**University of Asia Pacific (UAP)**

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

**Course Outline: CSE 100**

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

**Course Title:** Competitive Programming

**Course Code:** CSE 100

**Semester:** Spring 2020

**Level:** 1st Semester (Section: B)

**Credit Hour:** 0.0

**Name & Designation of Teacher:** Md. Imran Bin Azad, Assistant Professor

**Office/Room: 701,** 7th Floor, teacher’s compound

**Class Hours:** Tuesday 5:00 – 6:20 pm, Thursday 2:00 – 3:20 pm

**Consultation Hours:** Thursday 6:30 – 7:50 pm

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**Rationale:**

To improve analytical thinking, solving problems with programming, application of basic mathematics in problem solving

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

**Course Synopsis:**

Introduction to Problem Solving and Competitive/Sport Programming, International Collegiate Programming Contest (ICPC): What, Why and How, Qualification System, History of Bangladesh in ICPC, Similarity with other relevant competitions such as IOI, IMO; Secondary Level Mathematics: Mathematical series, Arithmetic Progression, Geometric Progression, Logarithmic Functions; Recursion: Recurrence Relation, Solving series using recurrence relations, Fibonacci series; Basic C programming for problem solving: tools, syntax, statements, input/output, conditions, loops; Solving problems in Online Judge platforms: URI beginner list, UVa ad hoc list, LightOJ beginner volume; Basic Data structures: Array, Stack, Queue.

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

1. To grow enthusiasm in Problem Solving and Competitive Programming
2. To demonstrate the basic programming tools to start Competitive Programming

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

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| --- | --- | --- | --- | --- | --- |
| **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 | **Explain** the need to practice analytical problem solving, competitive programming for better academic performance and career | 12 | Understand/Cognitive | Lecture, Sharing success stories and examples | Oral exams |
| CO2 | **Demonstrate** the use of basic programming tools for competitive programming | 5 | Apply/ Cognitive | Lecture, Problem Solving, Practice sessions | Problem solving, programming contest |
| CO3 | **Apply** secondary and higher secondary level mathematics for problem solving | 1 | Apply/ Cognitive | Lecture, Practice sessions | Written exams, problem solving |
| CO4 | **Solve** beginner level problems in various online judge platforms | 3 | Apply/ Cognitive | Lecture, Problem Solving, Practice sessions | Problem solving, programming contest |

**Weighting COs with Assessment methods:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assessment Type** | **% weight** | **CO1** | **CO2** | **CO3** | **CO4** |
| Final Evaluation: Programming Contest (Individual) | **40%** |  | 10 | 10 | 20 |
| Mid Semester Evaluation: Problem Solving Competition (Written) | **20%** |  | 5 | 15 |  |
| Continuous Evaluation:  Class performance, Short Quizzes, Problem Solving Sessions, Oral Exams | **40%** | 10 | 10 | 10 | 10 |
| **Total** | **100%** | 10 | 25 | 35 | 30 |

**Grading Policy:**

|  |  |
| --- | --- |
| **Obtained Marks (out of 100)** | **Grade** |
| 60 or above | Satisfactory |
| Below 60 | Unsatisfactory |

**Course Content Outline and mapping with COs**

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| --- | --- | --- | --- | --- |
| **Week** | **Topics / Content** | **Course Outcome** | **Delivery methods and activities** | **Additional Materials** |
| 1 | Introduction to the University, Department, Program: Curriculum, Outcome, Rules | CO1 | Lecture, multimedia | Prospectus of the BSc in CSE program |
| 2 | Introduction to Problem Solving and Competitive/Sport Programming, ICPC  Motivation to participate in Programming Contests | CO1 | Lecture, multimedia, Speech by invited guest (Dr. M Kaykobad, Dr. Abul L. Haque, Mr. Shahriar Manzoor or any renowned ICPC Alumni) | <https://icpc.baylor.edu/> |
| 3 | Getting started with C Programming Language for Problem Solving: Tools needed, Basic syntax, statements, Input/Output | CO2 | Lecture, Practice sessions | Chapter 3 – 5 of required text  Chapter 3 of recommended text |
| 4 | Competitive Programming at home: Online Judge, UVa, Codeforces, URI; Top problem solvers of the world, Leaders from Bangladesh | CO2 | Multimedia | <https://onlinejudge.org/>  <https://www.urionlinejudge.com.br/> |
| 5 | URI Online Judge Beginner List: 1001 – 1006  Short discussion on ICPC Asia Dhaka Regional Contest 2019: Contest Environment, Winners, Problemset Analysis | CO4 | Lecture, multimedia, Practice sessions, Problem solving | To be shared in Google Classroom |
| 6 | Mathematical series: Arithmetic Progression, Geometric Progression;  Recursion/Recurrence Relation, Fibonacci Series | CO3 | Lecture, Practice sessions | To be shared in Google Classroom |
| 7 | Logarithmic Functions and its applications: Digits in a number, Digits in Factorial, working with different number systems  Problem Discussion: Trailing zeroes in a number, Trailing zeroes in Factorial | CO3 | Lecture, Practice sessions | To be shared in Google Classroom |
| **Mid Semester Evaluation** | | | | |
| 8 | C Programming Language: Conditions, If/Else  URI Online Judge Beginner List: Up to 1038 | CO2 | Lecture, Practice sessions, Problem solving | Chapter 7 of required text |
| 9 | C Programming Language: Loops  URI Online Judge Beginner List: 1059 – 1145 | CO2 | Lecture, Practice sessions, Problem solving | Chapter 8 of required text |
| 10 | Uhunt (UVa helper) : Super Easy List | CO4 | Lecture, Practice sessions, Problem solving | To be shared in Google Classroom |
| 11 | Basic Data Structures: Array, Stack, Queue | CO2 | Lecture, Problem solving | To be shared in Google Classroom |
| 12 | Uhunt: Ad hoc problems Part 1 | CO4 | Lecture, Practice sessions, Problem solving | To be shared in Google Classroom |
| 13 | Introduction to LightOJ: Beginner Volume | CO4 | Lecture, Practice sessions, Problem solving | To be shared in Google Classroom |
| 14 | LightOJ: Beginner Volume (contd.) | CO4 | Lecture, Practice sessions, Problem solving | To be shared in Google Classroom |
| **Final Evaluation** | | | | |

**Required Reference(s):**

**Structured C/C++ Programming**

* Dr. M. A. Hakim Newton, Dr. Md. Mostofa Akbar, Dr. M. Kaykobad

**Recommended Reference(s):**

**Art of Programming Contest**

* Ahmed Shamsul Arefin

**Class code for Google Classroom:** Will be updated once the class routine is published

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| **Prepared by**  **Md. Imran Bin Azad**  Asst. Professor, CSE, UAP | **Checked by**  **Dr. Bilkis Jamal Ferdosi**  Professor and Head  CSE, UAP | **Reviewed by**  **Prof. Dr. M Kaykobad**  CSE, BUET |

**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. |

**Appendix-2**

