College of Engineering

Civil Engineering Department

First Semester (182)

Course Syllabus

Course code	Title	Credit Hr.
CE 301	**Computational Methods in Civil Engineering**	**2-3-3**

Instructor:	Dr. Moruf O. Yusuf
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Office Ext.:	1143
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Lab Instructor:	Dr Moruf O. Yusuf

Office hours:

Sunday	Monday	Tuesday	Wednesday	Thursday
11:00-11:50 AM	10:00-10:50 AM	09:00-09:50 A.M	10:00-10:50 AM 01-01:50 PM	01-01:50 PM

*Or by appointment

Lecture/Lab Information

Lecture	Lab
Location: Room 1311	**Location:** Room 0410 CE COMPUTER LAB
Time: 10 – 11:40 AM (Tuesday)	**Time**: 2 – 4:50 PM. (Monday)

Designation: Required

1. Course Description

Introduction to numerical methods; error analysis; solution of system of linear and nonlinear equations; numerical integration; numerical solutions of ordinary differential equations; curve fitting and interpolation; statistical methods, descriptive statistics, probability distributions, analysis of variance and regression; introduction to linear programming and optimization problems; introduction to the finite element method (FEM), applications of numerical methods in CE, system analysis, finite difference and finite elements using software packages such as MS Excel, Mathematica and/or MATLAB.

2. Textbook

Numerical Methods for Engineers, by Chapra and Canale, 7th Edition.
MATLAB® An Introduction with Applications by Amos Gilat 4th Edition, John Wiley.

3. Prerequisite:

MATH 202, CSE 103

4. Course Objectives

The overall objectives of this course are to:

i. Introduce basic computational and numerical methods.
ii. Build on student's skills acquired in mathematics to solve mathematical problems numerically and using software packages.
iii. Provide the analytical and approximation tools that can be applied in various CE engineering applications

5. Course Outcomes

After successful completion of this course, students should be able to:

i) get familiar with computational and numerical methods (such as finite different method) and their applications to solve engineering problems.
ii) to analyze and interpret data relevant to solving engineering problems.
iii) understand different techniques to model engineering experimental data towards modelling and optimization.
(iv) to communicate the outputs of data collection and analysis with statistical tools (central tendencies (mean, median and mode), measure of dispersion (standard deviation and variance) and probability by normal distribution).

6. Mapping Between Course Outcomes and Student Outcomes

Student outcomes / Course outcomes	a	b	c	d	e	f	g	h	i	j	k
i	✓										
ii		✓			✓						
iii											✓
iv							✓				

7. Major Topics Covered in the Course

No.	Content	Chapter	Contact Hours
1	Introduction to the course, Errors and Taylor series	1-4	2
2	Root of Polynomial (Bracketing Methods)	5	4
3	Roots of Polynomial (Open Methods)	6-7	4
4	Linear Algebraic Equations	9-12	4
3	Optimization Techniques	13-16	2
4	Curve Fitting and Interpolations	17-18	2
5	Numerical Integration and Differentiation	21-24	4
6	Ordinary Differential Equation	25-28	2
7	Partial Differential Equation	29-32	4
8	Introduction to Descriptive statistics and Dispersion	-	4

8. UOHB Rules and Regulations:

A. Attendance in the class (or Lab):

Attendance in the class will be strictly observed starting from the first day of classes. Students shall be warned after 2 and 5 unexcused absences. However, after 8 unexcused or 10 total absences (excused and unexcused absences), DN grade shall be awarded. Student shall be solely responsible for his DN grade and its accompanied repercussion or negative effects. The conditions are spelt out in the table below.

	Number of unexcused absences			Total absences (excused* + unexcused)
	Warning I	**Warning II**	**DN**	**DN**
30 course lectures per semester	**2**	**5**	**8**	**10**
Laboratory session	**1**	**2**	**3**	**4**

The following should be noted

i) Students must bring text book, notebook, calculator and pen to the class
ii) Attendance in the classes will be taken within five minutes of the beginning of the class. Any student who arrives class within 5 minutes from the start of class will be marked as late. If the student is marked late 3 times, then this is equivalent to 1 unexcused absence. Student who arrives after 5 minutes is considered absent with no excuse.

***Note:**

Officially authorized excuse of absences must be obtained from Deanship of Student Affairs and presented to the instructor **no later than two days** following the resumption of class attendance.

B. Waiting Time

: If the instructor is late, students are expected to wait for 15 minutes and then they are free to go

C. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but not limited to the following practices:

- **Cheating**, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- **Plagiarism**, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- **Impersonation** or taking an exam in proxy.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.

D. Penalties for Violations of Academic Integrity

Having witnessed or otherwise identified an apparent violation of the academic integrity policy, the faculty member may either impose or recommend an appropriate penalty, depending upon
the seriousness of the offense.
The instructor may impose any one of the following penalties:

- a written notice of warning, with a copy placed in the student's file with the advisor;
- a reduced grade on the assignment;
- a grade of F (zero if graded numerically) for the assignment;
- a reduced grade for the course;
- a grade of F for the course.

E. Class/Lab Rules

- Use of **mobile phones** is **not allowed** during the class period.
- **Smoking, eating or drinking** is **not permitted** at any time.
- **Excuse** must be sought and granted before **leaving the class** for any reason.
- Lab dress code: boot, trousers and shirt

F. Assignments and Quizzes

- Problems or questions will be assigned regularly. Students will be required to solve these problems and submit the solutions within one week or as may be determined by the instructor.
- No assignments will be accepted after its due date.
- There will be no makeup quiz.
- Students should make every effort to meet all announced deadlines. Any constraint to meet the deadline shall be reported to the instructor for him to determine whether an extension is required or not.

G. Communication

The students shall constantly use the blackboard to communicate among themselves and with the instructor. Students are encouraged to check their e-mails daily to check whether there exists any special instruction or information from the instructor.

9. Schedule of Classes

Week	Date	Topics	Section/Ref.	Assessments
1	07/01/19	Lab 1: Introduction to Excel	1.0	
	08/01/19	Introduction to the Course and error-approximation	3.4	**HW 1**
2	14/01/19	Lab 2: Introduction to Mathematica/MATLAB		
	15/01/19	Taylor series and root of single equations	4.1	
3	21/01/19	Lab 3: Root finding using Excel Solver Add-in		**Quiz 1**
	22/01/19	Graphical, Bisection Method and False position (BM)	5.1	
4	28/01/19	Lab 4: Finding root Using Mathematica/MATLAB		
	29/01/19	Simple Fixed Iteration Newton-Raphson and Secant Methods	6.1	

5	04/02/19	Lab 5: Linear Algebra Equations in Excel		**HW 2**
	05/02/19	Linear Algebraic Equation: Matrices: Gauss Elimination method, Gauss-Jordan and Gauss-Seidel Methods	9.1	**Quiz 2**
	Major 1 (Sunday: 3rd February 2019) 6 – 8:00 PM			
6	11/02/19	Lab 6: Solving linear algebraic equation in Mathematica and MATLAB	7.3	
	12/02/19	Case Study of Linear Algebraic Equation (truss analysis)	12.1	**Quiz 3**
7	18/02/19	Lab 7: Solving Non-Linear Algebraic Equation in Excel, Mathematica and MATLAB	13.1	
	19/02/19	Unconstraint Optimization: Golden search and Newton methods, Gradient and Hessian Matrix in multivariable optimization of a function	14.1	
	19/02/19	**MIDLAB EXAMS**		
8	25/02/19	Lab 8: Constraint Optimization		
	26/02/19	Constraint Optimization	15.1	
9	04/03/19	Lab 9: Curve fitting and plots in Excel		**HW 3**
	05/03/19	Curve fitting: Linear and least square regression	16.1	**Quiz 4**
10	11/03/19	Lab 10: Curve fitting and plot in Mathematica/MATLAB	17.2	
	12/03/19	Curve fitting: Non-Linear polynomial regression and Lagrange Interpolation Polynomial	17.5	
11	18/03/19	Lab 11: Numerical Integration and Differentiation (Excel)		
	Major 2 (Sunday: 10th March 2019) 6 – 8:00 PM			
	19/03/19	Numerical Integration: Trapezoidal rules, Simpson's rule and Gauss Quadrature	21.1 -22.4	
12	25/03/19	Lab 12: Numerical Integration and Differentiation (Mathematica/MATLAB)		
	26/03/19	Numerical Differentiation: Forward/Backward Divided, and Centered Difference.	23.6	
13	01/04/19	Lab 13: Ordinary Differential Equation		**HW 4**
	02/04/19	Ordinary differential Equation: Euler's method	25.1	**Quiz 4**
14	08/04/19	Lab 14: Introduction to Statistical Analysis (Excel/MATLAB)		
	09/04/19	Boundary Value Problem: Finite Difference Method	27.1.2	**HW 5**
15	15/04/19	STATISTICS: Measure of Central Tendency/Dispersion	-	**Quiz 5**
	16/04/19	FINAL LAB		
	26/12/19	Review	-	
		FINAL EXAMS		

10 Schedule of Exams for CE 301:

Examination	Major I	Mid-Lab	Major II	Final-Lab	Final Exam
Week No.	5	7	10	15	16-17
Date	Feb 05, 2019	Feb.19, 2019	March 18, 2019	April. 04, 2019	See final exam schedule

Note:

i. Make-up exam will be given only in case the affected student has an approved medical excuse authorized by the Student Affairs Unit and the University Rector

ii. Any potential conflicts with other exams must be reported **in advance** for adequate adjustment.

11. Assessment Plan for the Course

Assessment Policy	Weighting, %	Letter Grading Scale:
Quizzes	5	0% < 60% F
Homeworks	5	60% < 65% D
Lab reports	10	65% < 70% D+
Mid-term lab	10	70% < 75% C
Final lab	10	75% < 80% C+
Term project	10	80% < 85% B
First major exam	15	85% < 90% B+
Second major exam	15	90% < 95% A
Final exam	20	95% to 100% A+
Total	**100**	

12. ABET Category Contents

Engineering Science	15%	(0.45 credit hours)
Engineering Design	15%	(0.45 credit hours)
Engineering Applications	70%	(2.1 credit hours)

Prepared/Modified by: Dr. Moruf O. Yusuf **Signature:** **Date:** 04-01-2019