**National University** 



**Of Computer & Emerging Sciences**

**Karachi**

**Course Outlines of BSCS Degree Program**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Instructor** | Mr.Mohammad Jamilusmani | **Semester** | Spring |
| **Batch/Section(s)** | Batch 2016 / Sections GR1 , GR2 and GR3 | **Year** | 2018 |
| **Course Title** | MT213 COMPUTING METHODS-1 | **Credit Hours** | 3 |
| **Prerequisite(s)** |  | **Course TA** | 1AZZZ |

**Text Book(s)**

|  |  |  |
| --- | --- | --- |
| Title of book | Numerical Methods using MATLAB , 3rd Edition | |
| Author(s) | John H.Mathews |

**Reference Book(s)**

|  |  |
| --- | --- |
| 1. Numerical Methods , 9th Edition | |
| Faires and Burden |
| 1. Applied Numerical Methods with Matlab for Engineers and Scientist, 3rd Edition | |
| Steven C,Chapra |

|  |
| --- |
| **Course Objective:** |
| * To introduce the students to the mostly used computing methods in the different fields of engineering and sciences. * The emphasis will be on understanding the algorithem of the various methods for computing and on applying these to obtain the approximate solutions for various mathematical problems. * MATLAB & C++ will be used as tool for implementation and application of these computing methods. |

|  |
| --- |
| **Course Description:** |
| The computing methods-1 includes: Error concept and analysis , Roots of nonlinear algebraic equations ,Iteration for non linear system of equation, Solution for system of linear equations, Linear interpolation with 2nd and 3rd dimensional , Inverse interpolation , Interpolating polynomials , Differences , Operators and their relation , Numerical differentiation and integration |

**Marks Distribution:**

|  |  |
| --- | --- |
| **Particulars** | **% Marks** |
| 1. Project/Activity | 10 |
| 2. Assignments/ Quizzes | 10 |
| 4. First Mid Exam | 15 |
| 5. Second Mid Exam | 15 |
| 6. Final Exam | 50 |
| **Total:** | **100** |

**Tentative Weekly Lectures Schedule:**

|  |  |  |
| --- | --- | --- |
| **Week** | **Theory Contents/Topics** | **Exercises**  **Page No.** |
| 1 | Introduction of Computing Methods-1 with MathLab and C++  Accuracy and Precision ,Error analysis, Roundoff and truncation error, and chopping. |  |
| 2 | Absulute error relative error and percentage error , significant figures in approximation , Taylor series with order of approximation , loss of significance | 37,38 |
| 3 | Solution(Root) of non linear equations using Bisection(Bolzona) , Fixed Point(x=g(x)) iteration and Regula Falsi Method. | 50,61 |
| 4 | Newton Raphson , Secant Method , Muller method. | 85,86 |
| 5 | Solution of syetem of non linear equation ,Newton Method ,fixed point | 181-183 |
| 6 | **Review of 1st Mid Term Exam** |  |
| 7 | Solution of simultaneous linear equations, upper triangular linear system ,Gaussain Elimination and pivoting , LU decomposition. | 124,137,138,153 |
| 8 | Iterative methods for linear system,Gauss-Siedel and Jacobi’s methods. | 165 |
| 9 | Operator analysis  and E operators and their relations. |  |
| 10 | Taylor polynomial , Interpolation with equally spaced data, Newton’s Forward and Backward difference formula. | 195,196,205,217,218 |
| 11 | Interpolation with unequally spaced data, Lagrange and Newton’s divided difference formulae. | 228,229 |
| 12 | **Review of 2nd Mid Term Exam** |  |
| 13 | Numerical differentiation ,(1st and 2nd order derivative) .  The central-diffence formulas of o(h2) and o(h4) | 324-327  339,340 |
| 14 | Numerical Integration (Trapezoidal and Simpson’s rule)  Closed and open Newton-Cotes formulas ,  Numerical solution of DE | 352,364-366 |
| 15 |
| 16 | **Revision of all topics** |  |
| 17 | **Final Exam** |  |

|  |  |  |
| --- | --- | --- |
| **Week** | **Lab No.** | **Project-Activity** |
| **1** |  | **Introduction to MATLAB** |
| **2** | **1** | Matlab desktop,Matlab as a calculator ,Built-in variables and Function. Matrices and vectors ,use of colon and semi colon,Function input and output |
| **3** | **2** | function.m files , plot,relational and logical operator , if else , elseif,for loop, while break and return,practice with Matlab commands . |
| **4** | **3** | Write a programme for the solution of non linear equation using Bisection , Fixed Point(x=g(x)) iteration ,Regula Falsi , Newton and Secant Method. |
| **5** | **4** | Write a algorithem and flow chart using fixed point ,Bisection , Secant , Newton Raphson method . |
| **6** |  | **Mid-1 week** |
| **7** | **5** | Discuss algorithem for system of linear equation. |
| **8** | **6** | Write a programme for the solution for system of linear equation using  Gauss-Siedel and Jacobi’s methods. |
| **9** |
| **10** | **7** | Write the algorithem for system of linear equation and Interpolation.  Write a programme for Interpolation using lagrange and Newton formula. |
| **11** |
| **12** |  | **Mid-2 week** |
| **13** | **8** | Write a programme for forward , backword difference table . |
| **14** | **9** | Write a programme in matlab for diff.and Integration. |
| **15** | **10** | **LAB EXAM / VIVA** |
| **16** |
| **17** |  | **Final Exam week** |

**Important Instructions to be followed for this Course**

* Be in classroom on time. Any student who arrives more than 5 minutes late in the class would be marked LATE. Anybody coming to classmore than 15 minutes late will be marked ABSENT.
* Turn off your cell phones or any other electronic devices before entering the class.
* Maintain the decorum of the class room all the time.
* Avoid a conversation with your classmates while lecture is in progress.
* Submit your assignments on time, no assignment will be accepted after the deadline.

**Instructions / Suggestions for satisfactory progress in this course:**

* On average, most students find at least three hours outside of class for each class hour necessary for satisfactory learning.
* Chapters should be read and homework should be attempted before class.
* Do not get behind. You are encouraged to work with other students. Plus, I am always available during office hours to help you.
* The homework assigned is a minimum. You may always work extra hours on your own.
* Use the few minutes you usually have before the start of each class to review the prior meetings’ notes and homework. This will save us valuable in-class time to work on new material.
* Develop a learning habit rather than memorizing.work in groups, whenever appropriate.
* Apply the learned principles and gained knowledge.
* Be creative in thinking, but stick to the topic assigned for discussions, assignments and presentations.
* Always bring your Work Book and calculator with you in the class.

**Note:** Students are welcome all the time to get help from the Teacher.

Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_