



26. Course Plan of Computer Programming 2 (C/C++)

I. Information about Faculty Member Responsible for the Course:								
Name of Faculty Member	Asst. Prof. 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:	Programming Language 2 (C/C++)				
2.	Course Code & Number:	CCE143				
3.	Credit hours:	C.H				TOTAL
		Th.	Tu.	Pr.	Tr.	dd
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	2nd Year – 2nd semester				
5.	Pre-requisite (if any):	Programming Language I (Python) (CCE141)				
6.	Co-requisite (if any):	None.				
7.	Program(s) in which the course is offered:	Electrical Engineering – Computer and Control section				
8.	Language of teaching the course:	English				
9.	System of Study:	Semester				
10.	Mode of delivery:	Collective and individual learning				
11.	Location of teaching the course:	Electrical Engineering Department, Faculty of Engineering				

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III. Course Description:

This course aims to provide students with the basic principles and advanced concepts in the area of computer programming-based on structured and object-oriented programming techniques. Course topics includes; an introduction to programming in C/C++ and programming techniques, Basic data types, Program structure, statements, expressions, I/O operations, Control statements, Functions, Arrays, Pointers and dynamic memory management, Unions and structures, Object-Oriented Programming (OOP) concepts, principles, and techniques including encapsulation, inheritance, and polymorphism, and Templates and an introduction to STL (Standard Template Library). Throughout computer-based lab work students enhance problem-solving and personal skills related to structured & OO design and programming.

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

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

- 1- Define basic principles and concepts related to the structured programming technique and its applications in problem solving related to the field of computer engineering & control.
- 2- Understand advanced concepts in object-oriented analysis, design, and techniques and their applications in problem-solving based OO programming techniques.
- 3- Explore the logic of building a computer programs and independent blocks or functions that can be used in other programs.
- 4- Organize the programs in modular reusable blocks (functions, classes, templates) useful to be used in multiple projects and in the development of software.
- 5- Implement structured programs in C/C++, using the fundamental data types, building structures, arrays, and dynamic memory allocation.
- 6- Develop Object-Oriented programs efficiently by exploiting the reusability of the modular blocks such as functions, classes and templates, that were built to develop bigger projects.
- 7- Prepare plans for solving certain engineering problems related to programming skills.

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8- Function effectively individually or as a member in a team during the design and development of object-oriented projects to different problem domains.

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.	- General Introduction	<ul style="list-style-type: none"> - Basic computer concepts. - The different types of programming languages. - The history of the C/C++ programming language. - The elements of a typical C program development environment. - Simple computer programs in C. - C++ as a better C. - Simple computer programs in C.++ - Basic input/output statements. 	1 st	2
2.	- Decision and Loop Statements	<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. - The essentials of counter-controlled repetition. - The for and do...while repetition statements. - The switch selection statement. - The break and continue statements. 	2 nd , 3 rd	3

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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. 		
3.	- 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. 	3 rd , 4 th	3
4.	- Arrays & pointers	<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. - Pointers and pointer operators. - Passing arguments to functions using pointers. - Pointers, arrays and strings relationships. - Pointers to functions. - Arrays of strings. 	5 th , 6 th	4
5.	- Structures, Unions, Bit	<ul style="list-style-type: none"> - Creating and using structures, unions and enumerations. 	7 th	2

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	Manipulations and Enumerations	<ul style="list-style-type: none"> - Passing structures to functions by value and by reference. - Manipulating data with the bitwise operators. - Creating bit fields for storing data compactly. 		
6.	- Mid-Term Exam	- ALL Previous Topics	8 th	2
7.	- Introduction to Classes and Objects	<ul style="list-style-type: none"> - The concept of classes, objects, member functions (methods), and data members. - Defining a class and creating an object. - Defining methods (class's behaviors). - Declaring data members (class's attributes). - Calling methods of an object. - Differences between data members and local variables of a function. - Constructors for initializing an object. - Separating class's interface from its implementation. 	9 th	2
8.	- Classes in more details	<ul style="list-style-type: none"> - Preprocessor wrappers to avoid multiple definition errors. - Class scope and class members access. - Constructors with default arguments. - Destructors for a proper object termination. - Constant objects and constant methods. - Hierarchical object composition. - friend functions and friend classes. - this pointer for object self-referencing. - Creating and destroying objects dynamically (new & delete keywords). - Static data members and methods. 	10 th	2

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9.	- Operator Overloading	<ul style="list-style-type: none"> - The concept of operator overloading and its benefits. - Operator overloading mechanism. - The differences between overloading unary and binary operators. - Casting (converting) objects using operator overloading. - Explicit single-argument constructors to prevent implicit conversion. - Input/output streams overloading. 	11 th	2
10.	- OOP concepts: Inheritance	<ul style="list-style-type: none"> - Creating classes by inheriting from existing classes. - Understanding the concept of code reusability using inheritance. - The notions of base classes and derived classes. - The protected member access specifier. - Constructors and destructors in inheritance hierarchies. - The calling order of constructors and destructors in inheritance hierarchies. - The different types of inheritance (public, protected, and private) 	12 th	2
11.	- OOP concepts: Polymorphism	<ul style="list-style-type: none"> - The concept of polymorphism. - Virtual functions. - Abstract vs. concrete classes. - Declaring pure virtual functions to create abstract classes. - Safety in using virtual destructors. 	13 th	2
12.	- Templates	<ul style="list-style-type: none"> - The concept of templates. - Function templates. 	14 th	2

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		<ul style="list-style-type: none"> - Functions template and function template specializations. - Class templates. - Class templates and class template specializations. - Overloading function template. - The relationships among templates, friends, inheritance, and static members. 		
13.	- Introduction to Standard Template Library (STL)	<ul style="list-style-type: none"> - Introduction to containers, iterators, and algorithms. - Sequence containers. - Associative containers. - Container adapters. - Algorithms. 	15 th	2
14.	- Final Exam	- ALL Topics	16 th	2
Number of Weeks/Units Per Semester			16	32

B- Practical Aspect:			
Order	Topics List	Week Due	Contact Hours
1.	- Introducing C/C++ language compilers and some Integrated Development Environments (IDE)	1 st	2
2.	- Developing basic programs & using library basic input/output functions in C.	2 nd	2
3.	- Implementing conditional statements and using different types of loops.	3 rd	2
4.	- Creating functions and parameters passing.	4 th	2
5.	- Creating & using of arrays & pointers.	5 th	2

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6.	- Creating & using structures, unions, and enumerations and bit manipulations.	6 th	2
7.	- Writing simple programs using OO features and discovering the new input/output functions in C++	7 th	2
8.	- Developing C++ programs using classes	8 th	2
9.	- Explore function and operator overloading and overriding the default input/output stream functionalities	9 th	2
10.	- Demonstrating inheritance & polymorphism concepts in C++	10 th	2
11.	- Developing C++ programs using templates	11 th	2
12.	- Using Standard Template Library (STL)	12 th	2
13.	- Review	13 th	2
14.	- Project Presentations & Discussions	14 th	2
15.	- Final Lab Exam	15 th	2
Number of Weeks/Units Per Semester		15	30

VI. Teaching strategies of the course:	
<ul style="list-style-type: none"> • Active Lectures, • Computer-based Laboratory, • Homework & Assignments, • Self-Learning, • Projects, • Use of IT Tools. 	

VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Control Statements	a1, b1, c1, d2	2 nd	1
2.	Arrays, Structures & Functions	a1, b1, b2, c1, d2	3 rd to 6 th	2

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3.	OO Programming Search Web and prepare short reports to some environmental problems.	a2, b1, b2, c2, d1 d2	9 th to 14 th	4
4.	Lab Reports	a1, b1, b2, c1, c2, d1, d2	3 rd to 12 th	8
Total				15

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1.	Assignments & Reports	2 nd to 14 th	15	10%
2.	Quizzes	4 th , 10 th & 14 th	10	6.67%
3.	Mid-Term Exam (Theory)	8 th	20	13.33%
4.	Final Exam (practical including Project Evaluation)	14 th & 15 th	30	20%
5.	Final Exam (Theory)	16 th	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. P. J. Deitel, H. M. Deitel – 2010 - C How to Program, 6th edition - Pearson Education, Inc. (ISBN: 9780136123569)
2. Gary Bronson – 2011 - A First Book of C++, 4th edition - Cengage Learning

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2- Essential References.	
	1. Brian W. Kernighan & Dennis M. Ritchie - The C Programming Language, 2nd edition (ISBN: 9780131103627) 2. Bjarne Stroustrup, The C++ Programming Language, 4th edition - (ISBN: 978-0321563842)
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.html

X. Course Policies:	
1.	<p>Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he/she 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 an approved statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.</p>
2.	<p>Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.</p>
3.	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He/she 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</p>
4.	<p>Assignments & Projects: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.</p>

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5.	<p>Cheating: For cheating in exam, a student will be considered as failure. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.</p>
6.	<p>Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proved a plagiarism of a student, he/she 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 or according to the university roles.</p>
7.	<p>Other policies:</p> <ul style="list-style-type: none"> - 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 might be given directly to students using soft or hard copy.

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