Wiederhold, *Database Design*, McGraw-Hill Publication, 2nd Edition, 1983.
3.	Navathe, Fundamentals of Database System, Addison-Wesley Publication, 6 th Edition, 2012.

Useful Links	
1.	https://www.youtube.com/watch?v=T7AxM7Vqvaw
2.	https://www.guru99.com/what-is-dbms.html
3.	https://nptel.ac.in/courses/106105175

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4L007**	**JAVA (Lab)**			2	**1**

VISION	MISSION
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Prerequisites for the course	
1.	Object Oriented Programming
2.	Programming for problem solving

Prior Reading Material/useful links	
1.	https://www.techtarget.com/searchapparchitecture/definition/object-oriented-programming-OOP
2.	https://www.programiz.com/python-programming/object-oriented-programming
3.	https://www.youtube.com/watch?v=-DP1i2ZU9gk

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Identify classes, objects, members of a class and relationships among them needed for a specific problem
2	CO2	Student will be able to Write Java application programs using OOP principles and proper program structuring
3	CO3	Student will be able to Demonstrate the concepts of polymorphism and inheritance.
4	CO4	Student will be able to Write Java programs to implement error handling techniques using exception handling
5	CO5	Student will be able to Incorporate cutting-edge frameworks in web application development.

Course Contents List of Practical's		Hours
0	Introduction to Java Lab.	02
1	Install JDK, write a simple "Hello World" or similar java program, compilation, debugging, executing using java compiler and interpreter	02
2	Write a Java program that takes a number as input and prints its multiplication table upto 10.	02
3	Write a program in Java to find second maximum of n numbers without using arrays.	02
4	Designed a class that demonstrates the use of constructor and destructor.	02
5	Write a java program to demonstrate the implementation of abstract class	02
6	Write a java program to implement single level inheritance	02
7	Write a java program to implement method overriding	02
8	Create a package, Add the necessary classes and import the package in	02

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	java class	
9	Write a java program to implement thread life cycle.	02
10	Develop minimum two basic Applets. Display Output with Applet Viewer and Browser	02

Text Books	
1.	Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2.	Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3.	Complete Reference J2EE by James Keogh mcgraw publication.

Reference Books	
1.	Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath .
2.	Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.
3.	Spring in Action 3rd edition , Craig walls, Manning Publication.
4.	Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication

Useful Links	
1.	https://www.youtube.com/watch?v=m3jW02Kp6vg
2.	https://www.youtube.com/watch?v=Hkas0ILReoA
3.	https://www.youtube.com/watch?v=2KRp6YJdUkM
4.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4L008**	**Computer Networks (Lab)**			2	**1**

Prerequisites for the course	
1.	Computer Architecture

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs35/preview
2.	https://www.capectc.org/o/ctc/page/computer-networking-security

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Understand fundamental underlying principles of computer networking.

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2	CO2	Student will be able to Understand details and functionality of layered network architecture.
3	CO3	Student will be able to Apply mathematical foundations to solve computational problems in computer networking.
4	CO4	Student will be able to Analyze performance of various communication protocols.
5	CO5	Student will be able to Compare routing algorithms. Practice packet /file transmission between nodes.

Course Contents / List of Practical's		Hours
0	Introduction to Computer Network Lab.	02
1	Implement 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 using NS.	02
2	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS.	02
3	Connect Computer in LAN using topology. .	02
4	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination using NS.	02
	Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment using NS.	02
5	Write a Program for ERROR detecting code using CRC-CCITT (16bit).	02
6	Write a program to find the shortest path between vertices using bellman-ford algorithm.	02
7	Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS.	02
8	Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).	02
9	Implementation of auto configuration of IP address.	02

Text Books	
1.	Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2.	Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3.	Kurose and Ross, "Computer Networking - A top-down approach", Seventh

	Edition, Pearson, 2017.
4.	Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011.

Reference Books	
1.	An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2.	Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.

Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc21_cs18/preview
2.	https://onlinecourses.nptel.ac.in/noc19_cs75/preview
3.	https://www.bu.edu/online/programs/graduate-programs/computer-information-systems-masters-degree/computer-networks/
4.	https://www.youtube.com/watch?v=DpXwF2VzSJI

Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4L009**	**Database Management Systems (Lab)**			2	**1**

Prerequisites for the course	
1.	Discrete Mathematics
2.	Data Structures

Prior Reading Material/useful links	
1.	https://onlinecourses.nptel.ac.in/noc23_cs29/preview
2.	https://www.techtarget.com/searchdatamanagement/definition/database-management-system
3.	https://www.youtube.com/watch?v=c5HAwKX-suM

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Apply the basic concepts of Database Systems and Applications.
2	CO2	Student will be able to Use the basics of SQL and construct queries using SQL in database creation and interaction.
3	CO3	Student will be able to Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
4	CO4	Student will be able to Analyze and Select storage and recovery techniques of database system.

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5	CO5	Student will be able to Design the File Organization, Indexing and Hashing and exhibit the knowledge of transaction and concurrency control.

Course Contents List of Practical's		Hours
1	Creating tables, Renaming tables, Data constraints (Primary key, Foreign key, Not Null), Data insertion into a table.	02
2	Grouping data, aggregate functions, Oracle functions (mathematical, character functions).	02
3	Sub-queries, Set operations, Joins.	02
4	Creation of databases, writing SQL and PL/SQL queries to retrieve information from the databases.	02
5	Assignment on Triggers & Cursors.	02
6	Normal Forms: First, Second, Third and Boyce Codd Normal Forms.	02
7	Assignment in Design and Implementation of Database systems or packages for applications such as office automation, hotel management, hospital management.	02
8	Deployment of Forms, Reports Normalization, Query Processing Algorithms in the above application project.	02
9	Large objects – CLOB, NCLOB, BLOB and BFILE.	02
10	Distributed data base Management, creating web-page interfaces for database applications using servlet.	02

Text Books	
1.	Henry Korth, Abraham Silberschatz& S. Sudarshan, *Database System Concepts*, McGraw-Hill Publication, 6th Edition, 2011.
2.	Bipin Desai, An Introduction to Database System, West Publishing Company, College & School Division, 1990.
3.	RaghuRamakrishnan, Johannes Gehrke, *Database Management Systems*, McGraw-Hill Publication, 3rd Edition, 2003.

Reference Books	
1.	Joel Murach, *Murach's Oracle SQL and PL/SQL for Developers*, Mike Murach& Associates, 2nd Edition, 2014.
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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	**CS4T010**	**Consumer Affairs**	2		0	**Audit**

Prerequisites for the course	
1.	None

Prior Reading Material/useful links	
1.	https://www.youtube.com/channel/UCTyQpXH6_4xVR1CUyuPkm0Q
2.	https://consumeraffairs.nic.in/
3.	https://consumeraffairs.nic.in/consumeraffairsonyoutube/short-film-consumer-protection

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Student will be able to Remember the basic terminology related to Consumer Affairs
2	CO2	Student will be able to Understand the different approaches applied in different aspects of consumption, customer protection and consumer awareness and their evolution.
3	CO3	Student will be able to Apply the knowledge in different aspects of consumption, customer protection and consumer awareness.
4	CO4	Student will be able to Comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.
5	CO5	Student will be able to Analyse the norms applicable to different consumption patterns

Syllabus:

Course Contents		Hours
Unit I	**An Introduction to Consumer Affairs:** An Introduction to History and Development of Consumer Movement; An introduction to International Organizations and Agreements; Product Liabilities Including Tortious Liabilities; Role of Non Government Organizations (NGOs)and Voluntary Consumer Organizations(VCOs);Importance	**06**
Unit II	**Grievance Redress Mechanism under the Consumer Protection Act:** Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy to be provided; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Globalization and its	**06**

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	Consequences; Unfair Trade Practice;	
Unit III	**Legislation:** Features and Aim of Consumer Protection Act; Consumer Protection Act; Comparison between Pre and Post Legislation Period; Land Mark Judgement	**06**
Unit IV	**Understanding Consumption and Consumer Values:** Customer Awareness Importance, Companies' Behaviour and Customer Awareness Relevance, Understanding the Market and Companies' Behaviour, Companies' Practices RequiringConsumers' Protection, Customer Awareness Relevance and Strategies	**06**
Unit V	**Project Work:** Leading Cases decided under Consumer Protection Act: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity, Water, and Telecom Services; Education; Defective Product; Presenting a comprehensive solution to a selected case study.	**04**

Text Books	
1.	Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. "Consumer Affairs" (2007) Delhi University Publication
2.	Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th Ed. Bharat Law House, Delhi
3.	Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
4.	Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace Jovanovich, Inc.
5	Sharma, Deepa (2011).Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry(LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany

Reference Books	
1.	Empowering Consumers e-book, www.consumeraffairs.nic.in
2.	EBook www.bis.org8. The Consumer Protection Act, 1986 Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)
3.	Recent issues of magazines: Insight, published by CERC, Ahmedabad 'Consumer Voice', Published by VOICE Society, New Delhi.
4.	Upbhokta Jagran, Ministry of Consumer Affairs, Govt, of India, New Delhi

Useful Links	
1.	https://consumeraffairs.nic.in/consumeraffairsonyoutube/short-film-consumer-protection
2.	https://consumeraffairs.nic.in/consumeraffairsonyoutube/testimonial
3.	https://ncdrc.nic.in/
4.	https://state.bihar.gov.in/fcp/

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	CS4T011	Field Training/ Industrial Visit	0	0	2	1

Prerequisites for the course	
1.	Understand the visiting companies shall be relevant and suitable ones to the specialization and academic requirements.
2	Learning Iimportant tool for attracting investment and technology.

Prior Reading Material/useful links	
1.	https://www.quora.com/What-are-some-good-places-for-an-industrial-trip-of-CSE-students
2.	https://www.suas.ac.in/industrial-visit-for-computer-science-and-information-technology-5th-sem-students/

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	Students will able to functional opportunity in different sectors.
2	CO2	Students will able to helps to combine theoretical knowledge with industrial knowledge.
3	CO3	Students will able to provide an insight into the real working environment,
4	CO4	Students will able to get to learn a lot of things that will help in their development and also for the future.
5	CO5	Students will able to acquire and apply fundamental principles of science and engineering.

Industrial visits are an integral part of Engineering and acknowledgement of technology upgrades. The purpose of industrial visits for students is to provide technical knowledge with the technological development in the industry and to understand the gap between theoretical and practical knowledge that could be passed in future.

This experience can help students to provide information regarding the functioning of various industries and associated problems and limitations.

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Program: B. Tech. in Computer Science & Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	CS4T012	NPTEL			0	2

Course Outcomes:

Sr. No	Course Outcome number	CO statement
1	CO1	To obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme.
2	CO2	To inculcate mode of self-learning and get access to lectures of IIT/IISc distinguished Faculty.
3	CO3	To earn credits for completing the course on the platform and these credits can even be transferred to the academic record of the learner.
4	CO4	To ensure they have specific academic or professional expertise in the field.
5	CO5	To get the most from listing these certifications in your CV, ensure that they align with the job position you are currently in or aspiring to get.

Syllabus:

Course Contents	
	NPTEL web and video courses across 23 disciplines are available on our portal archive.nptel.ac.in. In 2014 process of getting certified from NPTEL courses was initiated, so that learners get a tangible end result in the form of a certificate from the IITs/IISc for their effort. Certification courses are offered twice a year (Jan-Jun, Jul-Dec). Joining a course is free. Anyone can learn from these courses anywhere anytime. No pre-requisites, no age limit, no entrance criteria to enroll. Learning can be done by watching videos and this is tested by the weekly assignments, that are to be submitted online within the prescribed deadline. Any queries/doubts you may have, you can post in the respective discussion forum, which will be answered by the faculty and his/her team. There is an optional proctored certification exam that the learner can take for a nominal fee at the end of the course to earn certificates from the IITs. The learner has to be present in person for the exam and currently exams are conducted only in India in about 130+ cities in two shifts. Learner has to appear at the designated exam centre to participate in the exam, where his/her id is verified. 25% of the final marks comes from the Assignments and 75% from the final exam. The main benefits of participating in an online course under NPTEL are:

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	Students: credit transfer and better resume Faculty: Refresher courses, AICTE recognized FDP courses. Working professionals: For upskilling and reskilling

Useful Links	
1.	https://onlinecourses.nptel.ac.in/

Sr. No.	Course Code	Course Name	Subject In charge Name
1	CS4T001	Formal Language Automata Theory	Dr. Supriya Sawwashere
2	CS4T002	Computer Architecture Organization	Prof. Kiran Bode
3	CS4T003	Java Programming	Prof. Yuvraj Suryawanshi.
4	CS4T004	Computer Network	Prof. Anuja Ghasad
5	CS4T005	Numerical Methods & Discrete Mathematics	Prof. Sana Anjum
6	CS4T006	Database Management Systems	Prof. Mittal Patne
7	CS4L007	JAVA Programming (Lab)	Ms. Gayatri Gawande
8	CS4L008	Computer Networks (Lab)	Prof. Anuja Ghasad
9	CS4L009	Database Management Systems (Lab)	Ms. Jagruti Thakre
10	CS4T010	Consumer Affairs	Prof. Mittal Patne
11	CS4P011	Field Training/ Industrial Visit	Prof. Pankaj Wankhede
12	CS4T012	NPTEL	Prof. Sujata Helonde

Prof. Anuja Ghasad,
Secretary BOS, CSE,
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Dr. Supriya Sawwashere,
Chairman BOS CSE,
JDCOEM, Nagpur