CptS322 Software Engineering Principles I
Course Project

1. General Description

The course project is a central component of your grade, designed to provide practical experience with the concepts and principles of software engineering. This project will allow you to apply the knowledge gained from the course in a real-world scenario, transforming theoretical concepts into tangible skills.

The project has several key goals:

i. Practical Software Engineering Experience: Provide an environment to practice software engineering on a smaller scale, allowing you to experience the complete software development process within a single semester and learn how to address common software engineering challenges.

ii. Understanding of Software Development Concepts: Facilitate a fundamental understanding of various software development concepts, such as requirements modeling, software design methodologies, and project management.

iii. Self-Motivated Research: Enhance your ability to conduct demand-driven research, encouraging you to learn and apply new concepts not covered in the course to complete your project successfully.

iv. Development of Essential Skills: Help you develop essential software development skills, including project planning, team collaboration, and software version control.

2. Project Topics

The objective of the project is to develop a software product for a real client who intends to use it in regular production. At the beginning of the course, you will form project teams of 3 to 4 members. Your team will work together throughout the semester, covering the entire development cycle from understanding requirements to delivering a functioning product. The client can be any person or organization other than yourself, such as a WSU department, a local company, an external organization, or a faculty or staff member.

You are encouraged to identify your own project topic and client. The project should involve a real client with a genuine intention to use the software in production. When selecting a project, think broadly—your project can be an application, system software, or even a toolkit, covering

a wide range of platforms from mobile devices to supercomputers. The only condition is that the project must have real users and a real client.

Below are some example project topics that you could choose if you prefer not to propose your own. For these suggested topics, the instructor and the TA will act as the clients.

i. **ClubHub: A Comprehensive University Club Management System**

ClubHub is designed to streamline the management of university clubs by providing a comprehensive platform for club officers, members, and administrators. The system will allow clubs to register officially with the university, schedule events, manage memberships, and communicate with members. The platform will include a robust database to store club data, member information, event details, and communication logs. Integration with the university portal will enable secure authentication, while email notifications will keep members informed about club activities.

ii. **ClassScheduler: An Automated Course and Timetable Scheduling System**

ClassScheduler is an automated system that helps universities manage course scheduling and timetable creation. The system will generate timetables while avoiding conflicts, considering faculty availability, room allocations, and student enrollments. A database will store information on courses, faculty, classrooms, and student registrations. The system will integrate with the university's course management system to ensure accurate and up-to-date scheduling.

iii. **CampusConnect: A Social Networking App for University Students and Faculty**

CampusConnect is a social networking platform tailored for university communities, allowing students and faculty to create profiles, connect with peers, participate in discussion forums, and share events. The app will support private messaging, event sharing, and group creation. A database will manage user profiles, posts, messages, and events. The system will integrate with the university's authentication system and support calendar synchronization for event reminders.

iv. **EventEase: A University Event Planning and Registration Platform**

EventEase is a platform designed to simplify the planning and management of university events. The system will enable event organizers to create and manage events, handle registrations, issue tickets, and send notifications to attendees. A database will store event details, attendee information, and ticket records. Integration with payment

gateways will facilitate ticket sales, and synchronization with the university calendar will ensure broad awareness of upcoming events.

v. **RoomMate: A University Dormitory Roommate Matching System**

RoomMate is a system designed to assist students in finding compatible roommates within university dormitories. The platform will allow students to create profiles, specify preferences, and search for potential roommates based on compatibility scores. A database will store student profiles, preferences, and matching history. Integration with the university housing system will enable seamless assignment and management of dormitory rooms.

vi. **StudyGroup: A Platform to Facilitate Study Group Formation and Collaboration**

StudyGroup is a platform that helps university students form and manage study groups based on their courses and academic interests. The system will allow students to create or join study groups, schedule study sessions, and share resources. A database will store group information, schedules, and shared materials. Integration with the university course system will allow for automatic suggestions of study groups based on enrolled courses.

vii. **E-Library: A Digital Library System with Integrated Research Tools**

E-Library is a digital library platform that offers students and faculty access to a wide range of academic resources, including e-books, journals, and research papers. The system will feature search functionality, citation tools, and personalized reading lists. A robust database will store digital resources, user activity, and search history. Integration with the university's library catalog will provide a seamless experience for users accessing both physical and digital resources.

viii. **GradeTracker: A Student Performance Monitoring and Feedback System**

GradeTracker is designed to help students and faculty monitor academic performance and provide timely feedback. The system will allow faculty to input grades and comments, while students can view their progress and receive personalized feedback. A database will store student grades, assignments, and feedback records. Integration with the university's learning management system will ensure seamless data flow and accurate grade tracking.

ix. **CampusSafe: A University Security and Emergency Alert System**

CampusSafe is a security platform designed to enhance safety on university campuses by providing real-time alerts and emergency communication tools. The system will allow users to report incidents, receive emergency alerts, and access safety resources. A database will track incidents, user reports, and alert history. Integration with the university's communication infrastructure will ensure timely and effective dissemination of safety information.

x. **AlumniNetwork: A Platform for Connecting Current Students with Alumni**

AlumniNetwork is a platform designed to foster connections between current students and alumni for networking, mentorship, and career opportunities. The system will allow alumni to create profiles, offer mentorship, and post job opportunities, while students can search for alumni by industry or expertise. A database will manage alumni and student profiles, mentorship requests, and job postings. Integration with the university's alumni database will keep the platform updated with current alumni information.

xi. **SmartHome: An IoT-Based Home Automation System**

SmartHome is an Internet of Things (IoT) platform designed to automate various household functions, such as lighting, heating, and security. The system will allow users to control and monitor their home devices remotely via a mobile app. A central database will manage device settings, user preferences, and automation schedules. Integration with popular IoT devices and platforms will enable seamless connectivity and control over home automation features.

xii. **HealthTrack: A Real-Time Health Monitoring System Using Wearable Devices**

HealthTrack is a health monitoring system that uses wearable devices to track real-time health metrics such as heart rate, activity levels, and sleep patterns. The system will allow users to view their health data through a mobile app, receive alerts, and share information with healthcare providers. A database will store health metrics, user profiles, and alert history. Integration with popular wearable devices and health platforms will provide a comprehensive health monitoring solution.

xiii. **SafeDrive: An Autonomous Vehicle Safety System Using Computer Vision**

SafeDrive is an autonomous vehicle safety system that leverages computer vision to detect obstacles, monitor road conditions, and prevent accidents. The system will process real-time video feeds from vehicle-mounted cameras to identify potential hazards and trigger safety responses. A database will store incident reports, sensor data, and vehicle performance metrics. Integration with existing vehicle control systems will ensure a seamless safety solution for autonomous driving.

xiv. **ShopSmart: An AI-Driven E-Commerce Platform for Personalized Shopping Experiences**

ShopSmart is an e-commerce platform that uses artificial intelligence to provide personalized shopping recommendations based on user behavior, preferences, and purchase history. The system will allow users to browse products, receive tailored recommendations, and complete purchases through an integrated shopping cart. A database will manage product listings, user profiles, and transaction history. Integration with payment gateways and shipping services will ensure a complete e-commerce experience.

xv. **TravelBuddy: A Trip Planning App with AI-Generated Itineraries**

TravelBuddy is a trip planning app that uses artificial intelligence to generate personalized travel itineraries based on user preferences, destination choices, and budget constraints. The system will allow users to input travel details and receive custom itineraries, including recommended activities, accommodations, and dining options. A database will store user profiles, travel preferences, and itinerary details. Integration with booking platforms and map services will enable seamless trip planning and execution.

xvi. **AutomatonSim: A Simulation Tool for Finite State Automata**

AutomatonSim is a software tool designed to simulate Finite State Automata (FSA) for educational and research purposes. The system will allow users to create, visualize, and test FSAs, providing a graphical interface for designing automata and running simulations. A database will store automata designs, simulation results, and user profiles. The platform will also include tools for generating state transition diagrams and analyzing automata behavior.

xvii. **E-Vote: A Secure and Transparent Electronic Voting System**

E-Vote is a secure electronic voting system designed to facilitate transparent and tamper-proof elections. The system will allow users to cast votes electronically, ensuring the integrity of the voting process through features such as encryption, voter authentication, and audit trails. A database will manage voter registrations, ballots, and election results. Integration with government or institutional databases will enable secure voter verification and accurate result reporting.

xviii. **LibrarianAssist: An Automated Librarian Assistant System**

LibrarianAssist is an automated system designed to support librarians in managing library operations such as cataloging, checkouts, and returns. The system will feature tools for automated book scanning, search functionality, and notifications for overdue items. A database will manage the library catalog, member profiles, and transaction histories. Integration with RFID or barcode scanning technologies will streamline the management of both physical and digital library resources, making it easier for librarians to manage large collections.

xix. **EngageHer: A Platform to Improve Enrollment of Girls in Engineering**

EngageHer is a web-based platform designed to increase the enrollment and participation of girls in engineering programs across the United States. Despite progress in STEM fields, women remain underrepresented in engineering, making up only 20% of the engineering workforce. EngageHer aims to address this disparity by offering resources such as success stories of women in engineering, scholarship information, and mentorship programs that connect prospective female students with current engineering students and professionals. The platform will also feature interactive webinars, workshops, and community forums to provide guidance, support, and inspiration. A central database will manage user profiles, mentorship connections, and scholarship opportunities, while integration with social media will enhance outreach and engagement. By creating a supportive and informative environment, EngageHer seeks to empower more girls to pursue careers in engineering, contributing to a more diverse and inclusive engineering workforce.

xx. **ResearchTrack: A Web Portal for Tracking Publications and Achievements**

ResearchTrack is a web portal designed to help universities and academic institutions keep track of the research publications and achievements of their scholars, faculty, and students. The system will allow users to submit and manage records of their publications, conference presentations, awards, and other academic achievements. A comprehensive database will store details such as publication titles, authors, journals, conference proceedings, and achievement descriptions. The portal will feature search and filtering capabilities, enabling users to easily access and showcase their work. Integration with external academic databases like Google Scholar or ORCID will allow for automatic updates and verification of publication records. Additionally, the system will support generating reports and statistics, which can be used for departmental reviews, grant applications, and institutional rankings.

xxi. **DineAuto: A Restaurant Automation and Ordering System**

DineAuto is a restaurant automation system designed to streamline the ordering and dining experience. The system will allow customers to place orders through a mobile app or in-restaurant kiosks, offering features such as menu browsing, customizations, and payment processing. A database will manage menu items, orders, and customer profiles. Integration with kitchen display systems and point-of-sale (POS) systems will ensure efficient order processing and customer satisfaction. The system will also support real-time order tracking and provide analytics for restaurant management, helping to optimize operations and improve service delivery.

xxii. **LearnSmart: An Integrated Learning Management System for Universities**

LearnSmart is a comprehensive Learning Management System (LMS) designed for universities to manage and deliver courses online. The system will provide tools for course creation, content delivery, assessments, grading, and student engagement. A database will store course materials, student records, and assessment results. Integration with university authentication systems will ensure secure access, while features like discussion forums, video conferencing, and progress tracking will enhance the learning experience for students and faculty alike, fostering a collaborative and interactive online learning environment.

xxiii. ClassRespond: An Interactive Classroom Response System

ClassRespond is an interactive classroom response system that enables real-time feedback and participation during lectures. The system will allow instructors to pose questions, conduct polls, and receive instant responses from students using their mobile devices or laptops. A database will store response data, participation records, and quiz results. Integration with presentation software and learning management systems will ensure seamless operation during classes, enhancing student engagement and allowing instructors to immediately gauge understanding and adjust their teaching accordingly.

xxiv. HackAssign: A HackerRank-Style Mini Assignment Submission Platform

HackAssign is an online platform designed for submitting and evaluating coding assignments, modeled after competitive programming platforms like HackerRank. The system will allow instructors to create coding challenges, and students to submit their solutions for automatic evaluation. A database will store assignment details, submissions, and grading results. Integration with learning management systems will streamline the assignment submission process and provide students with immediate feedback on their code performance, helping them to improve their coding skills in a structured environment.

xxv. AI4Good: Using AI for Social Good Initiatives

AI4Good is a platform designed to harness the power of artificial intelligence to address social challenges and promote the common good. The system will provide tools and frameworks for developing AI models aimed at solving issues such as poverty, healthcare access, environmental protection, and education. A database will store datasets, project descriptions, and AI models. Integration with open data platforms and collaboration tools will enable developers, researchers, and volunteers to work together on AI-driven social initiatives, fostering innovation and creating meaningful impact in various domains.

3. Team Structure

Each team should consist of 3 to 4 members. One member should be designated as the main point of contact, responsible for regular communication with the instructor and TA, such as scheduling milestone check-ins. By the Milestone 0 deadline, submit a team information PDF

to the TA and instructor, including your project topic, team name, member details (WSU ID, name, and email), and a private Git repository URL for the project.

Teams are encouraged to develop an organizational structure that best suits their working style, whether it's Agile (e.g., Scrum), having a team leader, or rotating leadership roles. Regular meetings, clear communication channels, and effective use of tools like mailing lists, chat platforms, and issue trackers are essential for success.

4. Milestones and Deliverables

The project is divided into several milestones, each marking a significant phase of the development process. For each milestone, your team will submit a deliverable, such as documents or code, to the project repository. These milestones are designed to guide you through the development process incrementally.

- Milestone 0 – Team Formation and Project Repository Creation: Set up your team and create a GitHub repository. Deliver a PDF with team details and project information.
- Milestone 1 – Tools, Technologies, and Process Plan: Identify and justify the tools, technologies, and processes your team will use. Submit a PDF describing these elements.
- Milestone 2 – Requirements Modeling: Scenario-Based Elements: Develop preliminary use cases and document scenario-based elements of the requirements model. Submit a PDF with use case diagrams and formal descriptions.
- Milestone 3 – Requirements Modeling: Class-Based Elements: Identify class-based elements and data models for your project. Deliver a PDF with class diagrams, and package diagrams.
- Milestone 4 – Design Modeling: Software Architecture: Propose a high-level software architecture, including key components and their interactions. Submit a PDF with architecture context and component diagrams.
- Milestone 5 – Design Modeling: Software Design: Develop detailed design diagrams for data, user interface, and component-level design. Deliver a PDF with design specifications.
- Milestone 6 – Construction: Implement the software based on your design. Submit a PDF with usage instructions and code to the repository.
- Milestone 7 – Testing: Develop and execute test cases to ensure the software meets design and requirement specifications. Submit a PDF with test case descriptions.
- Milestone 8 – Presentation: Demonstrate the functioning product and present the project to the class. Submit a PDF with screenshots, a retrospective summary, and conduct a presentation.

5. Project Evaluation

The project grade will consist of team-based milestone grades and peer evaluation scores. Each member will receive the team grade, which will then be adjusted based on peer evaluations. Details on peer evaluation will be provided later.