



Biomedical Engineering Program Specification

Course Specification of Computer Programming (1)

I. Course Identification and General Information:						
1.	Course Title:	Computer Programming (1)				
2.	Course Code & Number:	BE151				
3.	Credit hours:	C.H				TOTAL CR. HRS
		Th.	Seminar	Pr	Tu.	
		2	-	2	-	
4.	Study level/ semester at which this course is offered:	Second Year-Second Semester.				
5.	Pre –requisite (if any):	Computer Basics.				
6.	Co –requisite (if any):	-				
7.	Program (s) in which the course is offered:	Biomedical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Biomedical Engineering Department.				
10.	Prepared By:	Dr. Sami Al-Maqtari.				
11.	Date of Approval:					

II. Course Description:
<p>The course provides the students with the knowledge and skills in the area of computer programming through learning C programming language. The course includes: introduction to programming, how to think in designing a program, writing a program, the compiler, and programming language fundamentals (basic data types, program structure, statements, expressions, I/O operations, control statements, functions, arrays, pointers, and structures). It also covers the basics of more complex data structures like unions and structures and some advanced topics like pointers and dynamic memory management.</p>

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Characterize fundamentals of programming language: variables, selection statements, loops, functions, arrays, pointers and memory management techniques, and structures and understand the concept of control flow and its mechanisms.	A1, A2, A3, A5, A6
a.2	Describe the concept of reusability using functions and routines and understand arguments passing mechanism and return values of functions.	
b.1	Analyze the logic of building a computer program.	B1, B2
b.2	Explore independent blocks or functions that can be used in other programs.	
c.1	Implement simple programs in C language and understand the use of the fundamental data types, input, and output formatting capabilities of the language.	C1, C2, C5
c.2	Apply building structured computer applications with C, construct programs modularly from small pieces called functions, and use the array data structure to represent lists and tables of values and apply dynamic memory allocation for arrays.	
d.1	Review basic problem-solving techniques and inspect using the power of computers for solving certain engineering problems.	D3, D5, D7
d.2	Assess to algorithms through the process of top-down, stepwise refinement and evaluate how C language provides a foundation for further study of programming languages.	

(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. Characterize fundamentals of	• Active Lectures.	• Written Assessment.

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<p>programming language: variables, selection statements, loops, functions, arrays, pointers and memory management techniques, and structures and understand the concept of control flow and its mechanisms.</p> <p>a2. Describe the concept of reusability using functions and routines and understand arguments passing mechanism and return values of functions.</p>	<ul style="list-style-type: none"> • Tutorials. • The use of Communication and Information Technology. 	<ul style="list-style-type: none"> • Quizzes.
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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1. Analyze the logic of building a computer program.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes.
b2. Explore independent blocks or functions that can be used in other programs.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes.

(C) 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. Implement simple programs in C language and understand the use of the fundamental data types, input, and output formatting capabilities of the language.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. • Design Work. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes.

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c2. Apply building structured computer applications with C, construct programs modularly from small pieces called functions, and use the array data structure to represent lists and tables of values and apply dynamic memory allocation for arrays.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. • Design Work. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes.
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(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Review basic problem-solving techniques and inspect using the power of computers for solving certain engineering problems.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. • Group Learning. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes. • Presentations.
d2. Assess to algorithms through the process of top-down, stepwise refinement and evaluate how C language provides a foundation for further study of programming languages.	<ul style="list-style-type: none"> • Active Lectures. • Tutorials. • Group Learning. 	<ul style="list-style-type: none"> • Written Assessment. • Quizzes. • Presentations.

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IV. Course Content:					
A – Theoretical Aspect					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	History & General Introduction to C Programming Language.	a1, b1, c1, c2, d1, d2	<ul style="list-style-type: none"> - Basic computer concepts. - The different types of programming languages. - The history of the C programming language. - The purpose of the C Standard Library. - The elements of a typical C program development environment. - Simple computer programs in C. - Simple input and output statements. - Fundamental data types. - Computer memory concepts. - Arithmetic operators. - The precedence of arithmetic operators. - Simple decision making statements. 	2	4
2.	Structured Program Development.	a1, b1, c1, c2, d1, d2	<ul style="list-style-type: none"> - Basic problem-solving techniques. - The if selection statement and the if...else selection statements. - The while repetition statement. - Structured programming. - The increment, decrement and assignment operators. 	1	2
3.	Program Control.	a1, b1, c1, c2, d1, d2	<ul style="list-style-type: none"> - The essentials of counter-controlled repetition. - The for and do...while repetition statements. - The switch selection statement. - The break and continue statements. 	2	4

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			<ul style="list-style-type: none"> - The logical operators to form complex conditional expressions in control statements. - To avoid the consequences of confusing the equality and assignment operators. 		
4.	Functions.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Constructing programs modularly from small pieces called functions. - Common math functions in the C Standard Library. - Creating new functions. - The mechanisms used to pass information between functions. - The function call/return mechanism. - Random number generation functions. - Recursive functions. 	2	4
5.	Mid-Term Exam	a1, a2, b1, b2, c1, c2.	<ul style="list-style-type: none"> - The first 4 chapters. 	1	2
6.	Arrays.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Array data structure. - Defining and initializing an array. - Referring to individual elements of an array. - Define symbolic constants. - Passing arrays to functions. - Using arrays to store, sort and search lists and tables of values. - Multi-dimension arrays. 	1	2
7.	Pointers.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Pointers and pointer operators. - Passing arguments to functions using pointers. - Pointers, arrays and strings relationships. 	1	2

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			<ul style="list-style-type: none"> - Pointers to functions. - Arrays of strings. 		
8.	Characters and Strings.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Library of character-handling functions (<ctype.h>). - Library of string-conversion functions (<stdlib.h>). - Library of standard input/output functions (<stdio.h>). - String handling library (<string.h>) for string-processing. - The power of function libraries for achieving software reusability. 	2	4
9.	Formatted Input/Output.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Input and output streams. - Print formatting capabilities. - Input formatting capabilities. - Print with field widths and precisions. - Formatting flags in the printf format control string. - Dealing with literals and escape sequences. - Input formatting using scanf. 	1	2
10.	Structures, Unions, Bit Manipulations and Enumerations.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Creating and using structures, unions and enumerations. - Passing structures to functions by value and by reference. - Manipulating data with the bitwise operators. - Creating bit fields for storing data compactly. 	1	2
11.	Preprocessor.	a1, a2, b1, b2, c1, c2, d1, d2	<ul style="list-style-type: none"> - Developing large programs using #include. - Macros using #define. - Conditional compilation. 	1	2
12.	Final Exam.	a1, a2,	- All the chapters.	1	2

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	b1, b2, c1, c2.		
Number of Weeks /and Units Per Semester			16 32

B - Practical Aspect:				
Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1.	Introducing C language compilers and some Integrated Development Environments (IDE)	1	2	a1, b1, c1, d1, d2
2.	Developing basic programs & using library basic input/output functions.	2	4	a1, a2, b1, b2, c1, c2, d1, d2
3.	Implementing conditional statements.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
4.	Using different types of loops.	2	4	a1, a2, b1, b2, c1, c2, d1, d2
5.	Creating functions and parameters passing.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
6.	Creating & using of arrays & pointers.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
7.	Manipulating strings and characters.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
8.	Input/output formatting.	1	2	a1, a2, b1, b2, c1, c2, d1, d2
9.	Creating & using structures, unions, and enumerations and bit manipulations.	2	4	a1, a2, b1, b2, c1, c2, d1, d2
10.	Conditional compiling and	2	4	a1, a2, b1, b2, c1, c2, d1,

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	preprocessor manipulation.			d2
Number of Weeks /and Units Per Semester	14	28		

V. Teaching strategies of the course:

- Lectures,
- Laboratory,
- Demonstrations,
- Quizzes,
- Practical Classes,
- Assignments.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Practical Aspect (10 experiments)	a1, a2, b1, b2, c1, c2, d1, d2	Weekly	15
Total				15

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.	Participation (in the experimental work).	Weekly	15	10%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Quizzes.	Once a month	10	6.67%	a1, a2, b1, b2, c1, c2, d1, d2
3.	Mid-Term Exam.	8 th week	15	10%	a1, a2, b1, b2, c1, c2.
4.	Final Exam (theoretical).	16 th week	90	60%	a1, a2, b1, b2, c1, c2.
5.	Final Exam (practical).	13 th week	20	13.33%	a1, a2, b1, b2, c1, c2.
Total			150	100 %	

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VIII. Learning Resources:	
<ul style="list-style-type: none"> • Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher). 	
1- Required Textbook(s) (maximum two).	
	1- P. J. Deitel, H. M. Deitel – 2010 - C How to Program, 6 th edition - Pearson Education, Inc. (ISBN: 9780136123569)
2- Essential References.	
	1- Greg Perry - Absolute Beginner's Guide to C, 2nd edition (ISBN: 9780672305108) 2- Brian W. Kernighan & Dennis M. Ritchie - The C Programming Language, 2 nd edition (ISBN: 9780131103627) 3- Samuel P. Harbison & Guy L. Steele Jr. - C: A Reference Manual, 5 th edition (ISBN: 9780130895929)
3- Electronic Materials and Web Sites etc.	
	1- C Programming and C++ Programming: http://www.cprogramming.com/ 2- Optimizing C and C++ Code: http://www.eventhelix.com/realtimemantra/basics/optimizingcandcppcode.htm
IX. Course Policies:	
1.	Class Attendance: - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	Tardy: - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
3.	Exam Attendance/Punctuality: - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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: - If any cheating occurred during the examination, the student is not allowed to continue

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Faculty of Engineering

Department of Biomedical Engineering



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	and he has to face the examination committee for enquires.
6.	Plagiarism: - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	Other policies: - All the teaching materials should be kept out the examination hall and mobile phones are not allowed. - Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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Template for Course Plan Computer Programming (1)

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Dr. Sami Al-Maqtari.	Office Hours					
Location & Telephone No.	771010885	SAT	SUN	MON	TUE	WED	THU
E-mail	dr.samiaziz@gmail.com			10-12			

II. Course Identification and General Information:						
1.	Course Title:	Computer Programming (1)				
2.	Course Number & Code:	BE151				
3.	Credit hours:	C.H				Total Cr. Hrs.
		Th.	Seminar	Pr.	Tu.	
		2	-	2	-	
4.	Study level/year at which this course is offered:	Second Year-Second Semester.				
5.	Pre –requisite (if any):	Computer Basics.				
6.	Co –requisite (if any):	-				
7.	Program (s) in which the course is offered	Biomedical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures and Lab.				
11.	Location of teaching the course:	Biomedical Engineering Department.				

III. Course Description:

The course provides the students with the knowledge and skills in the area of computer

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programming through learning C programming language. The course includes: introduction to programming, how to think in designing a program, writing a program, the compiler, and programming language fundamentals (basic data types, program structure, statements, expressions, I/O operations, control statements, functions, arrays, pointers, and structures). It also covers the basics of more complex data structures like unions and structures and some advanced topics like pointers and dynamic memory management.

IV. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a.1	Characterize fundamentals of programming language: variables, selection statements, loops, functions, arrays, pointers and memory management techniques, and structures and understand the concept of control flow and its mechanisms.	A1, A2, A3, A5, A6
a.2	Describe the concept of reusability using functions and routines and understand arguments passing mechanism and return values of functions.	
b.1	Analyze the logic of building a computer program.	B1, B2
b.2	Explore independent blocks or functions that can be used in other programs.	
c.1	Implement simple programs in C language and understand the use of the fundamental data types, input, and output formatting capabilities of the language.	C1, C2, C5
c.2	Apply building structured computer applications with C, construct programs modularly from small pieces called functions, and use the array data structure to represent lists and tables of values and apply dynamic memory allocation for arrays.	
d.1	Review basic problem-solving techniques and inspect using the power of computers for solving certain engineering problems.	D3, D5, D7
d.2	Assess to algorithms through the process of top-down, stepwise refinement and evaluate how C language provides a foundation for further study of programming languages.	

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V. Course Content:				
A – Theoretical Aspect				
Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact hours
1.	History & General Introduction to C Programming Language.	<ul style="list-style-type: none"> - Basic computer concepts. - The different types of programming languages. - The history of the C programming language. - The purpose of the C Standard Library. - The elements of a typical C program development environment. - Simple computer programs in C. - Simple input and output statements. - Fundamental data types. - Computer memory concepts. - Arithmetic operators. - The precedence of arithmetic operators. - Simple decision making statements. 	1,2	4
2.	Structured Program Development.	<ul style="list-style-type: none"> - Basic problem-solving techniques. - The if selection statement and the if...else selection statements. - The while repetition statement. - Structured programming. - The increment, decrement and assignment operators. 	3	2
3.	Program Control.	<ul style="list-style-type: none"> - The essentials of counter-controlled repetition. - The for and do...while repetition statements. - The switch selection statement. - The break and continue statements. 	4,5	4

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		<ul style="list-style-type: none"> - The logical operators to form complex conditional expressions in control statements. - To avoid the consequences of confusing the equality and assignment operators. 		
4.	Functions.	<ul style="list-style-type: none"> - Constructing programs modularly from small pieces called functions. - Common math functions in the C Standard Library. - Creating new functions. - The mechanisms used to pass information between functions. - The function call/return mechanism. - Random number generation functions. - Recursive functions. 	6,7	4
5.	Mid-Term Exam.	<ul style="list-style-type: none"> - The first 4 chapters. 	8	2
6.	Arrays.	<ul style="list-style-type: none"> - Array data structure. - Defining and initializing an array. - Referring to individual elements of an array. - Define symbolic constants. - Passing arrays to functions. - Using arrays to store, sort and search lists and tables of values. - Multi-dimension arrays. 	9	2
7.	Pointers.	<ul style="list-style-type: none"> - Pointers and pointer operators. - Passing arguments to functions using pointers. - Pointers, arrays and strings relationships. - Pointers to functions. - Arrays of strings. 	10	2
8.	Characters and Strings.	<ul style="list-style-type: none"> - Library of character-handling functions (<ctype.h>). - Library of string-conversion functions (<stdlib.h>). 	11,12	4

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		<ul style="list-style-type: none"> - Library of standard input/output functions (<stdio.h>). - String handling library (<string.h>) for string-processing. - The power of function libraries for achieving software reusability. 		
9.	Formatted Input/Output.	<ul style="list-style-type: none"> - Input and output streams. - Print formatting capabilities. - Input formatting capabilities. - Print with field widths and precisions. - Formatting flags in the printf format control string. - Dealing with literals and escape sequences. - Input formatting using scanf. 	13	2
10.	Structures, Unions, Bit Manipulations and Enumerations.	<ul style="list-style-type: none"> - Creating and using structures, unions and enumerations. - Passing structures to functions by value and by reference. - Manipulating data with the bitwise operators. - Creating bit fields for storing data compactly. 	14	2
11.	Preprocessor.	<ul style="list-style-type: none"> - Developing large programs using #include. - Macros using #define. - Conditional compilation. 	15	2
12.	Final Exam.	<ul style="list-style-type: none"> - All the chapters. 	16	2
Number of Weeks /and Units Per Semester			16	32

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B - Practical Aspect:				
Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	Introducing C language compilers and some Integrated Development Environments (IDE)	1	2	a1, b1, c1, d1, d2
2.	Developing basic programs & using library basic input/output functions.	2,3	4	a1, a2, b1, b2, c1, c2, d1, d2
3.	Implementing conditional statements.	4	2	a1, a2, b1, b2, c1, c2, d1, d2
4.	Using different types of loops.	5,6	4	a1, a2, b1, b2, c1, c2, d1, d2
5.	Creating functions and parameters passing.	7	2	a1, a2, b1, b2, c1, c2, d1, d2
6.	Creating & using of arrays & pointers.	8	2	a1, a2, b1, b2, c1, c2, d1, d2
7.	Manipulating strings and characters.	9	2	a1, a2, b1, b2, c1, c2, d1, d2
8.	Input/output formatting.	10	2	a1, a2, b1, b2, c1, c2, d1, d2
9.	Creating & using structures, unions, and enumerations and bit manipulations.	11,12	4	a1, a2, b1, b2, c1, c2, d1, d2
10.	Conditional compiling and preprocessor manipulation.	13,14	4	a1, a2, b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		14	28	

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VI. Teaching strategies of the course:

- Lectures,
- Laboratory,
- Demonstrations,
- Quizzes,
- Practical Classes,
- Assignments.

VII. Assignments:

No	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Practical Aspect (10 experiments)	a1, a2, b1, b2, c1, c2, d1, d2	Weekly	15
Total				15

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Participation (practical aspect).	Weekly	15	10%	a1, a2, b1, b2, c1, c2, d1, d2
2.	Quizzes.	Once a month	10	6.67%	a1, a2, b1, b2, c1, c2, d1, d2
3.	Mid-Term Exam.	8 th week	15	10%	a1, a2, b1, b2, c1, c2.
4.	Final Exam (theoretical).	16 th week	90	60%	a1, a2, b1, b2, c1, c2.
5.	Final Exam (practical).	13 th week	20	13.33%	a1, a2, b1, b2, c1, c2.
Total			150	100 %	

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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- P. J. Deitel, H. M. Deitel – 2010 - C How to Program, 6th edition - Pearson Education, Inc. (ISBN: 9780136123569)

2- Essential References.

- 1- Greg Perry - Absolute Beginner's Guide to C, 2nd edition (ISBN: 9780672305108)
- 2- Brian W. Kernighan & Dennis M. Ritchie - The C Programming Language, 2nd edition (ISBN: 9780131103627)
- 3- Samuel P. Harbison & Guy L. Steele Jr. - C: A Reference Manual, 5th edition (ISBN: 9780130895929)

3- Electronic Materials and Web Sites etc.

- 1- C Programming and C++ Programming: <http://www.cprogramming.com/>
- 2- Optimizing C and C++ Code:
<http://www.eventhelix.com/realtimemantra/basics/optimizingcandcppcode.htm>

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X. Course Policies:	
Unless otherwise stated, the normal course administration policies and rules of the Faculty of Engineering apply. For the policy, see: -----	
1.	Class Attendance: - The students should have more than 75% of attendance according to rules and regulations of the faculty.
2.	Tardy: - The students should respect the timing of attending the lectures. They should attend within 15 minutes from starting of the lecture.
3.	Exam Attendance/Punctuality: - The student should attend the exam on time. The punctuality should be implemented according to rules and regulations of the faculty for mid-term exam and final 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: - If any cheating occurred during the examination, the student is not allowed to continue and he has to face the examination committee for enquires.
6.	Plagiarism: - If one student attends the exam on another behalf; he will be dismissed from the faculty according to the policy, rules and regulations of the university.
7.	Other policies: - All the teaching materials should be kept out the examination hall and mobile phones are not allowed. - Mutual respect should be maintained between the student and his teacher and also among students. Failing in keeping this respect is subject to the policy, rules and regulations of the university.

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