COURSE STRUCTURE (R20)
AND
DETAILED SYLLABUS
(IV YEAR)

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

For
B.Tech., Four Year Degree Course
(Applicable for the batches admitted from 2020-21)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE,ECE, EEE & ME)
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSIT)

B. Tech IV-Year Course Structure and Syllabus –R20

IV Year - I Semester							
S. No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R20CIT-PE4101.1 R20CIT-PE4101.2 R20CIT-PE4101.3	**Professional Elective Courses-3** 1.Software Architecture& Design Patterns 2. Soft Computing 3. Software Project Management	PE	3	0	0	3
2	R20CIT-PE4102.1 R20CIT-PE4102.2 R20CIT-PE4102.3	**Professional Elective Courses-4** 1.Big Data Analytics 2.Cryptogrphy & Network Security 3.E-Commerce	PE	3	0	0	3
3	R20CIT-PE4103.1 R20CIT-PE4103.2 R20CIT-PE4103.3	**Professional Elective Courses-5** 1.Cloud Computing 2.Advanced Computer Architecture 3.Distributed Systems	PE	3	0	0	3
4	R20CIT-OE4104 R20CIT-OE4105 R20BSH-OE4105	**Open Elective Courses/ Job oriented Elective -3** 1.Human Computer Interaction 2.Advanced Java Programming 3.Fuzzy Set, Logics and Systems	OE	3	0	0	3
5	R20CSE-OE4102 R20MEC-OE4101 R20ECE-OE4107	**Open Elective Courses/ Job oriented Elective-4** 1.Scripting Languages 2. Robotics 3. Fundamentals of Mobile Communication	OE	3	0	0	3
6	R20BSH-HM4101	Universal Human Values 2: Understanding Harmony	HM	3	0	0	3
7	R20CIT-SC4101	**React JS Framework (Skill Oriented Course-5)**	SC	0	1	1	2
8	R20CIT-SI4101	Summer Internship-2 **(Evaluation)**	SI	0	0	0	3
			Total	**18**	**1**	**1**	**23**
Honors Course -4							
Track No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R20CIT-HN4101	Mobile Adhoc Networks (MANETs) (Track-1)	HC	**3**	**1**	0	4
2	R20CIT-HN4102	Vulnerability Assessment & Penetration Testing (Track -2)	HC	**3**	**1 1**	0	4
3	R20CIT-HN4103	Java Enterprise Framework (Track-3)	HC	**3**	**1**	0	4
4	R20CIT-HN4104	Deep Learning (Track-4)	HC	**3**	**1**	0	4
Minor Course-4							

IV Year - II Semester							
S. No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R20CIT-PJ4201	Project Work	**PJ**	**0**	**0**	**0**	**12**
Total				**0**	**0**	**0**	**12**

HONOR DEGREE IN COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Track-I (Networks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2201	Data Communication	HN	3	0	2	4
2	III-I	R20CIT-HN3101	TCP/IP Protocol Suite	HN	3	0	2	4
3	III-II	R20CIT-HN3201	Wireless Sensor Networks	HN	3	0	2	4
4	IV-I	R20CIT-HN4101	Mobile Adhoc Networks (MANETs)	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS01.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS01.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track- II (Cyber Security)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2202	Information Security	HN	3	0	2	4
2	III-I	R20CIT-HN3102	Secure Coding	HN	3	0	2	4
3	III-II	R20CIT-HN3202	Blockchain Technologies	HN	3	0	2	4
4	IV-I	R20CIT-HN4102	Vulnerability Assessment & Penetration Testing	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS02.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS02.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track III (Web Frameworks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2203	Web UI Framework	HN	3	0	2	4
2	III-I	R20CIT-HN3103	Angular Framework	HN	3	0	2	4
3	III-II	R20CIT-HN3203	.Net Framework	HN	3	0	2	4
4	IV-I	R20CIT-HN4103	J2EE Framework	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track IV (Data Science)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CIT-HN2204	Advanced Python Programming	HN	3	0	2	4
2	III-I	R20CIT-HN3104	Mathematical Essential For Data Science	HN	3	1	0	4
3	III-II	R20CIT-HN3204	Natural Language Processing	HN	3	0	2	4
4	IV-I	R20CIT-HN4104	Deep Learning	HN	3	0	2	4
5	II Year to IV Year	R20CIT-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CIT-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

IV Year-I Semester

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4101.1	Software Architecture And Design Pattern **(Professional Elective Course-3)**	3	0	0	3

Course Objectives:

- To understand interrelationships, principles and guidelines governing architectureand evolution over time.
- To understand various architectural styles of software systems.
- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

Course Outcomes:

- Understand the importance of Software architecture with various reference models and documenting architectures.
- Evaluation of architectures with appropriate decision making by system architecture.
- Analyze how problems can be solved using design patterns.
- Understanding about the structural design patterns.
- Analyze the case study of design pattern to solve complex problems.

UNIT-I:

Envisioning Architecture: The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

Creating and Architecture: Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Learning Outcomes: Students will be able to

- Understand the necessity of Architecture Business Cycle and importance of software architecture.(L1)
- Understand the software architecture with various reference models.(L1)
- Understand documenting the software architecture and analyze the quality attributes.(L2)

UNIT-II:

Analyzing Architectures: Architecture Evaluation, Architecture design decision making, ATAM, CBAM

Moving from One System to Many: Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Learning Outcomes: Students will be able to

- Understand Architecture evaluation.(L2)
- Understand different analysis models.(L2)
- Analyze architectural design decision making.(L3)
- Analyze how software architectures can be used in different software applications.(L3)

Applications: MVC architecture.

UNIT-III:

Patterns: Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.

Creational Patterns: Abstract factory, Builder, Factory method, Prototype, Singleton

Learning Outcomes:

Students will be able to

- Understand what is the use of design pattern.(L1)
- Analyze how problems can be solved using design pattern.(L3)
- Analyze how to use creational design patterns for different problems.(L3)
- Evaluate the product design can be independent or not.(L3)

Applications: Usage of MVC architecture for developing web applications.

UNIT-IV:

Structural Patterns: Adapter, Bridge, Composite, Decorator, Facade, Flyweight, PROXY.

Learning Outcomes: Students will be able to

- Understand the structure of design pattern(L2)
- Analyze how classes and objects are compared to form large structures.(L3)

Applications: The result is a class that combines the properties of its parent classes. This pattern is particularly useful for amking independently developed class libraries work together.

UNIT-V:

Behavioral Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state,strategy, template method, visitor.

Case Studies: A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in Interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

Learning Outcomes: Students will be able to

- Analyze responsibilities between objects of classes.(L3)
- Apply complex control flow in application.(L3)
- Analyze various dependencies between objects with resPEt to classes.(L3)

Applications: Quality of application can be observed in web and desktop applications.

TEXT BOOKS:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

Reference Books:

1. Software Architecture, David Kane and James R. Wilson, Prentice Hall, PTR,2001
2. Beyond Software Architecture, Luke Hohmann, Addison Wesley, 2003.
3. Software Design, David Budgen, second edition, Pearson education, 2003.
4. Head First Design Patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4101.2	Soft Computing **(Professional Elective Course-3)**	3	0	0	3

Course Objectives:

- To make the students to be familiar with the concept of classification techniques to solve real problems.
- To Familiarize with Soft computing concepts.
- To have a detailed study of neural networks, Fuzzy Logic and uses of Heuristics based on human experience.
- To introduce the concepts of genetic algorithm and its applications to soft computing using some applications
- To make the students to have general overview on selection and decision making strategies.

Course Outcomes:

- Understand the neural networks and architectures with directed graphs.
- Analyze the Learning Process of Soft Computing.
- Understand various Fuzzy sets.
- Apply Fuzzy logic to Real time problems.
- Analyze decision tree algorithms

Unit I:

Introduction: what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural

Learning Outcomes: Student will be able to

- Identify and describe soft computing techniques and their roles in building intelligent machines.(L1)
- Learn neural networks and architectures with directed graphs.(L2)

Unit II:

Learning Process: Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process.

Learning Outcomes: Student will be able to

- Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.(L2)
- Recognize the feasibility of applying a soft computing methodology for a particular problem.(L3)

Unit III:

Classical & Fuzzy Sets: Introduction to classical sets – properties, operations and relations; Fuzzy sets – memberships, uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.

Learning Outcomes: Student will be able to

- List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.(L2)
- Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic(L2)

Unit IV:

Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Learning Outcomes: Student will be able to

- Apply basics of Fuzzy logic and neural networks. (L3)
- Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.(L2)
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.(L3)

Unit V:

Decision Tree Learning: Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning

Learning Outcomes: Student will be able to

- Apply neural networks to pattern classification and regression problems.(L3)
- Effectively use existing software tools to solve real problems using a soft computing approach.(L3)
- To be able to solve Engineering problems using decision tree learning algorithms.(L3)

Text Books

1. Neural networks A comprehensive foundations, Simon Haykin, Pearson Education 2nd edition2004
2. Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis and Applications by Raja sekharan and Pai, PHI Publications
3. Machine Learning, Tom M. Mitchell, MGH

Reference Books:

1. Simon Haykin , "Neural Networks: A Comprehensive Foundation ", PHI Publication.
2. C. Eliasmith and CH. Anderson, "Neural Engineering ", PHI.
3. John Yen and Reza Langari , "Fuzzy Logic¨ Intelligence, Control and Information", Pearson Publication.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4101.3	Software Project Management **(Professional Elective Course-3)**	3	0	0	3

Course Objectives:

- Plan and manage projects at each stage of the software development life cycle (SDLC)
- Train software project managers and other individuals involved in software project planning and tracking.
- Understand successful software projects that support organization's strategic goals
- Provides an oversight in the implementation of the software project management process.

Course Outcomes:

1. Understand the various software management activities.
2. Understand the organization's strategic plans and business justification throughout project lifecycle.
3. Analyze project cost estimation and perform cost benefit evolution.
4. Evaluate outcomes of risk management plan.
5. Design framework for monitoring & control in Project Management.

Unit I:

Introduction Project Management: Software Project Management activities, Challenges in software projects, Stakeholders, Objectives & goals.

Project Planning: Step-wise planning, Project Scope, Project Products & deliverables, Project activities, Effort estimation, Infrastructure.

Learning Outcomes: Student will be able to

- Plan software projects, including risk and quality management.(L2)
- Recognize the importance of aligning the strategic direction of an
- organization with project selection.(L1)

Unit II:

Project Approach Lifecycle models, Choosing Technology, Prototyping Iterative & incremental Process Framework: Lifecycle phases, Process Artefacts, Process workflows.

Learning Outcomes: Student will be able to

- Analyze the software estimate using various technologies.(L3)
- Applying process models in required fields of project.(L2)
- Documenting software development project plans.(L2)

Unit III:

Effort estimation & activity Planning Estimation techniques, Function Point analysis, SLOC, COCOMO, Use case-based estimation , Activity Identification Approaches, Network planning models, Critical path analysis

Learning Outcomes: Student will be able to

- Estimate software development size, effort, and schedule for new program proposals or enhancements to existing programs(L3)
- Analyze the software estimate(L4)
- Develop metrics on a software development program(L3)

Unit IV:

Risk Management Risk categories, Identification, Assessment, Planning and management, PERT technique, Monte Carlo approach

Learning Outcomes: Student will be able to

- Assess and control risk engineering.(L3)
- Evaluate performance using PERT technique.(L4)

Unit V:

Project Monitoring & Control , Resource Allocation Creating a framework for monitoring & control, Progress monitoring, Cost monitoring, Earned value Analysis, Defects Tracking, Issues Tracking, Status reports, Types of Resources, Identifying resource requirements, Resource scheduling

Learning Outcomes: Student will be able to

- Manage cost and schedules.(L3)
- Manage both the technical and socio-cultural asPEts of the project.(L3)

Applications: For all software's.

Text Books

1. Software Project Management, Bob Hughes & Mike Cotterell, TATA Mcgraw-Hill
2. Software Project Management, Walker Royce: Pearson Education, 2005.
3. Software Project Management in practice, Pankaj Jalote, Pearson.

Reference Book:

1. Software Project Management, Joel Henry, Pearson Education.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4102.1	Big Data Analytics **(Professional Elective Course-4)**	**3**	**0**	**0**	**3**

Course Objectives:

- Optimize business decisions and create competitive advantage with Big Data analytics.
- Introducing Java concepts required for developing map reduce programs.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

Course Outcomes:

1. Understands data summarization, query, and analysis.
2. Applying data modelling techniques to large data sets.
3. Creating applications for Big Data analytics.
4. Creating a complete business data analytic solution.

UNIT-I

Data structures in Java: Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization

Learning Outcomes: **Student will be able to**

- Understands sets and maps.(L1)
- Understands Generic classes and wrapper classes.(L2)

UNIT-II

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

Learning Outcomes: **Student will be able to**

- Understand HDFS and its basic building blocks.(L1)
- Understand configuring Hadoop cluster and XML files.(L2)

UNIT III

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

Learning Outcomes: **Student will be able to**

- Understand and implement Hadoop I/O.(L1)

UNIT IV

Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner

Learning Outcomes: **Student will be able to**

- Understand HADOOP API for Map Reduce Framework (L1).
- Apply Map Reduce on application (L3).

UNIT-V

Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, going with the Pig Latin, Application Flow, Working through the ABCs of Pig Latin, Evaluating Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin , Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing

How the Hive isPut Together,Getting Started with Apache Hive, Examining the Hive Clients.

Learning Outcomes: **Student will be able to**

- Understand programming tools PIG & HIVE in Hadoop echo system.(L1)
- Creating a complete business data analytic solution.(L3)

TEXT BOOKS:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss

REFERENCE BOOKS:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

SOFTWARE LINKS:

1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4102.2	Cryptography & Network Security **(Professional Elective Course-4)**	3	0	0	3

Course Objectives:

- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers) are Introduced.
- Introduction to Public-key cryptography (RSA, discrete logarithms) is provided.
- Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes are learnt.
- An overview of e-mail and web security is provided.
- An overview of viruses, firewalls and system security is provided.

Course Outcomes:

- Understand the basics of Cryptography, the goals, services and mechanisms.
- Analyze the Symmetric Encryption Algorithms.
- Analyze the Asymmetric Cryptographic Algorithms.
- Understand the Digital signature Schemes.
- Understand the email security and system security.

UNIT- I:

Basic Principles Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography

Learning Outcomes: Student will be able to

- Understand what is meant by Cryptography.(L1)
- Understand the goals, mechanisms and services of Cryptography.(L1)

UNIT- II:

Symmetric Encryption Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

Learning Outcomes: Student will be able to

- Understand symmetric key Cryptography (L2)
- Analyze the various algorithms of Symmetric key Cryptography(L3)

UNIT- III:

Asymmetric Encryption Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

Learning Outcomes: Student will be able to

- Understand symmetric key Cryptography (L1)
- Analyze the various algorithms of Asymmetric key Cryptography(L2)

UNIT- IV:

Data Integrity, Digital Signature Schemes & Key Management Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

Learning Outcomes: Student will be able to

- Understand about Digital Signature and the security schemes.(L1)
- Understand the Hash functions and its importance.(L2)

UNIT -V:

Network Security: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, IPSec, System Security.

Learning Outcomes: Student will be able to

- Understand email-security.(L1)
- Understand the mechanisms of Transport Layer Security.(L1)

- Understand about system security.(L2)

Text Books:

1. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, (3e) Mc Graw Hill.
2. Cryptography and Network Security, William Stallings, (6e) Pearson.
3. Everyday Cryptography, Keith M.Martin, Oxford.

Reference Books:

1. Network Security and Cryptography, Bernard Meneges, Cengage Learning

Subject Code	Subject Name	L	T	P	C
R20CIT-PE41023	E-Commerce **(Professional Elective Course-4)**	3	0	0	3

COURSE OBJECTIVES:

- Discuss fundamentals of e-commerce, types and applications.
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business
- Identify the major management challenges for building and using information systems and learn how to find appropriate solutions to those challenges.
- Learn strategies for e-commerce, Mobile Commerce, Wireless Application Protocol, WAP technology and Mobile Information devices.

COURSE OUTCOMES:

1. Understand the basic concepts and technologies used in the field of management information systems.
2. Understand the processes of developing and implementing information systems.
3. Be aware of the ethical, social, and security issues of information systems and
4. Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.
5. Understand the role of information systems in organizations, the strategic management processes, and the implications for the management and learn about the importance of managing organizational change associated with information systems implementation.

Unit I:

INTRODUCTION: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Learning Outcomes: Student will be able to

- Understand the technology and basics of ecommerce.(L1)
- Learns different models of ecommerce.(L1)

Unit II:

NETWORK INFRASTRUCTURE FOR E- COMMERCE: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipment's, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Learning Outcomes: Student will be able to

- Understand ecommerce problems and its infrastructure.(L1)
- Analyse the difference between ecommerce and mobile commerce.(L2)

Unit III:

WEB SECURITY: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Learning Outcomes: Student will be able to

- Understands firewalls and security.(L2)
- Design the factors responsible for firewall.(L2)

Unit IV:

ENCRYPTION: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures.

Learning Outcomes: Student will be able to

- Understand the encryption techniques. (L2)
- Learns about difference between public and private network.(L2)

UNIT V:

ELECTRONIC PAYMENTS: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

Learning Outcomes: Student will be able to

- Analyse different applications.(L3)
- Learn the law, agreement and policies for ecommerce.(L2)

TEXT BOOKS:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison Wesley.

REFERENCE BOOKS:

1. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International
2. Goel, Ritendra “E-commerce”, New Age International
3. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
4. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
5. Turban, “Electronic Commerce 2004: A Managerial PersPEtive”, Pearson Education

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4103.1	Cloud Computing **(Professional Elective Course-5)**	3	0	0	3

Course Objectives:

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

Course Outcomes

1. Understand different computing paradigms
2. Understand the basics of cloud computing and different cloud deployment models.
3. Understand different cloud implementation and management strategies.
4. Understand different cloud service models.
5. Analyze and use different cloud services/applications/tools available from key cloud providers.

UNIT-I:

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

Learning Outcomes: **Student will be able to**

- Learns the various computing types.(L1)
- Understand the applications of computing types.(L1)

UNIT-II:

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

Learning Outcomes: student will be able to

- Learns the need of cloud computing.(L2)
- Learns the principles and models of cloud.(L2)

UNIT-III:

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

Learning Outcomes: **Student will be able to**

- Understands the architecture and layers of cloud.(L1)
- Learns the applications of cloud.(L2)

UNIT-IV:

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

Learning Outcomes: **Student will be able to**

- Learns different cloud service models.(L2)
- Understands the characteristics of cloud services.(L2)

UNIT-V:

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

Learning Outcomes: **Student will be able to**

- Analyze different cloud providers.(L3)
- Understand different applications of cloud.(L3)

Text Book:

1. Essentials of Cloud Computing, K. Chandrasekhran, CRC press.

Reference Books:

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

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4103.2	Advanced Computer Architecture **(Professional Elective Course-5)**	3	0	0	3

Course Objectives:

- To make students know about the Parallelism concepts in Programming
- To give the students an elaborate idea about the different memory systems and buses.
- To introduce the advanced processor architectures to the students.
- To make the students know about the importance of multiprocessor and multi-computers.
- To study about data flow computer architectures.

Course Outcomes:

1. Demonstrate concepts of parallelism in hardware/software.
2. Discuss memory organization and mapping techniques.
3. Describe architectural features of advanced processors.
4. Interpret performance of different pipelined processors.
5. Development of software to solve computationally intensive problems.

Unit – I

Design Space Exploration and Optimizations: Performance metrics and performance enhancement techniques, Basic concepts of parallel processing and pipelining, Power dissipation in processors, power metrics, and low-power design techniques.

Learning Outcomes: **Student will be able to**

- Learn basics of pipelining and parallel processing.(L2)
- Learns various processor design methods.(L2)

Unit – II

Instruction set architecture design: Instruction set design, implementation and performance Perspectives, relative advantages of RISC and CISC instruction set, Data Path Design

Learning Outcomes: **Student will be able to**

- Understands the design of instruction set .(L1)
- Analyzes the difference between RISC and CISC.(L2)

Unit – III

Instruction-level parallelism (ILP): Pipeline data-path, data-dependence. Challenges in ILP realization. Pipeline hazards and their solutions, out-of-order execution, branch prediction, and dynamic scheduling. VLIW and superscalar processors.

Learning Outcomes: student will be able to

- Understands the challenges of ILP.(L2)
- Analyzes various pipeline hazards.(L3)

Unit – IV

Memory systems: Overview of memory hierarchy, Cache design considerations, instruction vs. data caches, write-policy and replacement policy, analysis of cache performance, and cache design for performance enhancement.

Learning Outcomes: **Student will be able to**

- Learn cache design factors.(L2)
- Analyzes the performance and cache enhancement.(L3)

Unit - V

Memory hierarchy design- cache performance- reducing cache misses penalty and miss rate– virtual memory-protection and examples of VM. Flynn Processor classification.

Learning Outcomes: student will be able to

- Learn memory hierarchy and virtual memory.(L1)

- Understand the examples of virtual memory and processor taxanomy.(L2)

TEXT BOOK:

1. Computer Architecture A quantitative approach 3rd edition JohnL. Hennessy & DavidA. Patterson Morgan Kufmann (An Imprint of Elsevier)

REFERENCES:

1. "Computer Architecture and parallel Processing" Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, DezsoSima, TerenceFountain, Peter Kacsuk, Pearson.

Subject Code	Subject Name	L	T	P	C
R20CIT-PE4103.3	Distributed Systems **(Professional Elective Course-5)**	3	0	0	3

Course Objectives:

- Understand how systems will communicate through network and to understand the Architectural design of Distributed Systems.
- Understand and apply the various communication techniques and analyse the network
- IP address allocation.
- Understand the Local and Remote procedure calls between processes.
- Understand the role of operating Systems in Distributed Communication and the different technologies used for file sharing in Distributed Systems.
- Apply Distributed algorithms for communication and to understand the Distributed Deadlocks and Replication requirement.

Course Outcomes:

1. Understand the characteristics of Distributed architecture.
2. Apply inter process communication in a distributed environment.
3. Apply standard protocols (RMI& RPC) in distributed systems.
4. Understand the fundamentals of Distributed File systems.
5. Analyze the Transactions and replications in distributed systems.

Unit 1:

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.

Learning Outcomes: Student will be able to

- Outline the characteristics of file systems.(L2)
- Understand the challenges of system models.(L2)
- Understand the Design Requirements of Distributed Architecture.(L2)

Unit 2:

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, Reliability and Ordering of Multicast.

Learning Outcomes: Student will be able to

- Understand the Inter process communication. (L2)
- Apply the TCP stream communication.(L3)
- Outline IP Multicast and its ordering.(L2)

Unit 3:

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

Learning Outcomes: Student will be able to

- Understand the communication between objects.(L2)
- Apply Java RMI to different applications.(L3)
- Experiment with Remote Procedure call.(L3)

Unit 4:

Operating System Support: Introduction, The Operating System Layer, Protection, Processes and Threads –Address Space, Creation of a New Process, Threads.

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.

Learning Outcomes: Student will be able to

- Understand Operating system Layers.(L2)
- Illustrate the file server Architecture.(L2)
- Understand Peer to Peer Middleware Routing.(L2)

Unit 5:

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

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.

Learning Outcomes: Student will be able to

- Compare coordination and Agreement.(L2)
- Understand system Model and Group communication.(L2)
- Summarize the challenges of Replication.(L2)

Text Books:

1. Ajay D Kshemkalyani, MukeshSighal, "Distributed Computing, Principles, Algorithms and Systems",Cambridge
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, PearsonPublication

Reference Books

1. Distributed-Systems-Principles-Paradigms-Tanenbaum PHI

Subject Code	Subject Name	L	T	P	C
R20CIT-OE4104	Human Computer Interaction **(Open Elective/Job Oriented Course-3)**	3	0	0	3

Course Objectives:

- To get student to think constructively and analytically about how to design and evaluate interactive technologies.
- Describe the various styles and interactive devices in designing.
- Analyze the quality and different strategies in language processing.
- Study the design principles and guidelines of HCI.
- Apply different search patterns on data.

Course Outcomes:

1. Understand the capabilities of interactive systems.
2. Understand the human–computer interaction (HCI) models
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Understand HCI design principles, standards and guidelines.
5. Analyzed tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

Unit 1:

Introduction: Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession

Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

Learning Outcomes: Student will be able to

- Describe basic concepts of interactive systems.(L1)
- Analyse basic design and development methods.(L2)

Applications: useful for managing design process.

Unit 2:

Menu Selection, Form Fill-In and Dialog Boxes: Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays.

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

Learning Outcomes: Student will be able to

- Describe utilisation of menus &dialog boxes.(L1)
- Analyse the interactive devices.(L2)

Applications:

- useful for designing of menus & dialog boxes in newly developed user applications.

Unit 3:

Command and Natural Languages: Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing

Quality of Service: Introduction, Models of Response-Time impacts, ExPEtations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences

Learning Outcomes: Student will be able to

- Describe structure & strategies of natural language computing.(L2)
- Analyse working quality of designed applications.(L2)

Applications: useful for verifying quality of service by taking certain parameters.

Unit 4:

Balancing Function and Fashion: Introduction, Error Messages, Non anthropomorphic Design, Display Design, Web Page Design, Window Design, Color

User Documentation and Online Help: Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process.

Learning Outcomes: Student will be able to

- Analyse and design different web pages.(L3)
- Analyse documentation generation.(L3)

Applications: useful for designing of different pages,documentation for each application

Unit 5:

Information Search: Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

Learning Outcomes: Student will be able to

- Analysis of information search in textual documentation.(L3)

Applications: Easy to apply information search in all categories.

Text Books:

1. Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed,
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson
3. The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley Dreama Tech.

Reference Books:

1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, Soren Lauesen , PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley

Subject Code	Subject Name	L	T	P	C
R20CIT-OE4105	Advanced Java Programming **(Open Elective/Job Oriented Course-3)**	3	0	0	3

Course Objectives:

- Create GUI screens for stand alone applications.
- Understand the features of lambdas and streams.
- Understand the different driver specific database connections.
- Implement server-side programming using Servlets.
- Implement server-side programming using Java Server pages.

Course Outcomes:

1. Create GUI based applications using Panels and Components.
2. Analyze the collections using Lambdas and Streams.
3. Implement JDBC connections using java SQL packages.
4. Create Server Side programs for request-response handling using Servlets.
5. Apply JSP for server side tag implementation.

Unit 1:

GUI Programming: Basics of Swing, Swing Features, Components and Containers, Event Handling, Various Swing components, Writing Swing Application

Learning Outcomes: Student will be able to

- Understand the fundamentals of GUI programming. (L2)
- Understand components and panels for user interface. (L2)
- Create Stand-alone GUI components using Swing Components. (L4)

Unit 2:

Lambdas & Streams : Functional Interface, Lambda expressions, scope, streams-creation, collections, filtering, pipeline, lazy invocation, reduction, collect method

Learning Outcomes: Student will be able to

- Understand the functional interface and expressions. (L2).
- Apply streams and lambdas for data collectors. (L4).
- Create Filters and maps for generated collection data. (L4)

Unit 3:

Java database Programming: Basics of Java database, JDBC Architecture, Different Types of Drivers of JDBC, Establishing JDBC Database Connections, JDBC Statements, ResultSet Interface, RowSet interface, JDBC Batch Processing, exploring java.sql.*, javax.sql.*

Learning Outcomes: Student will be able to

- Understand fundamentals of SQL and its operations (L2)
- Create JDBC drivers for different database vendors. (L4)
- Implement JDBC connections for CRUD operations. (L4)

Unit 4:

Java Servlet Programming: Servlet: Basics of Servlet, Types of Servlet, Servlet Life Cycle, HTTP request, HTTP response, Servlet init parameters, ServletRequest, ServletConfig, ServletContext, Session Tracking, Database Handling

Learning Outcomes: Student will be able to

- Understand the life cycle of servlet. (L2)
- Implement HTTPRequest and response handling using HTTPServlet APIs. (L4)
- Implement Sessions and Cookies using servlet APIs. (L4)

Unit 5:

Java Server Pages (JSP): Basics of JSP, Life cycle of JSP, Scripting elements, Implicit Objects, Directive Elements, JSP actions: include and forward, Session Tracking, Page redirection, Database Handling

Learning Outcomes: Student will be able to

- Understand Life cycle of JSP over Servlet. (L2)
- Implement scripting elements of JSP in web pages. L4)
- Apply implicit objects and actions on server side APIs. (L4)

Text Books:

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book Paperback – 1 January 2009 by Kogent Learning Solutions Inc, Dreamtech Press; 1st edition.
2. Java for Web Development (English, Paperback, Vivek, Gupta Sarika, Agarwal), BPB Publications

Reference Books:

1. Java: How to Program, 9th Edition (Deitel) 9th Edition by Paul Deitel (Author), Harvey M. Deitel (Author).
2. Java 8 in Action: Lambdas, Streams, and functional-style programming Paperback, 2014 by Raoul-Gabriel Urma (Author), Mario Fusco (Author), Alan Mycroft (Author)

Subject Code	Subject Name	L	T	P	C
R20BSH-OE4105	Fuzzy Set, Logics and Systems **(Open Elective/Job Oriented Course-3)**	3	0	0	3

Course Objectives:

- To familiarize the concepts of fuzzy sets, operations and fuzzy relations.
- To enlighten the learner with the concepts of fuzzy logic.
- To analyze the models in uncertainty using Fuzzification and Defuzzification methods.

Course Outcomes:

After successful completion of the course, the students are able to

1. Apply the operations on fuzzy sets to uncertainty by assigning membership functions.(L3)
2. Understand the properties and characteristics of fuzzy relations and composition. (L2)
3. Find extrema of fuzzy functions. (L3)
4. Apply fuzzy logic to the inference system. (L3)
5. Apply Fuzzification and Defuzzification methods to the engineering problems. (L3)

Unit-I

Fuzzy Sets: Review on set theory and its operations, Membership function, characteristics of crisp set, fuzzy set, Type-n Fuzzy Set, Level-k fuzzy set, Relation between Universal Set and Fuzzy Set, α-cut set, Level set, Convex Fuzzy Set, Fuzzy Number, The Magnitude of Fuzzy Set, Subset of fuzzy set,

Operations of Fuzzy Set: Standard operations, Fuzzy complement, Fuzzy Partition, Fuzzy union, fuzzy intersection, other operations in fuzzy set, Difference in Fuzzy Set, Distance in Fuzzy Set.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of membership function and different types of fuzzy sets. (L2)
- Understand different operators on fuzzy sets. (L2)
- Apply the operations on fuzzy sets to uncertainty. (L3)

Unit II

Fuzzy Relation and Fuzzy Composition: Cartesian Product of Fuzzy Set, crisp relation, properties of relation on a single set, fuzzy relation, extension of fuzzy set, Fuzzy Graph, Characteristics of Fuzzy Relation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of fuzzy relations and their characteristics. (L2)
- Apply the concept of fuzzy relation to construct a fuzzy graph. (L3)

Unit III

Fuzzy Number: Concept of fuzzy number, operation on fuzzy number, Triangular fuzzy number.

Fuzzy Function: Fuzzy function, kinds of fuzzy function, Fuzzy extrema of function.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply Fuzzy operations on fuzzy number and triangular fuzzy number. (L3)
- Find extrema of fuzzy functions. (L3)

Unit IV

Fuzzy Logic: Review on Classical Logic, Fuzzy Expression, Fuzzy logic, Operators in Fuzzy Expression, linguistic variable, Fuzzy Predicate, Fuzzy truth quantifier, Representation of Fuzzy Rule.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain linguistic variables with different examples of membership function. (L2)
- Apply fuzzy logic to the inference system. (L3)

Unit V

Fuzzy Logic Systems (FLSs): Fuzzification, Defuzzification**,** Defuzzification Methods (Centre of gravity method and Mean of Maximum method), comparison between Fuzzification and Defuzzification, Fuzzy Logic Systems Architecture, Algorithm of a Fuzzy Logic System for solving real engineering problem, Application Areas of Fuzzy Logic systems in different fields, Advantages and Disadvantages of FLSs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand and compare Fuzzification and Defuzzification.(L3)
- Apply Fuzzification and Defuzzification methods to the engineering problems. (L3)

Text books

1. Kwang H.Lee, First Course on Fuzzy Theory and its Applications, Springer, 2005.

References

1. George. J. Klir, Bo Yuan, Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice-Hall of India Pvt Limited, 2008.
2. S.Rajasekharan, G.A.Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI, 2000
3. Timothy J.Ross, Fuzzy Logic with Engineering Applications, 3rd edition, John wiley & sons Ltd, 2004.
4. B.S Grewal, Higher Engineering Mathematics, 42nd edition, khanna publications, 2012.

Web Resources

1. https://archive.nptel.ac.in/courses/108/104/108104157/
2. https://www.google.com/search?q=fuzzy+logic+and+systems+video+lectures&e
3. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_fuzzy_logic_systems.htm
4. https://www.tutorialspoint.com/difference-between-fuzzification-and-defuzzification#:~:text=Fuzzification%20is%20the%20process%20of,member%20into%20a%20crisp%20member.&text=Fuzzification%20converts%20a%20precise%20data%20into%20imprecise%20data.

Subject Code	Subject Name	L	T	P	C
R20CSE-OE4102	Scripting Languages **(Open Elective/Job Oriented Course-4)**	3	0	0	3

Course Objectives:

- Understanding Linux Shell Scripting functionalities.
- Implementing TCL/TK scripting for network simulation.
- Understanding basic operations of perl programming.
- Working with Server side scripting through PHP Programming.
- Writing ruby scripts for building objects.

Course Outcomes:

1. Implementing Linux Shell Scripts for handling processes.
2. Implement TCL/TK Scripts for writing complex network simulations.
3. Understand basics of perl for running scripts dynamically.
4. Implementing server-side scripts for handling client requests.
5. Create simple ruby scripts for developing model objects.

Unit -I:

Shell Scripting: What is Scripting, Determining the shell, She-bang, Comment,Variables, Sourcing a File, Troubleshooting a Script, Prevent setuid root Spoofing, Executing Shell Script, Shell Script Parameters, Shell Shift Parameters, Shell Sourcing Config File, Shell Getopts Options, Loops, if then else,if then elif, for loop,while loop, until loop, Advance Shell, Function, case, eval, Let

Learning Outcomes: student will be able to

- Understand basics of Shell Scripting.(L2)
- Write Configuration file for running processes. (L4)
- Create advanced shell operations for controlling complex processes. (L4)

Unit -II:

TCL/Tk Scripting: Introduction to TCL/Tk, Execution of command, Arguments, Command & Backslash substitution, Expressions (expr), Flow control, Lists, Arrays, String manipulation, Regular expressions, Generating & parsing strings, Procedures - extending Tcl, eval, package, File I/O in Tcl, Treating errors, Script files.Tk Library: Tk widget commands, Tk widget set, Resource (options) management, Geometry managers, Bindings, Send command and Hypertools

Learning Outcomes: Student will be able to

- Understand the basic functionalities of TCL/TK Scripting. (L2).
- Implement Regular expressions for parsing different data formats.(L4).
- Implement TK Widget set for script files. (L4)

Unit -III:

Perl Scripting: Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

Learning Outcomes: Student will be able to

- Understand the basics of perl programming.(L2)
- Implement Data Processing using Perl regular expressions. L4)
- Understand Object oriented approach using perl classes. (L2)

Unit-IV:

Server Side Scripting: PHP introduction. Basic PHP Syntax, Comments in PHP, Variables, PHP Operators, Control Structures(If else, switch, all loops), Arrays, For Each Loop, Functions, Form Handling, PHP $_GET, PHP $_POST, PHP $_REQUEST, PHP date Function, PHP include File, File Handling, File Uploading, PHP Sessions, Sending Emails,

PHP Cookies, Working with databases.

Learning Outcomes: Student will be able to

- Understand the advantages of server-side scripting for handling requests. (L2)
- Create request-response scripting using sessions and cookies. (L4)
- Create database operations with PHP for secure data storage. (L4)

Unit -V:

Ruby Scripting: Data Types & Variables, String, Integer, Float, Boolean and Nil values, Properties of Ruby data types, Instance variables, Local & Global variables, Functions & Control Flow, Built-in functions, Creating your own functions, Passing arguments and returning values If/Else and Unless Statements, While/Until Loops, Ruby Data Structures Arrays, Hashes, Enumerators, Iterators, Classes, Creating classes, Inheritance, Class Methods, Overriding Methods

Learning Outcomes: Student will be able to

- Understand the fundamentals of Ruby scripts. (L2)
- Write functions for handling complex data structures. (L4)
- Create classes for introspecting real time objects. (L4)

Applications:

- Multimedia applications.
- Gaming and Monetisation.
- Web and Enterprise Applications.
- Web Scraping
- Data Science and Visualization.

Text Books:

1. Learning Perl – 8th Ed. Randal Schwartz, Tom Phoenix and Brain D Foy. 2021.
2. "Beginning PHP", Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi, Wiley Publishing, In feb 2005
3. The Ruby Programming Language: Everything You Need to Know by David Flanagan and Yukihiro Matsumoto .19 feb2008
4. Classic Shell Scripting by Arnold Robbins and Nelson H.F. Beebe .1st edition
5. Tcl and Tk Programming for the Absolute Beginner by Kurt Wall 2007 1st edition.

Reference Books:

1. Teach Yorself Perl in 21 days by David Till.
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, Sams Publishing.
3. PowerShell Cookbook: Your Complete Guide to Scripting the Ubiquitous Object-Based Shell by Lee Holmes.
4. Programming Perl: Unmatched power for text processing and scripting by Tom Christiansen, brian d foy, et al.

Subject Code	Subject Name	L	T	P	C
R20MEC-OE4101	Robotics **(Open Elective Courses/ Job Oriented Elective-4)**	3	0	0	3

Course Objectives: The objectives of this course are to

- Define the fundamental concepts of industrial robotic technology
- Apply the basic mathematics to calculate kinematic forces in robot manipulator
- Apply the basic mathematics to calculate dynamic forces in robot manipulator
- Understand the robot controlling and programming methods
- Illustrate concept of robot vision system

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

1. Explain fundamentals of Robots. (L2)
2. Apply kinematics and differential motions and velocities. (L3)
3. Demonstrate control of manipulators. (L2)
4. Understand robot vision. (L2)
5. Develop robot cell design and programming. (L3)

Unit –I

Fundamentals of Robots: Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis

Applications: welding , material handlingLearning outcomes:

At the end of this unit, the student will be able to

- Explain a robot and homogeneous transformations. (L2)
- Compare the types of robot manipulators based on applications.(L2)
- Outline the advantages, disadvantages and applications of robot. (L2)
- Explain the robot characteristics. (L2)

Unit –II

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg(D-H) representation of forward kinematic equations of robots, the inverse kinematic of robots, degeneracy and dexterity, simple problems with D-H representation.

Applications: pick and place robot, robot arm trajectory planning

Learning outcomes:

At the end of this unit, the student will be able to

- Evaluate D-H notations for simple robot manipulator.(L5)
- Identify the position of robot gripper within work volume. (L3)

Unit –III

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian

Applications: Material Handling Robot

Learning outcomes

At the end of this unit, the student will be able to

- Select Jacobian, Lagrange-Euler and Newton- Euler formations to solve manipulator dynamic problems. (L3)
- Explain the concepts of manipulator kinematics and dynamics. (L2)

Unit –IV

Control of Manipulators: Open- and close-loop control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

Applications: Welding robots, painting robots

Learning outcomes:

At the end of this unit, the student will be able to

- Explain the basic concepts of robot controlling systems. (L2)
- Outline PD and PID control schemes. (L2)
- Apply force control strategies to determine the forces in robot. (L3)
- Explain the force control and torque control techniques. (L2)

Unit –V

Robot Vision: Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision. Robot Cell **Design and Programming:** Robot cell layouts-Robot centred cell, In-line robot cell, considerations in work cell design, work cell control, inter locks, error detection, work cell controller methods of robot programming, WAIT, SIGNAL, and DELAY commands, Robotic languages, VAL system

Applications: Humanoid Robot

Learning outcomes:

At the end of this unit, the student will be able to

- Identify the components of robot vision system. (L3)
- Illustrate the industrial applications of robot vision system. (L2)
- List the various methods of robot programming. (L1)
- Design the robot cell for simple manufacturing system. (L6)
- Explain the concepts of work cell control, inter locks and error detection. (L2)

Text Books:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — Mc Graw Hill,
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India, 2005

References:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley-Interscience
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited
4. Mohsen shahinpoor, A robot Engineering text book, Harper & Row Publishers
5. John.J.Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley
6. K.S. FU, R.C. Gonzalez and C.S.G Lee, Robotics: Control, sensing, vision, and intelligence . Mc Graw Hill
7. Richard D. Klafter, Thomas Robotic Engineering an integrated approach, PHI publications

Subject code	Subject Name	L	T	P	C
R20ECE-OE4107	Fundamental of Mobile Communication **(Open Elective/Job Oriented Course-4)**	3	0	0	3

CourseObjectives:

- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

CourseOutcomes:

1. Interpret Wireless local area networks(WLAN): MAC design principles, 802.11 WIFI
2. Discuss fundamental challenges in mobile communications and potential Techniques in GSM
3. Demonstrate Mobile IPin Network layer
4. Elaborate TCP/IP Protocols and database issues
5. Illustrate different data delivery methods and synchronization protocols

UNITI

Mobile Communications: An Overview- Mobile Communication, mobile computing- novel applications and limitations, mobilecomputing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Mobile smart phones, Smart mobiles and systems, hand held pocket computers, Hand held devices, Smart systems, Limitations of mobile
devices.

Learning Outcomes: student will be able to

- Understands the mobile architecture. (L1)
- Learns the applications of smart phones and its limitations. (L2)

UNITII

GSM and other 2G Architectures: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication, IMT-20003G wireless communication standards, WCDMA 3G communication standards, CDMA 3G communication standards, Broad band wireless access, 4G networks, 5G Networks.

LearningOutcomes: student will be able to

- Understands the GSM architecture and communication(L1)
- Analyzes about different networks. (L2)

UNITIII

Mobile IP Network layer: IP and Mobile IP network layers: OSI layer functions, TCP/IP andInternetprotocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Adhoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network; Wireless sensor networks; sensor networkapplications.

LearningOutcomes: student will be able to

- Learns about Mobile IP and its layers. (L1)
- Learns the applications of MANETS. (L2)

UNITIV

Synchronization: Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependent specific rules for data synchronization, Personal information manager, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.

Learning Outcomes: student will be able to

- Learn the basic rules for synchronizing. (L2)
- Understands the mobile agents and application server. (L1)

UNITV

Mobile Wireless Short-Range Networks and Mobile Internet: Wireless networking and wirelessLAN, Wireless LAN (WLAN) architecture, IEEE 802.11protocol layers, Wireless applicationprotocol (WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transpor tLayer Security (WTLS), wireless transaction and session layers, wireless application environment.

LearningOutcomes: student will be able to

- Understands the WLAN architecture. (L1)
- Analyzes the layers and its services. (L3)

Text Books:

1. Mobile Computing, 2nd edition, Rajkamal, Oxford,2011
2. Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa RYavagal, McGraw Hill,2017

ReferenceBooks:

1. "Principles of Mobile Computing, "2nd Edition, UWE Hansmann, Lother Merk, Martin S.Nocklous,Thomas Stober, Springer.2003

Subject Code	Subject Name	L	T	P	C
R20BSH-HM3101	Universal Human Values-2:Understanding Harmony	3	0	0	3

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.(L3)
- Relate the harmony in the human being, family, society and nature/existence(L4)
- Outline and strengthening of self-reflection.(L2)
- Improvement of commitment and courage to act.(L5)
- Integrate the humanistic constitution and humanistic universal order.(L2)

Course Outcomes: At the end of the course, student will able to

1. Enriches the knowledge on need of Value Education. (L2)
2. Considerate Human being as the Co-existence of the Self and the Body.(L2)
3. Identify the basic unit of human interaction(L3)
4. Comprehend the harmony in the nature (L2)
5. Analyze and exploring Ethical Human Conduct.(L4)

UNIT-I :

Introduction to Value Education: Understanding Value Education- Self-exploration as the Process for Value Education- Continuous Happiness and Prosperity – Basic Human Aspirations- Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario.

Learning Outcomes:

- Apply Human values to balance their life and profession (L3)
- Identify and incorporate the levels of human values(L2)

Application:

- Natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT-II:

Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body-The Body as an Instrument of the Self -Understanding Harmony in the Self - Harmony of the Self with the Body.

Learning Outcomes:

- Distinguish physical facilities the self and body (L4)
- Related to proper upkeep of the body and practice them in their daily routine. (L2)

Application:

- Differentiate between prosperity and accumulation.
- Discuss program for ensuring health vs dealing with disease

UNIT-III:

Harmony in the Family and Society: Harmony in the Family –Basic Unit of Human Interaction - Values in Human-to-Human Relationship - 'Trust' – Foundational Value in Relationship-'Respect'–Right Evaluation -Understanding Harmony in the Society -Vision for the Universal Human Order.

Learning Outcomes:

- Interpreting Natural acceptance is always for living in harmony(L2)
- Exemplifying Right evaluation leads to fulfillment in relationship(L3)

Application:

- Reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc., Gratitude as a universal

value in relationships.

UNIT-IV:

Harmony in the Nature/Existence: Understanding Harmony in the Nature - Inter connectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence.

Learning Outcomes:

- Organizing Confident that they can understand the whole existence made appropriate and holistic.(L2)
- Differentiate between the characteristics and activities of different orders able to see the interconnectedness in the nature(L3)

Application:

- Human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V:

Implications of the Holistic Understanding – a Look at Professional Ethics : Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Competence in Professional Ethics - Holistic Technologies, Production Systems and Management Models.

Learning Outcomes:

- Present sustainable solutions to the problems in society and nature. (L2)
- Able to grasp the right utilization of their knowledge in their streams of Technologyto ensure mutual fulfilment.(L3)

Application:

- Discuss Exercises and Case Studies will be taken up in Practice

Text Book

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN978-93- 87034-47-1

Reference Books

1. JeevanVidya:EkP arichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, NewAge Intl.Publishers, NewDelhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth-by Mohandas Karamchand Gandhi
5. Small is Beautiful -E. FSchumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-J C Kumarappa
8. Bharat Mein Angreji Raj -Pandit Sunderlal
9. Rediscovering India- by Dharampal
10. Hind Swaraj o rIndian Home Rule-by Mohandas K.Gandhi
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland(English)

E-Resources:

1. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SAIC4003.pdf
2. https://gyansanchay.csjmu.ac.in/wp-content/uploads/2022/09/UHVE-2.0-Class-Notes-Part-1-of-4-1.pdf

Subject Code	Subject Name	L	T	P	C
R20CIT-SC4107	React JS Framework **(Skill Oriented Course-5)**	0	1	2	2

Course Objectives:

- Understand the anatomy of react java script framework.
- Understand the life cycle of React applications.
- Implement React components for interactive user interfaces.
- Create react hooks for component independence and reusability.
- Apply rendering methods on react components for encapsulating behaviour

Course Outcomes:

1. Understand the anatomy of React Java Script.
2. Understand the life cycle hooks of React JS.
3. Create React components for building applications.
4. Create React hooks for component reusability and monitoring.
5. Implement react rendering for interactive applications.

Unit 1:

React JS – Introduction to React JS, React vs Angular, React Version History, Anatomy of React Project, Creating and Running React App.

Templating using JSX: Expressions, Operators, Attributes, Fragments.

Learning Outcomes: Student will be able to

- Understand react framework for building applications.(L2)
- Understand the installations of react packages.(L2)
- Create templates in react applications. (L4)

Unit 2:

React Core: Props, State, Event Handling, Lists and Keys, Styling, React Life Cycle, Life cycle methods, Mounting Life Cycle,

Learning Outcomes: Student will be able to

- Understand event handling in React. (L2).
- Implement life cycle methods in react.(L4).
- Create props and states in building react apps.(L4)

Unit 3:

React Components: Pure Components, memo, Refs, Portals, Higher Order Components(HOC), Context, HTTP requests(POST & GET).

Learning Outcomes: Student will be able to

- Understand http request methods in handling end points. (L2)
- Create components to handle react requests. (L4)
- Create higher order components and refs in react .(L4)

Unit 4:

React Hooks: Introduction to Hooks, useState, useEffect, Run Effects, Fetching Data, useContext, useReducer, useCallBack, useMemo, useRef, Custom Hooks.

Learning Outcomes: Student will be able to

- Understand react hooks. (L2)
- Create hooks and custom methods for handling components. (L4)
- Implement context and callback methods in hooks. (L4)

Unit 5:

React Render: Introduction to Rendering, useState, useReducer, State Immutability, Parent & Child, Memo, Context, useCallBack.

Learning Outcomes: Student will be able to

- Understand the working react rendering. (L2)

- Implement userReducer and context for rendering react apps.. (L4)

APPLICATIONS:

- Online web applications
- Financial, banking applications and gateways etc
- Online and Social media applications

TEXT BOOKS:

1. React.js Book: Learning React JavaScript Library From Scratch by Greg Sidelnikov, Learning Curve.
2. React: Quickstart Step-By-Step Guide To Learning React Javascript Library (React.js, Reactjs, Learning React JS, React Javascript, React Programming) by Lionel Lopez

REFERENCE BOOKS:

1. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, 2nd Edition by Shama Hoque, Packt

IV B.Tech I Semester (Honors Courses)

Subject Code	Subject Name	L	T	P	C
R20CSE-HN3201	Mobile Adhoc Networks (MANETs) (Track-1)	3	1	0	4

Course Objectives:

- To understand the concepts of Ad Hoc Wireless Networks
- To understand the Data Transmission in MANETS
- To understand the MAC protocols for ad-hoc networks
- To understand and analyze the various routing protocols and model link cost
- Understanding security in Adhoc Networks

Course Outcomes:

1. Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
2. Discuss the challenges in designing MAC, routing, and transport protocols for wireless ad-hoc sensor networks
3. Understand the MAC Protocols for Ad Hoc Wireless Networks
4. Illustrate the various Routing Protocols And Transport Layer In Ad Hoc Wireless Networks
5. Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT- I

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology-based routing protocols, Position-based routing, and Other Routing Protocols.

Learning Outcomes: Students will be able to

- Understand the characteristics & Applications of the MANETs
- Understand various routing protocols in MANETS

UNIT-II

Data Transmission In MANETs: The Broadcast Storm, Multicasting, Geo casting

TCP over Ad Hoc Networks: TCP Protocol overview, TOP and MANETs, Solutions for TOP over Ad Hoc

Learning Outcomes: Students will be able to

- Understand the Data transmission and TCP Protocols over Adhoc Networks

UNIT- III

MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi-channel MAC - IEEE 802.11.

Learning Outcomes: Students will be able to

- Understand the Issues in designing the MAC for MANETS.
- Understand the MAC Protocols

UNIT- IV

Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Ad hoc networks, Classification, proactive routing, reactive routing (on demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer solutions-TCP over Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements.

Learning Outcomes: Students will be able to

- Understand various Routing protocols in Adhoc Networks.

UNIT- V

Security in Ad Hoc Networks: Introduction- Security Attacks, Intrusion Detection System, Intrusion Prevention System, Intrusion Response system, Wired Equivalent Privacy(WEP) - A Security Protocol for Wireless Local Area Networks (WLANs), Security in MANETs.

Learning Outcomes: Students will be able to

- Understand the Security system in Adhoc Networks

TEXTBOOKS

1. "Ad Hoc Wireless Networks: Architectures and Protocols ", C. Siva Ram Murthy, and B. S. Manoj, Pearson Education, 2008
2. Ad Hoc and Sensor Networks — Theory and Applications, Car/os Corderlo Dharma R Aggarwal, World Scientific Publications /Cambridge University Press, March 2006

REFERENCE BOOKS

1. “Ad Hoc & Sensor Networks: Theory and Applications”, 2nd edition, Carlos De Morais Cordeiro, Dharma Prakash Agrawal , World Scientific Publishing Company, 2011
2. Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
3. Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
4. Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
5. Wireless Ad hoc Networking, Shih-Liri Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007
6. Wireless Ad hoc and Sensor Networks — Protocols, Performance and Control, Jagannathan Sarangapani, CRC Press, Taylor & Francis Group, 2007, rp 2010.
7. Security in Ad hoc and Sensor Networks, Raheem Beyah, et al., World Scientific Publications / Cambridge University Press, 2010
8. Ad hoc Wireless Networks — A communication-theoretic perspective, Ozan K.Tonguz, Giatuigi Ferrari, Wiley India, 2006, rp2009.

Subject Code	Subject Name	L	T	P	C
R20CSE-HN3202	Vulnerability Assessment & Penetration Testing (Track-2)	3	1	0	4

Course Objectives:

- To Recognize various penetration testing phases and types.
- To identify security vulnerabilities and weaknesses in the target applications.
- To identify how security controls can be improved to prevent hackers gaining access to operating systems and networked environments.
- To identify various advanced hacking methods.
- To understand the impact of hacking in real time machines.

Course Outcomes:

1. Understand Penetration testing phases, types and techniques.
2. Analyze various social engineering attacks.
3. Understand System Hacking Techniques in real time applications
4. Analyze advanced system hacking methods and procedures,
5. Understand the techniques for Bypassing WLAN Authentication

UNIT-I:

Introduction-Penetration Testing phases/Testing Process, types and Techniques, Blue/Red Teaming, Strategies of Testing, Non Disclosure Agreement Checklist, Phases of hacking, Open-source/proprietary Pen test Methodologies.

Learning Outcomes: student will be able to

- Understand various testing procedures(L2).
- Analyze the steps of Testing Phases (L4).

UNIT -II –

Information Gathering and Scanning- Information gathering methodologies- Foot printing, Competitive Intelligence- DNS Enumerations- Social Engineering attacks, Port Scanning-Network Scanning- Vulnerability Scanning- NMAP scanning tool- OS Fingerprinting-Enumeration.

Learning Outcomes: student will be able to

- Analyze the information gathering methodologies.(L4)
- Understand the DNS enumerations (L2).
- Understand about various social engineering attacks (L2).
- Understand the scanning tools. (L2).

UNIT- III

System Hacking: Password cracking techniques- Key loggers- Escalating privileges- Hiding Files, Double Encoding, Steganography technologies and its Countermeasures. Active and passive sniffing- ARP Poisoning, MAC Flooding- SQL Injection - Error- based, Union-based, Time-based, Blind SQL, Out-of-band. Injection Prevention Techniques

Learning Outcomes: student will be able to

- Understand the file handling and steganographic techniques (L2).
- Analyse SQL injection prevention techniques. (L4).

UNIT- IV

Advanced System Hacking: Broken Authentication, Sensitive Data Exposure, XML External Entities, Broken Access Code, XSS - Stored, Reflected, DOM Based.

Learning Outcomes: student will be able to

- Understand the Authentication techniques. (L2).
- Understand the XSS stored and reflection methods.(L2)

UNIT -V

Wireless Pentest: Wi-Fi Authentication Modes, Bypassing WLAN Authentication, Types of Wireless Encryption, WLAN Encryption Flaws, AP Attack, Attacks on the WLAN Infrastructure, DoS-Layer1, Layer2, Layer 3, DDoS Attack, Client Misassociation, Wireless Hacking Methodology, Wireless Traffic Analysis.

Learning Outcomes: student will be able to

- Understand the WLAN Flaws and attacks.(L2)
- Analyze Wireless traffic analysis. (L4).

Text Books:

1. Kali Linux 2: Windows Penetration Testing, By Wolf Halton, Bo Weaver , June 2016 PacktPublishing

Reference Books:

1. Mastering Modern Web Penetration Testing By Prakhar Prasad, October 2016 PacktPublishing.
2. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication

Subject Code	Subject Name	L	T	P	C
R20CSE-HN3203	Java Enterprise Frame work (Track-3)	3	1	0	4

Course Objectives:

- Implement CRUD operations using Java APIs
- Understand server side environment using Servlets.
- Create server side web pages using Java Server Pages.
- Understand Object relational mapping using Hibernate.
- Write business logics using Spring MVC and AOP programming.

Course Outcomes:

1. Implement database operations from front end java APIs.
2. Write server side programs for controlling HTTP requests.
3. Create dynamic server side web pages using JSP tags.
4. Create Hibernate objects for mapping objects and database relations.
5. Create model based java objects for controlling server based applications.

Unit I:

Java Database Connectivity - JDBC Overview & Architecture, JDBC Driver Types, Types of ResultSet, Statement, PreparedStatement, CallableStatement, Executing DDL and DML Commands.

Learning Outcomes: Student will be able to

- Understand JDBC Drivers for connecting Database.(L2)
- Write complex queries for retrieving data from database.(L4)
- Create callable statements for executing database procedures. (L4)

Unit- II:

Servlets: Web Server, Container, Servlet Overview, Life cycle of Servlet, Handling Web Form Data in Servlets., Dynamically including Content in Servlets, Handling Exceptions in Web Applications, Reading and Setting Cookies, Session Tracking, Servlet Filters, Accessing Databases.

Learning Outcomes: Student will be able to

- Understand Web container for storing server side programs (L2).
- Implement Request and response handlers using Http libraries.(L4).
- Create Servlet for retrieving data from databases. (L4)

Unit III:

Java Server Pages: Overview of JSP, JSP Architecture & life cycle, Components of Java Server Pages, Implicit Objects & Standard JSP Tags, Scope of JSP objects, Dynamically including content in JSPs, Handling Form data in JSPs, Accessing Databases, Tag Libraries. **Learning Outcomes: S**tudent will be able to

- Understand the structure of JSP and its Life Cycle(L2)
- Create dynamic web pages using JSP tag libraries. L4)
- Implement JSP scope for switching between pages.(L4)

Unit -IV:

HIBERNATE: Introduction to Hibernate, Hibernate Architecture, Understanding Object Persistence, Hibernate Basics, Types of Relations, Querying Persistent Objects, Hibernate Query Language (HQL)

Learning Outcomes: Student will be able to

- Understand Hibernate Object relational mapping (L2)
- Create Hibernate objects for implementing relations between tables. (L4)
- Implement Hibernate queries for persisting java objects. (L4)

Unit V:

Spring Framework: Spring Architecture and Container, Spring Setup in Eclispe, Spring Bean Factory, Bean factory VS Application Context, Dependency Injection (DI), Types of DI, Bean Auto wiring, Collections with Spring, Bean Scopes, Event Handling in Spring, Introduction to Aspect Oriented Programming (AOP).

Learning Outcomes: Student will be able to

- Understand architecture of spring container. (L2)
- Implement dependency injection for setting data for beans. (L4)
- Create spring beans for handling events and aspects. (L4)

Applications:

- Building enterprise level applications like IRCTC.
- Building Financial, banking applications, gateways etc
- Online and Social media applications

Text Books:

1. JDBC, Servlets and JSP Black Book, by Kogent Solutions Inc. Santosh Kumar K, Dream tech Publications. 2nd Edition, 2016.
2. Java Servlet & JSP Cookbook by Bruce W. Perry Publisher(s): O'Reilly Media, 2004
3. Spring and Hibernate-2ed, by K. Santosh Kumar , McGraw-Hill Education

Reference Books:

1. Spring in Action, 4ed (Manning), by Craig Walls (Author) , Dream tech.
2. Java Persistence with Hibernate: Revised of Hibernate in Action, Dream tech, by Christian Bauer.

Subject Code	Subject Name	L	T	P	C
R20CSE-HN3204	Deep Learning (Track-4)	3	1	0	4

Course Objectives:

- To learn the techniques and principles of Machine Learning.
- To study the different models in deep learning
- To familiarize deep learning concepts with Convolutional Neural Network.

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

1. Illustrate basic concepts of machine learning.
2. Demonstrate the architecture of deep learning.
3. Outline the basics of Convolution Neural Networks (CNN).
4. Inspect basics of transfer learning.
5. Illustrate applications of deep learning

Unit-I:

Machine Learning Basics : Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants stochastic gradient decent, Curse of Dimensionality.

Learning Outcomes: Student will be able to

- Outline the basics of machine learning.
- Reproduce the algorithms of machine learning.

Unit-II:

Deep Learning Architectures : Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications

Learning Outcomes: Student will be able to

- Describe the various architectures of deep learning.
- Explain the training of neural networks.

Unit-III :

Convolutional Neural Networks : Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet - Applications

Learning Outcomes: Student will be able to

- Sketch the architecture of convolutional neural networks.
- Explain the popular CNN architectures.

Unit-IV:

Transfer Learning : Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet

Learning Outcomes: Student will be able to

- Illustrate the transfer learning techniques.
- Explain the different variants of CNN.

Unit-V:

Deep Learning -Applications : Large Scale deep learning, Computer Vision, Speech Recognition, Natural Language processing, Other Applications

Learning Outcomes: Student will be able to

- Demonstrate the applications of deep learning
- Explain applications of NLP

Text Books:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning", MIT Press,2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.
3. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018.

Reference Books:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz,Shai BenDavid, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.