

Instructor: Dr. Kevin Cornelius, JSC 316, corneliusk@obu.edu
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Office hours posted on office door
Course website: <http://plaza.obu.edu/corneliusk/nm/>

Textbook: Applied Numerical Methods with Matlab, *Steven Chapra, 5e*

Course Description: This is an upper level engineering course that provides an introduction to the basic principles of Numerical Methods for problems that arise in engineering design and analysis. Numerical solutions of linear and nonlinear algebraic equations, integration, curve-fitting, and ordinary differential equations will be surveyed. Focus will be on using software when solving engineering problems. Prerequisite: MATH 3034, Co-requisite: MATH 3043.

University Learning Goals (ULG): The University Learning Goals may be found on the University Mission, Vision, and Values webpage at: <http://www.obu.edu/about/vision-mission-and-values/>

Departmental Learning Outcomes (DLO) - (ABET Student Outcomes):

Upon completion of the departmental curriculum, students will have an ability to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. **ULG 1, 5, 6**
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. **ULG 1, 3–6**
3. Communicate effectively with a range of audiences. **ULG 1, 5**
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. **ULG 3, 5, 6**
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. **ULG 3, 5, 6**
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. **ULG 1, 5, 6**
7. Acquire and apply new knowledge as needed, using appropriate learning strategies. **ULG 1, 5, 6**

Student Learning Outcomes:

At the end of this course, students will be able to demonstrate a proficiency to:

1. Be able to numerically find roots of nonlinear scalar equations. **DLO 1**
2. Be able to numerically solve systems of linear algebraic equations. **DLO 1**
3. Be able to interpolate and extrapolate a data set. **DLO 1**
4. Be able to integrate numerically. **DLO 1**
5. Be able to find numerical solutions to select boundary value problems. **DLO 2**
6. Be able to find numerical integrations of ordinary differential equations. **DLO 2**
7. Be able to curve fit a data set. **DLO 2**

Areas of Study:

Basics of Numerical Methods & Programming (Ch. 1)
MATLAB Fundamentals (Ch. 2 - 3)
Roots & Optimizations (Ch. 5 - 7)
Linear Systems (Ch. 8 - 13)
Curve Fitting (Ch. 14 - 18)
Integration (Ch. 19 - 20)
Ordinary Differential Equations (Ch. 22 - 24)

Journal Notebook:

This is primarily a problem-solving course. Small homework sets will be assigned regularly during the course of the semester for each chapter. Your participation grade will be based on whether or not you are prepared to explain your assigned problems during lecture or while working problems on the board. **Students will keep a notebook of all assigned problems and solutions (*one problem/solution per page using the appropriate formatting*).** Your notebook will be turned in and evaluated after each exam.

It is expected that all students do their own work. Software, such as Mathcad, may be used so long as a printout of the work done is included with the associated problem. **No work shown = No credit given!**

Exams:

Notice of an upcoming exam will be given at least 1 week prior to the exam date. If you plan to miss the day of the exam due to an unavoidable, valid/verifiable absence, you must inform me *before* the exam date so that we can make arrangements for an alternate test time or a make-up exam.

Project:

Each student will be required to complete a project displaying their knowledge of numerical methods. Students will work in small groups or pairs to solve a numerical engineering problem. Details regarding this project, along with its due date, will be handed out separately.

Grading:

Grades will be determined from the following areas:

Homework/Programs:	20%	
Class Participation:	5%	
Project:	10%	
Exams:	50%	
In-Class Final	15%	Tue., Dec 15 th @ 11 am

Grades will NOT be posted. Come see me anytime for your current grade.

A = 100% – 90% B = 89% – 80 % C = 79% – 70 % D = 69% – 60 % F < 60%

Absences:

You get one free absence, but after that, each additional unexcused absence *of any kind* will result in a 1% deduction toward your class participation grade. Valid excuses include, but are not limited to, medical emergencies and school activities; however, if you plan to miss class for a school event, you must let me know in advance so that we can make arrangements. Your success in our program is of great concern to me, but part of that success is you behaving like a responsible adult.

No Class:

There will be **NO** classes on the following dates:

Conference: Sept. 15, Fall Break: Oct. 22-23, Thanksgiving: Nov. 23-27

Americans with Disabilities Act:

Ouachita Baptist University is committed to extending access and opportunity to those who have disabilities. The University policy concerning ADA 504 Accommodations is available in the *Tiger Handbook*. To request modifications or accommodations due to a disabling condition, contact Daniel Jarboe, Coordinator of Counseling Services and ADA 504 Accommodations. You may request an appointment by using the online self-service scheduling system available at <https://obu.edu/counseling/>. Appointments may also be scheduled with him by contacting the Student Development Office (email: curryh@obu.edu; phone: 870-245-5220). You can communicate directly with Mr. Jarboe by email at jarboed@obu.edu. Additional helpful information can be found at <https://obu.edu/counseling/students-with-disabilities.php>.

Covenant on Academic Honor:

Students at Ouachita are obligated to uphold the Covenant on Academic Honor, which reads in part, "I will refrain from all forms of academic dishonesty, and I will act responsibly when confronted with the knowledge of such behavior." For the possible consequences of any violation of this covenant, please see **The Tiger Handbook**.

AI Policy:

The development of generative AI, e.g., ChatGPT, introduces a powerful technological tool. Like most new technologies, such tools may be used for good or ill. **The benefit and purpose of academic work lies in the PROCESS, not merely in the PRODUCT.** Unless we have discussed and agreed upon how and when AI may be used in this class, I will view the use of AI for any aspect of academic work in this course as a violation of the Covenant on Academic Honor.

Title IX Policy Summary:

"Title IX of the Education Amendments of 1972 is a federal civil rights law that prohibits discrimination on the basis of sex in any education program or activity that receives federal funding."

(<https://www.aclu.org/know-your-rights/title-ix-and-sexual-assault>) If you are the victim of Title IX discrimination—including sexual harassment, rape, sexual assault, quid pro quo and hostile environment harassments, sexual exploitation, dating violence, domestic violence, and stalking—you may report this discrimination.

Formal Reporting to the University

- *Ouachita students, employees, and all other community members* may contact Title IX Coordinator Dr. Christa Neal at TitleIX@obu.edu or nealc@obu.edu, Berry Peebles Bible Building 131, 870-245-4896

For All Other Concerns:

- *Members of Ouachita's campus* may contact Mr. Scott Clark, Director of Campus Safety and Emergency Management, 870-245-4000 or 870-245-4258, Evans Student Center 131
- *All Ouachita students* may contact Mr. Tim Harrell, Dean of Students, 870-245-5225, Evans Student Center 220
- *All Ouachita employees* may contact Mrs. Jana Hardage, Human Resources, 870-245-5583, Cone Bottoms 330

Tips for Success:

1. Read the textbook. This will provide a second point of view of the material covered in class.
2. Solve problems. Physics & Engineering is a performance discipline just like athletics or music. It is not a subject that can be learned solely through reading, regular practice is required. Work as many extra problems and examples as your time will allow.
3. Develop good time management and proper priorities. (*May require hard choices and sacrifices*)
4. Get help. There are a variety of resources available, from tutors to the success center to professors.
5. Form a study group. People in study groups tend to have a letter grade higher compared to those who don't.
6. Turn in homework and labs on time. Some credit is better than none at all.
7. Take good notes.
8. **For optimal learning, recopy your notes after each lecture. Understanding may not come during class because information is coming hard and fast, but valuable insight often occurs as you go over the material again. This is also an excellent tool in preparing for tests.