BOB JONES UNIVERSITY
PURSUE A HIGHER CALLING

Numerical Analysis
CpS 406 | Ma 476
Spring 2026

College of
Arts and Science
Mathematical Sciences Division

Professor:	James A. Knisely, Ph.D.
Office:	Alumni 64
Office Hours:	MWF 7:30 – 8:45 a.m. | Th 7:30 – 9:15 a.m. Tu 1:30 – 2:45 p.m. | Please email or text to confirm availability
Email/Text/Teams:	jknisely@bju.edu | Cell 864-517-2437 | MA 136 S26
Communication Policy:	Feel free to email or contact me via Microsoft Teams for questions and/or extended help. You may text where appropriate (not during class).
Classroom/Meets:	AL 315 / TTH 3:00 - 4:15 p.m.
Credit/Load:	3/3
Textbook(s):	Numerical Methods For Engineers by Steven C. Chapra and Raymond P. Canale. ISBN: 1-26-023207-7 Mathematica, JupyterHub, Excel, and Python are among the tools that will be used in this course.

Catalog Description:

Will solve interesting problems from upper level mathematics or computer science by programming one's own solution or by using a standard mathematical program like *Mathematica* or *Maple*.

Course Context:

Computational Math/Numerical Analysis is an advanced elective that can be taken by strong students majoring in mathematics, computer science, and engineering. It fulfils the following Math and CpS program goals.

Mathematics Major Goal	Computer Science Major Goal
MM1. Graduates will exhibit maturity in the development and implementation of mathematical procedures.	CS1. Design and implement solutions to practical problems
MM2. Exhibit independent and abstract thought and make judgments about the value of innovative developments from a Biblical world view.	CS2. Use appropriate technology as a tool to solve problems in various domains
MM3. Display understanding of what constitutes mathematics, including its role within the framework of Biblical Truth.	CS3. Create efficient solutions at the appropriate abstraction level
MM4. Provide a solid foundation for graduate studies in mathematics.	CS8. Demonstrate understanding of fundamental concepts in the student's discipline

Course Goals:

The goals this course are to increase your knowledge of scientific computing, specifically in these areas:

- Floating-point arithmetic
- Error, stability, convergence
- Iterative solutions for finding roots (Newton's Method)
- Linear algebra
- Curve fitting; function approximation
- Numerical differentiation and integration (Simpson's Rule)
- Differential equations

Course Objectives:

The student will be able to

1. Demonstrate the algorithms and techniques discussed in each section. *Evaluated in the homework and each chapter test.*
2. Discuss the strengths and weaknesses of competing algorithms used to solve problems in a particular section. *Evaluated in each chapter test and the final exam.*
3. Define error, stability, machine precision concepts and the inexactness of computational approximations. *Evaluated in the first section test.*
4. Identify the sources of inexactness in computational approximations. *Evaluated in the first section test*
5. Design, code, test, and debug programs that implement numerical methods. *Evaluated in the two programs.*
6. Present the solution to a problem to the class. *Evaluated in the class presentation.*

Course Requirements:

The grade for this class will be based upon the following categories:

Category	Points	Description
Tests	400	There will be three section tests.
Homework	192	There will be homework assigned for each chapter.
Programs		There will be two programs assigned. Their grades will be included in the homework grade.
Presentation	60	Each student will present two problems to the class.
Final	150	The final exam is cumulative, but 75% will be based upon material covered since the last test.

General Policies:

Deportment

Compliance with student handbook policies is expected during class. The classroom is to be a professional environment. That means you are to come to class prepared for the day's discussion, your attention is expected to be on course related material, and you are expected to positively contribute to the class.

Emergencies During Class

In case of emergency requiring evacuation, students will go down the stairs on the fountain side and exit the door facing Wade Hampton underneath the stairs. Students will immediately cross the street and gather by the fence with their class. If we are unable to exit the building, the professor will instruct the students on the best course of action. To be able to respond quickly to external threats, professors may keep classroom doors locked. If you are late arriving to class, you may need to knock on the door and be let in.

Absences

BJU attendance policy is in effect (see https://home.bju.edu/bju-policies/ for details).

- Scheduled tests/quizzes should be taken before your planned absence; please contact your professor to make arrangements for doing so. You are personally responsible for getting notes from your classmates and discussing the missed material with them. You should not expect your professor to privately re-teach you the material you missed. Your professor is always available to help you with specific questions. If an unannounced quiz/assessment is taken during the class that you miss, you will NOT be allowed to make it up, and you WILL receive a zero on the assignment. Work may always be completed early (see your professor if you wish to take a test early).
- Missing an in-class test because you feel you are not prepared to take it is not acceptable. Work missed for this reason will not be made up and you will receive a zero on the assignment.
- For absences due to incapacitating illness or emergency, you should contact the instructor as soon as you realize you will not be in class to make arrangements to make up any missed work. Tests will be made up without penalty for the first occurrence. Each subsequent time a test is missed because of incapacitating illness or emergency, an additional 10% grade penalty for that test will be incurred. A 10% penalty will be assessed for a late submission of take-home tests. All late work must be made up by the next class period unless other arrangements have been made with the professor.

Presentation of Work

The goal is professional, fluent, and clear communication of what you know.

PW 1: Proper use of mathematical notation is expected. The structure of notation conveys specific meaning and should be used appropriately.

PW 2: Mathematical presentation is like grammar. There are subjects, verbs (=, ≤, >, etc.), and objects. Always write in complete sentences.

PW 3: Tests/presentations/projects are not only about what you know, but about what you can communicate about what you know so the presentation of your work/logic should always be neat, orderly, clearly defined, and with the appropriate amount of supporting detail. (Excessive steps are not required; however, answers alone are not (usually) acceptable.)

PW 4: Always work down the page. (Working in multiple columns is generally not acceptable.) There should be one problem worked in each row because this contributes to clarity and the development of your logical argument.

PW 5: Skip lines between problems. If you have dense handwriting, skip every other line and skip 2-3 lines between problems.

PW 6: Clearly label problems/sub-problems. Problems do not necessarily have to be worked in order but must be clearly labeled either way. Your professor will communicate their expectation on presenting problems out of order.

PW 7: Answers are to be presented as the logical conclusion of your work, not as the only important thing (e.g. at the start of the problem and/or unconnected with any justifying work).

PW 8: Work should be submitted on clean 8.5 × 11 inch (standard-size) paper and should not be submitted with spiral/ripped edges.

PW 9: Take-home tests (when time is not limited) should be neatly presented (rewritten, organized, no scratchwork, etc.) as a final polished piece.

PW 10: Follow any additional instructions given.

Your professor may refuse to accept work that does not meet the minimum presentation requirements above, or they may choose to deduct up to 10% from the assignment.

Problems Expectations

The goal is to prove your mastery (not your just barely comprehending). Failure to meet these expectations will be reflected in lower test scores.

PE 1: Read all words carefully in a question. Everything is important, so know what the meanings of all words are and how those words tell you to respond.

PE 2: Theory is a precise expression of important ideas. While it is not graded word for word, jot for jot, the precise ideas must be maintained. Embrace thorough, smooth learning and presentation. Can you recite the theory from the last class period quickly, comfortably, and conversationally?

PE 3: Theory tells us how to solve problems. Know exactly what problems connected to each theorem or definition look like, and know how to solve them.

PE 4: Know what the key steps of each problem are. Present only the key steps (or the minimum needed to get the answer right and show all your logic).

PE 5: Do enough practice for each type of problem so that you are smooth.

Homework

Homework is intended as a space for you to develop conceptual understanding and skill at communicating your understanding. It is collected only as way to help you develop discipline and maturity. It is due at the start of the indicated class period (or may be turned in early). No late homework is accepted, and you may not copy solutions from another source.

You may upload scans of your work instead of submitting it on paper.

You are done with homework when you can anticipate test questions, solve them, and appropriately communicate those solutions regardless of how many or few problems you have completed.

Late Policy

Assignments not submitted as directed by the due date will incur the following late penalty.

- No late homework/in-class assignments are accepted.
- Written assignments/projects/take-home tests are penalized at 10% per day for the first three days and a grade of 0% after that. Oral presentations are a 0 if not presented on the day assigned.
  Late paper submissions must include the date and time the paper is submitted and be in the credenza by 8am the next day. The next day penalty begins at 8am.
- In-class tests must be taken by the date given in class (or selected time in the case of an oral exam) unless there is incapacitating illness (see attendance policy below). Missing a test/taking the test late (including an oral exam) will result in a 10% penalty unless excused by the professor. Tests should be made up prior to the next class period unless other arrangements have been made with the professor.
- Work may always be completed early. Contact your professor if you wish to take a test early.

Academic Integrity Policies:

The university's Academic Integrity Policy is in effect (see https://home.bju.edu/bju-policies/ for additional details).

Definitions of Integrity Violations

Integrity is the reflection of the character and nature of God in our actions; therefore, students will be expected to work with integrity. In academia, violations of integrity generally fall into one or more of the following categories:

- Cheating: unauthorized use or attempted use of assistance, information, or aids in any academic assignment
- Falsification: submitting work done by others, changing work after submitting an assignment, reporting false information about the completion of an assignment
- Unacceptable collaboration: working with others when not permitted, using AI to generate ideas, thoughts, or content without the explicit permission of the professor
- Facilitation of Cheating: helping another student violate academic integrity, communicating quiz/test questions to other students
- Plagiarism: the intentional or unintentional use to any degree of the ideas or words of one's source material without proper acknowledgement

All work done for this class must represent your own effort, your own understanding, and your own communication of the material.

Course Integrity Policies

If information is taken from other sources (which is at times appropriate), it always needs to be referenced and credit given where it is due. Use standard referencing techniques as taught in En 102. Solutions found on the internet are not to be copied.

- Homework: While you are encouraged to work together on the homework assignments, simply copying someone else's solution is neither useful nor acceptable. Your homework should represent your work and your understanding of the work.
- Tests (In-Class and Take-Home): No resources may be used while taking the test unless permitted by the professor. The presence of any unauthorized material on your desk, in your calculator, on your laptop, etc. while taking a test will be construed as cheating and will be dealt with as such.
  Internet/AI enabled devices or any communication devices (including but not limited to smart glasses, watches, earbuds, etc.) are not permitted to be used and should be stored out of sight during the testing period. Access these type of devices during the test will be construed as cheating and will be dealt with as such.
  Cheating on a test will likely result in a zero on the test and will be submitted to the Academic Integrity Committee.
- Projects: You are encouraged to discuss the general ideas needed to complete the project as discussed in this course with your classmates but are not permitted to work together on your project (outside of your own team and any faculty appointed advisors). Your projects must represent your own ideas, your own work, and your own communication of your work.

Assignment submissions will be evaluated for plagiarism and AI usage at the discretion of the professor. If you have a question about any source you are considering using, it is wise to gain your professor's approval before using it. You are always permitted to ask your professor for help. Any help they choose to provide is acceptable.

AI Usage Policy

The goal of the assignments in this course is to learn to develop the skills covered, NOT to complete the tasks assigned. The use of AI to complete or jumpstart tasks defeats the goal of the assignments. Therefore, you may not use generative AI tools in this course for any assignment without the professor's express permission. AI tools include, but are not limited to, CoPilot, Apple Intelligence, Chat GPT, Bing Chat, Google Bard, Grok, Deepseek, Grammarly, and language translators.

Use of generative AI to develop code (such as Python or R) may be helpful during the project (each student has permission to use AI for only this purpose, other purposes require express permission). It would be wise to consult with your professor before incorporating it into your work. Reliance on AI to generate code has not yet resulted in an acceptable paper. If you do use it, you must document it as indicated above. You may NOT use AI to generate the text/discussion in your project.

Documentation of Permitted AI Use

Should an AI tool be used with permission, its use must be documented (including the tool used, a summary of the prompts provided and the portions of the assignment that were based on AI generated work). See https://style.mla.org/citing-generative-ai/ for details on citing the use of AI.

Additional Document(s)

- Lecture schedule