

Chulalongkorn University
Faculty of Engineering
Department of Computer Engineering

2110335 Software Engineering I (1st Semester, 2021)

Course Description: Software life cycle; software process; software development process models; feasibility study; software project management; modeling language; requirements gathering; requirements analysis; requirements specification; analysis model; analysis model verification and validation; requirements management; analysis patterns; user interface design.

Course Objectives: The objectives of this course encourage students to

1. create software project management plan that is suitable for project characteristics
2. create software requirements specification
3. analyze and design software models
4. create a software design specification

Instructors:

Section 1: Assist. Prof. Nakornthip Prompoon (nakornthip.s@chula.ac.th): Head Instructor
office hours: (Wednesday 13:00-14:00, Thursday 11:00-12:00, Thursday 13:00-15:00)

Section 2: Assoc. Prof. Dr. Twittie Senivongse (twittie.s@chula.ac.th)
office hours: (Thursday 16:00-17:30, Saturday 16:00-17:30)

Section 3: Ajarn Dr. Pittipol Kantavat (pittipol.k@chula.ac.th)
office hours: (Tuesday 13:00-14:30, Thursday 13:00-14:30)

Section 33: Ajarn Dr. Nuengwong Tuaycharoen (nuengwong.t@chula.ac.th)
office hours: (Wednesday 13:00-14:30, Thursday 13:00-14:30)

Required Textbook:

1. Roger Pressman and Bruce Maxim, “Software Engineering: A Practitioner's Approach”, 9th Edition, McGRAW-HILL, 2020 [ISBN13: 9781259872976]
<https://www.mheducation.com/highered/product/software-engineering-practitioner-s-approach-pressman-maxim/M9781259872976.html>
2. Alan Dennis, Barbara Haley Wixom, David Tegarden “Systems Analysis and Design An Object-Oriented Approach with UML”, 5th Edition, John Wiley and Sons, Inc. 2020 [ISBN: 978-1-119-56121-7]
<https://www.wiley.com/en-us/Systems+Analysis+and+Design%3A+An+Object+Oriented+Approach+with+UML%2C+6th+Edition-p-9781119561217>

References:

1. Bernd Bruegge and Allen H. Dutoit, “Object-Oriented Software Engineering Using UML, Patterns, and Java”, 3rd Edition, Pearson
<https://www.pearson.com/us/higher-education/program/Bruegge-Object-Oriented-Software-Engineering-Using-UML-Patterns-and-Java-3rd-Edition/PGM58934.html>
2. ISO/IEC/IEEE 29148 Systems and software engineering — Life cycle processes — Requirements engineering

Course student outcomes

After studying from this class, a student should have the following capabilities.

1. be able to explain and apply types of SDLC
2. be able to describe basic project management processes
3. be able to create a software project management plan
4. be able to identify requirements determination processes
5. be able to create a software requirements specification
6. be able to describe the software design principles
7. be able to create a software design specification
8. be able to create a software prototype
9. be able to explain a list of processes of system installation and operations
10. be able to apply the class content and work together as a team to produce a class project work results as a software project management plan, software requirements specification, system and software design specification, a system prototype and a list of system installation and operations, and present them to the class

Course Evaluation:

1st Exam (15%), 2nd Exam (15%), 3rd Exam (15%), 4th exam (15%), Review questions (5%), Group workshop (5%), Term project (30%)

1. Term Project 30 %

Term project is an assignment that helps students to apply knowledge to the real-world applications, emphasizing the software analysis and design phases. Students must work together as a team (7-8 persons) to analyze and design a selected computerized/information system. Each team must submit and present project deliverables for four milestones by using the assigned templates. Time duration specification for each presentation is 15 minutes.

A list of project milestones document and presentation is as follows.

- **Milestone 1: System request document (No point)**
- **Milestone 2: Proposal document and presentation (4%+1%*)**
- **Milestone 3: Analysis Phase: System and software requirements document and presentation (8%+2%*)**
- **Milestone 4: Design phase: (2%*)**
 - (1) System and software design specification document and presentation (10%)
 - (2) System installation and operation document and presentation (3%)

Note: *An ability to write well-structured reports with clarity and conciseness and presentation

All reports must be submitted on the date indicated in the class schedule by 24:00 (midnight) via **CourseVille** using Course Dropbox feature. After having feedback from the instructor and classmates, each group must make a correction and resubmit the updated works on the date indicated in the class schedule.

All late submissions will be deducted by 10% from the assigned score.

2. **Examination: 1st Exam (15%), 2nd Exam (15%), 3rd Exam (15%), 4th exam (15%),**
3. **Review questions 10 times 5%**
4. **Workshop 5%** (Workshop is a collaboration and brainstorming work for in-class term project assignment.)

Notes: Exercises will be given for the main lessons. Students are encouraged to do the exercises individually for reviewing the class content and applying the knowledge to the problem.

Suggested Software Tool

Project management: GanttProject, ProjectLibre, TeamGantt

UML: draw.io (diagrams.net), Lucidchart, Argo UML

UI: Figma, Adobe XD

Class communication

- Announcement via myCourseVille
- Class Facebook: 2110335 Software Engineering I 2564/1

Class Attendant

According to the university policy based on the Coronavirus disease (COVID-19) pandemic situation, all students must attend online classes via the Zoom application to study and perform required activities as listed in the class schedule.

Students must attend at least 80% of all class hours to fulfill the right to take the examination.

Class Schedule

Week	Date	Lesson/Activity	Assignment
1	10 Aug 2021	<ul style="list-style-type: none"> - Introduction to SE I class (Class expectations and term project requirements) - Chapter 1: Types of information system and application, major success or failure in software development project, SA role and skills (Aj. Nakornthip) - Explain term project requirements 	
	12 Aug 2021	- Nation Mother Day (no class)	
2	17 Aug 2021	<ul style="list-style-type: none"> - Chapter 1: Systems Development Life Cycle (SDLC), SD Methodologies, system and software modelling using UML and tool - Demo by using Patterson case study, select appropriate SDLC 1.Review questions chapter 1 	<ul style="list-style-type: none"> - Exercise-1: CD selection, select appropriate SD methodologies - Students submit member name list for class term project on 18 Aug
	19 Aug 2021	<ul style="list-style-type: none"> - Chapter 2: Project identification, system request, feasibility study, project selection (Aj. Twittie) - Demo develop system request, feasibility (technical, organizational, economic) study 	- Exercise-2.1: CD selection, develop system request, feasibility
	20 Aug 2021 13:00-16:00	Invited speaker: From challenges to product development	Problem/Customer understanding and design thinking
3	24 Aug 2021	Workshop#1: Develop a system request of term project	
	26 Aug 2021	<ul style="list-style-type: none"> - Chapter 2: Project management tool (WBS, Gantt Chart, Network Diagram), project effort estimation, project organizational structure, project standards (continue) - Demo Gantt chart, effort estimation 2.Review questions chapter 2 	<ul style="list-style-type: none"> - Exercise-2.2: CD selection, develop Gantt chart, calculate effort estimation - Due Milestone 1: Term project's system request on 30 Aug

4	31 Aug 2021	- Chapter 3: Requirements Determination (Aj. Pittipol)	- Exercise-3: CD selection, define analysis techniques, requirements gathering method, identify list of user requirements and nonfunctional requirements
	2 Sept 2021	- Chapter 3: Requirements Determination (continue) - Demo select requirements analysis techniques, requirements gathering method, identify list of user requirements and nonfunctional requirements 3.Review questions chapter 3	
5	7 Sept 2021	- Chapter 4: Business Process and Functional Modeling (Aj.Nuengwong)	Exercise-4: CD selection, develop business process model (using activity diagram), use case diagram and description (only one case diagram and use case description)
	9 Sept 2021(9:45-11:00 AM)	First Examination (midterm part 1)	Cover lesson 1-2
6	14 Sept 2021	- Chapter 4: Business Process and Functional Modeling, - Demo business process model, use case diagram and description 4.Review questions chapter 4	
	16 Sept 2021	Workshop#2: Develop activity diagram, use case diagram, and use case description of term project	- Due Milestone 2: Term project's proposal document on 17 Sept - All groups submit slide presentation on 20 Sept
7	21 Sept 2021	Proposal presentation	
	23 Sept 2021	Proposal presentation	Due Term project's revised proposal document on 4 Oct.
8	27 Sept 2021 (14:30-16:00)	Second Examination (midterm part 2)	Cover lesson 3-4
9	5 Oct 2021	- Chapter 5: Structural Modeling, Analysis patterns (Aj. Nakornthip) - Demo a class diagram and CRC card	- Exercise-5: CD selection, develop a class diagram and CRC card
	7 Oct 2021	- Chapter 5: Structural Modeling, Analysis patterns (continue) Workshop#3: Develop class diagram and CRC card of term project 5.Review questions chapter 5	
10	12 Oct 2021	- Chapter 6: Behavioral Modeling, Requirements and analysis model verification and validation (Aj. Twittie)	Exercise-6: CD selection, construct a sequence diagram, and a state machine diagram, perform requirements and analysis model verification and validation

	14 Oct 2021	<ul style="list-style-type: none"> - Chapter 6: Behavioral Modeling, Requirements and analysis model verification and validation (cont.) - Demo a sequence diagram and a state machine diagram, Requirements and analysis model verification and validation <p>Workshop#4: Develop sequence diagram and state machine diagram of term project</p> <p>6.Review questions chapter 6</p>	-
11	19 Oct 2021	<p>Chapter 7: Moving on to Design, Design Process</p> <p>Demo package diagram (Aj.Pittipol)</p> <p>7.Review questions chapter 7</p>	- Exercise-7: CD selection, construct package diagram
	20 Oct 2021 16:30 – 18:00 Make up class for 21 Oct 2021 (วันออกพรรษา)	<p>Chapter 8: Class and Method Design (Aj.Pittipol)</p> <p>Demo contract and method specification, component diagram</p>	- Exercise-8: CD selection, create contract, method specification and component diagram
12	26 Oct 2021	<p>Workshop#5: Develop contract, method specification and component diagram of term project</p> <p>8.Review questions chapter 8</p>	<p>-Due Milestone 3: Term project's systems and software requirements specification document on 29 Oct</p> <p>-All groups submit slide presentation on 1 Nov</p>
	28 Oct 2021 (9:45-11:00)	Final exam part 1	Cover lesson 5,6,7,8
13	2 Nov 2021	Systems and software requirements specification presentation	Due revised systems and software requirements specification on 12 Nov
	4 Nov 2021	<p>Chapter 10: Human-Computer Interaction Layer Design (Aj.Nuengwong)</p> <p>Demo user interface design, real use case</p>	Exercise-9: CD selection, create user interface design, real use case
14	9 Nov 2021	<p>Chapter 10: Human-Computer Interaction Layer Design (continue)</p> <p>Demo user interface design, real use case</p> <p>Workshop#6: Develop user interface design, real use case of term project</p> <p>9.Review questions chapter 10</p>	
	11 Nov 2021	<p>Chapter 11: Physical Architecture Layer Design (Aj.Twittie) + VDO</p> <p>Demo system deployment diagram, network model</p>	Exercise-10: CD selection, create system deployment diagram, network model
15	16 Nov 2021	No class, students attend database class activity	
	18 Nov 2021	SE I Guest speaker on industrial practices and current trends in software engineering	
16	23 Nov 2021	<p>Chapter 11: Physical Architecture Layer Design (Aj.Twittie) + VDO</p> <p>Chapter 13: Installation and operations (Aj.Nakornthip) + VDO</p> <p>10.Review questions chapter 11 and 13</p>	<p>- Due Milestone 4: Term project's final part on 19 Nov including: final term project prototype design and document (project design</p>

			phase and installation and operation phase document) All groups submit slide presentation on 24 Nov
	25 Nov 2021	Term project final presentation	
17	3 Dec 2021 Final exam (8:30-10:30 AM)	Final exam part 2	Cover lesson 10, 11, 13

Recommendation for project topic list that should be included in each required deliverable document

1. System request: Overview and background of the project, project sponsor, business need, business requirements, business value, special issue, and constraints

2. Project proposal:

2.1 The following topics should be included in the project proposal:

Project name, introduction {organization background, existing system, problem statement (problem types, problem name, problem description, cause, effect)}, Definitions (นิยามศัพท์เฉพาะ), to-be system, objective of the project, system development constraint, scope (list of requirements (functional, non-functional), selected SDLC methodology, Gantt chart, team organization and responsibility, benefit of the project, the positive or negative impact of the to-be system with respect to the society, environment, economic issues, and global issues,

Appendix: result of feasibility study, software tool for software project management and system analysis and system design

Notes: Scope (list of requirements) shall use the recommended syntax for writing requirements and consider good characteristics of requirements.

2.2 List of teammate contributions

3. Project analysis phase document:

The following topics should be included in the project analysis phase document:

3.1 Project name, introduction (revised from MS 2), objective of the analysis document, **details of requirements**, overview of the to-be system context, term definition, list of stakeholders and their responsibilities, proposed method of systems analysis, Business process modeling (using Activity diagram), Detail Essential Use Case diagram and description, Class diagram and CRC CARD (only entity class), Sequence diagram, State machine, Verifying and validating the analysis model

Details of requirements should include

RequirementID, Requirement Name, Input (Name, Type, Description, Valid value, Invalid value), Output (Name, Type, Description, Output for valid input, and Output for invalid input (error message)).

Notes: Details of requirements shall use the recommended syntax for writing requirements and consider good characteristics of requirements.

3.2 List of teammate contributions

4. Project design phase and installation and operation phase document

4.1 System and software design specification document

The following topics should be included in the **project system and software design phase document**:

Project name, introduction (revised from MS 3), objective of a design document, design criteria and principles, system design constraint, overview of infrastructure design (Network diagram and Deployment diagram), Hardware and Software specification, Detail Real Use Case diagram, and description (applying Package diagram), Class diagram and CRC class (with invariants and applying Package diagram), Component diagram, Verifying CRUDE matrix, Contract specification, method specification, and validating class and method design, User interface design principles and techniques, User interface design, Nonfunctional requirements and physical architecture design, Verifying and validating the physical architecture layer.

4.2 System installation and operation document

The following topics should be included in the **project system installation and operation phase document**:

Migration plan (conversion plan, change management), post-implementation activities,

4.3 List of teammate contributions

Project Description

Each group shall identify the problems and propose the solutions for a **Matchmaker Organization**. The proposed solutions shall follow the guidelines of the topics listed in the four milestones.

เจ้าของบริษัท Matchmaker (อาจารย์ประจำตอนเรียน) ต้องการสร้าง ระบบ Matchmaker เป็นระบบจับคู่ระหว่างผู้ให้บริการ และผู้รับบริการ เช่น ระบบช่าง โดยผู้ให้บริการ (ช่างสามารถ สร้าง ติดตั้ง ซ่อม โครงสร้างบ้าน ประปา ไฟฟ้า หรือ แอร์ เป็นต้น) และผู้รับบริการคือผู้ที่ต้องการใช้บริการต่าง ๆ ของช่าง ระบบนี้มีฟังก์ชันเบื้องต้นดังต่อไปนี้

1. มีส่วนจัดการทะเบียนสมาชิกผู้ให้บริการและผู้รับบริการ (เพิ่ม ลบ แก้ไขทะเบียน)
2. ฟังก์ชันของผู้ให้บริการ
 - ระบบบริการที่จะให้บริการ
 - ระบบลักษณะงานที่ให้บริการ เพิ่ม ลบ แก้ไขบริการ โดยระบุราคาค่าให้บริการ ช่วงเวลาที่ให้บริการ การรับประกันงาน และอื่น ๆ ตามความต้องการของเจ้าของบริษัท Match Maker
3. ฟังก์ชันของผู้รับบริการ
 - สามารถสืบค้นบริการที่ต้องการ
 - สามารถสืบค้นผู้ให้บริการ (สืบค้นตามราคา, คุณภาพการให้บริการของแต่ละผู้ให้บริการ)
 - สามารถจองขอรับบริการจากผู้ให้บริการ และยกเลิกการจองได้
4. มีส่วนการชำระเงิน
 - ผู้ให้บริการสามารถระบุค่าบริการ และค่าอะไหล่/วัสดุ (ถ้ามี) เพื่อแจ้งให้ผู้รับบริการทราบ ซึ่งผู้รับบริการสามารถ ยอมรับ หรือปฏิเสธได้ ถ้ายอมรับผู้ให้บริการก็จะดำเนินการให้บริการต่อไป
 - ผู้รับบริการสามารถชำระเงินหลังจากยอมรับโดยผู้ให้บริการ
 - การชำระเงิน ชำระเป็นเงินโอนเข้าบัญชีธนาคาร หรือผ่านบัตรเครดิต

หมายเหตุ

- 1) ระบบอื่น ๆ ที่มีลักษณะ Matchmaker เช่น ระบบแม่บ้าน ระบบผู้ดูแลผู้สูงอายุและเด็ก ระบบจักรยานยนต์รับ-ส่งเอกสาร ระบบจ้างโปรแกรมเมอร์ฟรีแลนซ์ เป็นต้น
- 2) ระบบนี้ให้พัฒนาเป็น **web application** โดยที่สามารถใช้งานได้ทั้งบนมือถือ และบนเครื่องคอมพิวเตอร์ (**responsive design**)
- 3) ขอสงวนสิทธิ์ในการเพิ่มเติม แก้ไข เปลี่ยนแปลง รายละเอียดบางส่วนเพื่อความเหมาะสมโดยจะแจ้งให้ทราบในห้องเรียน