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|  | **East West University**  **Department of Computer Science and Engineering**  **Course Outline**  **Fall 2019 Semester** |  |

**Course Information**

**Course: CSE225 Numerical Methods (Section: 4)**

**Teaching Scheme:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Theory | Laboratory | Total |
| Credits | 3 | 1 | 4 |
| Contact Hours | 3 Hours/Week for 13 Weeks | 2 Hours/Week for 13 Weeks | 5 Hours/Week for 13 Weeks |

**Prerequisite:** CSE105 (Structured Programming) and MAT102 (Differential Equations & Special Functions)

**Instructor Information**

**Instructor** **Yeasir Rayhan**

Lecturer, Department of Computer Science & Engineering,

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**Course Site https://sites.google.com/site/yeasirrayhan111/cse225**

**Class Routine and Office Hour**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Day** | **08:30–10:00** | **10:10–11:40** | **11:50–01:20** | **01:30–03:00** | **03:10–04:40** | **4:50-6:50** |
| **Sun** | **CSE 225**  **AB2 205** | **Office**  **Hour** | **CSE 101**  **529** | **Office**  **Hour** | **Office**  **Hour** | **CSE110**  **638** |
| **Mon** | **Office**  **Hour** | **CSE 205**  **109** | **Office**  **Hour** | **CSE110**  **AB2 502** |  |  |
| **Tue** | **CSE225**  **638** | **Office**  **Hour** |  |  |  |  |
| **Wed** | **Office**  **Hour** | **CSE 205**  **109** | **Office**  **Hour** | **CSE110**  **AB2 502** |  |  |
| **Thu** | **CSE 225**  **AB2 205** | **Office**  **Hour** | **CSE 101**  **AB2 205** |  |  |  |

**Course Objective**

This course will emphasize the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. Knowledge of this course will be needed as prerequisite knowledge for future course such as CSE365 Artificial Intelligence.

**Course Outcomes (COs)**

After completion of this course students will have the ability to:

|  |  |
| --- | --- |
| CO1 | **Understand** and **use** error estimation and root finding algorithms for solving scientific and engineering problems. |
| CO2 | **Understand** and **use** direct and iterative methods of systems of linear equations for solving scientific and engineering problems. |
| CO3 | **Understand** and **use** numerical techniques of interpolation, differential and integral equations for solving scientific and engineering problems. |
| CO4 | **Interpret** and **apply** numerical techniques; **demonstrate** this knowledge and **write** report for realistic solution of complex scientific and engineering problems. |

**Course Topics, Teaching-Learning Method, and Assessment Scheme**

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| --- | --- | --- | --- | --- | --- | --- |
| **Course Topic** | T**eaching-Learning Method** | **CO** | **Mark of Cognitive Learning Levels** | | **Mark of COs** | **Exam**  **(Mark)** |
| C2 | C3 |
| Numerical methods used for problem solving. Steps in solving a problem with a computer. Mathematical modelling and Error estimation. | Lecture, Class Discussion, Discussion Outside Class with Instructor/ Teaching Assistant | CO1 | 5 |  | 5 | **Midterm Exam I**  **(20)** |
| Root Finding Algorithms (Open and bracketing methods) | Do | CO1 |  | 15 | 15 |
| Introduction to system of linear equations, Analytical and Iterative methods for linear equations, LU decomposition. | Do | CO2 |  | 20 | 20 | **Midterm Exam II**  **(20)** |
| Curve fitting, Interpolation and Extrapolation. | Do | CO3 |  | 6 | 6 | **Final Exam**  **(20)** |
| Numerical solution of differential and Integral equations. | Do | CO3 |  | 14 | 14 |

**Laboratory Experiments/Project, Teaching-Learning Method, and Assessment Scheme**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Experiment** | **Teaching-Learning Method** | **CO** | **Mark of Learning Levels** | | | **CO**  **Mark** |
| C3 | P3 | A2 |
| Bisections Method and False Position Method | Preparing Pre-Lab Report, Lab Experiment and Result Analysis, Preparing Post-Lab Report | CO4 | 3 | 4 | 3 | 10 |
| Newton-Rapson Method | Do | CO4 |
| Iterative Method | Do | CO4 |
| Jacobi’s method and Gauss –Seidel method | Do | CO4 |
| Interpolation | Do | CO4 |
| Numerical Integration | Do | CO4 |
| Differential Equations solve | Do | CO4 |
| Lab Exam | Individual Lab Exam | CO4 | 2 | 2 | 1 | 5 |
| **Total** |  |  | **5** | **6** | **4** | **15** |

**Mini Project**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Mini Project** | **Teaching-Learning Method** | **CO** | **Mark of Cognitive Learning Levels** | **Mark of Psychomotor Learning Levels** | **Mark of Affective Learning Levels** | **CO**  **Mark** |
| C3 | P3 | A2 |
| Mini Lab Project including Report and Presentation | Group-based moderately complex Project with report writing, and oral/poster presentation | CO4 | 4 | 3 | 3 | 10 |

**Overall Assessment Scheme**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **CO** | | | | **Assessment Area Mark** |
| **Assessment Area** | **CO1** | **CO2** | **CO3** | **CO4** |  |
| Class Participation | 1.66 | 1.66 | 1.66 |  | 5 |
| Class Test/Quiz | 3.33 | 3.33 | 3.33 |  | 10 |
| Midterm Exam - I | 20 |  |  |  | 20 |
| Midterm Exam -II |  | 20 |  |  | 20 |
| Final Exam |  |  | 20 |  | 20 |
| Mini Project with report and presentation |  |  |  | 10 | 10 |
| Laboratory Experiments and Exam |  |  |  | 15 | 15 |
| **Total Mark** | **25** | **25** | **25** | **25** | **100** |

**Teaching Materials/Equipment**

**Textbook:**

1. S. C. Chapra, R.P. Canale, *Numerical Methods for Engineers*, Seventh Edition, Mc-Graw Hill, 2002.

**Reference Materials:**

1. J. D. Hoffman, *Numerical Methods for Engineers and Scientists*, Second Edition, Mc-Graw Hill, 1992.

**Teaching Materials:** Lecture Notes\*, Lab Exercises/Notes\*, Reference Book, and Computer &Software Python.

**Teaching-Learning Method:** Lecture Notes\*, Lab Exercises\*, Assignment.

*\*Lecture and Lab Notes that are required for the course will be delivered during class.*

*\*\* Software to compile Python programs:*

|  |  |  |
| --- | --- | --- |
| **IDE** | **Platform** | **Console programs** |
| Command Terminal | Linux | [Compile console programs using from](http://www.cplusplus.com/doc/tutorial/introduction/codeblocks/) terminal |

**Grading System**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Marks (%)** | **Letter Grade** | **Grade Point** | **Marks (%)** | **Letter Grade** | **Grade Point** |
| 97-100 | A+ | 4.00 | 73-76 | C+ | 2.30 |
| 90-96 | A | 4.00 | 70-72 | C | 2.00 |
| 87-89 | A- | 3.70 | 67-69 | C- | 1.70 |
| 83-86 | B+ | 3.30 | 63-66 | D+ | 1.30 |
| 80-82 | B | 3.00 | 60-62 | D | 1.00 |
| 77-79 | B- | 2.70 | Below 60 | F | 0.00 |

**Exam Dates**

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Mid Term I** | **Mid Term II** | **Final** |
| 4 | 10 October | 7 November | 12 December |

**Academic Code of Conduct**

**Academic Integrity:**

Any form of cheating, plagiarism and personification, falsification of a document as well as any other form of dishonest behavior related to obtaining academic gain or the avoidance of evaluative exercises committed by a student is an academic offence under the Academic Code of Conduct and **may lead to severe penalties as decided by the Disciplinary Committee of the university.**

**Special Instructions:**

* Students are expected to attend all classes and examinations. A student MUST have at least 80% class attendance to sit for the final exam.
* Students will not be allowed to enter into the classroom after 20 minutes of the starting time.
* For plagiarism, the grade will automatically become zero for that exam/assignment.
* Normally there will be **NO make-up exam**. However, in case of **severe illness, death of any family member, any family emergency, or any humanitarian ground**, if a student miss any exam, the student MUST get approval of makeup exam by written application to the Chairperson through the Course Instructor **within 48 hours** of the exam time. Proper supporting documents in favor of the reason of missing the exam have to be presented with the application.
* For **final exam**, there will be NO makeup exam. However, in case of **severe illness, death of any family member, any family emergency, or any humanitarian ground**, if a student miss the final exam, the student MUST get approval of **Incomplete Grade** by written application to the Chairperson through the Course Instructor **within 48 hours** of the final exam time. Proper supporting documents in favor of the reason of missing the final exam have to be presented with the application. **It is the responsibility of the student to arrange an Incomplete Exam within the deadline mentioned in the Academic Calendar in consultation with the Course Instructor**.
* All mobile phones MUST be turned to silent mode during class and exam period.
* There is **zero tolerance for cheating** in exam. Students caught with cheat sheets in their possession, whether used or not; writing on the palm of hand, back of calculators, chairs or nearby walls; copying from cheat sheets or other cheat sources; copying from other examinee, etc. would be treated as cheating in the exam hall. The only penalty for cheating is **expulsion for several semesters as decided by the Disciplinary Committee of the university**.