**University of Asia Pacific (UAP)**

**Department of Computer Science and Engineering (CSE)**

**Course Outline**

**Program:** Computer Science and Engineering (CSE)

**Course Title:** Compiler Design Lab

**Course Code:** CSE 430

**Semester:** Spring-2021

**Level:** 8th semester

**Credit Hour:** 1.5

**Name & Designation of Teacher:** Nayeema Sultana

**Office/Room:** 7th Floor

**Class Hours:** 9:30AM – 12:20PM Wednesday (Section A1)

2.00PM ­– 4.30 PM Thursday (Section A2)

9:30AM – 12:20PM Thursday (Section B1)

2.00PM ­– 4.30 PM Wednesday (Section B2)

**Consultation Hours:** 9:30 AM – 12: 20 AM (Tuesday) Section A1, A2, B1 & B2

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**Rationale:** Required course in the CSE program. The technology to build compilers which translate high-level programming languages has made the proliferation of computer use possible. The knowledge and skills in compiler construction are essential for computing professionals.

**Pre-requisite** (if any)**:** None

**Course Synopsis:** This course will cover the main aspects of the Compiler Designing. Student will learn how to use scanner and parser generator tools (e.g., Flex, Yacc, etc). Students will then learn the designing and implementation of lexical analyzer, symbol tables, parser, intermediate code generator and code generator.

**Course Objectives:** The objectives of this course are to:

1. **Teach** various aspects of Compiler Design.
2. **Teach** different phases of compiler and implement them.
3. **Demonstrate** how to use various compiler-construction tools.

**Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CO**  **No.** | **CO Statements:**  Upon successful completion of the course, students should be able to: | **Corresponding**  **POs**  **(Appendix-1)** | **Bloom’s taxonomy domain/level**  **(Appendix-2)** | **Delivery methods and activities** | **Assessment**  **Tools** |
| CO1 | **Describe** basic aspects of Compiler Design. | 1 | 1/Understand | PPT presentation, Live lecture | Written online Quiz, short question, Oral Exam |
| CO2 | **Implement** different phases of compiler for the purpose of complete generation of a compiler. | 3 | 1/Apply | PPT presentation, Live lecture | Assignment with Viva, Online Presentation, Online test |
| CO3 | **Use** various compiler-construction tools for compiler designing and constructing purpose. | 5 | 2/Manipulation | Live lecture, Tutorial class | Assignment with Viva, Online test |

**Weighting COs with Assessment methods:**

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| --- | --- | --- | --- | --- |
| **Assessment Type** | **% weight** | **CO1** | **CO2** | **CO3** |
| Final (Implementation using coding ) | 40% |  | 20% | 20% |
| Final Viva (based on final exam) | 10% |  | 5% | 5% |
| Classwork Performance, Assignment and Viva | 50% | 10% | 20% | 20% |
| Total | 100% | 10% | 45% | 45% |

**Course Content Outline and mapping with COs**

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| --- | --- | --- | --- | --- |
| **Weeks** | **Topics / Content** | **Course Outcome** | **Delivery methods and activities** | **Reading Materials** |
| 1-2 | Class on Introduction to compiler, Basic  issues, String Manipulation , Space and comment handling | CO1  CO2 | PPT presentation, Live lecture | Slides, Books, reference links |
| 3-4 | Introduction to Lexical Analyzer, its implementation, | CO2 | PPT presentation, Live lecture, Tutorial Class | Slides, Tutorial Video/PPT |
| 5-6 | Class on hashing and implementation of Symbol Table, Assignment on symbol table | CO2 | PPT presentation, Live lecture | Slides, Books, reference links |
| 7 | **Mid-term Exam** | | | |
| 8-9 | Class on Syntax Analysis and implementation of LL(1) parser | CO1  CO2  CO3 | PPT presentation, Live lecture, Tutorial class | Slides, Books, reference links |
| 10 | Introduction to Unix text processing tools- flex and necessary software setup | CO1  CO2  CO3 | PPT presentation, Live lecture | Slides, Books, reference links |
| 11 | Building a lexical analyzer using flex | CO2  CO3 | PPT presentation, Live lecture, Tutorial class | Slides, Books, reference links |
| 12 | Introduction to Unix text processing tools- bison and necessary software setup and implementing desktop calculator | CO1  CO2  CO3 | PPT presentation, Live lecture, Tutorial class | Slides, Books, reference links |
| 13 | Class on Intermediate Code Generation (ICG) , Optimization techniques, Assignment | CO1  CO2  CO3 | PPT presentation, Live lecture, Tutorial class | Slides, Books, reference links |
| 14 | **Final Exam** | | | |

**Minimum attendance:** 60% class attendance is mandatory for a student in order to appear at the final examination.

**Textbook:** Compilers - Principles, Techniques, and Tools, Aho, Sethi, Ullman

# **Required References:** Flex & Bison, John R. Levine A Compact Guide to Lex & YACC, Thomas Niemann

**Recommended References:**

**Grading System:** As per the approved grading scale of University of Asia Pacific (Appendix-3).

**Special Instructions:**  **Assignment**: **Unfinished** work should be submitted as assignment. **Additional** assignments may be given as needed. Copied home work will be graded as zero. Late submission will result a 50% deduction in score.

**Student’s responsibilities:** Students must come to the class prepared for the course material covered in the previous class (es).

They must submit their assignments on time.

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| **Prepared by**  **(**Course Teacher**)** | **Checked by**  **(**Chairman, PSAC committee**)** | **Approved by**  **(**Head of the Department**)** |
| Nayeema Sultana |  |  |

**Appendix-1:**

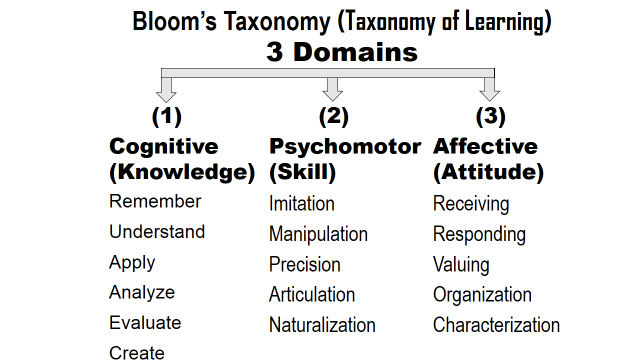
**Washington Accord Program Outcomes (PO) for engineering programs:**

|  |  |  |
| --- | --- | --- |
| **No.** | **PO** | **Differentiating Characteristic** |
| 1 | Engineering Knowledge | Breadth and depth of education and type of knowledge, both theoretical and practical |
| 2 | Problem Analysis | Complexity of analysis |
| 3 | Design/ development of solutions | Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified |
| 4 | Investigation | Breadth and depth of investigation and experimentation |
| 5 | Modern Tool Usage | Level of understanding of the appropriateness of the tool |
| 6 | The Engineer and Society | Level of knowledge and responsibility |
| 7 | Environment and Sustainability | Type of solutions. |
| 8 | Ethics | Understanding and level of practice |
| 9 | Individual and Team work | Role in and diversity of team |
| 10 | Communication | Level of communication according to type of activities performed |
| 11 | Project Management and Finance | Level of management required  for differing types of activity |
| 12 | Lifelong learning | Preparation for and depth of Continuing learning. |

**Generic Skills (Detailed):**

1. **Engineering Knowledge (T)** -Apply knowledge of mathematics, sciences, engineering fundamentals and manufacturing engineering to the solution of complex engineering problems;
2. **Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;
3. **Design/Development of Solutions (A)** –Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues.
4. **Investigation (D)** Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
5. **Modern Tool Usage (A & D)** -Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations;
6. **The Engineer and Society (ESSE)** -Apply reasoning based on contextual knowledge to assess societal, health, safety, legal, cultural, contemporary issues, and the consequent responsibilities relevant to professional engineering practices.
7. **Environment and Sustainability (ESSE)** -Understand the impact of professional engineering solutions in societal, global, and environmental contexts and demonstrate knowledge of and need for sustainable development;
8. **Ethics (ESSE)** –Apply professional ethics with Islamic values and commit to responsibilities and norms of professional engineering code of practices.
9. **Communication (S)** -Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
10. **Individual and Team Work (S)** -Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
11. **Life Long Learning (S)** -Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
12. **Project Management and Finance (S)** -Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one’s own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.

**Appendix-2**



**Appendix-3**

**UAP Grading Policy:**

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| **Numeric Grade** | **Letter Grade** | **Grade Point** |
| 80% and above | A+ | 4.00 |
| 75% to less than 80% | A | 3.75 |
| 70% to less than 75% | A- | 3.50 |
| 65% to less than 70% | B+ | 3.25 |
| 60% to less than 65% | B | 3.00 |
| 55% to less than 60% | B- | 2.75 |
| 50% to less than 55% | C+ | 2.50 |
| 45% to less than 50% | C | 2.25 |
| 40% to less than 45% | D | 2.00 |
| Less than 40% | F | 0.00 |