

**PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**



Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Computer Science

**Name of the Course: B.Sc. (Entire Computer Science) - III
(Semester –V and VI)**

(Syllabus to be implemented w.e.f. June 2024)

Punyashlok Ahilyadevi Holkar Solapur University,
Solapur
Faculty of Science and Technology
Choice Based Credit System
(CBCS) (w.e.f.2024-25) Revised
Structure for B.Sc. (ECS)-III

Subject/ Core Course	Name and Type of the Paper		No. of Papers/ Practica l	Hrs./ Week			Total Mark sper Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class:	B.Sc. (Entire Computer Science)- III Semester – V									
Ability Enhancement Course	(AECC)	English (Business English)	Paper II Part A	4	--	--	50	40	10	2.0
Core	%DSC 1E	Data Communicationand Networking	Paper IX	4	--	--	100	80	20	4.0
	DSC 1F	Advanced Java	Paper X	4	--	--	100	80	20	4.0
	DSC 1G	Dot NET Core	Paper XI	4	--	--	100	80	20	4.0
	DSE 1	A-Advanced Python Programming or B-Theory of Computatio or C-Mobile Application and Development	Paper X	4	--	--	100	80	20	4.0
Skill Enhancement Course	\$ SEC 2	Artificial Intelligence	Paper XI	4	--	--	100	80	20	4.0
Total Theory Semester-V				24			550	440	110	22
Class:	B.Sc. (Entire Computer Science)- III Semester – VI									
Ability Enhancement Course	(AECC)	English (Business English)	Paper II Part B	4	--	--	50	40	10	2.0
Core	%DSC 2E	Network Security	Paper XII	4	--	--	100	80	20	4.0
	DSC 2F	Data Warehousing and Data Mining	Paper XIII	4	--	--	100	80	20	4.0
	DSC 2G	ASP.Net Core MVC	Paper XIV	4	--	--	100	80	20	4.0

	DSE 2	A- React JS or B- Compiler Construction or C- Internet of things	Paper XV	4	--	--	100	80	20	4.0
Total Theory Semester-VI				20			450	360	90	18
Practical's on	Project			--	--	5	100	80	20	4.0
	DSC 1F and 2F			--	---	5	100	80	20	4.0
	DSC 1G and 2G			--	--	5	100	80	20	4.0
	DSE 1A/B/C and 2A/B/C			--	--	5	100	80	20	4.0
Total (practical's)						20	400	320	80	16
Grand Total				42	--	20	1400	1120	280	56

% Theory paper: (Core Computer Science Course)

\$The students can choose MOOCs/ NPTEL/SWAYAM/Pathshala/Add-on / Skill based courses of university/college initiated courses of same credits.

\$ These courses are not compulsory, but after completion of these courses students get additional credits on their

Marklist.

\$SEC Courses initiated by colleges

Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA : University Assessment

CA : College Assessment

CC: Core Course

AEC : Ability Enhancement Course

DSE : Discipline Specific Elective Paper

SEC : Skill Enhancement Course

Type: DSC 2E
Course Title: System Security
(Paper Code: Paper XIV)

Course Objectives:

1. To learn cryptographic tools.
2. To learn security issues regarding user Authentication.
3. To understand the various access control mechanisms.
4. To learn various types of malicious softwares and Denial-of-Service attacks.

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

1. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2. Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
3. Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Unit 1: Fundamental of Security

[20]

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks – Active and Passive, Security services, Security Mechanisms, A model for Network Security , Access Control Mechanisms: Access Matrix, ACL and capabilities, Access Control Models.

Unit 2: Cryptography Concepts and Techniques

[20]

Introduction to Cryptography, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography,

steganography, key range and key size, possible types of attacks, Symmetric Key Cryptographic Algorithms: Algorithm Types and Modes, An overview of Symmetric Key Cryptography, DES, International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Asymmetric Key Cryptography: Brief History of Asymmetric Key Cryptography, An overview of Asymmetric Key Cryptography, The RSA Algorithm, Symmetric and Asymmetric Key Cryptography Together.

Unit 3: Digital Signatures and Internet Security Protocols

[12]

Digital Signatures: Introduction, Message digests, MD5, SHA-512, MAC, HMAC, Knapsack Algorithm, Elliptic curve Technology, ElGamal Algorithm, Internet Security Protocols: Secure Socket Layer/TLS, Secure Electronic Transaction, SSL versus SET, E-mail Security- PGP, S/MIME.

Unit 4: User Authentication and Network Security

[8]

Introduction User Authentication, Authentication basics, Passwords, use of smart cards, Biometrics, Kerberos, Introduction Network Security, Firewalls, types of firewalls, IP Security, Intrusion: Intruders, Audit Records, Intrusion Detection, honey pots.

Reference Books:

- Cryptography and Network Security by Atul Kahate, Tata McGraw-Hill
- Cryptography and Network Security by Behrouz A. Forouzan, Debdeep Mukhopadhyay, Special Indian Edition, Tata McGraw-Hill.
- Network Security Essentials: Applications and Standards by William Stallings, Pearson Education.
- Fundamentals of Computer Security Technology: Edward Amoroso, Prentice-Hall.
- Cryptography and Data Security: Dorothy E. Denning, Addison-Wesley.
- Cryptography -Theory and Practice: Douglas R. Stinson, CRC Press.

Type: DSC 2F
Course Title: Data Warehouse and Data Mining

(Paper Code: Paper XV)

Course Objectives:

1. To understand the principles of Data warehousing and Data Mining.
2. To understand the Architecture of a Data Mining system.
3. To perform classification, association, and prediction of data.

Course Outcomes: The students should be able to:

1. Identify data mining problems and implement the data warehouse.
2. Write association rules for a given data pattern.
3. Choose classification and clustering solutions.

Unit 1: Introduction to Data Warehouse and Data Mining [15]

Differences between Operational Database Systems and Data Warehouses, Data Warehouse Architecture, Data Warehouse Components, A Multidimensional Data Model, Schemas, Data Warehouse Implementation, Data cube Technology, OLAP operations, Data mining query language, Data Mining:- What is data mining, Evolution, KDD, What kind of data, Architecture, data mining views, Data Mining Functionalities, Issues in Data Mining.

Unit 2: Data Preprocessing and Association Rule mining [15]

Data Preprocessing: An Overview, Extract, Transform, Load (ETL) Processes, Data Cleaning, Data Integration, Data Transformation and Data Discretization, Data Reduction, Frequent Patterns,

Associations, and Correlations: Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Itemset Mining Methods-Apriori Algorithm: Finding Frequent Itemsets, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, A Pattern-Growth Approach for Mining Frequent Itemsets, Mining Multilevel and multidimensional Association Rules, Constraint-Based Frequent Pattern Mining

Unit 3: Supervised Learning Technique

[15]

supervised and unsupervised learning, What Is Classification? What is regression, difference between classification and regressing, General Approach to Classification, Issues regarding Classification and Predication, Binary and Multiclass Classification, Types of classifications, Classification by Decision tree induction, Bayesian Classification, Classification by Back propagation, Logistic regression, k-Nearest-Neighbor Classifiers, SVM, Introducing Ensemble Methods-Bagging, Boosting, AdaBoost, Random Forests, Other classification methods, Prediction: regression. Model Evaluation and Selection- Metrics for Evaluating Classifier Performance, Cross-Validation, underfitting and overfittin.

Unit 4: Unsupervised Learning Technique and Applications

[15]

Clustering: What is Cluster Analysis, Types of data in Cluster Analysis, A Categorization of Major Clustering Methods., Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering Methods: Statistical Approach, Neural Network Approach, Outlier Analysis, Applications and Trends in Data Mining: Data Mining Applications, Data Mining for Financial Data Analysis, Data Mining for Retail and Telecommunication Industries, Data Mining in Science and Engineering, Data Mining for Intrusion Detection and Prevention, Data Mining and Recommender Systems, Spatial Data Mining. Text Data Mining, Multimedia Data Mining, Web Data Mining, Privacy, Security, and Social Impacts of Data Mining, Data Mining and Intelligent Query Answering, Trends in Data Mining.

Reference Books:

- Data Mining – Concepts and Techniques – Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2006.
- Introduction to Data Mining, Pang – Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
- Data Warehouse Fundamentals, Pualraj Ponnaiah, Wiley Student Edition.

Type: DSC 2G

Course Title: ASP.Net Core MVC

(Paper Code: Paper XVI)

Course Objectives:

1. Demonstrate the creation of ASP.NET Core MVC Web Applications using .NET 8, covering project file structure, main method, hosting options, and configuration files.
2. Cover Models, Controllers, Views, and Dependency Injection in ASP.NET Core MVC applications.
3. Introduce Entity Framework Core and guide the installation process also explain DbContext in Entity Framework Core and database connection string configuration and database operations.
4. Discuss Transactions, Migration, and Database Seeding in Entity Framework Core.
5. Introduce Partial Views, View Components, and Razor View Engine.
6. Cover Action Results, Routing, Model Binding, HTML Helpers and Tag Helpers in ASP.NET Core MVC.

Course Outcomes: Students will be able to:

1. Demonstrate the creation of ASP.NET Core MVC Web Applications using .NET 8.
2. Understand project file structure and implement Models, Controllers, Views, and Dependency Injection in ASP.NET Core MVC applications.
3. Utilize Entity Framework Core for Data Access and perform database operations using Entity Framework Core.
4. Discuss transactions, migration, and database seeding in Entity Framework Core.
5. Implement Reusability in Views using Partial Views, View Components, and the Razor View Engine for efficient view management.
6. Cover Action Results, Routing, Model Binding, HTML Helpers, and Tag Helpers in ASP.NET Core MVC applications.
7. Data Annotations and Model Validations, including custom validations and remote validation.
8. Discuss different methods of State Management, including Cookies and Sessions.

Unit 1: Introduction to ASP.Net Core MVC

[20]

Overview of Microsoft Web Technologies, Introduction to ASP.NET Core Framework. NET Core Environment Setup, Install .NET Core SDK, SQL Server 2022, SSMS, Creating ASP.NET Core Web Application using .NET 8, NET Core Project File Structure, NET Core Main

Method, NET Core In Process Hosting, out of Process Hosting, Launch Settings.json File, AppSettings .json file, Middleware Components, Web Root (wwwroot) Folder, Static Files Middleware, Configuring Default Page, Developer Exception Page Middleware Command Line Interface, Project Templates in ASP.NET Core Application, Introduction to ASP.NET Core MVC Framework, Set up MVC in ASP.NET Core, Models, Controllers and Views in ASP.NET Core MVC, ASP.NET Core Dependency Injection, Creating ASP.NET Core Application using MVC.

Unit 2: Entity Framework Core

[20]

Introduction to Entity Framework Core, How to Install Entity Framework Core, DbContext in Entity Framework Core, Database Connection String in Entity Framework Core, CRUD Operations in Entity Framework Core, Entity States in Entity Framework Core, Data Annotation Attributes in Entity Framework Core- Table Attributes, Column Attributes, Key Attribute, ForeignKey Attribute, Index Attribute, InverseProperty Attribute, NotMapped Attribute, Required Attribute, MaxLength and MinLength Attribute, Database Generated Attribute, Timestamp Attribute, ConcurrencyCheck Attribute, Relationships in Entity Framework Core- One-to-One Relationships, One-to-Many Relationships, Many-to-Many Relationships, Self-Referencing Relationship, Asynchronous Programming with Entity Framework Core, Disconnected Entities in Entity Framework Core, Stored Procedures in Entity Framework Core, Transactions in Entity Framework Core, Migration in Entity Framework Core, Database Seedd in Entity Framework Core, Entity Framework Core Database First Approach

Unit 3: Model, View, Controller and Routing

[10]

ViewData, ViewBag, Strongly Typed View, ViewModel, TempData, Post-Redirect-Get (PRG) Pattern Example, Layout View, Sections in Layout View, ViewStart, ViewImports, Partial Views, Different Ways to Render Partial View, View Components, Razor View Engine and Razor Syntax, How to Install and use Bootstrap in ASP.NET Core MVC, Action Results in ASP.NET Core MVC- Action Results, View Result, Partial View Result, JSON Result, Content Result, File Result, Redirect Results, Status Results, Object Result, EmptyResult , Routing in ASP.NET Core MVC, Custom Routing, Custom Route Constraints in Web Application, Attribute Routing, Attribute Routing using Tokens, Attribute Routing vs Conventional Routing, Model Binding in ASP.NET Core MVC, Model Binding using- FromForm, FromQuery, FromRoute, FromHeader, FromBody, Complex Type, Custom Model Binding in ASP.NET Core MVC.

Unit 4: HTML, Tag Helper, Data Annotation Validation and State management [10]

HTML Helpers for-TextBox, TextArea, DropDownList, RadioButton, Check Box, ListBox, Password, Hidden, Custom HTML Helper in ASP.NET Core MVC, Creating Form Using HTML Helpers, Different Ways to Generate Links in ASP.NET Core MVC, Tag Helpers for-Image Tag , Environment Tag, Navigation Menus, Form Tag, Partial Tag, Creating Custom Tag Helper, View Component Tag Helper, Cache Tag Helper, Data Annotations, Model Validations, Data Annotation Attributes- Custom Data Annotation, Remote Validation, Blacklist and Whitelist Checks using Data Annotation, Displaying and Formatting Attributes, Real-Time Examples of Data Annotations in ASP.NET Core MVC, Cookies, Encrypt Cookies, Persistent vs Non-Persistent Cookies, Sessions, In-Memory vs Distributed Sessions, Differences Between Cookies and Sessions, Upload File, Restrict Uploaded File Size, Restrict Uploaded File Type, Save Uploaded file to Database, Display Images, Delete Images, Upload Multiple Files, Export Data to Excel File, Import Excel Data to Database, Generate PDF, Generate Password Protected PDF, Convert HTML to PDF, Send Email with Attachment.

Reference Books:

- Professional ASP.NET– Wrox Publication by Bill Evjen, Scott Hanselman, Farhan Muhammed, Sirnivasa Sivakumar, Devin Rader.
- Microsoft ASP.NET Step by Step - Microsoft Press by George Shepherd.

Type: DSE3-A
Course Title: ReactJS
(Paper Code: Paper XVI)

Course Objectives:

1. Understand Single Page React application is different than traditional web development frameworks.
2. Develop an application from scratch.
3. Understand the benefits of unidirectional data flow.

Course Outcomes:

1. To understand basic fundamentals of Front-end Technologies
2. To apply the advanced concepts of ReactJS and WebAPI
3. To develop ReactJS applications.

Unit 1: Introduction to ReactJS

[20]

Introduction, Workflow, Scope, Pros and Cons, Difference between JS and JSX, React Components overview, Child Components, JSX expressions,

Building Blocks of ReactJS: JSX, Components, State and Props, Conditional Rendering, Why JSX, Advantages of JSX, Expressions in JSX, Implementation of JSX, Creating a react component with jsx

Environment Setups: Node setup, How to use NPM, Npm and Setting Environment for ReactJS projects, How to create package.json and purpose, IDE for ReactJS, ReactJS browser plugins overview.

Components: Types of components, Functional component vs Class Component, Converting Functional Components to Class Components, Component Life Cycles and its different methods.

Unit 2: Conditional Rendering and List

[10]

if-else Statement, logical and and operator, operators, Preventing Component from Rendering, Switch case operator

List and Keys: react key prop, map function to iterate the List, References, use Refs, Create Refs, access Refs, Event Binding types: Bind () method, Arrow function

Props and State: What is a state, use and role of the state, what are props, Props validation, Passing data between multiple components, Managing Component State

Unit 3: Handling Events and Forms

[10]

Lists of Form components, Setup Controlled and Uncontrolled form components, Control Input elements, Form Submission and Validation, how to set default values on all formats of Input elements, Form validations, writing Styles, Animations overview, Event, Event Binding, Event Handlers, Common React Events, Key Events, Event Pooling, Synthetic Event.

Unit 4: Routing and State Management

[20]

Introduction to React Router, History of Router, Single Page Application Overview, configure React Router, Load the router library, Navigating between Routes, Route Parameters and Nested Routes, Dynamic Routing, Nesting Routes, Invalid URL, Handle Conditional statement in JSX

State Management: Local State vs. Global State, State Lift-Up, Context API for Global State

Redux: Introduction to Redux, Redux Architecture- Actions, Reducers, and Store, Provider Component, Dispatchers, View Controllers, Connecting React with Redux

Hooks: Introduction to Hooks, The useState hook, useEffect hook, Custom hook, useRef hook, useMemo hook, The useContext hook, The useReducer hook, Another Hooks.

Reference Books:

- Introduction to React By Cory Gackenhimer, Apress
- React and React Native: A complete hands-on guide to modern web and mobile development with React.js By Adam Boduch, Roy Derks
- React 16 Essentials: A fast-paced, hands-on guide to designing and building scalable and maintainable web apps with React 16 By Artemij Fedosejev, Ada