Far Western University
Faculty of Education
Bachelors in computer science education

Course Title: Web Technology I — Nature: Theory and Practical
Course No.: CS.Ed.356 — Credits: 3
Semester: Fifth Semester — Teaching Hrs: 48+16
Level: Undergraduate

1. Course Description

This course is introduced to provide some fundamental concepts behind the web development and upon which the www is based. It provides the framework to work on development field. It also introduced some fundamental differences between Client-side scripting and server-side scripting languages. This course includes the HTML,CSS, XHTML,XML, java script and some concept behind ruby on rail framework which are the very basic things which are used on web development.

2. Objectives

On completion of this course students should be able to:

- describe the components of the Internet and Web technology.
- explain the basics of Internet technology, such as http and the World Wide Web, HTML, XML, and Java Scripts.
- create WWW pages to serve as front-end to client/server, Internet applications.
- effect client-side programming using tools such as JavaScript.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Recognize WWW and internet fundamentals • Explore the concepts of IP addresses and domain names. • Explain HTTP and other application layer protocols	**Unit I: Web Fundamentals (6 Hrs)** 1.1. Internet and its services, World Wide Web, URL, Web Server, Web Browser, Web Page, Web Site, Dynamic and Static Pages, ISP, W3C 1.2. IP addresses and Domain Names, Web Hosting and its Types 1.3. HTTP: Overview, Parameters, Messages, Requests, Response, Methods, Status Codes, Header Fields 1.4. Overview of FTP, SMTP, MIME, POP 1.5. Web Services: Introduction, Characteristics, Components, Standards, Examples 1.6. Server-Side Scripting Languages, Overview, Examples 1.7. Client-Side Scripting Languages, Overview, Examples
• Recognize HTML elements, tags and attributes. • Discuss different HTML tags and their attributes. • Apply HTML tags and attributes to design web pages. • Create web pages having different	**Unit II: Hypertext Markup Language(7 Hrs)** 2.1. HTML Overview, Tags, Elements, Attributes, Structures of HTML Documents 2.2. Basic Tags: Headings, Paragraph, Center, Line Break, Horizontal Line, Non-breaking Spaces, Pre 2.3. Formatting Tags, Phrase Tags, Meta Tag, Comments, Images, Tables, Lists 2.4. Hyperlinks (Text Links, Image Links, Email Links, Download Links), Intra-page Links, Frames, iframes,

layouts • Figure out HTML Form and apply different attribute of Form on web page.	Blocks, Background, Color, Fonts, Forms, Embedded Multimedia, Marquees, Header 2.5. HTML Layouts: Using Tables, DIV & Span Tags, HTML Style Sheets, HTML Entities, Events 2.6. HTML Forms: creating a single Line-Input Field on a Form, Creating Multiple Input Field on Form, placing check box on Form, placing Radio Buttons on a Form, placing a Drop-Down list(selection menu) on a Form, Adding reset Button on Form, Adding Submit Button on Form.
• Recognize XHTML and HTML5 • Differentiate HTML from XHTML • Explain features of HTML5 and XHTML	**Unit III: XHTML & HTML5 (5 Hrs)** 3.1. XHTML: Overview, Syntax, HTML vs. XHTML, Doctypes, Attributes, Validations, Events 3.2. HTML5: Overview, Features, Syntax, Document Structure, Web Forms 2.0, MathML, Canvas, Audio, Video, Events
• Explain the concepts and importance of CSS and Web page designing • Apply different selectors while creating style sheets • Apply different formatting features with CSS • Explain CSS Box model, and dimensions	**Unit IV:Cascading Style Sheets(7 Hrs)** 4.1. Introduction, Advantages, Syntax, Inserting Style Sheets: Inline, Internal, External 4.2. Selectors: Type Selector, Universal Selector, Descendent Selector, Class Selector, ID Selector, Child Selector, & Attribute Selector, Grouping Selectors 4.3. CSS Colors, Background, Fonts, Text, Images, Links, Tables, Borders, Margins, Lists, Padding, Cursor, Outlines, Dimensions, Scrollbars, CSS Box Model 4.4. CSS Visibility, Positioning, Layers, Pseudo-classes and Pseudo-elements
• Explain role of java script in web page designing • Discuss syntax and features of java script • Describe DOM tree and its traversal • Handle different events using java script • Validate web forms by using java script • Types of errors in JavaScript and handling mechanism • Learn how to create HTML animations with JavaScript	**Unit V: JavaScript (9 Hrs)** 5.1. Overview, Why Java Script?, Syntax, Variables, Operators, Screen Output and Keyboard Input, Selection Statements, Loops 5.2. Functions, Events, Page Redirect, Dialog Boxes 5.3. JavaScript Objects: Number, Boolean, String, Array, Date, Math, Random 5.4. Events & Event Handling, DOM, Element Access in JavaScript, DOM Tree Transversal & Modification 5.5. Regular Expression, Form Validation & Pattern Matching, Error Handling, Image Map 5.6. JS Animations: Positioning Elements, Moving Elements, Element Visibility, Changing Colors& Fonts, Stacking Element, Locating Cursor, Reacting to Mouse Click, Dragging and Dropping Element

• Introduction to Front End Development in web technologies • Describe React JS and its role in Web Development. • Do Installation and setting of Node, NPM and React • Develop a simple application using React JS • Figure out Bootstrap and its classes for Front End Development	**Unit VI: Front End Development (6Hrs)** 6.1. Introduction and Implementation of Technologies in Front End Development 6.2. Introduction to React 6.3. Role of NodeJs and NPM in React 6.4. Installation of Node, and NPM 6.5. Installation of React 6.6 Creating First React Application 6.7. Introduction of Bootstrap 6.8. Installation of Bootstrap
• Mention purpose of XML and XML tags • Describe XML syntax rules, structure • Describe XML elements and attributes • Create DTD and XML schema • Figure out purpose of JSON, JSON tags and JSON data types • Describe JSON syntax, structure • JSON Parse, JSON Objects, JSON Arrays • XML vs JSON	**Unit VII: XML and JSON (8 Hrs)** **7.1 eXtensible Markup Language (XML) Foundations** 7.1.1 History and background 7.1.2 XML syntax, structure 7.1.3 XML Tags, Elements and Attributes, Comments 7.1.4 XML Document Type Definition (DTD) 7.1.5 XML Schema **7.2 JavaScript Object Notation (JSON) Foundations** 7.2.1 History and background 7.2.2 JSON syntax, structure 7.2.3 JSON Tags, JSON data types 7.2.4 JSON Parse, JSON Objects, JSON Arrays 7.2.5 XML vs JSON

4. Methodology and Techniques

Modes of instruction*:* Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work, Assignments in different topics, group discussion, reflective writing

Types of learning activities

Attending lectures, performing specific assignments, writing papers, independent and private study, reading books, journals and papers, providing constructive feedback, group study and peer discussion.

5. Evaluation Scheme

5.1 Internal Evaluation40%

Internal Evaluation will be conducted by course teacher based on following activities.

a) **Attendance and Participation in class activities**: **5+5=10 marks**

b) **Assignment I: Reflective Notes and Class presentation:** **5+5=10 marks**
(Reflectivenoteson2to4questionsgivenbyteacherattheend of every unit and presentation on any two questions among them)

c) **Assignment II**: **One Term paper/Essay/Project and Interview:** **5+5=10 marks**
(Logical essay /term paper /project on the topics chosen by students and approved by the teacher and interview)

d) **Mid-term exam**: **10marks**

5.2 External Evaluation (Final Examination) 40%

Types of questions	Total questions to be asked	Number of questions to be answered and marks allocated	Total marks
Group A: Multiple choice items	8 questions	8×1	8
Group B: Short answer questions	6 with 2 'or' questions	6×4	24
Group C: Long answer questions	1 with 1 'or' question	1×8	8

5.3 External Practical Evaluation (20%)

Office of the Controller of Examination will conduct final practical examination at the end of final examination.

After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the following evaluation criteria. There will be an internal examiner to assist the external examiner. Three hours' time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Evaluation System:

Practical	Weightage	Marks
Practical Report Copy	5	20
Viva	5	
Practical Exam	10	

Laboratory Work

Student should write programs and prepare lab sheet for all of theunits in the syllabus. Students should be able to write HTML and CSS scripts by using various tags & different controls and able to design web pages having different layouts. Besides this, students should be able to perform client side validation by using java scripts and should also be able to create XML documents, DTDs, & XML schemas.

Prescribed Text

1. Robert. W. Sebesta, "*Programming the World Wide Web*", Fourth Edition, Pearson Education, 2007.

References

1. Deitel, G. "*Internet & World Wide Web How To Program*", Third Edition, Pearson Education, 2006.
2. Jeffrey C.Jackson, "Web *Technologies--A Computer Science Perspective*", Pearson Education, 2006.
3. Kogent,*HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and JQuery***,** Wiley.

Far Western University
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Course Title: Advanced Java Programming | Nature: Theory and Practical
Course No.: CS.Ed.357 | Credits: 3
Semester: Fifth Semester | Teaching Hrs: 48+16
Level: Undergraduate

1. Course Introduction

This course is a study in Java language techniques beyond the introductory course. Emphasis will include, GUI and event-driven programming, Database Connectivity, Socket Programming, Remote Method Invocation and Servlets and JSP Technology.

2. Objectives

Upon completion of this course students should be able to:

→ Write sample applets and draw graphics by using AWT
→ Use libraries for creating GUIs handling events and accessing databases.
→ Develop desktop applications, web applications, and network applications.
→ Understand concepts of reusable software components and distributed program development.

3. Specific Objectives and Contents

Specific Objectives	Contents
• explain concepts of AWT containers and controls Use Containers and controls tocreate GUI • Demonstrate layout mangers and SetBound method. • Apply graphics libraries to create graphics • Create menus and Menubars using AWT	**Unit I: User Interface Components with AWT (10 Hrs.)** 1.1 AWT Basics: AWT class Hierarchy, AWT Containers & Controls, AWT Features, Java Applets, Applet Life Cycle; 1.2 AWT Containers: Window, Frame, Panel, Dialog, Creating Frames & Panels, 1.3 Layout Managers: No Layout, Flow layout, Border Layout, Grid Layout, Gridbag Layout, Group Layout; 1.4 AWT Controls: TextField, TextArea, Button, Label, Checkbox, Checkbox Group, Choice, List, Canvas, Image 1.5 AWT Menu: Menu Hierarchy, Menu, MenuBar, MenuItem, PopupMenu 1.6 AWT Graphics: Graphics and Graphics2D Class, Drawing Lines, Curves, rectangles, ellipse, Changing Color & Font
• Compare Swing with AWT and understand differences. • Use Swing library to create GUI with different controls and menus. • Demonstrate the use of advanced swing components. • Demonstrate the use of dialog boxes and internal frames. • use of different component organizers	**Unit II: GUI with Swing (8 Hrs.)** 2.1. Swing Basics: Swing Hierarchy, Swing Features, AWT vs Swing 2.2. Text Input: Text Fields, Password Fields, Text Areas, Scroll Pane, Label and Labeling Components 2.3. Choice Components: Check Boxes, Radio Buttons, Borders, Combo Boxes, Sliders 2.4. Menus: Menu Building, Icons in Menu Items, Check box and Radio Buttons in Menu Items, Pop-up Menus, Keyboard Mnemonics and Accelerators, Enabling and Disabling menu Items, Toolbars, Tooltips 2.5. Dialog Boxes: Option Dialogs, Creating Dialogs, Data Exchange, File Choosers, Color Choosers 2.6. Components Organizers: Split Panes, Tabbed Panes, Desktop Panes and Internal Frames, Cascading and Tiling

• describe event handling models. • Demonstrate the use of listeners and adapters • Write programs to handle different types of events	**Unit III: Event Handling (4 Hrs.)** 3.1 Event Handling Concept, Event Delegation Model, Listener Interfaces, Using Action Commands, Adapter Classes 3.2 Handling Action Events, Key Events, Focus Events, Mouse Events, Window Events, Item Events
• recognize steps of writing JavaFX program • Demonstrate used of FlowPane, Border Pane, Hbox, Vbox and GridPane. • Explain concept of JavaFX UI controls.	**Unit IV: GUI with JavaFX (5 Hrs.)** 4.1 Introduction, JavaFX vs Swing, Steps of Writing JavaFX Programs, Writing JavaFX programs. 4.2 JavaFX Layouts: Flow Pane, Border Pane, HBox, VBox, GridPane 4.3 JavaFX UI Controls: Label, Text Field, Button, Radio Button, Check Box, Hyperlink, Menu, Tooltips, File Chooser
• Figure out JDBC architecture and driver types. • Explain different steps used in connecting with databases. • Demonstrate used of different types of statements. • Create programs to executes DDL and DML statement	**Unit V: Java Database Connectivity (6 Hrs.)** 5.1 Architecture of JDBC, JDBC Driver Types, Steps of JDBC, Statements, Result Sets, CRUD Operations using Java 5.2 Executing SQL Statements: Managing Connections, Statements, Result Set, SQL Exceptions, Populating Database 5.3 Query Execution: Prepared Statements, Reading and Writing LOBs, SQL Escapes, Multiple Results, Scrollable Result Sets, Updateable Result Sets, Row Sets and Cached Row Sets, Transactions
• explain concepts of ports, IP address, and Protocols • Implement TCP/UDP servers and clients. • Perform different operations with URLs	**Unit VI: Network Programming (4 Hrs.)** 6.1 Review of Transmission control Protocol (TCP), User Datagram Protocol (UDP), TCP vs UDP, Ports, IP Address Network Classes in JDK 6.2 Steps of Writing Socket programs using TCP, Steps of Writing Socket programs using UDP, Examples of Socket programs using TCP and UDP, Working with URL's, Working with URL Connection Class
• Figure out Servlet basics and its life cycle. • Configure web servers and create servlets by using different classes and interfaces. • Demonstrate the use of session and cookies. • Understand JSP architecture and compare it with servlets. • Demonstrate the use of JSP tags by writing sample programs. • Under exceptions and exception handling	**Unit VII: Servlets and Java Server pages (8 Hrs.)** 7.1 Introduction to Servlets, Servlet Lifecycle, the servlet APIs, Methods of Writing Servlet Programs, Reading Form Parameters, Form Processing, Handling HTTP Request and Response (GET / POST Request), Servlets with JDBC 7.2 Introduction to JSP, JSP Access Model, JSP Syntax (Directions, Declarations, Expression, Scriplets, Comments), JSP Implicit Objects (JSP Request/ Response), Object Scopes (page, request, session and application), Form Processing, Servlet vs JSP
• Explain basics of RMI and CORBA • Write, Compile, and Execute sample RMI programs. • Understand CORBA and its architecture	**Unit VIII: RMI and CORBA (3 Hrs.)** 8.1 Introduction of RMI, Architecture of RMI, Creating and Executing RMI Applications 8.2 Introduction to CORBA, RMI vs CORBA, Architecture of CORBA, IDL

5. Methodology and Techniques

Modes of instruction*:* Lecture, seminar, exercise course, guided personal study, tutorial, independent study, project work, Assignments in different topics, group discussion, reflective writing.

Types of learning activities

Attending lectures, performing specific assignments, writing papers, independent and private study, reading books, journals and papers, providing constructive feedback, group study and peer discussion.

5. Evaluation Scheme

5.2 Internal Evaluation40%

Internal Evaluation will be conducted by course teacher based on following activities.

e) **Attendance and Participation in class activities**: **5+5=10marks**

f) **Assignment I: Reflective Notes and Class presentation: 5+5=10marks**
(Reflectivenoteson2to4questionsgivenbyteacherattheend of every unit and presentation on any two questions among them)

g) **Assignment II**: **One Term paper/Essay/Project and Interview: 5+5=10marks**
(Logical essay /term paper /project on the topics chosen by students and approved by the teacher and interview)

h) **Mid-term exam**: **10marks**

5.2 External Evaluation (Final Examination) 40%

Types of questions	**Total questions to be asked**	**Number of questions to be answered and marks allocated**	**Total marks**
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5.3 External Practical Evaluation (20%)

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Evaluation System:

Practical	Weightage	Marks
Practical Report Copy	5	20
Viva	5	
Practical Exam	10	

Laboratory Work

Student should write programs and prepare lab sheet for most of the units in the syllabus. They should practice design and implementation of java programs that demonstrates different concepts discussed is class. However, nature of programming can be decided by the instructor.

Laboratory Work: The laboratory work includes writing Java programs

- To create GUI applications using swing, event handling, and layout management
- To create applications to work with databases.
- To create JavaBeans
- To create server-side web programs using Servlet and JSP
- To create distributed applications using RMI

Textbooks

1. Cay S. Horstmann, Core Java Volume I--Fundamentals Ninth Edition, Prentice– Hall, 2012

2. Cay Horstmann and Grazy Cornell, Core Java Volume II-Advance Features, Eighth– Edition

3. Herbert Schildt, Java: The Complete Reference, McGraw-Hill Education, Eleventh Edition, 2018

Reference Books

1. Hebert Schildt Java: The Complete Reference, McGraw-Hill Education, Ninth Edition,– 2014

2. Steven Holzner, Java 7 Programming, Black Book, Dreamtech Press, 2013

3. D.T. Editorial Services, Java 8 Programming Black Book, Dreamtech Press, 2015

Far Western University
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Bachelors in computer science education

Course Title: System Analysis and Design
Course No.: CS.Ed.358
Semester: Fifth Semester
Level: Undergraduate

Nature: Theory and Practical
Credits: 3
Teaching Hrs: 48+16

1. Course Introduction

This course introduces students to the principles and practices of System Analysis and Design (SAD) with a focus on educational applications. Students will gain practical and theoretical knowledge to analyze, design, implement, and maintain information systems. The course covers methodologies such as structured analysis, object-oriented analysis, modeling tools, and concepts like feasibility studies, database design, and system testing. Practical sessions emphasize real-world applications and the use of modern tools.

2. Objectives

1. Develop a foundational understanding of systems analysis and design principles.
2. Equip students with skills to analyze, design, and manage information systems in educational and organizational settings.
3. Learn to apply structured and object-oriented methodologies using various tools and techniques.
4. Prepare students for real-world challenges in system development, implementation, and maintenance.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Explain systems, their characteristics, and types of information systems. • Describe the SDLC and the role of a system analyst. • Compare traditional system development approaches (waterfall, prototyping, spiral). • Discuss the role and challenges of information systems in education.	**Unit I: Foundations of System Analysis and Design *(9 Hrs)*** 1.1 Concepts of systems and their characteristics. 1.2 Information system and its types. 1.3 Development of Information system: System development life cycle. 1.4 System Analyst and roles of system analyst. 1.5 Traditional approach of system development: Waterfall prototyping, and spiral model. 1.6 Information systems in education: Necessities and Implementation Challenges.
• Explain the process of system analysis and requirement gathering. • Use data-gathering techniques like interviews, questionnaires, and observations. • Evaluate system feasibility and document findings using structured analysis tools.	**Unit II: Systems Analysis (Tools and Techniques) *(9 Hrs)*** 2.1 Process of system analysis: understanding the problem**,** requirement analysis, analyzing current processes, identifying gaps and goals, documentation. 2.2 Data gathering techniques: Interviews, questionnaires, observation. 2.3 Feasibility studies**:** Technical, economic, operational, and schedule feasibility. 2.4 Structured analysis: Data dictionaries**,** decision trees, and

• Create process models using DFDs and understand the role of CASE tools	decision tables. 2.5 Process modeling: Introduction to Data Flow Diagrams (DFDs)**.** 2.6 Introduction to CASE tools**:** Overview, types and their role in system analysis.
• Differentiate between logical and physical designs. • Apply structured design approaches (modularization, top-down, bottom-up). • Design inputs, outputs, forms, reports, and user interfaces. • Develop database designs using ER models, normalization, and file organization. • Incorporate security measures into system design.	**Unit III: System Design Methodologies** ***(10 Hrs)*** 3.1 Logical vs Physical design. 3.2 Structured design: Modularization**,** top-down**,** and bottom-up approaches. 3.3 Input and output design principles. 3.4 Form and report design. 3.5 Database design: ER Model (Entity, relationship, attributes, keys), relational model, rules for converting ER diagrams into tables for implementation, Normalization and file organization. 3.6 Interface design: User interface (UI) and System Interface design. 3.7 Security design.
• Explain system coding, testing types, and quality assurance processes. • Compare installation strategies and identify hardware/software selection criteria. • Outline system maintenance types and their importance. • Use project scheduling techniques and document systems effectively.	**Unit IV: System Implementation and Maintenance** ***(8 Hrs)*** 4.1 System coding. 4.2 System testing and its types: **White box**, **black box**, **unit testing**, and **integration testing.** 4.3 Software quality assurance: process and importance. 4.4 Implementation/ installation strategies: direct, parallel, phased, and pilot conversion. 4.5 Hardware and software selection criteria. 4.6 System maintenance: Types and importance. 4.7 Project scheduling techniques. 4.6 System documentation (types) and presentation.
• Describe object-oriented development and its benefits. • Create UML diagrams (use case, class, sequence, state). • Compare structured and object-oriented design approaches.	**Unit V: Object-Oriented Analysis and Design (OOAD) (6 Hrs)** 5.1 Overview of object-oriented development. 5.2 Unified Modeling Language (UML): Use case diagrams, class diagrams. 5.3 Dynamic modeling: Sequence and state diagrams. 5.4 Comparison between structured and object-oriented approaches.
• Explain Agile methodologies and Rapid Application Development (RAD). • Explore development for mobile and cloud systems. • Identify ethical considerations in system development.	**Unit VI: Emerging Trends in System Development (6 Hrs)** 6.1 Agile methodologies: Principles and practices. 6.2 Rapid Application Development (RAD). 6.3 Systems for mobile and cloud computing. 6.4 Ethical considerations in system development.

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Types of learning activities

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5.3 Internal Evaluation40%

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k) **Assignment II**: **One Term paper/Essay/Project and Interview:** **5+5=10 marks**
(Logical essay /term paper /project on the topics chosen by students and approved by the teacher and interview)

l) **Mid-term exam**: **10 marks**

5.2 External Evaluation (Final Examination) 40%

Types of questions	**Total questions to be asked**	**Number of questions to be answered and marks allocated**	**Total marks**
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Evaluation System:

Practical	Weightage	Marks
Practical Report Copy	5	20
Viva	5	
Practical Exam	10	

Lab Work

The lab component for this course is designed to provide students with hands-on experience in the complete System Development Life Cycle (SDLC). Students will work in groups to develop a functional system, starting from requirement analysis to system design, implementation, and maintenance. Each group will be assigned a project that simulates real-world scenarios, allowing them to apply theoretical knowledge to practical problem-solving. It is up to the instructor to decide how to manage and organize the project groups, ensuring effective collaboration among students.

As part of the lab work, students will be required to:

1. Conduct requirement analysis by gathering and documenting user needs and preparing feasibility reports.
2. Create design models, including Data Flow Diagrams (DFDs), Entity-Relationship (ER) diagrams, and Unified Modeling Language (UML) diagrams (use case, class, sequence, and state diagrams).
3. Develop a database design, including normalization and table creation.
4. Write system code to implement the design using appropriate programming languages and tools.
5. Perform system testing, including white-box, black-box, unit, and integration testing.
6. Document each phase of the SDLC, including system analysis, design, coding, testing, and implementation strategies.
7. Prepare and implement a system deployment plan, using strategies such as direct, parallel, phased, or pilot conversion.

The final deliverable will include a detailed project report encompassing all documentation and system artifacts. Students will also be required to present their project and demonstrate the developed system during an external viva, where they will be evaluated on both technical skills and understanding of the system development process.

Prescribed Books

Booch, G. (2007). *Object-Oriented Analysis and Design with Applications* (3rd ed.). Pearson Education.

Dennis, A., Wixom, B. H., & Tegarden, D. (2020). *Systems Analysis and Design: An Object-Oriented Approach with UML* (6th ed.). Wiley.

Hoffer, J. A., George, J. F., & Valacich, J. S. (2008). *Modern Systems Analysis and Design (2nd ed.).* Pearson Education.

Kendall, K. E., & Kendall, J. E. (2014). *Systems Analysis and Design* (9th ed.). Pearson Education.

Shelly, G. B., & Rosenblatt, H. J. (2012). *Systems Analysis and Design* (9th ed.). Cengage Learning.