MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech. in Information Technology
Scheme of Instruction and Examination
(Choice Based Credit System)
V SEMESTER

S. No	Course Code	Course Title	Instruction Hours Per Week			Examination Max. Marks		Duration of SEE in Hours	Credits
			L	T	P/D	CIE	SEE		
1	IT501PC	Software Engineering	3	0	0	40	60	3	3
2	IT502PC	Data Communications and Computer Networks	3	0	0	40	60	3	3
3	CM502PC	Machine Learning	3	0	0	40	60	3	3
4		Professional Elective - I	3	0	0	40	60	3	3
5		Professional Elective - II	3	0	0	40	60	3	3
6	MC501ES	Cyber Security	3	0	0	40	60	3	0
7	MC501HS	Intellectual Property Rights	3	0	0	40	60	3	0
8	IT551PC	Software Engineering & Computer Networks Lab	0	0	2	40	60	3	1
9	CM551PC	Machine Learning Lab	0	0	2	40	60	3	1
10		Professional Elective – II Lab	0	0	2	40	60	3	1
11	CS553PC	UI design- Flutter	0	0	2	40	60	3	1
12	EN551HS	Advanced English Communication Skills Laboratory	0	0	2	40	60	3	1
		Total Hours / Marks / Credits	**21**	**0**	**10**	**480**	**720**	**-**	**20**

VI SEMESTER

S. No	Course Code	Course Title	Instruction Hours Per Week			Examination Max. Marks		Duration of SEE in Hours	Credits
			L	T	P/D	CIE	SEE		
1	IT601PC	Automata Theory and Compiler Design	3	0	0	40	60	3	3
2	IT602PC	Algorithm Design and Analysis	3	0	0	40	60	3	3
3	IT603PC	Embedded Systems	3	0	0	40	60	3	3
4		Professional Elective – III	3	0	0	40	60	3	3
5		Open Elective-I	3	0	0	40	60	3	3
6	MC601ES	Artificial Intelligence	3	0	0	40	60	3	0
7	IT651PC	Compiler Design Lab	0	0	2	40	60	3	1
8	IT652PC	Embedded Systems Lab	0	0	2	40	60	3	1
9		Professional Elective – III Lab	0	0	2	40	60	3	1
10	IT653PC	Industrial Oriented Mini Project	0	0	4	-	100	-	2
		Total Hours / Marks / Credits	**18**	**0**	**10**	**360**	**640**	**-**	**20**

11	MC601BS	Environmental Science (For Lateral Entry Students)	3	0	0	40	60	3	0

L: Lecture T: Tutorial D: Drawing P: Practical CIE - Continuous Internal Evaluation SEE - Semester End Examination

*Note: MC – Environmental Science – Should be Registered by Lateral Entry Students Only. MC – Satisfactory / Unsatisfactory

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
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VII SEMESTER

S. No	Course Code	Course Title	Instruction Hours Per Week			Examination Max. Marks		Duration of SEE in Hours	Credits
			L	T	P/D	CIE	SEE		
1	IT701PC	Information Security	3	0	0	40	60	3	3
2	IT702PC	Cloud Computing	3	0	0	40	60	3	3
3		Professional Elective -IV	3	0	0	40	60	3	3
4		Professional Elective -V	3	0	0	40	60	3	3
5		Open Elective-II	3	0	0	40	60	3	3
6	IT751PC	Information Security Lab	0	0	2	40	60	3	1
7	IT752PC	Cloud Computing Lab	0	0	2	40	60	3	1
8	IT753PC	Project Stage - I	0	0	6	100	-	-	3
		Total Hours / Marks / Credits	**15**	**0**	**10**	**380**	**420**	**-**	**20**

VIII SEMESTER

S. No	Course Code	Course Title	Instruction Hours Per Week			Examination Max. Marks		Duration of SEE in Hours	Credits
			L	T	P/D	CIE	SEE		
1	MS801HS	Organizational Behavior	3	0	0	40	60	3	3
2		Professional Elective – VI	3	0	0	40	60	3	3
3		Open Elective – III	3	0	0	40	60	3	3
4	IT851PC	Project Stage – II including Seminar	0	0	22	40	60	-	11
		Total Hours / Marks / Credits	**9**	**0**	**22**	**160**	**240**	**-**	**20**

L: Lecture T: Tutorial D: Drawing P: Practical CIE - Continuous Internal Evaluation SEE - Semester End Examination

Semester	I	II	III	IV	V	VI	VII	VIII	**Total Credits**
Credits	20	20	20	20	20	20	20	20	**160**

B.Tech in INFORMATION TECHNOLOGY

List of Professional Electives Offered :

Professional Elective – I :

IT511PE	Biometrics
IT512PE	Quantum Computing
CS511PE	Advanced Computer Architecture
CS512PE	Principles of Programming Languages

Professional Elective – II :

IT521PE	DevOps and Its Applications
IT522PE	Software Testing Methodologies
CS521PE	Data Analytics
CS523PE	Data Science

Professional Elective – II Lab :

IT523PE	DevOps and Its Applications Lab
IT524PE	Software Testing Methodologies Lab
CS524PE	Data Analytics Lab
CS526PE	Data Science Lab

 # Courses in PE-II and PE-II Lab must be in 1-1 Correspondence.

Professional Elective – III :

IT631PE	Data Mining
IT632PE	Natural Language Processing
CS631PE	Full Stack Development
CS633PE	Mobile Application Development

Professional Elective – III Lab :

IT611PE	Data Mining Lab
IT612PE	Natural Language Processing Lab
CS611PE	Full Stack Development Lab
CS613PE	Mobile Application Development Lab

 # Courses in PE - Ill and PE - Ill Lab must be in 1-1 correspondence.

Professional Elective – IV :

IT741PE	Human Computer Interaction
IT742PE	High Performance Computing
IT743PE	Information Retrieval Systems
CS745PE	Ad-hoc and Sensor Networks

Professional Elective – V :

IT751PE	Intrusion Detection Systems
IT752PE	Augmented Reality & Virtual Reality
CS754PE	Blockchain Technology
CS755PE	Software Process & Project Management

Professional Elective – VI :

IT861PE	Web & Database Security
IT862PE	Digital Forensics
CS862PE	Distributed Systems
CS863PE	Deep Learning

B.Tech in INFORMATION TECHNOLOGY

List of Open Electives Offered :

Open Elective – I :

IT611OE	Java Programming
IT612OE	Object Oriented Programming using C++

Open Elective – II :

IT721OE	Full Stack Development
IT722OE	Scripting Languages

Open Elective – III :

IT831OE	Introduction to Big Data Technologies
IT832OE	Introduction to DevOps

Mahatma Gandhi Institute of Technology (Autonomous) B.Tech. in Information Technology
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			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	IT501PC	Software Engineering	3	0	0	40	60	3	3
2	IT502PC	Data Communications and Computer Networks	3	0	0	40	60	3	3
3	CM502PC	Machine Learning	3	0	0	40	60	3	3
4		Professional Elective - I	3	0	0	40	60	3	3
5		Professional Elective - II	3	0	0	40	60	3	3
6	MC501ES	Cyber Security	3	0	0	40	60	3	0
7	MC501HS	Intellectual Property Rights	3	0	0	40	60	3	0
8	IT551PC	Software Engineering & Computer Networks Lab	0	0	2	40	60	3	1
9	CM551PC	Machine Learning Lab	0	0	2	40	60	3	1
10		Professional Elective – II Lab	0	0	2	40	60	3	1
11	CS553PC	UI design- Flutter	0	0	2	40	60	3	1
12	EN551HS	Advanced English Communication Skills Laboratory	0	0	2	40	60	3	1
Total Hours / Marks / Credits			**21**	**0**	**10**	**480**	**720**	**-**	**20**

Professional Elective – I :

IT511PE	Biometrics
IT512PE	Quantum Computing
CS511PE	Advanced Computer Architecture
CS512PE	Principles of Programming Languages

PE – II (Professional Elective – II) :

IT521PE	DevOps and Its Applications
IT522PE	Software Testing Methodologies
CS521PE	Data Analytics
CS523PE	Data Science

PE – II Lab (Professional Elective – II Lab) :

IT523PE	DevOps and Its Applications Lab
IT524PE	Software Testing Methodologies Lab
CS524PE	Data Analytics Lab
CS526PE	Data Science Lab

B.Tech V Semester

L	T	P	C
3	0	0	3

IT501PC : Software Engineering

Course Objectives:

1. To understand different Software Process Models.
2. To understand Software Requirements and SRS document.
3. To understand different Software Architectural Styles.
4. To understand different Software Testing Strategies and Methods.
5. To understand Software Quality and metrics to ensure good quality software.

Course Outcomes:

1. Ability to apply different Process Models.
2. Ability to identify minimum requirements for the development of application.
3. Ability to translate requirements to high level design models.
4. Ability to conduct appropriate testing strategies and methods.
5. Ability to measure software using metrics and conduct quality tasks.

UNIT – I :

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths.

A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI).

Process models: The waterfall model, Spiral model and Agile methodology

UNIT – II :

Software Requirements: 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.

UNIT – III :

Design Engineering: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

UNIT – IV :

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT – V :

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

Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Suggested Readings :

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill international Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

Reference Books :

1. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
3. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

B.Tech V Semester

L	T	P	C
3	0	0	3

IT502PC : Data Communications and Computer Networks

Course Objectives :

1. To introduce the fundamental various types of computer networks.
2. To demonstrate the TCP/IP and OSI models with merits and demerits.
3. To explore the various layers of OSI Model.
4. To introduce UDP and TCP Models.

Course Outcomes :

1. Students should understand and explore the basics of Computer Networks.
2. Students will be able to work on Various Protocols.
3. Students will be in a position to understand the World Wide Web concepts.
4. Students will be in a position to administrate a network and flow of information.
5. Students can understand easily the concepts of network security, Mobile and ad hoc networks.

UNIT – I : Data Communications :

Data Communications: Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN **Physical layer:** Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT – II : Data link layer:

Data link layer: Introduction, Framing and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. 111 Medium Access sub layer: ALOHA, CSMA/CD, LAN – Ethernet IEEE 802.3, IEEE 802.5 – IEEE 802.11, Random access, Controlled access, Channelization.

UNIT – III: Network layer:

Network layer: Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols.

UNIT – IV: Transport Layer:

Transport Layer: Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

UNIT –V: Application Layer:

Application Layer: Domain name space, DNS in Internet, Electronic Mail, SMTP, FTP, WWW, HTTP, SNMP.

Suggested Readings :

1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition TMH.

Reference Books:

1. Computer Networks, Andrew S Tanenbaum, 6th Edition. Pearson Education.
2. Computer Networking: A Top-Down Approach Featuring the Internet. James F. Kurose & Keith W. Ross, 3rd Edition, Pearson Education
3. Data communications and Computer Networks, P.C Gupta, PHI.
4. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.

B.Tech V Semester

L	T	P	C
3	0	0	3

CM502PC: MACHINE LEARNING
(Common to IT & CSE (AI & ML))

Pre-requisites :
- Data structures
- Knowledge on statistical methods

Course Objectives :

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes :

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT – I :
Introduction: Learning- types of machine learning, Perspectives and issues in machine learning, bias variance trades off, testing machine learning algorithms, confusion matrix, accuracy metrics, turning data into probabilities. Dimensionality reduction- Linear discriminant analysis, principal component analysis, Factor analysis, independent component analysis.

UNIT - II
Supervised Learning: Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, Information Gain, Gini Index. issues in decision tree learning, overfitting, pruning.
Instance-Based Learning- Introduction, k-nearest neighbors' algorithm, remarks on lazy and eager learning.

UNIT – III
Neural Networks: The perceptron- learning rate, bias, perceptron learning algorithm, linear separability- Exclusive-OR function, backpropagation algorithm, initialization of weights, MLP in practice, deriving back propagation, radial basis functions. An illustrative example: face recognition.

UNIT- IV
Bayesian learning – Introduction, Conditional probability, Joint probability, Bayes theorem, maximum likelihood hypotheses for predicting probabilities, Bayes optimal classifier, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks.
Support vector machines, optimal separation kernels, SVM algorithm.

UNIT - V
Unsupervised learning- Clustering, Hierarchical and partitional clustering, k means algorithm, ensemble learning-Boosting Bagging. Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning.

TEXT BOOKS:
1. Machine Learning – Tom M. Mitchell, - MGH
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, 2015

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

B.Tech V Semester

L	T	P	C
3	0	0	3

IT511PE : Biometrics
(Professional Elective – I)

Course Objectives:

1. Will learn the biometric technologies.
2. Learn the computational methods involved in the biometric systems.
3. Learn methods for evaluation of the reliability and quality of the biometric systems.

Course Outcomes:

1. Identify the various Biometric technologies.
2. Design of face recognition for the organization.
3. Develop Retina and Iris Segmentation applications.
4. Design finger print, hand geometry applications.
5. Develop simple applications for privacy.

UNIT – I :

Introduction, history, type of Biometrics, General Architecture of Biometric Systems, Basic Working of biometric Matching, Biometric System Error and performance Measures, Design of Biometric Systems, Applications of Biometrics, Benefits of Biometrics Versus Traditional Authentication Methods

UNIT – II :

Face Biometrics & Retina And Iris Biometrics Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, Face Recognition Methods, Advantages and Disadvantages, Performance of Biometrics.

UNIT– III :

Design of Retina Biometrics, Iris Segmentation Method, Determination of Iris Region, Experimental Results of Iris Localization, Applications of Iris Biometrics, Advantages and Disadvantages.

UNIT – IV :

Vein and Fingerprint Biometrics & Biometric Hand Gesture Recognition For Indian Sign Language. Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages, Basics of Hand Geometry, Sign Language, Indian Sign Language, SIFT Algorithms- Practical Approach Advantages and Disadvantages.

UNIT – V :

Privacy Enhancement Using Biometrics & Biometric Cryptography And MultimodalBiometrics: Introduction, Privacy Concerns Associated with Biometric Developments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics - Introduction to Biometric Cryptography.

Suggested Readings :

1. G r Sinha and Sandeep B. Patil, Biometrics: concepts and applications, Wiley, 2013.
2. Paul Reid, Biometrics for Network Security, Pearson Education.

Reference Books:

1. Samir Nanavathi, Micheal Thieme and Raj Nanavathi, Biometrics, Identity verification in a networked world, Wiley, dream Tech.
2. John D. Woodward and Jr. Wiley Dreamtech, Biometrics, The Ultimate Reference.

Online websites / Materials:

1. https://www.biometricsinstitute.org
2. https://www.tutorialspoint.com/biometrics/biometrics_quick_guide.htm

B.Tech V Semester

L	T	P	C
3	0	0	3

IT512PE : Quantum Computing
(Professional Elective – I)
(*Common to CSE & IT*)

Course Objectives:

1. To introduce the fundamentals of quantum computing
2. The problem-solving approach using finite dimensional mathematics

Course Outcomes:

1. Understand basics of quantum computing
2. Understand the concepts of Linear algebra, quantum mechanics
3. Understand physical implementation of Qubit
4. Understand Quantum algorithms and their implementation
5. Understand the Impact of Quantum Computing on Cryptography

UNIT – I :

History of Quantum Computing: Importance of Mathematics, Physics and Biology. Introduction to Quantum Computing: Bits Vs Qubits, Classical Vs Quantum logical operations

UNIT – II :

Background Mathematics: Basics of Linear Algebra, Hilbert space, Probabilities and measurements. Background Physics: Paul's exclusion Principle, Superposition, Entanglement and super-symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

Background Biology: Basic concepts of Genomics and Proteomics (Central Dogma)

UNIT – III :

Qubit: Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere Quantum Circuits: single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

UNIT – IV :

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

UNIT – V :

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation. Quantum Information and Cryptography: Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation

Suggested Readings :

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge

Reference Books :

1. Quantum Computing for Computer Scientists by Noson S. Yanofsky and Mirco A. Mannucci
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

B.Tech V Semester

L	T	P	C
3	0	0	3

CS511PE : ADVANCED COMPUTER ARCHITECTURE
(Professional Elective-I)
(*Common to CSE, IT)*

Prerequisites: Computer Organization

Course Objectives :

- To impart the concepts and principles of parallel and advanced computer architectures.
- To develop the design techniques of Scalable and multithreaded Architectures.
- To Apply the concepts and techniques of parallel and advanced computer architectures to design modern computer systems

Course Outcomes :

- Gain knowledge of Computational models and Computer Architectures.
- Concepts of parallel computer models.
- Scalable Architectures, Pipelining, Superscalar processors, multiprocessors

UNIT – I :
Theory of Parallelism, Parallel computer models, The State of Computing, Multiprocessors and Multi computers, Multi vector and SIMD Computers, PRAM and VLSI models, Architectural development tracks, Program and network properties, Conditions of parallelism, Program partitioning and Scheduling, Program flow Mechanisms, System interconnect Architectures.

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

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

UNIT- IV
Parallel and Scalable Architectures, Multiprocessors and Multicomputer, Multiprocessor system Interconnects, cache coherence and synchronization mechanism, Three Generations of Multi computers, Message-passing Mechanisms, Multivetor and SIMD computers, Vector Processing Principals, Multivector Multiprocessors, Compound Vector processing, SIMD computer Organizations, The connection machine CM-5.

UNIT - V
Scalable, Multithreaded and Dataflow Architectures, Latency-hiding techniques, Principals of Multithreading, Fine-Grain Multicomputers, Scalable and multithreaded Architectures, at a flow and hybrid Architectures

TEXT BOOKS:

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

REFERENCE BOOKS:

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

L	T	P	C
3	0	0	3

B.Tech V Semester

CS512PE : Principles of Programming Languages
(Professional Elective-I)
(*Common to CSE, IT)*

Course Objectives :

- Introduce important paradigms of programming languages
- To provide conceptual understanding of high-level language design and implementation
- Topics include programming paradigms; syntax and semantics; data types, expressions and statements; subprograms and blocks; abstract data types; concurrency; functional and logic programming languages and scripting languages

Course Outcomes :

- Acquire the skills for expressing syntax and semantics informal notation
- Identify and apply a suitable programming paradigm for a given computing application
- Gain knowledge of and able to compare the features of various programming languages

UNIT – I : Preliminary Concepts:
Reasons for Studying Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design Trade- Offs, Implementation Methods, Programming Environments Syntax and Semantics: General Problem of Describing Syntax and Semantics, Formal Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs.

UNIT – II : Names, Bindings, and Scopes :
Introduction, Names, Variables, Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants.
Data Types : Introduction, Primitive Data Types, Character String Types, User Defined Ordinal Types, Array, Associative Arrays, Record, Union, Tuple Types List Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence
Expressions and Statements: Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short Circuit Evaluation, Assignment Statements, Mixed-Mode Assignment
Control Structures: Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands.

UNIT – III *:* Subprograms and Blocks:
Fundamentals of Sub-Programs, Design Issues for Subprograms, Local Referencing Environments, Parameter Passing Methods, Parameters that Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms; Design Issues for Functions, User Defined Overloaded Operators, Closures, Coroutines.
Implementing Subprograms: General Semantics of Calls and Returns, Implementing Simple Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping
Abstract Data Types: The Concept of Abstraction, Introductions to Data Abstraction, Design Issues, Language Examples, Parameterized ADT, Encapsulation Constructs, Naming Encapsulations

UNIT- IV *:* Concurrency:
Introduction, Introduction to Subprogram Level Concurrency, Semaphores, Monitors, Message Passing, Java Threads, Concurrency in Function Languages, Statement Level Concurrency.
Exception Handling and Event Handling: Introduction, Exception Handling in Ada, C++, Java, Introduction to Event Handling, Event Handling with Java and C#.

UNIT – V : Functional Programming Languages:

Introduction, Mathematical Functions, Fundamentals of Functional Programming Language, LISP, Support for Functional Programming in Primarily Imperative Languages, Comparison of Functional and Imperative Languages

Logic Programming Language: Introduction, an Overview of Logic Programming, Basic Elements of Prolog, Applications of Logic Programming.

Scripting Language: Pragmatics, Key Concepts, Case Study: Python –Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library. (TextBook2)

TEXT BOOKS:

1. Robert. W. Sebesta, "Concepts of Programming Languages", 10th Edition, Pearson Education.
2. D.A.Watt, "Programming Language Design Concepts", Wiley Dreamtech, 2007.

REFERENCE BOOKS:

1. A.B.Tucker, R.E.Noonan, "Programming Languages", TMH, 2nd Edition
2. K.C.Louden, "Programming Languages", Thomson, 2003, 2nd Edition

B.Tech V Semester

L	T	P	C
3	0	0	3

IT521PE : DevOps and Its Applications
(Professional Elective – II)
(*Common to IT & CSE [Data Science]*)

Prerequisites :
1. Software Engineering
2. Software Project Management

Course Objectives:
1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

Course Outcomes:
1. Identify components of DevOps environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tool.
4. Investigate different DevOps Software development models.
5. Assess various DevOps practices.
6. Collaborate and adopt DevOps in real-time projects.

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

UNIT – II : Software development models and DevOps :
DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT – III : Introduction to project management:
The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Containers, Containerized applications using Docker, Gerrit, The pull request model, GitLab.

UNIT – IV : Integrating the system :
Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, Kubernetes, Containerized applications using Kubernetes, Orchestration on kubernetes. The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

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

Suggested Readings :

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

Reference Books:

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

B.Tech V Semester

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IT522PE : Software Testing Methodologies
(Professional Elective – II)
(*Common to CSE & IT*)

Prerequisites :
- Software Engineering

Course Objectives:

1. To provide knowledge of the concepts in software testing such as testing process, criteria, strategies, and methodologies.
2. To develop skills in software test and management using. To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
3. To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
4. To learn the domain testing, path testing and logic based testing to explore the testing process easier.

Course Outcomes :

1. Understand purpose of testing and path testing
2. Understand strategies in data flow testing and domain testing
3. Develop logic-based test strategies
4. Implement test cases using any testing automation tool
5. Understand graph matrices and its applications

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

UNIT – II : Transaction Flow Testing:
Transaction flows, transaction flow testing techniques.
Data Flow testing: Basics of data flow testing, strategies in data flow testing, application of data flow testing.
Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT – III : Paths, Path products and Regular expressions :
Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
Logic Based Testing: overview, decision tables, path expressions, kv charts, specifications.

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

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

Suggested Readings :

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

Reference Books :

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

B.Tech V Semester

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CS521PE : Data Analytics
(Professional Elective-II)
(*Common to CSE, IT*)

Course Objectives :

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models, and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes :

After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

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

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

UNIT – III *:*
Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

B.Tech V Semester

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CS523PE : Data Science
(Professional Elective-II)
(*Common to CSE, IT*)

Course Objectives :

- To learn concepts, techniques, and tools they need to deal with various facets of data science practice, including data collection and integration
- To exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
- To understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
- To identify the importance of recommendation systems and data visualization techniques

Course Outcomes :

- Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
- Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Apply basic machine learning algorithms and to identify common approaches used for Feature Generation
- Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components

UNIT – I :
Introduction to Data Science, Big Data and Data Science hype and getting past the hype Datafication, Current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model - Intro to R

UNIT – II :
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs, and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: Real Direct (online real estate firm) - Three Basic Machine Learning Algorithms, Linear Regression - k-Nearest Neighbours (k- NN) - k-means

UNIT – III *:*
One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why itworks for Filtering Spam

UNIT- IV *:*
Data Wrangling: APIs and other tools for scrapping the Web - Feature Generation and Feature Selection(Extracting Meaning from Data) - Motivating application: user (customer) retention - Feature Generation(brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT – V :

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset - Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

Suggested Readings :

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Mining of Massive Datasets v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Cambridge University Press, 2014
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2013 (ISBN 0262018020)

REFERENCE BOOKS:

1. Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, 2nd Edition, 2009 (ISBN 0387952845)
2. Foundations of Data Science, Avrim Blum, John Hopcroft and Ravindran Kannan
3. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr. Cambridge University Press, 2014
4. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, 3rd Edition, 2011 (ISBN 0123814790).

B. Tech V Semester

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MC501ES: CYBER SECURITY
(*Common to CSE, IT, CSBS*)

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: By the end of the course students shall:

- The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and how to protect them self and ultimately the entire Internet community from such attacks.

UNIT – I:
Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defence, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.
UNIT – II:
Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.
UNIT III:
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.
UNIT IV:
Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web Threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.
Cybercrime and Cyber terrorism: Introduction, intellectual property in cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.
UNIT – V:
Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.
Cybercrime: Examples and Mini-Cases Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

B. Tech V Semester

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MC501HS: Intellectual Property Rights
(***Common to EEE, CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)***)

Course Objectives: The objectives of the course are:

1. To enable the students to have an overview of Intellectual Property Rights.
2. To provide comprehensive knowledge to the students regarding Trademarks Registration process and law related to it.
3. To disseminate knowledge on Copyrights, its related rights and recent developments.
4. To make the students understand Patent Regime in India and abroad.
5. To understand the framework of Trade secrets.

Course Outcomes: By the end of the course students shall:

1. Gain knowledge on Intellectual property rights and their importance.
2. Understand Indian and International Trademark Law and procedure for registration of Trademarks.
3. Acquire knowledge on Copyright Law, and the privileges awarded to the copyright owners
4. Familiarized with the process of acquiring the patent and relevant laws.
5. Learn the importance of trade secrets for business sustainability.

UNIT – I: INTRODUCTION TO INTELLECTUAL PROPERTY

Introduction of IPR-Meaning of intellectual property, types of intellectual property-trademarks, copyrights, patents, trade secrets, importance of intellectual property rights, International organizations-WTO-WIPO-USPTO-INTA, International Conventions, agencies and treaties-Paris Convention-Berne Convention- Madrid Protocol-NAFTA-PCT-GATT-TRIPS.

UNIT – II: TRADEMARKS

Trademarks: Purpose and functions of Trademarks-Categories of marks, acquisition of trademark rights - Protectable matter - Selecting and evaluating Trademark- Trademark registration process – Trademark Infringement - Remedies for infringement of Trademarks-New developments in Trademark Law- International Trademarks Law.

UNIT III: COPYRIGHT

Copyrights-Fundamentals of Copyright Law - Requirements of Copyrightability - Originality of material, fixation of material, Authorship works, exclusions from copyright protection-Rights of Copyright Owner-Right of reproduction of copyrighted work, right to do derivative works ,right to distribute copies of the copyrighted work, right to perform the work publicly, right to display the copyrighted work, – Copyright Ownership issues – Joint Works, Works made for Hire, Specially commissioned works, Copyright Registration - Notice of Copyright – Copyright Infringement - Remedies for infringement in Copyrights- New developments in Copyright Law- International Copyright Law.

UNIT IV: PATENTS

Concept of Patent - Classification – Utility Patents – Design Patents and Plant Patents, Patent searching process-Types of Patent Applications-Patent Registration Process, Ownership, Transfer, Assignment and Licensing of Patent-Patent Infringement, Remedies for Infringement of Patents, New developments in Patent Law- International Patent Law.

UNIT – V: TRADE SECRETS & LAW OF UNFAIR COMPETITION

Trade Secrets: Trade secret law, determination of trade secret status, measures for protecting trade secret status-Liability for misappropriation of trade secrets, protection for submissions, trade secret litigation. New developments in Trade secrets Law - International Trade Secret law.

Law of Unfair Competition: Passing off, Misappropriation, Right of publicity, Dilution of trademarks, Product disparagement, False advertising, Internet Piracy.

TEXT BOOKS:

1. Deborah. E.Bouchoux, Intellectual property, Cengage learning India Pvt.Ltd., 4th edition, 2013.
2. Prabuddha Ganguli, Intellectual property right, Tata McGraw Hill Publishing Company, 8th edition, 2016.

REFERENCES

1. Richard Stim, Intellectual Property, Cengage learning India Pvt. Ltd. 3rd edition, 2017
2. Vinod.V. Sope, Managing Intellectual Property, Asoka K. Ghosh, 2nd edition, 2010.

B.Tech V Semester

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IT551PC: Software Engineering & Computer Networks Lab

Software Engineering Lab:

Course Objectives:

1. To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes:

1. Ability to translate end-user requirements into System and software requirements
2. Ability to generate a high-level design of the system from the software requirements.

List of Experiments

1. Development of problem statement.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration

Suggested Readings :

1. Software Engineering, A practitioner's Approach – Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education

Computer Networks Lab :

Course Objectives :

1. To understand the working principle of various communication protocols.
2. To understand the network simulator environment and visualize a network topology and observe its performance
3. To analyze the traffic flow and the contents of protocol frames

Course Outcomes :

1. Implement data link layer farming methods
2. Analyze error detection and error correction codes.
3. Implement and analyze routing and congestion issues in network design.

List of Experiments

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIII
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijsktra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Write a program for congestion control using Leaky bucket algorithm.

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CM551PC: MACHINE LEARNING LAB
(*Common to IT & CSE (AI & ML)*)

Course Objectives :

- The objective of this lab is to get an overview of the various machine learning techniques and can demonstrate them using python.

Course Outcomes :

- Understand modern notions in predictive data analysis
- Select data, model selection, model complexity and identify the trends
- Understand a range of machine learning algorithms along with their strengths and weaknesses
- Build predictive models from data and analyze their performance

List of Experiments

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

TEXT BOOK:

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

REFERENCE BOOK:

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

B.Tech V Semester

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IT523PE: DevOps and Its applications Lab
(Professional Elective – II Lab)

Course Objectives:

1.Describe the agile relationship between development and IT operations.
2.Understand the skill sets and high-functioning teams involved in
3.DevOps and related methods to reach a continuous delivery capability
4.Implement automated system update and DevOps lifecycle.

Course Outcomes:

1.Identify components of DevOps environment
2.Apply different source code management on Github
3.Demonstrate continuous integration and development using Jenkins.
4.Investigate different Docker and Kubernetes Software development models
5.Install and develop test cases using Selenium

List of Experiments:

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

Suggested Readings :

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

Reference Books / Learning Resources:

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

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IT524PE: Software Testing Methodologies Lab
(Professional Elective – II Lab)
(Common to CSE & IT)

Course Objectives:

1. To provide knowledge of Software Testing Methods.
2. To develop skills in software test automation and management using latest tools

Course Outcomes:

1. Design and develop the best test strategies in accordance with the development model.
2. Design and develop GUI, Bitmap and database checkpoints
3. Develop database checkpoints for different checks
4. Perform batch testing with and without parameter passing
5. Perform Data driven batch

List of Experiments

1. Recording in context sensitive mode and analog mode
2. GUI checkpoint for single property
3. GUI checkpoint for single object/window
4. GUI checkpoint for multiple objects
   a) Bitmap checkpoint for object/window
   b) Bitmap checkpoint for screen area
5. Database checkpoint for Default check
6. Database check point for custom check
7. Database checkpoint for runtime record check
8. a) Data driven test for dynamic test data submission
   b) Data driven test through flat files
   c) Data driven test through front grids
   d) Data driven test through excel test
9. a) Batch testing without parameter passing
   b) Batch testing with parameter passing
10. Data driven batch
11. Silent mode test execution without any interruption
12. Test case for calculator in windows application

Suggested Readings :

1. Software Testing techniques, Baris Beizer, 2nd Edition, Dreamtech.
2. Software Testing Tools, Dr. K.V.K.K.Prasad, Dreamtech.

Reference Books :

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

B.Tech V Semester

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CS524PE: DATA ANALYTICS LAB
(Professional Elective –II Lab)
(Common to CSE, IT)

Course Objectives :

- To learn the principles and methods of statistical analysis
- To explore the fundamental concepts of preprocessing Methods
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various visualization techniques.

Course Outcomes :

- Implement numerical and Statistical analysis on various data source
- Apply Data Preprocessing Methods on Raw Data
- Implement Regression Techniques on data for Prediction
- Implement and evaluate the performance of Supervised and Unsupervised Models
- Implementation of Data visualization techniques

List of Experiments

1. To perform data import/export (CSV, XLS, TXT) operations using Data frames in Python.
2. To perform statistical operations (Mean, Median, Mode and Standard deviation) using python
3. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUMMARY)
4. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
5. Implementation of Tree Building-Linear Regression
6. Implementation of Tree Building-Logistic Regression
7. Implementation of KN classification and plot the result
8. To Perform K-Means Clustering operations and visualize for iris Data set
9. Implementation of Tree Building –Decision Tree Algorithm
10. Implementation of Tree Multiple Decision Trees
11. Implementation of Time Series Models
12. Implementation of Data visualization techniques (Pixel-Oriented, Geometric, etc..) using python

TEXT BOOKS:

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

B.Tech V Semester

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CS526PE: DATA SCIENCE LAB
(Professional Elective –II Lab)
(*Common to CSE, IT*)

Course Objectives :

- Understand the R Programming Language.
- Exposure on Solving data science problems.
- Understand The classification and Regression Model

Course Outcomes :

- Illustrate the use of various data structures.
- Analyze and manipulate Data using Pandas
- Creating static, animated, and interactive visualizations using Matplotlib.
- Understand the implementation procedures for the machine learning algorithms.
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real-world problems.

LIST OF EXPERIMENTS:

1) R AS 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) DESCRIPTIVE STATISTICS IN R

a) Write an R script to find basic descriptive statistics using summary
b) Write an R script to find subset of dataset by using subset ()

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.
c) Reading XML dataset in R.

4) VISUALIZATIONS

a) Find the data distributions using a box and scatter plot.
b) Find the outliers using a plot.
c) Plot the histogram, bar chart and pie chart on sample data

5) CORRELATION AND COVARIANCE

a) Find the correlation matrix.
b) Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
c) Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data

6) 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).

7) MULTIPLE REGRESSION MODEL

Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

8) **REGRESSION MODEL FOR PREDICTION**
   Apply regression Model techniques to predict the data on above dataset
9) **CLASSIFICATION MODEL**
   a) Install relevant packages for classification.
   b) Choose a classifier for classification problems.
   c) Evaluate the performance of the classifier.
10) **CLUSTERING MODEL**
   a) Clustering algorithms for unsupervised classification.
   b) Plot the cluster data using R visualizations.

Suggested Readings :

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly,2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

Reference Books:

1. Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012

B.Tech V Semester

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CS553PC: UI-DESIGN-FLUTTER

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

Course Objectives :

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

Course Outcomes :

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

List of Experiments : Students need to implement the following experiments

1. a) Install Flutter and Dart SDK.
   b) Write a simple Dart program to understand the language basics.
2. a) Explore various Flutter widgets (Text, Image, Container, etc.).
   b) Implement different layout structures using Row, Column, and Stack widgets.
3. a) Design a responsive UI that adapts to different screen sizes.
   b) Implement media queries and breakpoints for responsiveness.
4. a) Set up navigation between different screens using Navigator.
   b) navigation with named routes.
5. a) Learn about statefull and stateless widgets.
   b) Implement state management using set State and Provider.
6. a) Create custom widgets for specific UI elements.
   b) Apply styling using themes and custom styles.
7. a) Design a form with various input fields.
   b) Implement form validation and error handling.
8. a) Add animations to UI elements using Flutter's animation framework.
   b) Experiment with different types of animations (fade, slide, etc.).
9. a) Fetch data from a REST API.
   b) Display the fetched data in a meaningful way in the UI.
10. a) Write unit tests for UI components.
    b) Use Flutter's debugging tools to identify and fix issues.

TEXT BOOKS:

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

B. Tech V Semester

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EN551HS: Advanced English Communication Skills Laboratory
(*Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)*)

Introduction:

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

The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

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

Course Objectives:

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

1. Improve the students' fluency in English, with a focus on vocabulary.
2. Enable them to listen to English spoken at normal conversational speed by educated English speakers.
3. Respond appropriately in different socio-cultural and professional contexts.
4. Communicate their ideas relevantly and coherently in writing.
5. Prepare the students for placements.

Course Outcomes:

Students will be able to:

1. Enhance listening proficiency and reading comprehension and cultivate critical thinking ability.
2. Acquire essential vocabulary and develop strategic planning skills for effective technical writing and gain expertise in E-Correspondence and (N) etiquette.
3. Understand the nuances of oral skills (Speaking skills), gain competence in delivering effective presentations, employing suitable language and body language.
4. Communicate confidently in group discussions and enhance the employability skills of students.
5. Apply effective techniques and strategies for successful job interviews.

Syllabus:

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

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub-skills ofreading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.

2. **Activities on Writing Skills**: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application – Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.
3. **Activities on Presentation Skills –** Dealing with Glossophobia or stage fear, starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation - Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion - myths and facts (Dos and Don'ts) of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas - GD Strategies – Exercises for Practice.
5. **Activities on Interview Skills**: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

Suggested Books:

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

Reference Books:

1. Rizvi, M. Ashraf (2018). *Effective Technical Communication*. (2nd ed). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). *Engineering English.* Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic *Writing: A Handbook for International Students.* (5th Edition). Routledge.
4. Koneru, Aruna. (2016). *Professional Communication*. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication, 3E: Principles and Practice.* Oxford University Press.
6. Anderson, Paul V. (2007). *Technical Communication***.** Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). *English Vocabulary in Use* Series. Cambridge University Press.
8. Sen, Leela. (2009). *Communication Skills.* PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). *Writing with Power.* Oxford University Press.
10. Goleman, Daniel. (2013). *Emotional Intelligence*: *Why it can matter more than IQ.* Bloomsbury Publishing.
11. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
12. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

13. How to Write and Speak Better, Reader's Digest, 2003.
14. TOEFL Reading & Writing Workout, The Princeton Review.
15. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad, Tata McGraw Hill.
16. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010).
17. Objective English, Edgar Thorpe & Showick Thorpe, Pearson; 5th edition (1 August 2013).
18. Communication Skills for Engineers, Sunitha Mishra, C. Murali Krishna, Pearson; 4th Edition.

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Mahatma Gandhi Institute of Technology(Autonomous)
B.Tech. in Information Technology
Scheme of Instruction and Examination
(Choice Based Credit System)

VI SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	IT601PC	Automata Theory and Compiler Design	3	0	0	40	60	3	3
2	IT602PC	Algorithm Design and Analysis	3	0	0	40	60	3	3
3	IT603PC	Embedded Systems	3	0	0	40	60	3	3
4		Professional Elective –III	3	0	0	40	60	3	3
5		Open Elective-I	3	0	0	40	60	3	3
6	MC601ES	Artificial Intelligence	3	0	0	40	60	3	0
7	IT651PC	Compiler Design Lab	0	0	2	40	60	3	1
8	IT652PC	Embedded Systems Lab	0	0	2	40	60	3	1
9		Professional Elective-III Lab	0	0	2	40	60	3	1
10	IT653PC	Industrial Oriented Mini Project	0	0	4	-	100	-	2
		Total Hours / Marks / Credits	**18**	**0**	**10**	**360**	**640**	**-**	**20**

11	MC601BS	Environmental Science (For Lateral Entry Students)	3	0	0	40	60	3	0

PE – III (Professional Elective – III) :

IT631PE	Data Mining
IT632PE	Natural Language Processing
CS631PE	Full Stack Development
CS633PE	Mobile Application Development

PE – III Lab (Professional Elective – III Lab) :

IT611PE	Data Mining Lab
IT612PE	Natural Language Processing Lab
CS611PE	Full Stack Development Lab
CS613PE	Mobile Application Development Lab

OE – I (Open Elective – I) :

IT611OE	Java Programming
IT612OE	Object Oriented Programming using C++

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT601PC : Automata Theory and Compiler Design

(*Common to IT, CSBS & CSE (Data Science)*)

Course Objectives:

1. To introduce the fundamental concepts of formal languages, grammars and automata theory.
2. To understand deterministic and non-deterministic machines and the differences between decidability and undecidability.
3. Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
4. Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, intermediate code generation.

Course Outcomes:

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

UNIT – I :

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

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

Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA

UNIT – II :

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III :

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state

Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT – IV :

Introduction: The structure of a compiler

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT – V :

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's,Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

Suggested Readings :

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

Reference Books :

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi,Jeffry D. Ullman, 2nd Edition, P earson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan,Rama R, Pearson.
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O’reilly
5. Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT602PC : Algorithm Design And Analysis

(*Common to IT & CSBS*)

Prerequisites :

- Programming for problem solving and Data Structures

Course Objectives :

1. Introduces the notations for analysis of the performance of algorithms.
2. Introduces the data structure disjoint sets. Describes major algorithmic techniques (divide and-conquer, backtracking, dynamic programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate;
3. Describes how to evaluate and compare different algorithms using worst-, average and best case analysis.
4. Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

Course Outcomes :

1. Analyze the performance of algorithms and apply the general method for various sorting algorithms
2. Illustrate Greedy method with various applications
3. Understand and apply the concept of dynamic programming for various applications.
4. Choose appropriate backtracking strategy for a specified application
5. Demonstrate Branch and Bound strategy for various applications

UNIT – I : Introduction:

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

Divide and conquer : General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT – II :

Disjoint Sets: Disjoint set operations, union and find algorithms

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimumcost spanning trees, Single source shortest path problem.

UNIT – III: Dynamic Programming:

General method, applications- Optimal binary search trees, 0/1 knapsack problem, All pairsshortest path problem, Traveling sales person problem, Reliability design.

UNIT – IV: Backtracking:

General method, applications, n-queen's problem, sum of subsets problem, graph coloring; Hamiltonian path problem

UNIT –V: Branch and Bound:

General method, applications - Travelling sales person problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

Suggested Readings :

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharan, University Press.

Reference Books:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and sons.

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT603PC : Embedded Systems

Prerequisites :

1. A course on "Digital Logic Design and Microprocessors"
2. A course on "Computer Organization and Architecture"

Course Objectives :

1. To provide an overview of principles of Embedded System.
2. To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

Course Outcomes :

1. Expected to understand the selection procedure of processors in the embedded domain.
2. Design procedure of microcontroller architecture.
3. Expected to visualize the role of real-time operating systems in embedded systems.
4. Design procedure of embedded firm ware.
5. Expected to evaluate the correlation between task synchronization and latency issues

UNIT – I : Introduction to Embedded Systems :
Processor embedded into a system, Embedded Hardware units and devices in a system, Embedded software in a system, Design process of an embedded system, classification ofembedded systems, characteristics and quality attributes of an embedded systems

UNIT – II :
Introduction to processor/microcontroller architecture, Real world interfacing, processor and memory organization, memory types, memory maps and addresses, interrupt sources and interrupt service mechanism.

UNIT – III: On board Communication Basics: serial; communication devices, Parallel devices, Wireless devices, Real time clock, Serial bus communication Protocols-I2C, SPI; Parallel buss communication-ISA, PCI.

UNIT – IV: Embedded Firmware Development: Overview of programming concepts - in assembly language and in high level language 'C', C Program elements- Heads, Sourcefiles, Processor Directives, Macros, Functions, Data types and Data Structures

UNIT – V: OS Based Embedded Systems: OS services - Process/Task Management, Memory Management, I/O subsystem manager, Inter Process/Task communications - Tasks, Task states, Shared data, Signals, Message Queues, Mailbox, Pipes and conceptsof Semaphores.

Suggested Readings :

1. Embedded Systems, Raj Kamal, 2nd edition, Tata Mc Graw Hill
2. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

Reference Books :

1. RajKamal, "Embedded Systems",TMH.
2. Frank Vahid, Tony Givargis, "Embedded Systems Design: A Unified Hardware /Software Introduction", John & Wiley Publications, 2002.
3. Lyla B. Das, "Embedded Systems",Pearson,2013.
4. David E. Simon, "An Embedded Software Primer", Pearson Education

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT631PE : Data Mining
(Professional Elective – III)
(*Common to CSE & IT*)

Course Objectives:

1. Students will become acquainted with both the strengths and limitations of various data mining techniques like Association, Classification, Cluster and Outlier analysis.

Course Outcomes:

1. Understand the need of data mining and pre-processing techniques.
2. Perform market basket analysis using association rule mining.
3. Utilize classification techniques for analysis and interpretation of data.
4. Identify appropriate clustering and outlier detection techniques to handle complex data.
5. Understand the mining of data from web, text and time series data.

UNIT – I : Introduction to Data Mining :
What Data mining ? Kinds of Data, Knowledge Discovery process, Data Mining Functionalities, Kinds of Patterns, Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity, Data Pre-processing**:** Major Tasks in Data Pre-processing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT – II : Association Analysis:
Basic Concepts, Market Basket Analysis, Apriori Algorithm, FP-growth, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel Associations and Multidimensional Associations.

UNIT– III : Classification :
Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Ensemble Methods, Multilayer Feed- Forward Neural Network, Support Vector Machines, k-Nearest-Neighbor Classifiers.

UNIT – IV: Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods-k-Means, k-Medoids, Hierarchical Methods-AGENES, DIANA, BIRCH, Density- Based Method-DBSCAN, Outlier Analysis: Types of Outliers, Challenges of Outlier Detection, and Overview of Outlier Detection Methods

UNIT – V : Advanced Concepts:
Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining-Spatial Data Overview, Spatial Data Mining Primitives, Spatial Rules, Spatial Classification Algorithm, Spatial Clustering Algorithms, Temporal Mining- Modeling Temporal Events, Time Series, Pattern Detection, Sequences, Temporal Association Rules.

Suggested Readings :

1. Jiawei Han, Micheline Kamber, Jian Pei., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann/Elsevier, 2012.
2. Margaret H Dunham, Data Mining Introductory and Advanced Topics, 2nd Edition, Pearson Education, India, 2006.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne and Vipin Kumar, Introduction to Data Mining, 2nd Edition, Pearson Education India, 2021.
3. Amitesh Sinha, Data Warehousing, Thomson Learning, India, 2007.

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT632PE : Natural Language Processing
(Professional Elective – III)

Prerequisites:
Data structures, finite automata and probability theory

Course Objectives:

1. To introduce the fundamental concepts and techniques of natural language processing (NLP).
2. To gain an in-depth understanding of the computational properties of natural languages.
3. To study commonly used algorithms for processing linguistic information.
4. To examine NLP models and algorithms using both the traditional and the more recent approaches.
5. To Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

1. Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
2. To carry out proper experimental methodology for training and evaluating empirical NLP systems
3. Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
4. Able to design, implement, and analyze NLP algorithms

UNIT – I :
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

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

UNIT – III :
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT – IV :
Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT – V:
Discourse Processing: Coherence, Building hierarchical discourse structure, Reference Resolution
Language Modelling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling

Suggested Readings :

1. Multilingual natural Language Processing Applications: From Theory to Practice –Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary, Oxford University Press

Reference Books:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications
2. Python Natural Language Processing Cookbook –Zhenya Antic, Pearson Publications, IBM Press
3. Natural Language Processing – Ela Kumar, I.K. International publishing house pvt. Ltd.

B.Tech VI Semester

L	T	P	C
3	0	0	3

CS631PE : Full Stack Development
(Professional Elective – III)
(Common to CSE, IT, CSE(AI&ML) (PE-II), CSE (Data Science))

Prerequisites:
- Object Oriented Programming
- Web Technologies

Course Objectives:
- Students will become familiar to implement fast, efficient, interactive and scalable web applications using run time environment provided by the full stack components.

Course Outcomes:
- Understand Full stack components for developing web application.
- Apply packages of NodeJS to work with Data, Files, Http Requests and Responses.
- Use MongoDB data base for storing and processing huge data and connects with NodeJS application.
- Design faster and effective single page applications using Express and Angular.
- Create interactive user interfaces with react components.

UNIT-I
Introduction to Full Stack Development:
Understanding the Basic Web Development Framework- User, Browser, Webserver, Backend Services, Full Stack Components - Node.js, MongoDB, Express, React, Angular. Java Script Fundamentals, NodeJS- Understanding Node.js, Installing Node.js, Working with Node Packages, creating a Node.js Application, Understanding the Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks.

UNIT-II
Node.js:
Working with JSON, Using the Buffer Module to Buffer Data, Using the Stream Module to Stream Data, Accessing the File System from Node.js- Opening, Closing, Writing, Reading Files and other File System Tasks. Implementing HTTP Services in Node.js- Processing URLs, Processing Query Strings and Form Parameters, Understanding Request, Response, and Server Objects, Implementing HTTP Clients and Servers in Node.js, Implementing HTTPS Servers and Clients. Using Additional Node.js Modules-Using the os Module, Using the util Module, Using the dns Module, Using the crypto Module.

UNIT-III
MongoDB:
Need of NoSQL, Understanding MongoDB, MongoDB Data Types, Planning Your Data Model, Building the MongoDB Environment, Administering User Accounts, Configuring Access Control, Administering Databases, Managing Collections, Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, Understanding the Objects Used in the MongoDB Node.js Driver, Accessing and Manipulating Databases, Accessing and Manipulating Collections

UNIT-IV
Express and Angular:
Getting Started with Express, Configuring Routes, Using Requests Objects, Using Response Objects. Angular: importance of Angular, Understanding Angular, creating a Basic Angular Application, Angular Components, Expressions, Data Binding, Built-in Directives, Custom Directives, Implementing Angular Services in Web Applications.

UNIT-V

React:

Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React, Rendering and Life Cycle Methods in React, Working with forms in React, integrating third party libraries, Routing in React.

TEXT BOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas, React in Action, 1st Edition, Manning Publications.

REFERENCE BOOKS:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, Apress, 2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', 1st edition, Apress, 2018.
3. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2nd edition, Addison-Wesley Professional, 2018.

B.Tech VI Semester

L	T	P	C
3	0	0	3

CS633PE – Mobile Application Development
(Professional Elective – III)
(Common to CSE, IT, CSE (Data Science))

Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems.
- To improves their skills of using Android software development tools.
- To demonstrate their ability to develop software with reasonable complexity on mobile platform.
- To demonstrate their ability to deploy software to mobile devices.

Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications

UNIT – I:
Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT – II:
Android User Interface: Measurements – Device and pixel density independent measuring units Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT – III:
Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying Toasts

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

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

TEXT BOOKS:

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

REFERENCE BOOK:

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

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT611OE : Java Programming
(Open Elective – I)

Course Objectives:

1. To introduce object-oriented programming principles and apply them in solving problems.
2. To introduce the implementation of packages and interfaces.
3. To introduce the concepts of exception handling and multithreading.
4. To introduce the design of Graphical User Interface using swing controls.

Course Outcomes:

1. Able to solve real world problems using OOP techniques.
2. Able to solve problems using java collection framework and I/O classes.
3. Able to create and access packages, interfaces and implement classes
4. Able to develop multithreaded applications with synchronization.
5. Able to design GUI based applications.

UNIT – I : Foundations of Java:

History of Java, Java Features, Variables, Data Types, Operators, Expressions, Control Statements. Elements of Java - Class, Object, Methods, Constructors and Access Modifiers, Generics, Inner classes, String class and Annotations.

OOP Principles: Encapsulation – concept, setter and getter method usage, this keyword. Inheritance concept, Inheritance Types, super keyword. Polymorphism – concept, Method Overriding usage and Type Casting. Abstraction – concept, abstract keyword and Interface.

UNIT– II : Exception Handling:

Exception and Error, Exception Types, Exception Handler, Exception Handling Clauses – try, catch, finally, throws and the throw statement, Built-in-Exceptions and Custom Exceptions.

Files and I/O Streams: The file class, Streams, The Byte Streams, Filtered Byte Streams, The Random Access File class.

UNIT – III : Packages :

Defining a Package, CLASSPATH, Access Specifiers, importing packages. Few Utility Classes - String Tokenizer, BitSet, Date, Calendar, Random, Formatter, Scanner. Collections: Collections overview, Collection Interfaces, Collections Implementation Classes, Sorting in Collections, Comparable and Comparator Interfaces.

UNIT – IV: Multithreading:

Process and Thread, Differences between thread-based multitasking and process- based multitasking, Java thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

Java Database Connectivity: Types of Drivers, JDBC architecture, JDBC Classes and Interfaces, Basic steps in Developing JDBC Application, Creating a New Database and Table with JDBC.

UNIT– V:

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Layout Manager Classes, Simple Applications using AWT and Swing.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes.

Suggested Readings :

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India)Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

B.Tech VI Semester

L	T	P	C
3	0	0	3

IT612OE : Object Oriented Programming using C++
(Open Elective – I)

Course Objectives:

1. Introduces Object Oriented Programming concepts using the C++ language
2. Understand the principles of data abstraction, inheritance and polymorphism
3. Implementation of the principles of virtual functions and polymorphism
4. Handling formatted I/O, unformatted I/O in C++ and implementation of exception handling

Course Outcomes :

1. Develop programs with reusability and understand OO functions
2. Develop programs for file handling, data abstraction, data hiding
3. Develop inheritance, overloading and exceptions in programming
4. Implement I/O operations and file handling
5. Develop applications for a range of problems using object-oriented programming techniques

UNIT – I :

Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and deallocation operators-new and delete,Preprocessor directives.

UNIT – II :

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, this pointer, Friend to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT – III :

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

UNIT – IV :

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, Formatted I/O.

UNIT – V :

Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

Suggested Readings :

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.
2. Problem solving with C++: The Object of Programming, 4th Edition, Walter Savitch,Pearson Education.

Reference Books:

1. B. Stroutstrup, The C++ Programming Language, 3rd Edition, Pearson Education.
2. R. Lafore, Object Oriented Programming in C++, 3rd Edition, Galigotia Publications PvtLtd.
3. T. Gaddis, J. Walters and G. Muganda, OOP in C++, 3rd Edition, Wiley Dream Tech Press.

MGIT (A), Hyderabad

B.Tech VI Semester

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MC601ES: Artificial Intelligence
(*Common to IT, CSBS*)

Course Objectives:

- To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning.
- Study of Markov Models enable the student ready to step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Non-monotonic Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009

REFERENCE BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall, 2010.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

B.Tech VI Semester

L	T	P	C
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IT651PC : Compiler Design Lab

Prerequisites :

1. A Course on "Objected Oriented Programming through Java"

Course Objectives:

1. To understand the various phases in the design of a compiler.
2. To understand the design of top-down and bottom-up parsers.
3. To understand syntax directed translation schemes.
4. To introduce lex and yacc tools.

Course Outcomes:

1. Design, develop, and implement a compiler for any language.
2. Use yacc tools for developing a scanner.
3. Design and implement LL and LR parsers.
4. Use lex tools for developing a parser and analyzer.
5. Design and implement recursive descent parsers

List of Experiments

1. Implementation of symbol table.
2. Develop a lexical analyzer to recognize a few patterns inc (ex. Identifiers, constants,comments, operators etc.)
3. Implementation of lexical analyzer using lex tool.
4. Generate yacc specification for a few syntactic categories.
   a) Program to recognize a valid arithmetic expression that uses operator +,-, * and /.
   b) Program to recognize a valid variable which starts with a letter followed by any number of letter or digits.
   c) Implementation of calculator using lex and yacc.
5. Convert the bnf rules into yacc form and write code to generate abstract syntax tree.
6. Implement type checking
7. Implement any one storage allocation strategies (heap, stack, static)
8. Write a lex program to count the number of words and number of lines in a given file orprogram.
9. Write a 'C' program to implement lexical analyzer using c program.
10. Write recursive descent parser for the grammar E->E+T E->T T->T*F T->F F->(E)/id.
11. Write recursive descent parser for the grammar S->(L) S->a L->L,S L->S
12. Write a C program to calculate first function for the grammar
    E->E+T E->T T->T*F T->F F->(E)/id
13. Write a YACC program to implement a top down parser for the given grammar.
14. Write a YACC program to evaluate algebraic expression.

Suggested Readings :

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman.

Reference Books :

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Louden, Thomson.

B.Tech VI Semester

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IT652PC: Embedded Systems Lab

Pre-requisites:

1. A course on "Digital Logic Design and Microprocessors".
2. A course on "Computer Organization and Architecture".

Course Objectives:

1. To provide an overview of principles of Embedded System
2. To provide a clear understanding of role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:

1. Expected to understand the various operations and time delay generation in microcontroller.
2. Implement the procedure for port header file and usage of RS232
3. Expected to visualize the role of Flash operating systems in desktop environment
4. Expected to develop the GPIO Programs, LED and game simulation using LCD
5. Expected to understand the export display, hosting a website and how to interface a regular USB

The following experiments have to be executed using

i) Microcontroller Kits (8051/ Raspberry Pi /Arduino)

(ii) Use embedded C/ Python/ assembly language.

List of Experiments:

1. Programs to perform arithmetic, logical, branching, and loop operations by a microcontroller.
2. Generate time delay using timers in a microcontroller.
3. Write a C program to count the number of times the switch is pressed and released.
4. Illustrate the use of a port header file (Port M) using an interface consisting of a keypad and LCD.
5. Write a program to display "Hello world" on display of the receiving microcontroller using RS232.
6. Flash the operating System onto the device into a stable functional state by porting desktop environment with n away Packages necessary packages
7. Program available GPIO Plus of the corresponding device using native programming language, interface LEDs and interface LED / Switches and test it's functionality
8. Using the light sensor, monitor the light intensity and automatically turnON/OFF LED.(for Predefined threshold light intensity value)
9. Dice game simulation- generate a random value Similar to dice value and display the same using 16x2 LCD
10. Export display to other system using available desktop display as display for the device using SSH client and X11 display seven.
11. Hosting a website on Board- Build and host a simple website (static) on the device and make it accessible online. (Need to install Sewn (e.g., Apache).)
12. Interface a regular USB webcam to the device and turn it into fully functional IP webcam Note: Devices include Arduino, Raspberry Pi, and BeagleBour.

Suggested Readings :

1. Embedded Systems, Raj Kamal, 2nd edition, Tata Mc Graw Hill
2. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill

Reference Books:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill
2. Frank Vahid and Tony Givargis, "Embedded Systems Design" - A Unified Hardware/Software Introduction, John Wiley
3. Lyla, "Embedded Systems" –Pearson
4. David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

B.Tech VI Semester

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IT611PE: Data Mining Lab
(Professional Elective – III Lab)
(*Common to CSE & IT*)

Prerequisites: A course on "Database Management System".

Course Objectives:

1. The course is intended to obtain hands-on experience using data mining software.
2. Intended to provide practical exposure of the concepts in data mining algorithms.

Course Outcomes:

1. Apply preprocessing statistical methods for any given raw data.
2. Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
3. Implement various association analysis approaches
4. Implement various classification algorithms
5. Implement various clustering approaches

List of Experiments

Experiments using Weka Tools / Python

1. Implement Data Pre-Processing Techniques
2. Implementation of Attribute oriented induction algorithm
3. Implementation of apriori algorithm
4. Implementation of FP –Growth algorithm
5. Implementation of Decision Tree Induction
6. Calculating Information gain measures
7. Classification of data using Bayesian approach
8. Classification of data using K–Nearest Neighbour Approach
9. Implementation of K–means algorithm
10. Implementation of PAM (Partition Around Medoids) algorithm

Suggested Readings :

1. Data Mining–Concepts and Techniques - JIAWEIHAN & MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining & OLAP-Alex Berson and Stephen J. Smith – Tata Mc Graw-Hill Edition, Tenth reprint 2007

Reference Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Anuj Karpatne, Introduction to Data Mining, Pearson Education.

B.Tech VI Semester

L	T	P	C
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IT612PE: Natural Language Processing Lab
(Professional Elective – III Lab)

Prerequisites: Machine Learning, Linguistics, Statistics and Probability.

Course Objectives:

1. Learn and apply various text preprocessing techniques
2. Learn and apply popular NLP libraries and frameworks, such as NLTK and PyTorch.
3. Explore a range of NLP applications such as PoS Tagging and Chunking

Course Outcomes:

1. Ability to learn linguistic structure and creation or prediction of words based on learned patterns or models.
2. To represent internal structure and formation of words.
3. To capture contextual relationships between adjacent words for improved language modeling.
4. Building a POS Tagger in NLP, is the accurate labeling of each word in a given text with its part-of-speech.
5. Identification and grouping of consecutive words into syntactically meaningful units or chunks, aiding in higher-level linguistic analysis and information extraction from text.

List of Experiments

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
6. POS Tagging: Hidden Markov Model
7. POS Tagging: Viterbi Decoding
8. Building POS Tagger
9. Chunking
10. Building Chunker

Suggested Readings:

1. Practical Natural Language Processing: A Comprehensive Guide to building Real-World NLP Systems, First Edition by Anuj Gupta ,Bohisattwa Majumber , Sowmya Vajjala
2. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit , First Edition by Steven Bird , Ewan Klein , Edward Loper

Reference Books:

1. Taming Text, First Edition, by Steven Bird, Ewan Klein and Edwar

B.Tech VI Semester

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CS611PE–Full Stack Development Lab
(Professional Elective – III Lab)
(*Common to CSE, IT, CSE (Data Science)*)

Prerequisite :
1. Object Oriented Programming
2. Web Technologies

Course Objectives:

- Introduce fast, efficient, interactive and scalable web applications using run time environment provided by the full stack components.

Course Outcomes:

- Design flexible and responsive Web applications using Node JS, React, Express and Angular.
- Perform CRUD operations with MongoDB on huge amount of data.
- Develop real time applications using react components.
- Use various full stack modules to handle http requests and responses.

List of Experiments :
1. Create an application to setup node JS environment and display "Hello World".
2. Create a Node JS application for user login system.
3. Write a Node JS program to perform read, write and other operations on a file.
4. Write a Node JS program to read form data from query string and generate response using NodeJS
5. Create a food delivery website where users can order food from a particular restaurant listed in the website for handling http requests and responses using NodeJS.
6. Implement a program with basic commands on databases and collections using MongoDB.
7. Implement CRUD operations on the given dataset using MongoDB.
8. Perform Count, Limit, Sort, and Skip operations on the given collections using MongoDB.
9. Develop an angular JS form to apply CSS and Events.
10. Develop a Job Registration form and validate it using angular JS.
11. Write an angular JS application to access JSON file data of an employee from a server using $http service.
12. Develop a web application to manage student information using Express and Angular JS.
13. Write a program to create a simple calculator Application using React JS.
14. Write a program to create a voting application using React JS
15. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days using react application.
16. Build a music store application using react components and provide routing among the web pages.
17. Create a react application for an online store which consist of registration, login, product information pages and implement routing to navigate through these pages.

TEXT BOOKS:

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development,
   2nd Edition, Addison-Wesley,2019.
2. Mark Tielens Thomas., React in Action, 1st Edition, Manning Publications.

REFERENCE BOOKS:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo Express, React, and Node, 2nd Edition, Apress,2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of Modern Full Stack Web Developer', 1st edition, Apress, 2018.
3. Brad Green& Seshadri. Angular JS. 1st Edition. O'Reilly Media, 2013.
4. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2nd edition, Addison-Wesley Professional, 2018.

B.Tech VI Semester

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CS613PE: Mobile Application Development Lab
Professional Elective – III Lab
(*Common to CSE, IT, CSE (Data Science)*

Course Objectives:

- To learn how to develop Applications in android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

List of Experiments

1. (a) Create an Android application that shows Hello + name of the user and run it on an emulator.
   i. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button.
   Use (a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button.
   If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to sendan SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification isinserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should beverified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.

11. Create an application that saves user information like name, age, gender etc. in shared preference andretrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
13. Create an application that shows the given URL (from a text field) in a browser.

TEXT BOOKS:

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

REFERENCE BOOK:

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

B.Tech VI Semester

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MC601BS: Environmental Science

(*Common to all branches*)

Course Objectives:

- To understand the natural resources and their conservation.
- To understand the importance of ecosystem, biodiversity and ecological balance for sustainable development.
- To gain knowledge about environmental pollution, effects and controlling measures.
- To study about global environmental problems and global issues.
- To understand the environmental policies, regulations and sustainable development

Course Outcomes:

After completing the course, the student will be able to:

- Learn about different types of natural resources and take up the measures to protect the resources.
- Get the information about ecosystem, biodiversity and their usage and conservation.
- Get the information about the types of pollution, understand their effects and controlling measures.
- Gain the knowledge about current global environmental issues and initiations to be taken to protect the environment.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity.

UNIT – II Natural Resources:

Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefitsand problems. **Mineral resources:** use and exploitation, environmental effects of extracting and usingmineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, causes and effects, Ambient air quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, biomedical waste management and handling rules, hazardous waste management and handling rules.

Environmental Impact of Assessment (EIA): structure, methods of baseline data acquisition. Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Environmental Education, Human health, Environmental Ethics, Concept of Green Building, Green chemistry principles, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

REFERENCE BOOKS:

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

Mahatma Gandhi Institute of Technology
(Autonomous)
B.Tech. in Information Technology
Scheme of Instruction and Examination
(Choice Based Credit System)
VII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	IT701PC	Information Security	3	0	0	40	60	3	3
2	IT702PC	Cloud Computing	3	0	0	40	60	3	3
3		Professional Elective -IV	3	0	0	40	60	3	3
4		Professional Elective -V	3	0	0	40	60	3	3
5		Open Elective-II	3	0	0	40	60	3	3
6	IT751PC	Information Security Lab	0	0	2	40	60	3	1
7	IT752PC	Cloud Computing Lab	0	0	2	40	60	3	1
8	IT753PC	Project Stage - I	0	0	6	100	-	-	3
Total Hours / Marks / Credits			**15**	**0**	**10**	**380**	**420**	**-**	**20**

(PE – IV) Professional Elective – IV :

IT741PE	Human Computer Interaction
IT742PE	High Performance Computing
IT743PE	Information Retrieval Systems
CS745PE	Ad-hoc and Sensor Networks

(PE – V) Professional Elective – V :

IT751PE	Intrusion Detection Systems
IT752PE	Augmented Reality & Virtual Reality
CS754PE	Blockchain Technology
CS755PE	Software Process & Project Management

(OE – II) Open Elective – II :

IT721OE	Full Stack Development
IT722OE	Scripting Languages

B.Tech VII Semester

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IT701PC : Information Security

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Prerequisites :

1. A Course on Computer Networks and a course on Mathematics

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To understand various key distribution and management schemes
3. To understand how to deploy encryption techniques to secure data in transit across data networks
4. To apply algorithms used for secure transactions in real world applications

Course Outcomes:

1. Demonstrate the knowledge of cryptography, network security concepts and applications.
2. Ability to apply Public Key Cryptographic and Message Authentication algorithms
3. Investigate the Digital Signature Concept and apply Email security algorithms
4. Understand IP Security and Web Security concepts
5. Understand and learn the various concepts like intruders, viruses, firewalls

UNIT – I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, Access Control and Availability) and Mechanisms, A model for Internetwork security

Classical Encryption Techniques : DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT – II

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography.

Message authentication and Hash Functions: Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT – III

Digital Signatures: Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service.

Email Security : Pretty Good Privacy (PGP), S/MIME

UNIT – IV

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security: Web Security Requirements, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Electronic Transaction (SET)

UNIT – V

Intruders, Viruses and Worms Intruders, Viruses and related threats Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

Suggested Readings :

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

Reference Books :

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

B.Tech VII Semester

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IT702PC : Cloud Computing

Prerequisites :
Knowledge on Computer Networks, Operating Systems and Distributed Systems.

Course Objectives :

1. This course provides an insight into cloud computing
2. Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing

Course Outcomes :

1. Understand different computing paradigms and potential of the paradigms and specifically cloud computing
2. Understand cloud service types, cloud deployment models and technologies supporting and driving the cloud
3. Acquire the knowledge of programming models for cloud and development of software application that runs the cloud and various services available from major cloud providers
4. Understand the security concerns and issues in cloud computing
5. Acquire the knowledge of advances in cloud computing.

UNIT – I
Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

UNIT – II
Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing: SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

UNIT – III
Virtualization, Programming Models for Cloud Computing: MapReduce, Cloud Haskell, Software Development in Cloud

UNIT – IV
Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service providers

UNIT – V
Security in Cloud Computing, and Advanced Concepts in Cloud Computing

Suggested Readings :

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.

Reference Books :

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Brobergand, Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

B.Tech VII Semester

L	T	P	C
3	0	0	3

IT741PE : Human Computer Interaction
(Professional Elective - IV)

Course Objectives :

1. To gain an overview of Human-Computer Interaction (HCI)
2. Understanding the alternatives to traditional "keyboard and mouse" computing.
3. Getting familiarity with the vocabulary associated with sensory and cognitive systems
4. Be able to apply models from cognitive psychology to predicting user performance
5. Working in small groups on a product design with invaluable team-work experience.

Course Outcomes :

1. Apply HCI and principles to interaction design.
2. Design certain tools for blind or PH people
3. Understand the social implications of technology and ethical responsibilities as engineers.
4. Understand the importance of a design and evaluation methodology
5. Develop the cognitive models

UNIT – I

Introduction: Importance of user Interface – definition, importance of good design.
Benefits of good design, A brief history of Screen design.
The graphical user interface popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT – II

Design process Human interaction with computers, importance of human characteristics, human consideration, Human interaction speeds, understanding business junctions.
Screen Designing: Design goals Screen planning and purpose, organizing screen elements, ordering of screen data and content screen navigation and flow Visually pleasing composition amount of information focus and emphasis presentation information simply and meaningfully information retrieval on web statistical graphics Technological consideration in interface design.

UNIT – III

Windows New and Navigation schemes selection of window, selection of devices based and screen – based controls. Components – text and messages, Icons and increases Multimedia, colors, uses problems, choosing colors

UNIT IV :

HCI in the software process :

The software life cycle, Usability engineering, Iterative design and prototyping
Design Focus: Prototyping in practice, Design rationale, Design rules, Principles to support usability Standards, Golden rules and heuristics, HCI patterns, Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method, Universal design, Universal design principles Multimodal interaction

UNIT V :

Cognitive models Goal and task hierarchies Design Focus:

GOMS saves money, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures, Ubiquitous computing and augmented realities, Ubiquitous computing applications research
Design Focus: Ambient Wood augmenting the physical, Virtual and augmented reality
Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization

Suggested Readings:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley Dream Tech.
2. Human Computer Interaction. Alan Dix, Janet Fincay, Gregory's, Abowd, Russell Bealg, Pearson Education.

Reference Books:

1. Designing the user interface. 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen, Pearson Education.
4. Human Computer Interaction, D. R. Olsen, Cengage Learning.
5. Human Computer Interaction, Smith - Atakan, Cengage Learning.

B.Tech VII Semester

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IT742PE : High Performance Computing
(Professional Elective IV)

Prerequisites :

- Computer organization & Architecture
- Operating Systems
- Algorithms and Data Structures
- Programming Language (C/C++)

Course Objectives :

1. To teach students to become good at parallel computing algorithm design
2. To teach students to become good at modeling and solving problems using different types of parallel computing architectures
3. To teach students the ability to measure the performance of parallel algorithms and arrive at reasonable estimates of cost tradeoffs
4. To teach students the various paradigms in algorithm design for computationally intensive applications
5. To teach students to become good at understanding and using modern multiprocessor and multi-core architectures

Course Outcomes :

1. Understand different parallel computing architectures and networks
2. Design parallel algorithms and measure their performance
3. Understand vector processing, memory bottlenecks, data and thread-level parallelism
4. Understand the various programming frameworks like MPI, OpenMP and CUDA
5. Gain knowledge of writing efficient parallel programs

UNIT I :

Modern Processors: Stored-Program Computer Architecture, General-Purpose cache-based Microprocessor

Architecture, Memory Hierarchies, Multicore processors, Multithreaded processors, Vector processors.

Basic optimization techniques for serial code: Scalar profiling, Common sense optimizations, Simple measures, large impact, The role of compilers, Data access optimization.

UNIT II :

Parallel computers:

Taxonomy of parallel computing paradigms, Shared-memory computers, Distributed-memory computers, Hierarchical (hybrid) systems, Networks.

Basics of parallelization: Need for Parallelism, Parallel scalability

UNIT - III:

Shared-memory parallel programming with OpenMP: Introduction to OpenMP, Profiling OpenMP programs, Performance pitfalls, Case study: OpenMP-parallel Jacobi algorithm

UNIT- IV :

Distributed-memory parallel programming with MPI: Message passing, Introduction to MPI, MPI performance tools, Communication parameters, Synchronization, serialization, contention, Reducing communication overhead, Case study: Parallel sparse matrix-vector multiply.

UNIT V :

CUDA: Understanding the CUDA computing model and the API using nvcc compiler, Introduction to modern supercomputing architectures featuring NVIDIA processors

Suggested Readings :

1. Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, VipinKumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652
2. Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science series, 2011.

Reference Books:

1. CUDA Programming A Guide to Parallel Computing with GPUs by Shane Cook, Morgan Kaufman Publishers
2. Parallel Computing Theory and Practice, Second Edition, Michaek J. Quinn, Tata McGraw-Hill Edition.
3. Parallel Computers Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI.
4. Parallel Programming in C with MPI and OpenMP by Michael Quinn, McGraw-Hill Publisher
5. Computer Architecture A Quantitative Approach by John Hennessey and David Patterson, Morgan Kaufman Publishers

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IT743PE : Information Retrieval Systems
(Professional Elective IV)

Prerequisites : Data Structures

Course Objectives:

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to construct various data structures and models
3. Ability to design different document clustering algorithms
4. Implement retrieval systems for web search tasks.
5. Design an Information Retrieval System for Text & Multimedia search tasks.

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

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

UNIT III : Automatic Indexing :
Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages
Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters

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

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

Suggested Readings :

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

Reference Books :

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

B.Tech VII Semester

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CS745PE: Adhoc and Sensor Networks
(Professional Elective - IV)
(Common to CSE, IT)

Prerequisites:

- A course on Computer Networks
- A course on Mobile Computing

Course Objectives:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes:

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and
- Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN

UNIT I :

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT II :

Data Transmission - Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AM Route, MCEDAR.

UNIT III :

Geocaching: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR.

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT IV :

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT V :

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

Suggested Readings :

1. Ad Hoc and Sensor Networks Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN 981 256 681 3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN 978-1-55860-914-3 (Morgan Kauffman).

Reference Books :

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy, B. S. Manoj, Pearson
2. Principles of Wireless Networks KavehPahLaven and P. Krishna Murthy, 2002, PE
3. Mobile Cellular Communication Gottapu Sasibhushana Rao, Pearson Education,

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IT751PE : Intrusion Detection Systems
(Professional Elective - V)

Prerequisites: Computer Networks, Computer Programming

Course Objectives:

1. Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion.
2. Identify and describe the parts of all intrusion detection systems and characterize new and emerging IDS technologies according to the basic capabilities all intrusion detection systems share.

Course Outcomes:

1. Understand fundamental knowledge of intrusion detection and prevention
2. Understand different types of attacks in network layer and code injection human layer
3. Describe the taxonomy and evaluate IDS models
4. Analyze different anomaly detection algorithms
5. Acquire the alerts and issues related to correlation, Emili and collaborative security

UNIT I :

Introduction : The state of threats against computers, and networked systems-Overview of computer security solutions and why they fail- - Vulnerability assessment, firewalls, VPN's – Overview of Intrusion Detection and Intrusion Prevention, Network and Host-based IDS

UNIT II :

Classes of attacks : Network layer: scans, denial of service, penetration Application layer: software exploits, code
injection- Human layer: identity theft, root access-Classes of attackers- Kids/hackers/sop Hesitated groups-Automated: Drones, Worms, Viruses

UNIT III :

A General IDS model and taxonomy, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS

UNIT IV :

Anomaly Detection Systems and Algorithms

Network Behaviour Based Anomaly Detectors (rate based)- Host-based Anomaly Detectors-Software Vulnerabilities-State transition, Immunology, Payload Anomaly Detection

UNIT V :

Attack trees :

Correlation of alerts- Autopsy of Worms and Botnets-Malware detection-Obfuscation, polymorphism-Document vectors.

Email/IM security issues-Viruses/Spam-From signatures to thumb prints to zero day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation Traitors, Decoys and Deception-Future: Collaborative Security

Suggested Readings :

1. Peter Szor, "The Art of Computer Virus Research and Defense ", Symantec Press ISBN : 0-321-30545-3.
2. Markus Jakobsson and Zulfikar Ramzan, Crimeware, " Understanding New Attacks and Defenses"

Reference Books :

1. Saiful Hasan, " Intrusion Detection System", Kindle Edition.
2. Ankit Fadia, " Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection"

ONLINE WEBSITES/MATERIALS:

1. https://www.intechopen.com/books/intrusion-detection-systems/

ONLINE COURSES:

1. https://www.sans.org/course/intrusion-detection-in-depth
2. https://www.cybrary.it/skill-certification-course/ids-ips-certification-training-course

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IT752PE : Augmented Reality & Virtual Reality
(Professional Elective - V)

Course Objectives:

1. Provide a foundation to the fast growing field of AR and make the students aware of the various AR concepts.
2. To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Outcomes:

1. Describe how AR systems work and list the applications of AR.
2. Understand the software architectures of AR.
3. Understand the history of virtual reality and its geometric models
4. Understand the Visual perception and rendering in VR
5. Understand the interaction, auditory perception and rendering in VR

UNIT – I : Introduction to Augmented Reality:
Augmented Reality - Defining augmented reality,history of augmented reality, Examples, Related fields
Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display Model, Visual Displays
Tracking: Tracking, Calibration, and Registration, Coordinate Systems, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors
UNIT - II: Computer Vision for Augmented Reality:
Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Outdoor Tracking.
Interaction: Output Modalities, Input Modalities, Tangible Interfaces, Virtual User Interfaceson Real Surfaces, Augmented Paper, Multi-view Interfaces, Haptic Interaction
Software Architectures: AR Application Requirements, Software Engineering Requirements, Distributed Object Systems, Dataflow, Scene Graphs
UNIT - III: Introduction to Virtual Reality:
Defining Virtual Reality, History of VR, Human Physiology and Perception
The Geometry of Virtual Worlds: Geometric Models, Axis-Angle Representations of Rotation, Viewing Transformations
Light and Optics: Basic Behavior of Light, Lenses, Optical Aberrations, The Human Eye, Cameras, Displays
UNIT - IV: The Physiology of Human Vision: From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements, Implications for VR
Visual Perception: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color
Visual Rendering: Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates, Immersive Photos and Videos
UNIT- V: Motion in Real and Virtual Worlds: Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection
Interaction: Motor Programs and Remapping, Locomotion, Social Interaction
Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering

Suggested Readings :

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
2. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.

Reference Books :

1. Allan Fowler-AR Game Development‖, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman andAlan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002.
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig,William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381.
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija Utgivare Publisher. 2012. ISBN 978-951-38-7449-0.
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

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CS754PE: Blockchain Technology
(Professional Elective - V)
(Common to CSE, IT, CSBS)

Prerequisites:

- Knowledge in security and applied cryptography
- Knowledge in distributed databases

Course Objectives:

- To Introduce block chain technology and Cryptocurrency

Course Outcomes:

- Learn about research advances related to one of the most popular technological areas today.

UNIT- I
Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding
UNIT- II
Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment
UNIT- III
Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs
UNIT - IV
Currency, Token, Tokenizing, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency
UNIT - V
Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

TEXTBOOK:
1. Blockchain Blue print for Economy by Melanie Swan

REFERENCE:
1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

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CS755PE: Software Process & Project Management
(Professional Elective - V)
(Common to CSE, IT)

- A Course on "Object Oriented Programming through Java"
- A Course on "Web Technologies"

Course Objectives:

- To acquire knowledge on software process management
- To acquire managerial skills for software project development
- To understand software economics

Course Outcomes:

- Gain knowledge of software economics, phases in the life cycle of software development, project organization, project control and process instrumentation
- Analyze the major and minor milestones, artifacts and metrics from management and technical perspective
- Design and develop software product using conventional and modern principles of software project management

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

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

UNIT III : Workflows and Checkpoints of process
Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments.
Process Planning : Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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IT721OE : Full Stack Development
(Open Elective - II)

Pre-Requisites:

- Object Oriented Programming
- Web Technologies

Course Objectives:

1. Students will become familiar to implement fast, efficient, interactive and scalable web applications using run time environment provided by the full stack components.

Course Outcomes:

1. Understand Full stack components for developing web application.
2. Apply packages of NodeJS to work with Data, Files, Http Requests and Responses.
3. Use MongoDB data base for storing and processing huge data and connects with NodeJS application.
4. Design faster and effective single page applications using Express and Angular.
5. Create interactive user interfaces with react components.

UNIT –I : Introduction to Full Stack Development:

Understanding the Basic Web Development Framework- User, Browser, Webserver, Backend Services, Full Stack Components - Node.js, MongoDB, Express, React, Angular. Java Script Fundamentals, NodeJS- Understanding Node.js, Installing Node.js, Working with Node Packages, creating a Node.js Application, Understanding the Node.js Event Model, Adding Work to the Event Queue, Implementing Callbacks

UNIT –II : Node.js :

Working with JSON, Using the Buffer Module to Buffer Data, Using the Stream Module to Stream Data, Accessing the File System from Node.js- Opening, Closing, Writing, Reading Files and other File System Tasks. Implementing HTTP Services in Node.js- Processing URLs, Processing Query Strings and Form Parameters, Understanding Request, Response, and Server Objects, Implementing HTTP Clients and Servers in Node.js, Implementing HTTPS Servers and Clients. Using Additional Node.js Modules-Using the os Module, Using the util Module, Using the dns Module, Using the crypto Module.

UNIT –III : MongoDB :

Need of NoSQL, Understanding MongoDB, MongoDB Data Types, Planning Your Data Model, Building the MongoDB Environment, Administering User Accounts, Configuring Access Control, Administering Databases, Managing Collections, Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js, Understanding the Objects Used in the MongoDB Node.js Driver, Accessing and Manipulating Databases, Accessing and Manipulating Collections

UNIT – IV : Express and Angular :

Getting Started with Express, Configuring Routes, Using Requests Objects, Using Response Objects. Angular: importance of Angular, Understanding Angular, creating a Basic Angular Application, Angular Components, Expressions, Data Binding, Built-in Directives, Custom Directives, Implementing Angular Services in Web Applications

UNIT –V : React :

Need of React, Simple React Structure, The Virtual DOM, React Components, Introducing React Components, Creating Components in React, Data and Data Flow in React, Rendering and Life Cycle Methods in React, Working with forms in React, integrating third party libraries, Routing in React.

Suggested Readings :

1. Brad Dayley, Brendan Dayley, Caleb Dayley., Node.js, MongoDB and Angular Web Development, 2nd Edition, Addison-Wesley, 2019.
2. Mark Tielens Thomas, React in Action, 1st Edition, Manning Publications.

Reference Books :

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, Apress, 2019.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer ,1st edition, Apress, 2018.
3. Kirupa Chinnathambi, Learning React: A Hands-On Guide to Building Web Applications Using React and Redux, 2nd edition, Addison-Wesley Professional, 2018.

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IT722OE : Scripting Languages
(Open Elective - II)

Prerequisites :

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

Course Objectives:

1. This course introduces the script programming paradigm
2. Introduces scripting languages such as Perl, Ruby and TCL.
3. Learning TCL

Course Outcomes:

1. Comprehend the differences between typical scripting languages and typical system and application programming languages.
2. Gain knowledge of the strengths and weakness of Ruby
3. Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
4. Acquire programming g skills in Advanced Perl
5. Acquire programming g skills in TCL

UNIT - I : Introduction :

Ruby, Rails, The structure and Execution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and web services

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

UNIT - II : Extending Ruby :

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

UNIT - III : Introduction to PERL and Scripting

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

UNIT - IV : Advanced perl

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

UNIT - V : TCL :

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

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

Suggested Readings :

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

Reference Books :

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Leeand B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant,, O;Reilly, SPD
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J. P. Flynt, Cengage Learning.

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IT751PC: Information Security Lab

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To understand various key distribution and management schemes
3. To understand how to deploy encryption techniques to secure data in transit across data networks

Course Outcomes:

1. Demonstrate the knowledge of cryptography and implement basic algorithms.
2. Ability to apply public key cryptographic principles in system design.
3. Ability to identify and investigate various authentication based algorithms
4. Implement Rabin, Kerberos and Elgamal algorithms
5. Demonstrate Digital Certificates, PKI and MAC concepts

List of Experiments

1. Implementation of symmetric cipher algorithm (AES and RC4)
2. Random number generation using a subset of digits and alphabets.
3. Implementation of RSA based signature system
4. Implementation of Subset sum
5. Authenticating the given signature using the MD5 hash algorithm.
6. Implementation of Diffie-Hellman algorithm
7. Implementation of the ELGAMAL cryptosystem.
8. Implementation of Goldwasser-Micali probabilistic public key system
9. Implementation of Rabin Cryptosystem. (Optional).
10. Implementation of Kerberos cryptosystem
11. Implementation of a trusted secure web transaction.
12. Digital Certificates and Hybrid (ASSY/SY) encryption, PKI.
13. Message Authentication Codes.
14. Elliptic Curve cryptosystems (Optional)

Suggested Readings :

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

Reference Books :

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Principles of Information Security, Whitman, Thomson.

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IT752PC: Cloud Computing Lab

Course Objectives:

1. This course provides an insight into cloud computing
2. Topics covered include- distributed system models, different cloud service models, service oriented architectures, cloud programming and software environments, resource

Course Outcomes:

1. Understand various service types, delivery models and technologies of a cloud computing environment.
2. Understand the ways in which the cloud can be programmed and deployed.
3. Understand cloud service providers like Cloudsim, Globus Toolkit etc.
4. Examine various programming paradigms suitable to solve real world and scientific problems using cloud services.

List of Experiments:

1. Install Virtual box/VMware Workstation with different flavors of Linux or windows OS on top of windows 7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IP address with the instance.
4. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8. Install Hadoop single node cluster and run simple applications like word count.
9. Create a database instance in the cloud using Amazon RDS.
10. Create a database instance in the cloud using Google Cloud SQL

Suggested Readings :

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books / Learning Resources:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier,2012.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

Mahatma Gandhi Institute of Technology
B.Tech. in Information Technology
Scheme of Instructions and Examination
(Choice Based Credit System)
VIII SEMESTER

S. No	Course Code	Course Title	Instruction			Examination			Credits
			Hours Per Week			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MS801HS	Organizational Behavior	3	0	0	40	60	3	3
2		Professional Elective – VI	3	0	0	40	60	3	3
3		Open Elective – III	3	0	0	40	60	3	3
4	IT851PC	Project Stage – II including Seminar	0	0	22	40	60	3	11
Total Hours / Marks / Credits			**9**	**0**	**22**	**160**	**240**	**-**	**20**

Professional Elective – VI :

IT861PE	Web & Database Security
IT862PE	Digital Forensics
CS862PE	Distributed Systems
CS863PE	Deep Learning

Open Elective – III :

IT831OE	Introduction to Big Data Technologies
IT832OE	Introduction to Devops

B.Tech VIII Semester

L	T	P	C
3	0	0	3

MS801HS: ORGANIZATIONAL BEHAVIOUR
(*Common to CSE, IT & CSE (DS)*)

Course Objective: The objectives of the course are:

1. To understand the perception and attribution concepts in organizational and external environmental Context.
2. To discuss the concepts and theories of personality, attitudes and motivation.
3. To understand the decision making and communication process in interpersonal and their intrapersonal context.
4. To familiarize the students with the basic understanding of individual behavior and explore issues of power and empowerment.
5. To discuss the concepts of High performance, Learning and Leadership.

Course Outcomes: Upon the completion of the subject, the student will be able to

1. Analyze the concepts of perception and attribution of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
2. Acquire knowledge of personality and attitudes of individuals in applying motivational theories to resolve problems of employees.
3. Apply group dynamics and skills required for working in groups and identify the processes used in developing communication and decision making to overcome stress and conflicts.
4. Analyze organizational behavioral issues in the context of, power, and empowerment issues.
5. Acquire the knowledge of learning concepts and leadership styles to achieve high performance levels.

UNIT I: INTRODUCTION, PERCEPTION AND ATTRIBUTION

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organisational Behaviour.

Cognitive Process I: Perception and Attribution: Meaning of Perception, Nature and importance of Perception — Sensation versus Perception - Perceptual selectivity and organization – Social perception.

Attribution: Meaning - Attribution Theories – Fritz heider's theory of attribution; Jones & Davis correspondent inference theory; Kelley's Covariation Model; and Weiner's Three-Dimensional Model - Locus of control –Attribution Errors – Impression Management – Types - Strategies of Impression Management.

UNIT II: PERSONALITY, ATTITUDES AND MOTIVATION

Cognitive Process II: Personality and Attitudes - Personality as a continuum –Meaning of personality, Personality Traits - Johari Window and Transactional Analysis .Attitudes: Nature and Dimension of Attitudes - Job satisfaction and organizational commitment.

Motivation: Motivational needs and processes- Theories of Motivation– the content theories of motivation: Maslow's hierarchy of needs; Herzberg's two factor theory of motivation; Alderfer's ERG theory – The process theories of work motivation: Vroom's expectancy theory of motivation; the Porter-Lawler's model.

UNIT III: COMMUNICATION, DECISION-MAKING, STRESS AND CONFLICT

Dynamics of OB - I: Communication: Meaning and types - interactive communication in organizations – barriers to communication and strategies to improve the flow of communication.
Decision Making: Participative decision-making techniques – creativity and group decision making.
Dynamics of OB – II: Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict -strategies to cope with stress and conflict.

UNIT IV: POWER AND EMPOWERMENT

Dynamics of OB - III Power: Meaning - Types of power – Legitimate power, Coercive power, Expert power, Informal power and Referent power.
Empowerment – Benefits, Process, Determinants, Techniques of Empowerment; Groups vs. Teams –Nature of groups –dynamics of informal groups – Dysfunctions of groups and teams – Teams in modern work place.

UNIT V: HIGH PERFORMANCE, LEARNING AND LEADERSHIP

Leading High performance: Job design and Goal setting for High Performance - Quality of Work Life - Socio technical Design and High-performance work practices - Behavioural performance management.
Learning: Reinforcement and Punishment as principles of Learning – Process of Behavioural modification.
Leadership: Definition of leadership – Traits of effective leaders - Leadership behaviour Vs Traits – Leadership skills – Leadership theories: Trait theories; Behavioural theories; Contingency approaches to leadership, Leadership Styles: Autocratic Leadership style, Democratic Leadership style, Free rein Leadership style.

TEXT BOOKS:

1. Luthans, Fred, Organizational Behavior, McGraw-Hill, 10th Edition, 2009.
2. Robbins, P. Stephen, Timothy A. Judge, Organizational Behavior, PHI/Pearson, 18th Edition, 2022.
3. Pareek Udai, Behavioral Process at Work: Oxford & IBH, New Delhi, 2009.

REFERENCE BOOKS:

1. Schermerhorn, Organizational Behavior Wiley, 9th Edition, 2008.
2. Michael A Hitt, Organizational Behavior, Wiley, 2008.
3. Aswathappa, Organizational Behavior, Himalaya, 2009.

B.Tech VIII Semester

L	T	P	C
3	0	0	3

IT861PE : Web & Database Security
(Professional Elective – VI)

Course Objectives :

1. Give an Overview of information security
2. Give an overview of Access control of relational databases

Course Outcomes :

1. Understand the Web architecture and applications
2. Understand client side and service side programming
3. Understand the access control policies for database Security
4. Understand how common mistakes can be bypassed and exploit the application
5. Identify common application vulnerabilities

UNIT – I : Web Technology :
The Web Security Landscape: The Web Security Problem, Risk Analysis and Best Practices. **Cryptography and the Web :** Cryptography and Web Security, Working Cryptographic Systems and Protocols, Legal Restrictions on Cryptography.
Digital Identification I: Passwords, Biometrics, and Digital Signatures : Physical Identification-Computer-Based Identification Techniques, Using Public Keys for Identification , Real-World Public Key Examples : Document Author Identification Using PGP, Public Key Authentication Using SSH, **Digital Identification II:** Digital Certificates, CAs, and PKI : Understanding Digital Certificates with PGP, Certification Authorities: Third-Party Registrars, Public Key Infrastructure.
UNIT – II: Privacy and Security for Users :
The Web's War on Your Privacy : Understanding Privacy, User-Provided Information, Log Files, Understanding Cookies, Web Bugs
Privacy-Protecting Techniques: Choosing a Good Service Provider, Picking a Great Password, Sharing Passwords, Beware of Password Sniffers and Stealers, Cleaning Up After Yourself, Avoiding Spam and Junk Email, Identity Theft, Backups and Antitheft: Using Backups to Protect Your Data, Preventing Theft.
Web Server Security: Physical Security for Servers, Host Security for Servers, Securing Web Applications
UNIT – III: Database Security :
Recent Advances in Access Control, Access Control Models for XML, Database Issues in Trust Management and Trust Negotiation, Security in Data Warehouses and OLAP Systems
UNIT – IV: Security Re-engineering for Databases :
Concepts and Techniques, Database Watermarking for Copyright Protection, Trustworthy Records Retention, Damage Quarantine and Recovery in Data Processing Systems, Hippocratic Databases: Current Capabilities and Future Trends.
UNIT – V: Future Trends Privacy in Database Publishing :
A Bayesian Perspective, Privacy-enhanced Location based Access Control, Efficiently Enforcing The Security and Privacy Policies in a Mobile Environment
Suggested Readings :
1. Simson G Arfinkel, Gene Spafford, "Web Security, Privacy and Commerce",O'Reilly.
2. Michael Gertz, Sushil, "Handbook on Database security applications and trends",Jajodia

B.Tech VIII Semester

L	T	P	C
3	0	0	3

IT862PE : Digital Forensics
(Professional Elective – VI)

Prerequisite: Network Security

Course Objectives :

1. A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
2. In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime.
3. According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes.

Course Outcomes :

1. Understand the usage of computers in forensic and how to use various forensic tools for a wide variety of investigations.
2. Acquire the skills to implement Forensic Duplication
3. Analyze and validate the Forensic data
4. Ability to evaluate the Forensic Tools
5. Understand working with windows and DoS systems

UNIT – I : Introduction of Cybercrime :
Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology –Steps - Activities in Initial Response, Phase after detection of an incident
The Web user Interface: The Popularity of the Web, Characteristics of a Web Interface.
UNIT – II :
Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive
UNIT – III : Forensics analysis and validation:
Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions
Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.
UNIT – IV : Current Forensic tools :
Evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software
E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e- mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.
Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT – V : Working with Windows and DOS Systems :

Understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

Suggested Readings:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.

Reference Books:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

B.Tech VIII Semester

L	T	P	C
3	0	0	3

CS862PE: Distributed Systems
(Professional Elective - VI)
(Common to CSE, IT)

1. To learn the fundamentals of distributed systems, IPC mechanism in Distributed systems.
2. To provide an insight on Remote Procedure Calls, Distributed Shred Memory.
3. To examine state-of-the-art distributed systems, such as Google File System.

Course Objectives:

On successful completion of the course, the student should be able to:

1. Identify the core concepts of distributed systems, characteristics and models.
2. Understand how IPC works in distributed systems.
3. Analyze remote communication in a distributed environment.
4. Examine Distributed File System structure.
5. Know about Concurrency control mechanism and Distributed Shared Memory.

Course Outcomes:

UNIT-I:
Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web Challenges.
System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

UNIT-II:
Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Case Study: IPC in UNIX.

UNIT-III
Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

UNIT-IV
Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. Case Study: Google FS (GFS)/ Hadoop Distributed FS (HDFS), Bigtable / HBase Map Reduce

UNIT-V:
Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.
Distributed Shared Memory: Design and Implementation issues, Consistency models.

TEXT BOOKS:

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, Pearson Publication
2. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.

REFERENCE BOOKS:

1. Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshema kalyani and Mukesh Singhal, Cambridge, pp 2010.
2. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India
3. Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.
4. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge

B.Tech VIII Semester

L	T	P	C
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CS863PE: Deep Learning
(Professional Elective - VI)
(Common to CSE, IT, CSBS)

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feedforward networks, Gradient-based learning, Hidden Units, Architecture Design, Back-Propagation, and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization, and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Optimization Strategies and Meta-algorithms.

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXTBOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall

B.Tech VIII Semester

L	T	P	C
3	0	0	3

IT831OE : Introduction to Big Data Technologies
(Open Elective – III)

Course Objectives:

1. The purpose of this course is to provide the students with knowledge of Big data Analytics principles and techniques.
2. This course is also designed to give an exposure of the frontiers of Big data Analytics

Course Outcomes:

1. Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
2. Ability to program using HADOOP and Map reduce, NOSQL
3. Ability to understand the importance of Hive and Pig in analyzing the data
4. Understand how to install and configure Oozie and NoSQL data management
5. Learn to implement ZooKeeper and Sqoop

UNIT – I :

Getting an Overview of Big Data

Big Data, History of Data Management – Evolution of Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics, Careers in Big Data, Future of Big Data

Technologies for Handling Big Data

Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In Memory Computing Technology for Big Data.

UNIT – II :

Understanding Hadoop Ecosystem

Hadoop Ecosystem, Hadoop Distributed File System, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie

Understanding MapReduce Fundamentals and HBase

The MapReduce Framework, Techniques to Optimize MapReduce Jobs, Uses of MapReduce, Role of HBase in Big Data Processing

UNIT – III :

Exploring Hive

Introducing Hive, Getting Started with Hive, Data Types in Hive, Built- In Functions in Hive, Hive DDL, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive

Analyzing

Data with Pig

Introducing Pig, Running Pig, Getting Started with Pig Latin, Working with Operators in Pig, Working with Functions in Pig

UNIT – IV :

Using Oozie

Introducing Oozie, Installing and Configuring Oozie, Understanding the Oozie Workflow, Oozie Coordinator, Oozie Bundle, Oozie Parameterization with EL, Oozie Job Execution Model, Accessing Oozie, Oozie SLA

NoSQL Data Management

Introduction to NoSQL, Aggregate Data Models, Key Value Data Model, Document Databases, Relationships, Graph Databases, Schema- Less Databases, Materialized Views, Distribution Models, Sharding, MapReduce Partitioning and Combining, Composing MapReduce Calculations

UNIT – V :

ZooKeeper: Installing and Running ZooKeeper, An Example, Group Membership in ZooKeeper, Creating the Group, Joining a Group, Listing Members in a Group, The ZooKeeper Service, Data Model, Operations, Implementation, Consistency, Sessions, Building Applications with ZooKeeper, A Configuration, Service, The Resilient ZooKeeper Application, A Lock Service, More Distributed Data Structures and Protocols, ZooKeeper in Production

Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Generated Code, Imports: A Deeper Look, Working with Imported Data, Importing Large Objects, Performing an Export, Exports: A Deeper Look.

Suggested Readings :

1. Big data, black book, DreamTech Press, 2015
2. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

Reference Books :

1. Big Data Analytics, Seema Acharya, Subhashini Chellappan, Wiley 2015.
2. Simon Walkowiak, Big Data Analytics with R, Packt Publishing, ISBN: 9781786466457
3. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiley CIO Series, 2013.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

B.Tech in VIII Semester

L	T	P	C
3	0	0	3

IT832OE : Introduction to DevOps
(Open Elective – III)

Prerequisites :

1. Software Engineering
2. Software Project Management

Course Objectives:

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
3. Implement automated system update and DevOps lifecycle.

Course Outcomes:

1. Identify components of Devops environment.
2. Describe Software development models and architectures of DevOps.
3. Apply different project management, integration, testing and code deployment tool.
4. Investigate different DevOps Software development models.
5. Assess various Devops practices.
6. Collaborate and adopt Devops in real-time projects.

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

UNIT – II : Software development models and DevOps :
DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing. DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT – III : Introduction to project management:
The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT – IV : Integrating the system :
Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building

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

Suggested Readings :

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

Reference Books:

1. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications.
2. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley. by dependency order, Build phases, Alternative build servers, Collating quality measures.