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| **College**  | Faculty of Engineering and Technology |
| **Department** | Computer System Engineering |
| **Program** | B.Sc. of Computer System Engineering  |
| **Course Title** | Data Structures | **Course Number:** | 12140203 |
| **Year** | 2020/2021 | **Semester:** | Summer |
| **Prerequisite(s)** | OOP (12140102) |
| **Instructor** | Dr.Nael Salman |
| **Instructor's e-mail** | n.salman@ptuk.edu.ps  |
| **Office Hours (ZOOM Meetings)** |  |
| **Class Time (ALL RECORDED LECTURES, Available through university LMS "MOODLE")** | Sun, Mon, Tue, Wed: (19:15:20:30)Thu(20:00 – 21:00) | **Class Room:** |  |
| **Course description** | This course covers data structures using the Java Programming Language. Topics include data abstraction, encapsulation, information hiding, and the use of recursion, creation and manipulation of various data structures: lists, queues, tables, trees, heaps, and graphs, and searching and sorting algorithms. Time and Space Complexity  |
| **Course Intended Learning Outcomes (CILOs)** | 1. Understand and analyze the time and space complexity of an algorithm
2. Understand, implement, and compare fundamental data structures
3. Understand and implement fundamental algorithms (including sorting algorithms and graph algorithms)
4. Apply different data structure and object oriented principles to write larger and more complex Java applications
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| **Textbook(s)** | Data Structures and Algorithms in Java™ Sixth Edition Michael T. Goodrich.. |
| **Other required material (References):** | Introduction to Java ProgrammingComprehensive, Tenth Edition, Y. Daniel Liang |

**Academic Quality Assurance Department**

**Course Syllabus Form**

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| **Course Teaching Methods** |
| **Teaching Method** | **CILOs** |
| Recorded Lectures (Available through University LMS "MOODLE") | 1,3-8 |
| Course Lecture Notes (.ppt, .pdf) will be posted weekly through university LMS "MOODLE") | 1,3 -8 |
| ZOOM Meeting (Wed, Thu) Lecture time. | 1,3-8 |

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| **Assessment Type** | **Details/Explanation of assessment in relation to CILOs** | **Weight** | **Date(s)** |
| **Midterm** | 1,2, 4 | 40 | 4-5th week |
| **Assignments and Participation** | 2,3,4 | 20 | - |
| **Final Exam** | 1-4 | 40 | 8-9th week |
| **Total** |  | 100% |  |

A. Analyze complex, real-world problems to identify and define computing requirements and apply computational approaches to the problem-solving process.

B. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the IT discipline.

C. Communicate effectively with diverse audiences the technical information that is consistent with the intended audience and purpose.

D. Make informed judgments and include unique perspectives of others in computing practice based on legal and ethical principles.

E. Function effectively on teams and employ self- and peer-advocacy to address bias in interactions, establish goals, plan tasks, meet deadlines, manage risk, and produce deliverables.

F. Identify and analyze user needs and consider them during the selection, integration, and administration of computer-based systems.

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| **Course Intended Learning Outcomes (CILOs)** |
| **CILOs**  | **Mapping to Program ILOs** |
| **On successful completion of the course, students will be able to:** | **a** | **b** | **c** | **d** | **e** | **f** |  |  |  |  |
| 1. Understand and analyze the time and space complexity of an algorithm
 | X | X |  |  |  |  |  |  |  |  |
| 1. Understand, implement, and compare fundamental data structures
 |  | X |  |  |  | X |  |  |  |  |
| 1. Understand and implement fundamental algorithms (including sorting algorithms and graph algorithms)
 |  | X |  |  |  | X |  |  |  |  |
| 1. Apply different data structure and object oriented principles to write larger and more complex Java applications
 | **X** | X |  |  |  | X |  |  |  |  |

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| **Course Weekly Breakdown** |
| **Week** | **Date** | **Topics Covered** | **CILOs** | **Lab Activities** | **Assessment** |
| 1 |  | Review of Object-Oriented principles Introduction to data structures | 2 | N/A | Readinglecture notes and book chapters 1 and 2 |
| 2 |  | Algorithm Analysis- Time and space complexity | 1 | N/A | Readinglecture notes and book chapters 1 and 2.Estimate time and space complexity for some given algorithms  |
| 2+3 |  | List and Iterator ADTs(Array based lists and linked lists) | 1,2 | N/A | Readinglecture notes and book chapters 7. |
| 3 |  | Generic classes and methods | 1,2 | N/A | Readinglecture notes and reference book chapters 19.  |
| 4 |  | Stacks, Queues, and Deques | 1,2 | N/A | Readinglecture notes and book chapters 6. |
| 4+5 |  | Recursion | 2,4 | N/A | Reading lecture notes and chapter 5. Solving programming exercises using recursion |
| 5+6 |  | Trees, binary Trees, Search Trees and Priority Queues. | 1,2,4 | N/A | Readinglecture notes and book chapters 8, 9 and 11.Programming assignment  |
| 7 |  | Maps, Hash Tables, | 1,2,4 | N/A | Readinglecture notes and book chapters 10. |
| 7 |  | Sorting | 1,3 | N/A | Readinglecture notes and book chapters 12. |
| 8 |  | Graphs and Graph Algorithms | 1,3 | N/A | Readinglecture notes and book chapters 14. |
| 8-9 |  | **Final Examination** |  |  |  |

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| **Prepared by:** | **Nael Salman** | **Signature**  | **Nael Salman** |
| **Head of Department**  |  | **Signature** |  |
| **Date**  | **3/7/2021** |