**Varendra University**
**Department of Computer Science and Engineering**
<u>**Course Outline**</u>

**Course Title:** Computer Algorithms
**Course Code:** CSE 2203
**Course Type**: Theory
**Credits**: 3
**Prerequisite Knowledge:** Object Oriented Programming, Data Structure
**Year and Semester:** 2nd Year, 4th Semester
**Session:** Summer-2025

**Instructor's details:**
**Name:** Sumaiya Tasnim
**Designation**: Lecturer
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**Older Power Point Slide's Web Link**: CSE_2203

**Motivation of Course:**
To learn the fundamentals of algorithm design, analysis, and application for solving computational problems.

**Course Objective:**
This course aims to develop students' ability to design solutions for emerging algorithmic problems in computer science as well as to apply well-known algorithms properly to real-world problems. It also aims to enhance their ability to analyze newly designed algorithms and select appropriate ones based on runtime and memory complexity. Students will learn to solve a variety of graph and combinatorial optimization problems commonly encountered in operations research. Additionally, the course introduces students to computational complexity, enabling them to assess the difficulty of algorithmic problems.

**Course Outcomes (COs), Program Outcomes (POs) and Assessment:**

| COs | Description | Taxonomy domain/level | POs | K | P | A |
|-----|-------------|----------------------|-----|---|---|---|
| CO1 | Apply runtime analysis techniques | Cognitive/ Apply | PO-a | K2 | | |
| CO2 | Design necessary algorithms to solve problems in real life. | Cognitive/ Creating | PO-c | K5 | | |
| CO3 | Analyze the requirements for approximation of Complexity Classes. | Cognitive/ Analyze | PO-b | K4 | | |

**Teaching-Learning strategy**

| COs | Teaching-Learning strategy | Assessment strategy |
|-----|---------------------------|---------------------|
| CO1 | Lectures, Power Point Slide, Book | Mid-Term exam |
| CO2 | Lectures, Power Point Slide, Book | Final Exam |
| CO3 | Lectures, Power Point Slide, Book | Presentation |

**Assessment Detail**

| Assessment Tools | | Marks (%) | |
|---|---|---|---|
| Continuous Assessment (CA) | Class Participation | 10% | 40% |
| | Class Test, Presentation | 30% | |
| Summative Assessment (SA) | Mid-term Examination | 24% | 60% |
| | Final Examination | 36% | |
| | **Total** | **100%** | |

**Text Book:**
1. Thomas H. Cormen, Charles E. Leiserson, : **Introduction to Algorithms**, *The MIT Press.*
   Ronald L. Rivest, Clifford Stein

**Reference Books:**
1. Jon Kleinberg, Eva Tardos : **Algorithm Design,** *Pearson*

2. Sartaj Sahni, Ellis Horrowitz, Rajasekara : **Fundamentals of Computer Algorithms,**
   *Universities Press (India) Private Limited*

**Course Conducting/Course Policies:**

1. It is the student's responsibility to gather information about the assignments and covered topics if he/she does miss the lecture
2. Regular class attendance is mandatory. Points will be taken off for missing classes.
3. Without **50% of** attendance, sitting for final exam is **NOT allowed**.
4. The students must enter the **classroom in time** to get the attendance. **No student** will be allowed to enter the classroom after the attendance has been done.
5. Once the attendance is done, a student can leave the class if he or she thinks that he or she is not getting benefits from the class
6. The reading materials for each class will be available at Microsoft Teams (inside the Course Materials section of a Team dedicated to this course) prior to that class so that student may have a cursory look into the materials.
7. The date and syllabus of quiz/class test will be announced in time in Microsoft Team
8. Students will be **notified** in due time for class cancelation, extra class, make-up class and tutorial class.
9. Students are encouraged to participate in the class discussion and to **ask questions**. The student can ask any question without any hesitation as long as he or she can't understand the topics being discussed; please keep in mind that if you don't understand, it's not your fault, it's my limitation that I could not make you understand. The class is expected to be interactive. The class is expected to be **interactive.**
10. Each student will have to present an oral presentation **for 5 minutes** on Computational Complexity related topics.
11. It is expected that the student will also provide some new knowledge related to the curriculum and then make the class as a **place of knowledge sharing among all participants, both teacher and students**.
12. Any attempt for **unfair means** in the examination is **strictly prohibited**.

**Class & Exam Schedule, Topics and Readings:**

| Sessions | Topics | Readings |
|---|---|---|
| Week-1 | Introduction and Basics of Algorithms, Searching Algorithms | • PowerPoint slides & Text Book |
| Week-2 | Sorting Algorithms | • PowerPoint slides & Text Book |
| Week-3 | Runtime Analysis Techniques | • PowerPoint slides & Text Book |
| Week-4 | Runtime Analysis Techniques (Practice Problems), Divide & Conquer Algorithms | • PowerPoint slides & Text Book |
| Week-5 | Divide & Conquer Algorithms | • PowerPoint slides & Text Book |
| Week-6 | Greedy Design | • PowerPoint slides & Text Book |
| Week-7 | Class Test and Review Class | |
| Mid Term Examination | | |
| Week-8 | Greedy Design | • PowerPoint slides & Text Book |
| Week-9 | Graph Theory | • PowerPoint slides & Text Book |
| Week-10 | Graph Theory, Dynamic Programming | • PowerPoint slides & Text Book |
| Week-11 | Dynamic Programming | • PowerPoint slides & Text Book |
| Week-12 | Computational Complexity | • PowerPoint slides & Text Book |
| Week-13 | Presentation | |
| Week-14 | Class Test and Review Class | |
| Final Examination | | |