

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
215511	DATA WAREHOUSING AND DATA MINING Major (Core) Theory		4
	<p>Course Outcomes: Learners will be able to:</p> <ul style="list-style-type: none"> • Understanding of Data Warehousing Concepts. • Design and implement a data warehouse schema, considering factor dimension hierarchies. • Explain the importance of metadata in data warehousing and develop strategies for managing metadata to support data governance and data lineage. • Understand and apply various data mining algorithms, such as classification, clustering and association rule mining. 		
Module 1	Overview And Concepts Data Warehousing:		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understand the basic concepts of data warehousing, including data warehouse architecture, components, and its role in decision support systems. • Design and implement a data warehouse schema, considering factors such as star schema, snowflake schema, and dimension hierarchies. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing. • Project planning and management, collecting the requirements. • Architectural Components, Infrastructure and metadata. • Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data Quality. 	
Module 2	Information Access And Delivery, Implementation, Maintenance and Data Mining		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understand Extract, Transform and Load processes from source systems, transform it for analysis, and load it into the data warehouse. • Integrate data from diverse sources into a organized and unified data warehouse, addressing issues related to data quality and consistency. • Define data mining and understand its role in extracting valuable patterns, trends, and insights from large datasets. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Information Access And Delivery: Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web. • Implementation And Maintenance: Physical design process, data warehouse deployment, growth and Maintenance. • Data Mining: Introduction Basics of data mining, related concepts, Data mining techniques. • Data Mining Algorithms: Classification, Clustering, Association rules. 	

Module 3	Web Mining and Visualizations		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Extracting useful information, patterns, and knowledge from web data. • Understand and apply various data mining algorithms, such as clustering, classification, regression, association rule mining, and anomaly detection. • Exploring and pre process data for mining, including handling missing values, and transforming variables for better analysis. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Knowledge Discovery: KDD Process • Web Mining: Web Content Mining, Web Structure Mining, Web Usage mining. • Advanced Topics: Spatial mining, Temporal mining. <p>Visualisation : Data generalization and summarization-based characterization, Analytical characterization : analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining Descriptive statistical measure sing large databases</p>	
Module 4	Data Mining Primitives, Languages, and System Architecture, Applications and Trends in Data Mining		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Analyse popular data mining tools and software to implement and experiment with different algorithms and techniques. • Identify and implement strategies for the performance of data warehouse queries, including indexing, partitioning Exploring the different Trends and application in data mining 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Data Mining Primitives, Languages, and System Architectures: Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems • Application and Trends in Data Mining: Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining 	
Assignments/ Activities			
	<p>These assignments aim to apply theoretical concepts to practical application and critical thinking.</p> <ul style="list-style-type: none"> • Discuss the importance of metadata in data warehousing, to create a metadata management plan for a given data warehouse, outlining how metadata will be collected, stored, and utilized. • From a dataset extract relevant information, transform it according to a predefined business rule, and load it into a data warehouse. • Create a set of business queries related to a hypothetical business problem • Find a dataset suitable for clustering analysis. then use clustering algorithms to identify natural groupings within the data and interpret the results. 		

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| | <ul style="list-style-type: none">• web mining project (perform web scraping, and apply web mining techniques) | |
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Bibliography:

Ponnian, Paulraj. *Data Warehousing Fundamentals*. John Wiley.

Dunham, M. H. *Data Mining: Introductory and Advanced Topics*. Pearson Education.

Han, Jiawei, and Micheline Kamber. *Data Mining: Concepts and Techniques*. Morgan Kaufmann.

Kimball, Ralph. *The Data Warehouse Lifecycle Toolkit*. John Wiley.

Berry, Michael, and Gordon Linoff. *Mastering Data Mining*. John Wiley.

Inmon, W. H. *Building the Data Warehouse*. Wiley Dreamtech.

Mallach, E. G. *Decision Support and Data Warehouse Systems*. TMH.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
215512	Database Management Systems Major (Core)		4
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> Understand fundamental concepts, overview and structure of database system. Design database and analyse using E-R and Relational Model. Implement and manage database with proficiency in SQL. Understand transaction and implement recovery techniques. Get information of object oriented and NoSQL databases. 		
Module 1	Introduction to Database model		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Understand core concept of database system Design and synthesized E-R model and Relational model 	Module Contents: <ul style="list-style-type: none"> Introduction: Database System application, Database System versus File systems, View of Data, Data Models, Database Languages, Database Users and administrator. DBA Roles and activity, Database system structure. Entity-Relational Model: Basic Concepts ,Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features, Design of E-R Database Schema, Reduction of an E-R Schema to Tables Relational model: Structure of Relational Databases, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus 	
Module 2	SQL and Database Design		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Write and understand SQL commands with application of constraints in different scenarios. Understand the concept of PL/SQL and Triggers Demonstrate decomposition of databases and normalizing data using normalization 	Module Contents: <ul style="list-style-type: none"> SQL: SQL commands , Functions, Data Constraints, Grouping Data, Sub-queries, Joins, Performance Tuning, Security Management ,PL/SQL, Triggers. Integrity & Security: Domain Constraints, Referential Integrity, Assertions, Triggers, Privileges in SQL. Relational Database Design: Functional Dependencies, Decomposition, Normalization-1NF-5NF,BCNF 	

Module 3	Storage and Transactions		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understand concept of RAID • Analyze the concept of hashing and indexing • Demonstrate the concept of transactions 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Storage & File Structure :RAID , Improvement of Reliability & Performance Indexing & Hashing – Basic Concepts, Ordered Indices, B+ & B Tree Index Files, Static & Dynamic Hashing, Comparison of Ordered Indexing & Hashing. • Transactions: Transaction Concept & State, Implementation of Atomicity & Durability, Serializability, Recoverability, Testing for Serializability. 	
Module 4	Concurrency control and Recovery system		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Compare and implement concurrency control protocol • Classify failure in database system and implement recovery techniques. • Understand and analyze object oriented Databases • Evaluate NoSQL databases. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Concurrency Control: Protocols-Lock Based, Timestamp-based, Validation Based, Deadlock Handling & Concurrency • Recovery System: Failure Classification, Storage Structure, Recovery & Atomicity, Log based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer management, failure with loss of non volatile storage, advanced recovery techniques. • Object-Oriented Databases: New Database Applications, Object-Oriented Data Model, Object-Oriented Languages, Persistent Programming Languages, Persistent C++Systems. • Introduction, Overview of NoSQL Databases–Four Types of NoSQL (Document-oriented, Key Value Pairs, Column-oriented and Graph). 	
Assignments/ Activities towards CCE			
	<ul style="list-style-type: none"> • Design database schema and E-R diagram for real-time/given scenario. • Store and manipulate the information for given schema using SQL. • Demonstrate the concept of constraints • Demonstration of Indexing and Hashing 		

	<ul style="list-style-type: none"> • Implement the concept of Transaction and Recovery system using real-time/given schema. • Implement concurrency control protocol. • Demonstrate the concept of object-oriented database and NoSQL databases. 	
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Bibliography:

Korth, Henry, Abraham Silberschatz, and S. Sudarshan. *Database System Concepts*. 5th Edition. McGraw-Hill.

Elmasri, Ramez, and Shamkant B. Navathe. *Fundamentals of Database Systems*. 3rd Edition. Pearson Education India, 2008.

Ramakrishnan, Raghu, and Johannes Gehrke. *Database Management Systems*. McGraw-Hill International Edition, 2002.

Hoffer, Jeffrey A., Mary Prescott, and Fred McFadden. *Modern Database Management*. 7th Edition. Prentice Hall, 2004.

Rob, Peter, and Carlos Coronel. *Database Systems: Design, Implementation and Management*. Thomson Publication, 2004.

Kroenke, David M. *Database Processing: Fundamentals, Design, Implementation*. 10th Edition. Prentice-Hall, 2005.

O'Neil, Patrick. *Database Principles Programming Performance*. 2nd Edition. Morgan Kaufmann Publishers, Inc., 2000.

Urman, Scott. *Oracle8i PL/SQL Programming*.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
215513	Web Technology Theory Major(Core)		2
	<p>Course Outcomes: Learners will be able to:</p> <ul style="list-style-type: none"> • Design and implement HTML forms with various input elements, understanding form validation and user interaction. • Develop responsive web pages using HTML and CSS to ensure optimal viewing experience across different devices and screen sizes • Demonstrate the configuration and administration of a web server. Discuss the concept of virtual hosting and its implementation. 		
Module 1	Web technology and scripting Languages		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understand overview of HTTP, covering its basics, client requests, server responses, and common HTTP headers. Discuss the significance of persistent connections and cookies in session management. • Create well-formed and valid XML documents. Define Document Type Definitions (DTD) and explore the Document Object Model (DOM) in XML. • Develop dynamic and interactive web pages using JavaScript, including the use of variables, functions, loops, and conditional statements. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Introduction to Web Technologies: Concepts of Internet, Concepts of World Wide Web, Internet based Services- Email, Telnet, FTP, WWW, Web Server, Web Hosting, DNS, SMTP. • HTML: Introduction to HTML, Structure of HTML document, Basic HTML tags. Introduction to HTML5. • Angular JS: Environment Setup, Creating and executing angular js application, directives, controllers, expressions, filters, tables, modules, forms, views, scopes, services. • CSS: Introduction to CSS, Types of CSS- use of <div>& in CSS, Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns. • XML: Introduction to XML, Valid and Well- Defined Document, Document Type Definition or DTD, uses of DTD, XML Tags, Elements, Attributes, PCDATA, CDATA, XML Schema, Defining, Accessing XML Document. • Client Side Scripting Language: Javascript: Introduction to javascript, Variables, identifiers constants, Operators in javascripts, , Eventhandling javascript, 	

		Validations inJavaScript.	
Module 2	Server side scripting		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understanding Structure • Understand the role of server-side scripting in web development. Compare various server-side scripting languages and their use cases. • Implement server-side scripts using PHP to handle server-side logic, database interactions, and dynamic content generation. • 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Structure ofHTMLDocument – Meta tags, <p>JQuery:</p> <ul style="list-style-type: none"> • Introduction to JQuery, Selectors, attributes, Traversing, CSS, DOM, Events, AJAX, Effects, Interactions, Widgets,Theming. • Server Side Scripting Language: PHP Configuration and Installation, Basic Structure of PHP script COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL. CMS: Wordpress • Introduction to CGI Programming, JSP, Servlet, AJAX. Creation of .jar project. Deployment of Java application on Appserver. 	
Assignments/ Activities			
	<p>These assignments aim to apply theoretical concepts to practical application and critical thinking.</p> <ul style="list-style-type: none"> • Creating an HTML document that includes various elements such as meta tags, links, text, lists, tables, and multimedia content. Apply styles, alignment, fonts, and frames to present the HTML document effectively. • Create well-formed and valid XML documents. Define Document Type Definitions and explore the Document Object Model in XML. • Develop a thread-safe servlet that can handle multiple concurrent requests. Discuss the challenges associated with thread safety in servlets. • Assign a project where students integrate various technologies covered in the course to develop a complete web application. This could include HTML, client-side scripting, server-side scripting, and deployment on Apache Tomcat. 		

Bibliography:

Duckett, Jon. *Beginning Web Programming with HTML, XHTML, CSS & JavaScript*. Wrox.

Spainhour, Stephen. *Webmaster in a Nutshell*. O'Reilly and Associates.

Flanagan, David. *JavaScript: The Definitive Guide*. O'Reilly and Associates.

Buser, David, et al. *Beginning ASP 3.0*. Wrox.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
215524	Database Management system Lab: Practical Major (Core)		2
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> • Create and managing databases using database management system(like oracle, MySQL etc) • Write and execute SQL queries efficiently. • Create and execute Triggers, procedures etc. • Implement transaction management. 		
Module 1	Creating Databases		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Implement Database schema with constraints. • Evaluate Normalization, Joining and different clauses. 	Module Contents: <ul style="list-style-type: none"> • Database, Table Creation • Defining Schema, Constraints, Normalization • SQL Basic Queries • Joining, and Clause's implementation 	
Module 2	Procedure , Functions and Triggers		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Evaluate execution of procedures, function, trigger, cursor and function etc • Illustrate concept of PL/SQL 	Module Contents: <ul style="list-style-type: none"> • Procedure, Function execution • PLSQL Script Execution • Stored Procedure, Function, Packages Execution • Cursor, Trigger Writing 	
Assignments/ Activities towards Comprehensive Continuous Evaluation			
	<ul style="list-style-type: none"> • Evaluate different database schemas with SQL commands • Illustrate the concept of normalization , SQL joins using different clauses. • Evaluate execution of Function, Trigger, Procedure etc 		

Bibliography

Loney, Kevin, and George Koch. *Oracle 8i: The Complete Reference*.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
215525	Web Technology Lab: Practical Major (Core)		2
	<p>Course Outcomes: Learners will be able to:</p> <ul style="list-style-type: none"> • Understand basic to advance concept of web technology like frontend, database and backend like PHP. • Illustrate the PHP language. • Evaluate and Illustrate different web features. • Understand different web services with MVC architecture. 		
Module 1	Introduction to Web Technology		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Explore the concept of HTML, CSS and JavaScript. • Illustrate the concept of MySQL and PHP. • Analyse server side scripting language PHP. • Install and use Xampp web server. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Introduction to Web Technology, HTML, Basic Tags, CSS, Table and Forms • Introduction to JavaScript, Variables, Operators, Data Type Conversions, functions, Control Structure, Date-Time functions and Form Manipulation • MYSQL – Introduction about Database, Data Types, DML, DDL, Aggregate functions, Data Time functions, Stored Procedure, Sub query and join • PHP-Introduction to PHP, History, Web Brower, Web Server, Xampp, Installation and Configuration files. • Syntax, Operators, Variables, Constants, Control, Structure, Language construct and functions • Function–Syntax, Arguments, Variables, References, Returns and Variable Scope • Arrays-Enumerated Arrays, Associative array, array iteration, Multi-dimensional array, Array function and SPL Date and Time functions. Arrays-Enumerated Arrays, Associative array, array iteration, Multi-dimensional array, Array function and SPL Date and Time functions. • OOP’s–Instantiation, Modifiers, Inheritance, Interfaces, Exceptions, Static Methods and Properties, Auto load, Reflection, 	

		Type Hinting and Class Constance.	
Module 2	Features of Web Technology		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Understand different web features like sessions and forms, cookies etc. • Analyze the Ajax concept from basic. • Demonstrate and use Joomla. • Explore the MVC architecture and web services related to cakePHP. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • String and Patterns-Quoting, Matching, Extracting, Searching, Replacing and Formatting • Web Features-Sessions, Forms, GET and POST data, Cookies, HTTP Headers. Database Programming. • Streams and Network Programming- Files, Reading, Writing, File System functions, Streams File Uploading and File Downloading. • Ajax Basics, Sending data to PHP with Ajax, Prototype- Utility functions, Ajax object and Form Object. Smarty variables, Variable Modifiers, Built-in Functions, custom functions, Config files. • Introduction to Joomla • CakePHP - MVC Overview, Naming Conversions, Model, V\view, Controller, Helpers, Scaffolding an Data Validation, Security, Web Services 	
Assignments/ Activities towards Comprehensive Continuous Evaluation			
	<ul style="list-style-type: none"> • Design and develop web pages using HTML and CSS. • Implement concepts of HTML and CSS for frontend development. • Illustrate the concept of JavaScript for web development. • Add the feature of database to website to store data using MySQL framework. • Implement backend of web development using PHP server side scripting language. • Illustrate different web services using all web technologies using Xampp server and Ajax . • Demonstrate the web development using Joomla. • Understand the working of CakePHP with MVC architecture and web services provided by it. 		

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Godbole, Achyut S., and Atul Kahate. *Web Technologies.* Tata McGraw Hill.

Powel, Thomas A. *PHP: The Complete Reference.*

Powel, Thomas A. *AJAX: The Complete Reference.*

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
225511	Ethical Hacking Major (Elective) Theory		4
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> Understand the core concepts related to malware, hardware and software vulnerabilities and their causes. Understand ethics behind hacking and vulnerability disclosure. Appreciate the Cyber Laws and impact of hacking. Exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies. 		
Module 1	Introduction to Ethical Disclosure:		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Define and understand fundamental concept of Ethical hacking. Understand ethics of hacking Comprehend legal surrounding of ethical hacking. Apply protocols for proper and ethical disclosure of security vulnerabilities. 	Module Contents: <ul style="list-style-type: none"> Ethics of Ethical Hacking, Ethical Hacking And the legal system, Proper and Ethical Disclosure 	
Module 2	Penetration Testing and Tools		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Used Penetration testing tool efficiently. Develop skills using Metasploit which is penetration testing tool with demonstration of BackTrack. 	Module Contents: <ul style="list-style-type: none"> Using Metasploit, Using BackTrack Live CDLinux Distribution. 	
Module 3	Vulnerability Analysis and Client-side browser exploits		1
	LOs: <ul style="list-style-type: none"> Understand and differentiate different vulnerability analysis technique. Develop expertise in advanced reverse engineering methodologies Apply Sulley's Intelligent fuzzing technique to find exploit weaknesses. 	Module Contents: <ul style="list-style-type: none"> Vulnerability Analysis: Passive Analysis, Advanced Static Analysis with IDA Pro, Advanced Reverse Engineering. Client-side browser exploits: Exploiting Windows Access Control Model for Local Elevation Privilege, Intelligent Fuzzing with 	

		Sulley, From Vulnerability to Exploit.	
Module 4	Malware Analysis		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Understand Fundamentals of malware • Define the Hacking malware. • Describe way to collect and analyse the malware • Illustrate the case study 	Module Contents: <ul style="list-style-type: none"> • Malware Analysis: Collecting Malware and Initial Analysis, Hacking Malware. • Case study of vulnerability of cloud platforms and mobile platforms & devices 	
Assignments/ Activities towards CCE			
	<ul style="list-style-type: none"> • Consider given/ real-time security scenario. • Apply the penetration testing using penetration tool • Perform vulnerability analysis on scenario. • Check for client side browsing exploits using Sulley's Intelligent fuzzing. • Perform malware analysis by collecting and analysing malware. • Explore case study. 		

Bibliography:

Harris, Shon, Allen Harper, Chris Eagle, and Jonathan Ness.

Gray Hat Hacking: The Ethical Hackers Handbook. TMH Edition.

Erickson, Jon. *Hacking: The Art of Exploitation.* SPD.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
225512	PROJECT MANAGEMENT Elective Theory		4
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> • Understanding Project Management Fundamental concepts. • Develop skills in creating project plans, Identify, assess, and manage project risks by developing risk management plans. • Explore software testing methodologies and quality assurance practices to ensure the reliability and functionality of software deliverables. • Define and implement configuration identification processes and version control systems to manage changes and track the evolution of software throughout the project. 		
Module 1	Project Management Framework		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Understanding fundamental project management concepts, including project scope and objectives. • Define different project life cycle models (e.g., Waterfall, Agile, Iterative) and understand when to apply each based on project requirements. • Identify the software scope statement for better estimates of cost and schedule. 	Module Contents: <ul style="list-style-type: none"> • Overview of project Management, Project Organization, Planning a s/w project, Project management life cycle, Risk management, Identification of Risks, Risk Analysis, Risk Planning & Monitoring • S/w Project Estimation: Project Estimation , Different methods of estimation (COCOMO model, Delphi cost estimation etc.), Function point analysis 	
Module 2	Project Management Tools, Techniques and Software Management, Testing & Quality Assurance		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Apply techniques for gathering, analyzing, and managing software requirements, ensuring clarity, completeness, and alignment with end users needs. • Understand the fundamentals of software testing, its goals, and its role in ensuring the quality of software products. • Understand the principles and objectives of quality assurance in software development, 	Module Contents: <ul style="list-style-type: none"> • Project Management Tools & Techniques PERT & Gantt Charts, Introduction to Microsoft Project • Software Quality Management & Testing • Quality Assurance & Standards, Quality Planning, Quality control Role of testing in Software development , Testing Procedure, Defect Management 	

	emphasizing prevention over detection.		
Module 3	Configuration Management(CM):		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Define and implement configuration identification processes and version control systems to manage changes and track the evolution of software throughout the project. 	Module Contents: <ul style="list-style-type: none"> CM planning, Change Management, Version and Release Management, Configuration Management 	
Module 4	S/W Team Management:		1
	LOs: Learners will be able to <ul style="list-style-type: none"> Understand role of Team and the user in various software management stages. Analyse the Team structure, behaviour and role of team and end user. 	Module Contents: <ul style="list-style-type: none"> S/W Team Management: Characteristics of Performance management, High performance Directive and collaborative styles, Team Structure, Team Communication, Managing customer expectations, Group Behaviour Role of User in Projects, User role in project management, User role in various stages of, S/W Development User role in System ,implementation. 	
Assignments/ Activities			
	These assignments aim to apply theoretical concepts to practical application and critical thinking. <ul style="list-style-type: none"> Develop a comprehensive software project proposal. The proposal should include project objectives, scope, deliverables, milestones, risks, and a preliminary project plan. Design a quality assurance plan for a software project. They should identify key quality metrics, testing strategies, and processes for ensuring the overall quality of the software. Assign readings or case studies that highlight project proposal, risk management plan for a given software project scenario. 		

Bibliography:

Bennatan, Edwin. *Software Project Management.*

Pressman, Roger S. *Software Engineering.*

Fairley, Richard. *Software Engineering Concepts.*

Kelkar, S.A. *Software Project Management.*

Sommerville, Ian. *Software Engineering.*

Whitten, J.L., L.D. Bentley, and K.C. Dittman. *Systems Analysis and Design Methods.*

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
225513	Fuzzy Logic and Neural Network Elective Theory		4
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> • Understanding Fuzzy Set membership functions, and fuzzy operations. • Understanding basic concepts of neural networks, including neurons, layers, weights, and activation functions. • Design and implement feed forward neural networks for tasks such as pattern recognition and classification. • Understand and apply the back propagation algorithm for training neural networks, including concepts like gradient descent and error minimization. 		
Module 1	FUNDAMENTALS OF FUZZY LOGIC		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Define and differentiate between crisp sets and fuzzy sets, explaining the concept of membership degrees and their role in handling uncertainty. • Explore compatibility relations and their role in defining the degree to which two fuzzy sets can coexist or overlap. • Understand the concept of morphisms in fuzzy sets, exploring how transformations can be applied to fuzzy sets while preserving their structure. 	Module Contents: <ul style="list-style-type: none"> • Basic concepts: fuzzy set theory- basic concept of crisp sets and fuzzy sets- complements- union intersection- combination of operation- general aggregation operations- fuzzy relations- compatibility relations-orderings- morphisms- fuzzy relational equations-fuzzy set and systems 	
Module 2	ARCHITECTURE OF NEURAL NETWORKS		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Understanding Motivation for Neural Networks • Explore different types of artificial neural networks, including feedforward, recurrent, and convolutional neural networks. • Understand the typical architecture of artificial neural networks, including layers and demonstrate the ability to set and adjust weights and biases in neural networks, understanding their impact on the network's performance. 	Module Contents: <ul style="list-style-type: none"> • Architectures: motivation for the development of natural networks- artificial neural networks-biological neural networks-area of applications-typical Architecture- setting weights-common activations functions Basic learning rules- Mcculloch-Pitts neuron- Architecture, algorithm, applications-single layer net for pattern classification- Biases and thresholds, linear separability - Hebb'srule- algorithm -perceptron - Convergence theorem-Delta rule 	

Module 3	BASIC NEURAL NETWORK TECHNIQUES		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> Define and explain the fundamental components of a neural network, including neurons, layers, weights, biases, and connections. 	<p>Module Contents:</p> <ul style="list-style-type: none"> Back propagation neural net: standard back propagation-architecture algorithm- derivation of learning rules number of hidden layers--associative and other neural networks- hetro associative memory neural net, auto associative net- Bidirectional associative memory-applications- Hopfield nets-Boltzman machine 	
Module 4	COMPETITIVE NEURAL NETWORKS		1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> Understand the architecture and principles of Kohonen Self-Organizing Maps, a popular competitive learning algorithm. Demonstrate how competitive learning can be used for feature mapping, where neural networks learn to represent high-dimensional data in a lower-dimensional space. Understand the hierarchical structure of the Neocognitron, including the arrangement of layers and the flow of information, and how it enables the network to recognize complex patterns. Analyse the difference of fuzzy and neural system 	<p>Module Contents:</p> <ul style="list-style-type: none"> Neural network based on competition: fixed weight competitive nets- Kohonenself organizing maps and applications-learning vector quantization-counter propagation nets and applications adaptive resonance theory: basic architecture and operation-architecture, algorithm, application and analysis of ART1 & ART2 Neocognitron - Architecture, training algorithm and application-fuzzy associate memories, fuzzy system architecture- comparison of fuzzy and neural system 	
Assignments/ Activities			
	<p>These assignments aim to apply theoretical concepts to practical application and critical thinking.</p> <ul style="list-style-type: none"> performing basic fuzzy set operations, including union, intersection, and complement, using real-world examples implement a single-layer perceptron for a binary classification task, and analyse its performance on different datasets. Create a feedforward neural network for a specific problem, define its architecture, and train it using backpropagation. 		

Bibliography:

Kosko, Bart. *Neural Networks and Fuzzy Logic: A Dynamical Systems*

Approach to Machine Intelligence. Prentice Hall.

SN	Courses, Modules and Outcomes	Course Contents	Cr
	Semester II		
225514	IoT (Internet Of Things) Major (Elective) Theory		4
	Course Outcomes: Learners will be able to: <ul style="list-style-type: none"> • Understand the fundamental concepts of IoT. • Differentiate between M2M and IoT. • Aware about different challenges have to face in IoT. • Explore different network and communication aspect in IoT. • Aware about different IoT tools. • Illustrate different application areas of IoT. • Implement IoT concept using Python Fundamentals. 		
Module 1	Fundamentals of IoT		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Define IoT and explore core concept of IoT. • Explore communication model and APIs used in IoT. • Understand and Differentiate between IoT and M2M. 	Module Contents: <ul style="list-style-type: none"> • Introduction to IoT , Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs • IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network 	
Module 2	Network and Communication aspects		1
	LOs: Learners will be able to <ul style="list-style-type: none"> • Aware about wireless medium access issues. • Understand the concept of MAC protocol survey and explore Survey routing protocols. • Describe data aggregation and dissemination. • Analyse the different challenges face while using IoT. 	Module Contents: <ul style="list-style-type: none"> • Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination • Challenges in IoT Design challenges, Development challenges, Security challenges, Other challenges 	
Module 3	Applications of IoT		1
	LOs: <ul style="list-style-type: none"> • Explore different application domains of IoT 	Module Contents: <ul style="list-style-type: none"> • Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications 	

Module 4	IoT Development	1
	<p>LOs: Learners will be able to</p> <ul style="list-style-type: none"> • Illustrate fundamental concepts of Python • Explore different python based IoT tools • Demonstrate the IoT concepts using Python. 	<p>Module Contents:</p> <ul style="list-style-type: none"> • Developing IoTs : Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python.
Assignments/ Activities towards CCE		
	<ul style="list-style-type: none"> • Explore the fundamentals of IoTs with real-time application of IoT. • Differentiate IoTs with M2M and explain concept of Software defined network (SDN). • Explore the different challenges faced in IoTs with help of realtime example. • Explore the applications of IoTs. • Comprehend the network and communication aspect issues in IoTs. • Refine the use of Python for implementing IoT concepts. • Synthesize the IoTs concept based application implementation. 	

Bibliography:

Madiseti, Vijay, and Arshdeep Bahga. *Internet of Things: A Hands-On Approach*.

Dargie, Walteneagus, and Christian Poellabauer. *Fundamentals of Wireless Sensor Networks: Theory and Practice*.

Exit:

On completion of 44 credits, if student wish to exit the Programme, then, student will get Post Graduate Diploma in Computer Science (PGD in CS)