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| **ISHIK UNIVERSITY FACULTY OF SCIENCE Department of INFORMATION TECHNOLOGY,2017-2018 Spring Course Information for** **IT 318 DATA STRUCTURES AND ALGORITHMS II** |

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| --- | --- |
| **Course Name:** | DATA STRUCTURES AND ALGORITHMS II |
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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Code** | **Course type** | **Regular Semester** | **Theoretical** | **Practical** | **Credits** | **ECTS** |
| IT 318 | 2 | 6 | 2 | 2 | 3 |  |

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| **Name of Lecturer(s)-Academic Title:** | Savriddin Halil - MSc |
| **Teaching Assistant:** | Rebin Mohammed |
| **Course Language:** | English |
| **Course Type:** | Non-area Elective |
| **Office Hours** | Wednesday 13:30 - 14:30 |
| **Contact:** | Email:savriddin.halil@ishik.edu.iq Tel:-  |
| **Teacher's academic profile:** | BSc Degree in Software Engineering. MSc Degree in Software Engineering. IT Department Head.  |
| **Course Objectives:** | This is course is continuity of IT-317. The main objective of this course is to provide an introduction to basic data structures and algorithms for manipulating them, by using C++ programming language. This course specifically has the following objectives: The fundamental design, analysis, and implementation of basic data structures as stacks, queues, linked lists, trees and algorithms as Bubble Sort, Selection Sort, Insertion Sort, Merge Sort and Quick Sort; The analysis and evaluation of the data structure needs of particular problems; The design, analysis, and implementation of C++ programs by using basic data structures and algorithms. |
| **Course Description (Course overview):** | The purpose of this course is to study advanced programming topics focused on logical structures of data, their physical representation, design and analysis of algorithms operating on the structures, and techniques for program development and debugging. Emphasis is placed on the appropriate use and choice of standard data structures. |
| **COURSE CONTENT**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Hour** |               **Date**               | **Topic** |
| **1** | 2 | 4-8/2/2018 | Intro to Data Structures. Linked Lists. |
| **2** | 2 | 11-15/2/2018 | Linked Lists and types. |
|  |  |  |  |
| **3** | 2 | 18-22/2/2018 | Backward Linked Lists. |
| **4** | 2 | 25/2-1/3/2018 | IEC-2018 Conference Days. Thanks to Martyrs. |
|  |  |  |  |
| **5** | 2 | 4-8/3/2018 | Doubly Linked Lists. |
| **6** | 2 | 25-29/3/2018 | Operations over Linked Lists. |
|  |  |  |  |
| **7** | 2 | 1-5/4/2018 | Midterm Exam |
| **8** | 2 | 8-12/4/2018 | Stack and queue structures in Linked Lists. |
|  |  |  |  |
| **9** | 2 | 15-19/4/2018 | Binary Trees. |
| **10** | 2 | 22-26/4/2018 | Binary Tree types. |
|  |  |  |  |
| **11** | 2 | 29/4-3/5/2018 | Graphs. |
| **12** | 2 | 6-10/5/2018 | Operations over Graphs. |
|  |  |  |  |
| **13** | 2 | 13-17/5/2018 | Shortest Path algorithms. Dijkstras shortest path algorithm. |
| **14** | 2 | 20-24/5/2018 | Revision. |
|  |  |  |  |
| **15** | 2 | 27-31/5/2015 | Final Exam |
| **16** | 2 | 3-7/6/2018 | Final Exam |
|  |  |  |  |
| **17** | 2 | 10-14/6/2018 |  |

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| **COURSE/STUDENT LEARNING OUTCOMES**

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| --- | --- |
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| **1** | understand the concept of time, space complexity and analyze the time and space complexities of an algorithm and a data structure. |
| **2** | understand well-known generic data structures such as linked list, stack, queue, tree and related algorithms and apply them to solve problems. |
| **3** | analyse, evaluate and choose appropriate abstract data types and algorithms to solve particular problems. |
| **4** | design and implement C++ programs that apply selected data structures and algorithms. |
| **5** | analyse graphs and understand shortest path principles. |

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| **COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES**(Blank : no contribution, I: Introduction, P: Profecient, A: Advanced )

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| --- | --- | --- |
|  | **Program Learning Outcomes** | **Cont.** |
| **1** | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution | A |
| **2** | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs | P |
| **3** | An ability to function effectively on teams to accomplish a common goal |  |
| **4** | An understanding of professional, ethical, legal, security, social, and economic issues and responsibilities |  |
| **5** | An ability to analyze the local and global impact of computing on individuals, organizations, and society | I |
| **6** | An ability to use current techniques, skills, and tools necessary for computing practice | P |
| **7** | An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, web systems and technologies | A |
| **8** | An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems |  |
| **9** | An ability to effectively integrate IT-based solutions into the user environment |  |
| **10** | An ability apply problem solving skills, core IT concepts, best practices and standards to information technologies | P |
| **11** | An ability to identify and evaluate organizational requirements and current and emerging technologies |  |
| **12** | An ability to select, design, integrate and administer IT-based solutions into the organizational environment |  |

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| **Prerequisites (Course Reading List and References):** | - Robert Sedgewick and Kevin Wayne - Algorithms, 4th edition, 2011. - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, Third Edition - 2009. - Data Structures and Algorithms in C++, 2nd edition, Adam Drozdek, 2001. - C++ Programming from Analysis to design, 5th edition, D.S.Malik, 2011. |
| **Student's obligation (Special Requirements):** | - Coming to lectures on time - Not disturbing class during lectures by talking, chewing, eating ... - Submitting assignments and project on time - Studying regularly at least 30 minutes after each lecture. |
| **Weekly Laboratory/Practice Plan:** |

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| --- | --- | --- | --- |
| **Week** | **Hour** |               **Date**               | **Topics** |
| 1 | 2 | 4-8/2/2018 | Linked Lists. Assignment 1. |
| 2 | 2 | 11-15/2/2018 | Operations over LL. Assignment 2. |
|  |  |  |  |
| 3 | 2 | 18-22/2/2018 | Backward LL. Assignment 3. |
| 4 | 2 | 25/2-1/3/2018 | IEC-2018 Conference Days. Thanks to Martyrs. |
|  |  |  |  |
| 5 | 2 | 4-8/3/2018 | Doubly Linked Lists. Assignment 4. |
| 6 | 2 | 25-29/3/2018 | Operations over Linked Lists. |
|  |  |  |  |
| 7 | 2 | 1-5/4/2018 | Midterm Exam |
| 8 | 2 | 8-12/4/2018 | Implementing sorting algorithms to LL. Assignment 5. |
|  |  |  |  |
| 9 | 2 | 15-19/4/2018 | Stack and queue structures in Linked Lists. Assignment 6. |
| 10 | 2 | 22-26/4/2018 | Stack and queue structures in Linked Lists. Assignment 7. |
|  |  |  |  |
| 11 | 2 | 29/4-3/5/2018 | Binary Tree implementation. Assignment 8. |
| 12 | 2 | 6-10/5/2018 | Binary Tree implementation. Assignment 9. |
|  |  |  |  |
| 13 | 2 | 13-17/5/2018 | Dijkstras shortest path algorithm. |
| 14 | 2 | 20-24/5/2018 | Dijkstras shortest path algorithm. Assignment 10. |
|  |  |  |  |
| 15 | 2 | 27-31/5/2015 | Practice Exam. |
| 16 | 2 | 3-7/6/2018 | Final Exam |
|  |  |  |  |
| 17 | 2 | 10-14/6/2018 | Final Exam |

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| **Course Book/Textbook:** | Robert Sedgewick and Kevin Wayne - Algorithms, 4th edition, 2011. - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, Third Edition - 2009. - Data Structures and Algorithms in C++, 2nd edition, Adam Drozdek, 2001. - C++ Programming from Analysis to design, 5th edition, D.S.Malik, 2011. |
| **Other Course Materials/References:** | Slides. Program/Algorithm codes. Lecture notes on web-page: http://www.ishik.edu.iq/science/savri-halil/ www.coursera.org www.programming.com www.stackoverflow.com www.happycodings.com |
| **Teaching Methods (Forms of Teaching):** | Lectures, Practical Sessions, Excersises, Presentation, Assignments |
| **COURSE EVALUATION CRITERIA**

|  |  |  |
| --- | --- | --- |
| **Method** | **Quantity** | **Percentage (%)** |
| Quiz | 2 | 5 |
| Homework | 15 | 1 |
| Midterm Exam(s) | 1 | 20 |
| Lab/Practical Exam(s) | 1 | 15 |
| Final Exam | 1 | 40 |
| **Total** | **100** |
| **Examinations:**Essay Questions, Short Answers, Matching |  |  |

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| **Extra Notes:** |
| **ECTS (ALLOCATED BASED ON STUDENT) WORKLOAD**

|  |  |  |  |
| --- | --- | --- | --- |
| **Activities** | **Quantity** | **Duration (Hour)** | **Total Work Load** |
| Course Duration (Including the exam week: 16x Total course hours) | 16 | 4 | 64 |
| Hours for off-the-classroom study (Pre-study, practice) | 16 | 2 | 32 |
| Assignments Mid-terms | 16 | 3 | 48 |
| Final examination | 2 | 6 | 12 |
| Other |  |  | 0 |
| **Total Workload** | **156** |
| **ECTS Credit (Total workload/25)** | **6.24** |

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**Peer review**

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| --- | --- | --- |
| Signature: | Signature: | Signature: |
| Name: | Name: | Name: |
| Lecturer                                                                       | Head of Department                                                         | Dean |

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