University of Sana'a
Faculty of Engineering
Department: Electrical Engineering
Title of the Program: Computer Engineering & Control

Course Specification of Software Engineering

I. Course Identification and General Information:

1.	Course Title:	Software Engineering				
2.	Course Code & Number:	CCE322				
3.	Credit hours:	C.Hs				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	4^{th} level / Second semester				
5.	Pre –requisite (if any):	Data Structures & Algorithm (CCE246) & Programming Language 3 (Java) (CCE244)				
6.	Co –requisite (if any):	Database Systems (CCE323)				
7.	Program (s) in which the course is offered:	Computer Engineering & Control				
8.	Language of teaching the course:	English				
9.	Location of teaching the course:	Department of Electrical Engineering class room				
10.	Prepared By:	Asst. prof. Dr. Ali AL-Hamdi				
11.	Date of Approval					

II. Course Description:

This course aims to provide students with scientific knowledge on the concepts, principles, and techniques related to the software development, as well as introducing technical tools used in software systems development to solve computing and information problems. The course covers the fundamentals of software engineering topics including S/W process models, requirements engineering, system modeling tools, architectural design, system design, system implementation, software

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evolution, distributed and reuses software, and quality management. Throughout lectures, computer-based lab and term project works, students develop the problem-solving and the personal skills to solve tasks related to the development of software industry productively. Moreover, the course develops the ability of students to operate effectively in a professional environment, providing ideas and producing solutions to make existing technologies more efficient, or to develop new technologies.

III. Course Intended learning outcomes (CILOs) of the course		**Referenced PILOs**
a1	Define important terminologies related to software engineering such as software process, requirements, architecture design, design, modeling, reuse, distribution systems, quality management, etc.…	A1 and A2
a2	Explain software development lifecycle activities, related models used, principles, professional and ethical issues and responsibilities, etc. linked to a software development for different applications.	A3 and A4
b1	Analyze efficiently and effectively user and system requirements (functional and nonfunctional) that meet the software customer needs and validate her/his satisfaction.	B2, and B3
b2	Design system structure and its functionality based on multiple personal views and adopting design pattern in considering technical, economic, social, and environment dimensions.	B4
c1	Employ CASE tools such as UML models, DFDs, and ERDs to analyze user and system requirements and to design system architecture.	C4
c2	Apply acquired knowledge and understanding in algorithms, database, and programing languages to implement and test software design that confirms user and system requirements.	C1 and C3

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d1	Work productively as individual or as member in an interdisciplinary group to prepare the different documents related to software development lifecycle in a specified time frame.	D1 and D2
d2	Communicate effectively orally and in written forms with the software stakeholders regarding the development process, multi field issues, constraints, proposed solutions, and decision making in assuming professional, social, and ethical responsibilities.	D3 and D4

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Define important terminologies related to software engineering such as software process, requirements, architecture design, design, modeling, reuse, distribution systems, quality management, etc…	• Active Lectures, • Interactive Class Discussions • Self-study.	• Written Exams (Quizzes, Midterm & Final) • Short Reports
a2- Explain software development lifecycle activities, related models used, principles, professional and ethical issues and responsibilities, etc. linked to a software development for different applications.	• Active Lectures, • Interactive Class Discussions • Self-study.	• Written Exams (Quizzes, Midterm & Final) • Short Reports

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies

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b1-	Analyze efficiently and effectively user and system requirements (functional and nonfunctional) that meet the software customer needs and validate her/his satisfaction.	• Active Lectures, • Interactive Class Discussions • Self-study, and • Laboratory sessions.	• Written Exams (Quizzes, Midterm & Final) • Short Reports • Lab project reports.
b2-	Design system structure and its functionality based on multiple personal views and adopting design pattern and considering technical, economic, social, and environment dimensions.	• Active Lectures, • Interactive Class Discussions • Self-study, and • Laboratory sessions.	• Written Exams (Quizzes, Midterm & Final) • Short Reports • Lab project reports.

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:			
Course Intended Learning Outcomes		Teaching strategies	Assessment Strategies
c1-	Employ CASE tools such as UML models, DFDs, and ERDs to analyze user and system requirements and to design system architecture.	• Laboratory sessions**,** • Projects.	• Lab & Project reports
c2-	Apply acquired knowledge and understanding in algorithms, database, and programing languages to implement and test software design that confirms user and system requirements.	• Laboratory sessions, • Projects**.**	• Lab & Project reports

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

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Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Work productively as individual or as member in an interdisciplinary group to prepare the different documents related to software development lifecycle in a specified time frame.	• Interactive Class Discussions, • Assignments & Homework • Self-study, and • Laboratory sessions.	• Short Reports, • Lab Assessments, • Lab & Project reports.
d2- Communicate effectively orally and in written forms with the software stakeholders regarding the development process, multi field issues, constraints, proposed solutions, and decision making in assuming professional, social, and ethical responsibilities.	• Interactive Class Discussions, • Assignments & Homework • Self-study, and • Laboratory sessions.	• Written Exams, • Short Reports, • Lab Assessments, • Lab & Project reports.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Course plan distribution and presentation	a1	- Course Identification and General Information, - Course Description, - Intended learning outcomes (ILOs) of the course, - Course Content: theoretical and practical aspects,	1	2

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			- Teaching strategies of the course, - Lab Assignments, - Assessment methods, - Learning Resources, - Course Policies.		
2.	Software Processes	a1, a2, b1, and d2	- S/W Process Notions, Process models, - S/W Process activities, Coping with changes, Process improvement, - Agile s/W development.	1	2
3.	Requirements Engineering	a1, a2, b1, and d2	- General Concepts, - Systems Requirements, Requirements engineering processes, - Requirements Specification, Requirements validation, Requirements change.	2	4
4.	System Modelling	a1, a2, b1, and d2	- Introduction, - Context models, - Interaction models, - Structural models, Behavioural models, - Model-driven Engineering.	1	2

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5.	Architectural Design	a1, a2, b1, and d2	- General Concepts, Architectural Design, Decisions, - Architectural Views, Architectural Patterns, Application Architecture.	1	2
6.	Design and Implementation	a1, a2, b2, and d2	- Introduction, - OO Design using UML, Design Patterns, Implementation issues, - Open source development.	1	2
7.	Software Testing	a1, a2, b1, and d2	- Introduction, - Development Testing, - Test-driven development, Release Testing.	1	2
8.	Software Evolution	a1, a2, b1, and d2	- Introduction, - Evolution Processes, - Legacy Systems, - Legacy System Management, Software Maintenance, Program Evolution Dynamics.	1	2
9.	Dependable Systems	a1, a2, b1, and d2	- Introduction, - Dependability properties, Sociotechnical Systems, Redundancy and Diversity, Dependable Processes, Formal methods and Dependability.	1	2

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10.	Distributed Software Engineering	a1, a2, b1, and d2	- Introduction, - Distributed systems, - Client–server computing, Architectural patterns for distributed systems, - Software as a service.	1	2
11.	Software Reuse Engineering	a1, a2, b1, and d2	- Introduction, - The reuse landscape, Application frameworks, S/W product lines, - COTS product reuse.	1	2
12.	Real-time software design	a1, a2, b2, and d2	- Embedded systems design, - Architectural patterns for real-time software, - Timing analysis, - Real-time operating system.	1	2
13.	Quality Management	a1, a2, b1, and d2	- Introduction, - S/W Quality, - S/W Standards, - Review and Inspection, Quality management and agile development, - S/W measurement.	1	2
Number of Weeks /and Units Per Semester:				**16**	**32**

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes

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1.	**Introduction**: Presentation of lab topics, CASE tools used in the lab, and lab projects.	1.5	3	c1
2.	**Developing projects requirements**: elicit user and system requirements (functional and non-functional), analyze the requirements, specify the requirements, validate the requirements, and document them using CASE tools if necessary.	2.5	5	a1,a2,b1, and c1
3.	**Developing system architectural design**: select the appropriate architectural design of the system and document.	1	2	a1,a2, and b2
4.	**Developing Use Case Diagram**: use any CASE tool such Rational rose, Argo UML, or Visual Paradigm etc. to model the external interaction with system and document it.	1	2	a1,a2,b1, and c1
5.	**Developing Sequence Diagram**: use the same CASE tool to model internal interaction of the system and document it.	1	2	a1,a2, and b1
6.	**Developing Class Diagram**: model the system structure (components) and document it.	1	2	a1,a2,b1, and c1
7.	**System implementation**: select an appropriate programming language and/or database development framework to implement the system, document it.	3	6	a1, a2,b1, b2, c1, c2,d1, and d2
8.	**System testing**: test the system to verify its correct operation.	1	2	c2, and d1

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9.	**Review**	1	2	a1,a2, b1, b2, c1, c2 and d1.
10.	**Course Project Presentation.**	1	2	a1, a2, b1, b2, c1, c2, d1 , d2.
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

- Active Lectures,
- Interactive-Class Discussions,
- Self-study,
- Laboratory sessions,
- Projects,
- Assignments & Homework.

VI. Assignments & Reports:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Requirements with mini report	a1, a2, b1, c1 and d1	4th	3
2.	System design with mini report	a1, a2, b2, c1 and d1	7th	3
3.	System implementation with mini report	b1, b2, c2, and d1	10th	4
4.	Topic preparation and delivery	a1, a2, b1, b2, d1, d2	Weekly	5
	Total			**15**

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VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignments & Reports	Weekly	15	10%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Quizzes	5th, 10th & 14th	10	6.67%	a1, a2, b1, d1
3.	Midterm Exam (Theory)	8th	20	13.33%	a1, a2, b1, b2
4.	Final Lab. Exam (including Course Project Evaluation)	14th & 15th	30	20%	a1, a2, b1, b2, c1, c2, d1, d2
5.	Final Exam (Theory)	16th	75	50%	a1, a2, b1, b2, c2
	Total		**150**	**100%**	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1- Ian Sommerville, 2016, Software Engineering, 10th edition, USA, PEARSON.

2- Roger S. Pressman, 2010, Software Engineering: A practitioner's Approach, 7th edition, USA, McGraw Hill.

2- Essential References.

Ian Sommerville, 2016, Software Engineering, 10th edition, USA, PEARSON.

3- Electronic Materials and Web Sites *etc*.

1- www.software-engineering-book.com
2- http://www.mhhe.com/

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	3- If additional websites are required, they will be submitted to the students during the semester. The addresses of those websites will be indicated in the handouts.

IX. Course Policies:

1.	**Class Attendance:** -A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:**

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	- Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

Reviewed By	**Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat** **President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi** **Name of Reviewer from the Department: Assoc. Prof. Dr. Farouk Al-Fuhaidy**
	Deputy Rector for Academic Affairs Asst. Prof. Dr. Ibrahim AlMutaa **Assoc. Prof. Dr. Ahmed Mujahed** **Asst. Prof. Dr. Munasar Alsubri**

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University of Sana'a
Faculty of Engineering
Department: Electrical Engineering
Title of the Program: Computer Engineering & Control

Template for Course Plan (Syllabus) of Software Engineering

I. Information about Faculty Member Responsible for the Course:

Name of Faculty Member	Asst. Prof. Dr. Ali AL-Hamdi	**Office Hours**					
Location& Telephone No.	Electrical department building	**SA**	**SU**	**MO**	**TU**	**WE**	**TH**
E-mail	aalhamdi1989@gmail.com		12-14				12-14

II. Course Identification and General Information:

1-	Course Title:	Software Engineering				
2-	Course Number & Code:	CCE322				
3-	Credit hours: 4	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4-	Study level/year at which this course is offered:	4^{th} level / Second semester				
5-	Pre –requisite (if any):	Data Structures & Algorithm (CCE246) & Programming Language 3 (Java) (CCE244)				
6-	Co –requisite (if any):	Database Systems (CCE323)				
7-	Program (s) in which the course is offered	Computer Engineering & Control				
8-	Language of teaching the course:	Mixed of English with Arabic				
9-	System of Study:	Semester				
10-	Mode of delivery:	Collective and individual learning				
11-	Location of teaching the course:	Electrical Engineering Dep. Class's room				

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III. Course Description:

This course aims to provide students with scientific knowledge on the concepts, principles, and techniques related to the software development, as well as introducing technical tools used in software systems development to solve computing and information problems. The course covers the fundamentals of software engineering topics including S/W process models, requirements engineering, system modeling tools, architectural design, system design, system implementation, software evolution, distributed and reuses software, and quality management. Throughout lectures, computer-based lab and term project works, students develop the problem-solving and the personal skills to solve tasks related to the development of software industry productively. Moreover, the course develops the ability of students to operate effectively in a professional environment, providing ideas and producing solutions to make existing technologies more efficient, or to develop new technologies.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop**:**

1. Define important terminologies related to software engineering such as software process, requirements, architecture design, design, modeling, reuse, distribution systems, quality management, etc.…
2. Explain software development lifecycle activities, related models used, principles, professional and ethical issues and responsibilities, etc. linked to a software development for different applications.
3. Analyze efficiently and effectively user and system requirements (functional and nonfunctional) that meet the software customer needs and validate her/his satisfaction.
4. Design system structure and its functionality based on multiple personal views and adopting design pattern in considering technical, economic, social, and environment dimensions.
5. Employ CASE tools such as UML models, DFDs, and ERDs to analyze user and system requirements and to design system architecture.

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6. Apply acquired knowledge and understanding in algorithms, database, and programing languages to implement and test software design that confirms user and system requirements.
7. Work productively as individual or as member in an interdisciplinary group to prepare the different documents related to software development lifecycle in a specified time frame.
8. Communicate effectively orally and in written forms with the software stakeholders regarding the development process, multi field issues, constraints, proposed solutions, and decision making in assuming professional, social, and ethical responsibilities.

V. Course Content:

- Distribution of Semester Weekly Plan of Course Topics/Items and Activities.

A – Theoretical Aspect:

Order	Topics List	Sub Topics List	Week Due	Contact Hours
1.	Course plan distribution and presentation	- Course Identification and General Information, - Course Description, - Intended learning outcomes (ILOs) of the course, - Course Content: theoretical and practical aspects, - Teaching strategies of the course, - Lab Assignments, - Assessment methods, - Learning Resources, - Course Policies.	1st	2
2.	Software Processes	- S/W Process Notions, Process models,	2nd	2

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		- S/W Process activities, Coping with changes, Process improvement, - Agile s/W development.		
3.	Requirements Engineering	- General Concepts, - Systems Requirements, Requirements engineering processes, - Requirements Specification, Requirements validation, Requirements change.	3rd and 4th	4
4.	System Modelling	- Introduction, - Context models, - Interaction models, - Structural models, Behavioural models, Model-driven Engineering.	5th	2
5.	Architectural Design	- General Concepts, Architectural Design, Decisions, - Architectural Views, Architectural Patterns, Application Architecture.	6th	2
6.	Design and Implementation	- Introduction, - OO Design using UML, Design Patterns, Implementation issues, - Open source development.	7th	2
7.	Midterm Exam	- ALL Previous Topics	8th	2
8.	Software Testing	- Introduction, - Development Testing, - Test-driven development, Release Testing.	9th	2
9.	Software Evolution	- Introduction, - Evolution Processes,	10th	2

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		- Legacy Systems, - Legacy System Management, Software Maintenance, Program Evolution Dynamics.		
10.	Dependable Systems	- Introduction, - Dependability properties, Sociotechnical Systems, Redundancy and Diversity, Dependable Processes, Formal methods and Dependability.	11th	2
11.	Distributed Software Engineering	- Introduction, - Distributed systems, - Client–server computing, Architectural patterns for distributed systems, - Software as a service.	12th	2
12.	Software Reuse Engineering	- Introduction, - The reuse landscape, Application frameworks, S/W product lines, - COTS product reuse.	13th	2
13.	Real-time software design	- Embedded systems design, - Architectural patterns for real-time software, - Timing analysis, - Real-time operating system.	14th	2
14.	Quality Management	- Introduction, - S/W Quality, - S/W Standards, - Review and Inspection, Quality management and agile development, - S/W measurement.	15th	2
15.	Final Exam	- ALL Topics	16th	2

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Number of Weeks /and Units Per Semester	16	32

B – Practical Aspect:			
Order	**Topics List**	**Week Due**	**Contact Hours**
1.	**Introduction**: Presentation of lab topics, CASE tools used in the lab, and lab projects.	1st to 2nd	3
2.	**Developing projects requirements**: elicit user and system requirements (functional and non-functional), analyze the requirements, specify the requirements, validate the requirements, and document them.	2nd to 4th	5
3.	**Developing system architectural design**: select the appropriate architectural design of the system and document it.	5th	2
4.	**Developing Use Case Diagram**: use any CASE tool such Rational rose, Argo UML, or Visual Paradigm etc. to model the external interaction with system and document it.	6th	2
5.	**Developing Sequence Diagram**: use the same CASE tool to model internal interaction of the system and document it.	7th	2
6.	**Developing Class Diagram**: model the system structure (components) and document it.	8th	2
7.	**System implementation**: select an appropriate programming language and/or database development framework to implement the system, document it.	9th to 11th	**6**
8.	**System testing**: test the system to verify its correct operation.	12th	2
9.	**Review**	13th	2

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Asst. prof. Dr. Ali AL-Hamdi	Asst. Prof. Dr. Adel Ahmed Al-Shakiri	Assoc. Prof. Dr. Mohammad Algorafi	Prof. Dr. Mohammed AL-Bukhaiti	Assoc. Prof. Dr. Huda Al-Emad

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10.	**Course Project Presentation**	14th	2
11.	Final Exam.	15th	2
Number of Weeks /and Units Per Semester:		**15**	**30**

VI. Teaching strategies of the course:

- Active Lectures,
- Interactive-Class Discussions,
- Self-study,
- Laboratory sessions,
- Projects,
- Assignments & Homework.

VII. Assignments & Reports:

No	Assignments	Week Due	Mark
1.	Requirements with mini report	4th	3
2.	System design with mini report	7th	3
3.	System implementation with mini report	10th	4
4.	Topic preparation and delivery	Weekly	5
	Total		**15**

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment

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1.	Assignments & Reports	Weekly	15	10%
2.	Quizzes	5th, 10th & 14th	10	6.67%
3.	Midterm Exam (Theory)	8th	20	13.33%
4.	Final Lab. Exam (including Course Project Evaluation)	14th & 15th	30	20%
5.	Final Exam (Theory)	16th	75	50%
	Total		**150**	**100%**

IX. Learning Resources:

• *Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1- Ian Sommerville, 2016, Software Engineering, 10th edition, USA, PEARSON,
2- Roger S. Pressman, 2010, Software Engineering: A practitioner's Approach, 7th edition, USA, McGraw Hill.

2- Essential References.

Ian Sommerville, 2016, Software Engineering, 10th edition, USA, PEARSON.

3- Electronic Materials and Web Sites *etc*.

1- www.software-engineering-book.com
2- http://www.mhhe.com/
3- If additional websites are required, they will be submitted to the students during the semester. The addresses of those websites will be indicated in the handouts.

X. Course Policies:

1.	**Class Attendance:**

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	-A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2.	**Tardy:** - For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	**Exam Attendance/Punctuality:** - A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	**Assignments & Projects:** - The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5.	**Cheating**: - For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7.	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. Lecture notes and assignments my given directly to students using soft or hard copy

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