

**University of Asia Pacific (UAP)**  
**Department of Computer Science and Engineering (CSE)**

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**Course Outline**

<b>Program:</b>	Computer Science and Engineering (CSE)
<b>Course Title:</b>	Software Engineering
<b>Course Code:</b>	CSE 313
<b>Semester:</b>	<b>Spring-2025</b>
<b>Level:</b>	6 <sup>th</sup> Semester
<b>Credit Hour:</b>	3.0
<b>Name &amp; Designation of Teacher:</b>	Dr. Md. Rashedul Islam Dr. Homeyra Akter Tahmid Taki Rahman
<b>Office/Room:</b>	7th Floor, UAP (Teachers' Area)
<b>Class Hours:</b>	<b>TBA</b>
<b>Consultation Hours:</b>	After Class Hour
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<b>Rationale:</b>	The Software Engineering course builds a basic understanding of the current trends in the IT industry and their resolutions. This course enhances the ability to design, develop, analyze a software-based solution and use engineering judgment to build a conclusion for the software application system.
<b>Pre-requisite (if any):</b>	CSE 305 (System Analysis and Design).
<b>Course Synopsis:</b>	<b>Software Engineering Concept:</b> Introduction, global software market: industry trends and IT sector of Bangladesh, key challenges, software engineering and web 3.0, 4IR, cloud-based software engineering, modern software engineering methodologies for mobile environments, green software engineering and sustainable development with 4IR, software

engineering ethics. **Project Management:** Software planning, Software Project Management, schedule: people and effort, timeline and schedule, risk: identification, refinement, mitigation, **Software Requirements:** System requirement specification (SRS): elementary business logic, function description, priority, dependency, nonfunctional requirement, **Software process model:** prescriptive model: waterfall model, v model, evolutionary model: spiral, incremental model: Agile, DevOps, **Design:** Software Design Principles, Strategy of Design: Coupling and Cohesion, Architectural Design, Distributed Systems Architectures, Client-Server Architecture, refinement, refactoring **Interface Design:** interface design pattern, **Data Design:** data design standard and practice. **Development:** Coding Standards and Guidelines, Coding Documentation, Software Reuse, Application Frameworks, Dev-Ops and collaborative software development, Application Programming Interface(API): REST-API. **Verification and Validation:** Planning verification and validation, Software inspections, Verification and formal methods, Cleanroom software development, **Software Testing:** Software Testing Principles, Testing Guidelines, Testing Process, Testing Types: Manual and automated, Testing Documentation, **Software Quality:** Testing vs. QA, QC and Audit, ISO 9000 Certification, Six Sigma. **Software Maintenance:** Types of Software Maintenance, Causes of Software Maintenance Problems, Software Maintenance supportability, **Cost Factors:** Software engineering cost model (CoCoMo), **Software Security:** Basic Software Security concepts, risk management and its solutions.

### Course Objectives:

#### The objectives of this course are to:

1. **Describe** the basic software engineering methods, models, patterns and their appropriate application.
2. **Relate** the software requirements, SRS document, object-oriented analysis and UML diagrams.
3. **Explain** different software testing approaches, verification, validation and quality control.
4. **Explain** different types of software process models and risk management systems, software evolution and related issues such as version management.
5. **Provide** the knowledge to design and implement of different software process models in different systems and how to ensure good quality software.
6. An **Ability** to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions globally.

**Course Outcomes (CO) and their mapping with Program Outcomes (PO) and Teaching-Learning Assessment methods:**

<b>CO No.</b>	<b>CO Statements:</b> Upon successful completion of the course, students should be able to:	<b>Corresponding POs (Appendix-1)</b>	<b>Bloom's taxonomy domain/level (Appendix-2)</b>	<b>Delivery methods and activities</b>	<b>Assessment Tools</b>
CLO 1	<b>Understand</b> the basic concept of software engineering, software engineering models, various architecture styles, patterns, diagrams, requirement specifications and testing methods that are used to design and develop real-life software applications.	(a)	1/Understand	Lecture, multimedia, Books	Mid and Final Exam
CLO 2	<b>Identify</b> appropriate software process model, application framework or web services, design pattern: architecture, interface, data according to requirements, testing techniques for developing and verifying the real-life software applications.	(b)	1/Analyze	Lecture, multimedia, Books	Quiz (1,2,3), Assignment, Mid and Final Exam
CLO 3	<b>Predict</b> project operating cost and estimated time for project evaluation by applying management principles and economic decision model.	(k)	1/Apply	Lecture, multimedia, Books	Final Exam
CLO 4	<b>Explain</b> the impact of software engineering solutions in terms of security and safety, public health and welfare, as well as cultural, social, and economic factors that lead to sustainable development for the upcoming industrial revolution.	(f)	1/Understand	Lecture, multimedia, Books	Final Exam, Quiz(4)

**Weighting COs with Assessment methods:**

Assessment Type	% weight	CLO1	CLO2	CLO3	CLO4
Final Exam	50%	10	20	10	10
Mid Term	20%	10	10	0	0
Class Quizzes+ Assignment	30%	0	20 (ct-1/2/3) (best-2)	10 ct-4	0
<b>Total</b>	<b>100%</b>	<b>20</b>	<b>50</b>	<b>20</b>	<b>10</b>

**Course Content Outline and mapping with Cos**

Weeks	Topics / Content	Course Outcome	Delivery methods and activities	Reading Materials
1-2	<b>Introduction to Software Engineering:</b> software as a product, different types of software, global software market – industry trends and forecast, it sector of Bangladesh, key challenges facing software engineering, software engineering and web 3.0, 4ir, cloud based software engineering, modern software engineering methodologies for mobile environments, green software engineering and sustainable development with 4IR, software engineering ethics. Socio-technical system, system design process, legacy systems, critical system.	CLO1, CLO4	Lecture, multimedia, Books	Books ( <b>chapter-1,2,3</b> ), Slides, and References
2-3	<b>Software Process Models:</b> SDLC, Software Process Model, Waterfall Model, RAD Model, Spiral Model Incremental Model, V-Model, Agile Model, Big bang model, Prototype Model, Agile, DevOps, Comparison among Various SDLC Models	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-4</b> ), Slides, and References

3	<b>Project Management:</b> Software project management, The 4 P's, Management activities, Project planning, Risk management	CLO1, CLO4	Lecture, multimedia, Books	Books ( <b>chapter-5</b> ), Slides, and References
4	<b>Software Requirements:</b> Requirements Engineering (RE), RE Document, RE Process, Feasibility Studies Requirements Elicitation and Analysis, Requirements Validation And Management.	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-6,7</b> ), Slides, and References
5-6	<b>Design:</b> Software design, Design Principles, Strategy of Design Coupling and Cohesion, Architectural Design, Abstract machine (layered) with some <b>case study</b> .	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-11,14</b> ), Slides, and References
7	<b>Design: Distributed Systems Architectures,</b> Client-Server Architecture, Broker Architectural Style: CORBA, Service-Oriented Architecture (SOA).	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-12,13</b> ), Slides, and References
<b>Mid- Term Exam</b>				
8	<b>Development:</b> Agile methods, Extreme programming, Coding, Coding Standards and Guidelines, Coding Documentation, Software Reuse, Application Frameworks, Model-View-Controller pattern, WAF Features, Dev-Opps and collaborative software development.	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-17,18</b> ), Slides, and References
9	<b>Verification and Validation:</b> Planning verification and validation, Software inspections, Automated static analysis, Verification and formal methods, Cleanroom software development	CLO1,C LO2	Lecture, multimedia, Books	Books ( <b>chapter-22</b> ), Slides, and References
10	<b>Software Testing:</b> Software Testing Principles, Testing Guidelines, Testing Process	CLO1,C LO2	Lecture, multimedia, Books	Books ( <b>chapter-23,24</b> ), Slides, and References

	, Testing Types: Manual & Automated, Black-box Testing & White-box Testing, Grey-box Testing.  <b>Software Testing:</b> Unit Testing , Integration Testing System Testing And It Types Acceptance Testing, Testing Documentation	CLO1, CLO2	Lecture, multimedia, Books	Books ( <b>chapter-23,24</b> ), Slides, and References
11	<b>Software Quality:</b> Testing vs. QA, QC and Audit ISO 9000 Certification, Six Sigma.	CLO1, CLO3	Lecture, multimedia, Books	Slides, and References
12	<b>Software Maintenance:</b> Need for Maintenance, Types of Software Maintenance, Causes of Software Maintenance Problems, Software Maintenance, Cost Factors Software Re-engineering	CLO1, CLO3	Lecture, multimedia, Books	Books ( <b>chapter-26,27</b> ), Slides, and References
13	<b>Emerging Technologies:</b> Security concepts, and risk management, Design for security, service-oriented software engineering and its security.	CLO1, CLO4	Lecture, multimedia, Books	Books ( <b>chapter-30</b> ), Slides, and References
<b>Final Exam</b>				

**Minimum attendance:** 70% class attendance is mandatory for a student in order to appear at the final examination.

**Required References:** **Software Engineering by Sommerville, 8th Edition , 10th Edition**  
The Unified Modeling Language User/Reference Guide - Grady Booch,  
James Raumbugh, Pearson Education INC

**Recommended References:**

1. Software Engineering a practitioner's approach - Roger S. Pressman, McGraw-Hill Book Company
2. Software Engineering (3rd ed.) by Aggarwal K.K., Singh Yogesh, K.K. Aggarwal, and Yogesh Singh
3. Agile Testing: A Practical Guide for Testers and Agile Teams 1st Edition by Lisa Crispin (Author), Janet Gregory (Author)

**Grading System:** As per the approved grading scale of University of Asia Pacific (Appendix-3).

**Special Instructions:**

**Late attendance:** Students who will enter the class after the attendance call will be marked as absent.

**Assignment:** Assignment will be given throughout the semester. Copied assignments will be graded as zero. Late submission will result a 50% deduction in score.

**Class Test:** There will be no make-up quizzes.

**Student's responsibilities:**

Students must come to the class prepared for the course material covered in the previous class (es).

They must submit their assignments on time.

<b>Prepared by</b> (Course Teacher)	<b>Checked by</b> (Chairman, PSAC committee)	<b>Approved by</b> (Head of the Department)
Dr. Md. Rashedul Islam Dr. Homeyra Akter Tahmid Taki Rahman		

**Appendix-1:****Washington Accord Program Outcomes (PO) for engineering programs:**

(a) Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in K1 to K4 respectively to the solution of complex engineering problems.

(b) Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (K1 to K4)

(c) Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (K5)

(d) Conduct investigations of complex problems using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

(e) Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of their limitations.

(f) Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (K7)

(g) Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (K7)

**(h)** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K7)

**(i)** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

**(j)** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**(k)** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**(l)** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Knowledge Profile**

K1 A systematic, theory-based understanding of the natural sciences applicable to the discipline

K2 Conceptually based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline

K3 A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline

K4 Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

K5 Knowledge that supports engineering design in a practice area

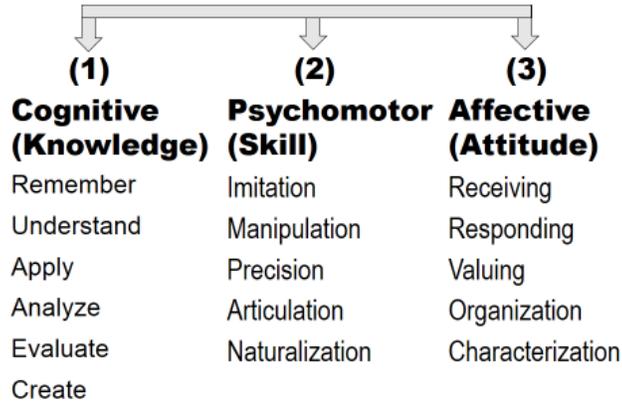
K6 Knowledge of engineering practice (technology) in the practice areas in the engineering discipline

K7 Comprehension of the role of engineering in society and of the identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity in economic, social, cultural, environmental and sustainability terms

K8 Engagement with selected knowledge in the research literature of the discipline

**Appendix-2**

**Bloom's Taxonomy (Taxonomy of Learning)**  
**3 Domains**



**Appendix-3**  
**UAP Grading Policy:**

<b>Numeric Grade</b>	<b>Letter Grade</b>	<b>Grade Point</b>
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00