Course Description

COURSE NAME	**PRG 240 Web Programming-II**
CODE	BSIT
UNITS	3
LENGTH OF CLASS	8 weeks
COURSE DESCRIPTION	This course enables students to enhance and enrich their skills in web programming. Students will learn to develop advanced web applications that use a three-tier architecture (model-view-controller), cookie management, object-oriented techniques, web services, database interactions, and web security. The following content will be covered in this course: elements of web applications, maven, controller, java beans, member variables, MVC framework, validation, persistence, advanced HTML, CSS, form validation, cookies management, web services, and database interaction.
REQUIRED TEXT	No textbook is required. All required online resources including journal and conference papers will be provided through direct links in each respective week. Supplementary books Downey Tim (2021), *Guide to web development with Java (2nd ed.)*. Springer International Publishing. eBook ISBN 978-3-030-62274-9 Hardcover ISBN 978-3-030-62273-2
METHOD OF INSTRUCTION	The course is conducted in a combination modality. Students interact with each other and with the faculty in a classroom setting and in an online learning system. Learning will be facilitated through lecture-discussions, presentations, cooperative learning, and case studies.
SCOPE	Student outcomes are measured through professional individual assignments, discussion postings, comprehensive learning assessments, and class participation.

Summary of Graded Work and Assessments

Graded work and assessments offer students the opportunity to show the degree of mastery for each CLO. The following table shows how assessments and CLOs align (link).

Assignments	Totals	Weight	CLOs
Engagement and Professionalism - Laboratory Class Activities (Rubric)	160	16%	1, 2, 3, 4, 5, 6
Week 1 Assignment	115	11.5%	1, 2
Week 2 Assignment	115	11.5%	1, 2, 5
Week 3 Discussion	50	5%	2, 5
Week 4 Assignment	115	11.5%	1, 2, 3, 4
Week 5 Assignment	115	11.5%	2, 3, 5
Week 6 Assignment	115	11.5%	2, 5
Week 7 Assignment	115	11.5%	4, 5
Week 8 Presentation and Demonstration	100	10%	1, 2, 3, 4, 5, 6
Total Points/Percentage	**1000 Points**	**100%**	

Course Policies

For Westcliff's course policies, please see the Course Policies document.

Discussion Requirements

For all discussions, the primary response is due by Thursday at 11:59 p.m. Pacific Time. The primary response must be at least 200 words in length and fully address the topic, demonstrating critical thinking and understanding. Each student must then also post a minimum of two responses to other students in the discussion by Sunday night at 11:59 p.m. Pacific Time. Each peer response must be at least 50 words in length and substantively engage with the other student's original post, continuing the discussion in a professional manner. If at any time information or material is brought in from an outside source or website, it must be properly cited following APA 7th edition guidelines and a full reference must be provided.

Assignment Requirements

Each assignment deliverable is specifically defined in the assignment instructions, such as page length, citations and references, audio or video, presentations, tables, etc. For all written assignments, the required page length does not include the cover or references pages. Refer to the specific requirements as stated in each assignment, and reach out to your instructor for additional information as needed. All graded submissions are due by Sunday at 11:59 p.m. Pacific Time.

All written work must adhere to APA 7th edition academic formatting requirements including core components such as the cover page, page numbers, headings, citations, 1" margins, paragraph indentations, left alignment, double spacing throughout, and the final references using hanging indents

Participation Requirements

Students are required to attend each live class session either in person or virtually as stipulated in the course policies. Participation in the live class session is determined by actively engaging, answering or asking questions, providing comments, interacting in group activities, etc., as required by the instructor. Students who are unable to attend the live in-class or virtual sessions must follow the VCS submission requirements as stated in the Course Policies document.

Writing Center

The Westcliff University Writing Center is dedicated to providing quality support to students and faculty. From assignment review, to in-class workshops, to dissertation support, to publication help, the Writing Center is committed to empowering individuals to use the written language to articulate and disseminate knowledge.

Course Learning Outcomes (CLOs)

Learning outcomes are statements that describe significant and essential scholarship that students have achieved and can reliably demonstrate at the end of the course. Learning outcomes identify what the learner will know and be able to do by the end of a course – the essential and enduring knowledge, abilities (skills), and attitudes (values, dispositions) that constitute the integrated learning needed for successful completion of this course. The learning outcomes for this course summarize what students can expect to learn, and how this course is tied directly to the educational outcomes of the degree.

Course Learning Outcomes (CLOs)	PLOs
1. Develop quality and scalable web applications by applying modern tools and techniques.	1, 2, 3
2. Apply three-tier architecture concept (model-view controller) and interactive database techniques in web applications.	1, 2, 3, 4, 7
3. Develop a rich interactive environment for the web.	4, 5, 6
4. Design attractive web pages by using HTML, HTML forms, and Cascading Style Sheets and manage cookies.	4, 5, 7
5. Integrate data validation techniques and write secure code for developing an advanced web application.	1, 2, 3
6. Demonstrate web based project case solutions in a professional manner.	1, 2, 4, 5, 6, 7

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Detailed Course Outline

The following outline provides important assignment details for this course, unit by unit. Students are responsible for all of the assignments given. Please refer to the Detailed Description of Each Grading Criteria in the syllabus for specific information about each assignment.

Week 1

Assignments to complete this week:

- Reading:
  - Introduction to Server Site Programming
  - Web Application and Maven
  - Introduction to web applications, architecture of web applications (components, layers - data, data access, business, presentation), types -, microservices, serverless, PWA), design patterns used by web applications, web applications frameworks and tools, web application containers
  - Aspect oriented programming, dependency injection, and plain old Java objects
- Articles to Read:
  - Web Application vs Enterprise Application, Wolfmatrix
  - An ultimate guide to web application architecture, Hiren Dhaduk, Simform
  - Spring Framework, Spring.io

Week 1 Live Class Activities

This week's live class activity involves an individual task for each student. The task is to develop a 'Hello World' Spring Web MVC project by writing client-side code, server-side code and project configuration. Following completion, students need to share their findings with the live class.

Week 1 Assignment (Rubric)

Propose a web application architecture for web application scenarios such as a job search portal, a video-sharing platform, online learning, a weather information provider service or whatsoever you want. Write a motivation behind developing this web application. Use Spring MVC to integrate the template for the static homepage into the project. Make sure that you use the proper naming convention while writing the code. Publish your webpage project on GitHub. Ensure to provide the GitHub link when submitting your assignment.

Week 2

Assignments to complete this week:

- Reading:
    - MVC Architecture
    - Spring framework - architecture
    - Controller
    - Spring Framework

- Articles to Read:
    - Spring Framework, Spring.io
    - Spring MVC Tutorial, Baeldung

Week 2 Live Class Activities

This week's live class activity involves an individual task for each student. In the live class activities for this week, students need to create an employee registration form with fields such as Name, Email , Contact number and Position and a submit button. Upon filling the fields and clicking the submit button, the data of this page must be sent to the server then be served to a second page, Employee registration summary, for display. Implement this using a controller, a service and Plain Old Java Objects (POJOs). Following the completion of the task, students will have the opportunity to share and discuss their findings with the live class.

Week 2 Assignment (Rubric)

For this task, students are required to create a login and user registration form for the application proposed in week 1. Make sure that you use the proper naming convention while writing the code. Publish your webpage project on GitHub. Ensure to provide the GitHub link when submitting your assignment.

Week 3

Assignments to complete this week:

- Reading:
  - Spring MVC
  - Data binding, URL parameters, services
  - SOAP and REST APIs
  - XML, JSON data structures, validation

- Articles to Read:
  - Building REST services with Spring, Spring.io
  - Creating a SOAP web service with Spring, Baeldung
  - A custom data binder in Spring MVC, Baeldung

Week 3 Live Class Activities

This week's live class activity involves an individual task for each student.
Create an API at the server end, send the form data in JSON format from client to the API, use data binding to map data into POJO class, validate data using annotations in the POJO class, return a second web page, Employee registration summary, if the data is valid. If the data is invalid, return with an appropriate error.

- For testing the application, use a web-browser. Inspect the web-browser's network activity.
- Test the API using CURL command as well as client tools such as 'postman'.

Share your outcomes with the live class.

Week 3 Discussion (Rubric)

Discuss the dependency injection invoked when a client's request is captured by a controller then passed to services. Provide two examples of when this technique would be used and why. Comment on other student's examples and share ideas.

Week 4

Assignments to complete this week:

- Reading:
  - Validation and Persistence
  - JDBC, ORM (JPA), Hibernate
  - Logging, error handling
- Articles to Read:
  - Object Relational Mapping, launchcode
  - A comparison between JPA and JDBC, Baeldung
  - The DAO Pattern in Java, Baeldung
  - Uploading files, spring.io

Week 4 Live Class Activities

In this week's live class, each student will undertake an individual task.
Engage in the following activities during the session: on the server side, persist the form data in a relational database JDBC and Spring Data. Use DAO and DTO objects to access and transfer data. Log data insertion event as an information in an 'application.log' file. For erroneous conditions such as database connection error, data validation error etc. write error log in the same 'application.log' file. Share your discoveries and experiences with the live class.

Week 4 Assignment (Rubric)

In this assignment, students need to enhance the login and user registration forms of the application introduced in week 2 by incorporating a database. The data must be securely stored in the database, with special attention to encrypting user passwords. Ensure the use of suitable APIs for seamless communication between the frontend and backend. Make sure that you use the proper naming convention while writing the code. Publish your webpage project on GitHub. Ensure to provide the GitHub link when submitting your assignment.

Week 5

Assignments to complete this week:

- Reading:
  - Advanced HTML and Form Elements
  - Web Application Security - sockets, sessions, authentication, tokens, logging, OWASP standard, WAF, identity management
- Articles to Read:
  - Securing a Web Application, spring.io
  - Basic Authentication, spring.io
  - Spring security basic authentication, Baeldung
  - Spring Security with JWT for REST API, TopTal

Week 5 Live Class Activities

In this week's live class, each student will undertake an individual task.
Create an API for basic authentication with username and password. Upon matching the username and password, JWT token and return the JWT token to the client. The client sends a POST request for form data submission along with a JWT token. The server should validate the JWT token first then insert the data into the database for persistence. If the JWT token is incorrect, the server must reply as an incorrect JWT token. If the token is expired, the server must reply as an expired token. Discuss and share your discoveries and experiences with the live class.

Week 5 Assignment (Rubric)

For this task, students are required to improve the application suggested in the prior week's assignment. This improvement involves integrating session management techniques and ensuring its security by applying theoretical concepts covered in the course content. Make sure that you use the proper naming convention while writing the code. Publish your webpage project on GitHub. Ensure to provide the GitHub link when submitting your assignment.

Week 6

Assignments to complete this week:

- Reading:
  - Account Cookies
  - Web application testing, BDD testing
- Articles to Read:
  - Testing the web layer, Spring.io
  - Set up and run Cucumber tests in Spring Boot applications, Medium
  - Quickstart, Gatling

Week 6 Live Class Activities

In this week's live class, each student will undertake an individual task.
Write a simple jUnit test case for validating Employee form data then run the test. On the client side, use Cucumber/Postman to develop a simple workflow of filling the Employee data form then run the test. Use the Gatling tool to build a test with predefined data for the form then run the test. Discuss and share your discoveries and experiences with the live class.

Week 6 Assignment (Rubric)

In this assignment, students must create test cases for the application proposed in the previous week's assignments. While formulating these test cases, include a comprehensive set for the CRUD (Create, Read, Update, Delete) operations pertinent to your application. Make sure that you use the proper naming convention while writing the code. Publish your webpage project on GitHub. Ensure to provide the GitHub link when submitting your assignment.

Week 7

Assignments to complete this week:

- Reading:
  - Web Services and Legacy Database
  - API design, API documentation, API test automation
- Articles to Read:
  - API Specifications, openbanking.org.uk
  - Stress testing, k6.io
  - Setting up Swagger 2 with Spring REST API using Springfox, Baeldung

Week 7 Live Class Activities

In this week's live class, each student will undertake an individual task.
Write an API test case in K6 (JavaScript). Configure the test case to run 1000 API calls for 5 minutes. Run the test then obtain the results of the test. Monitor the system resources of the server such as CPU load, memory usage, network bandwidth usage etc. while running the tests. Discuss and share your discoveries and experiences with the live class.

Week 7 Assignment (Rubric)

In this assignment, students are required to compile documentation for the project presented in the preceding assignments (Assignments 1-7). The documentation should encompass the following elements:

- Introduction
- Project scope
- Functional requirements
- Non-functional requirements
- Architecture and design
- Implementation details
- Test case reports
- Screenshots
- Performance report
- Summary

Week 8

Assignments to complete this week:

- Review all the chapters from week 1 to 7.

Week 8 Assignment Presentation and Demonstration (Rubric)

Create an enhanced PowerPoint presentation providing a concise overview of your discoveries across the weekly assignments spanning Week 1 to 7. Highlight essential aspects, the scope of your work, analyses performed, key findings, and the integration of any received suggestions. Ensure a thorough understanding of all theoretical concepts covered throughout the course is reflected in your presentation.