

Spring Semester 2019
CS3200 Numerical Methods for Engineers

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Class 8:00-9:15, 9:30-10:45
Office Hours TU,TH: 6:30-8:00AM, 12:30-3:30AM,
By appointment (unless some meeting) other times
(feel free to stop by any time I am in the office)

Numerical Methods for Computer Science
Prerequisites: Calc II, and Programming Competency

Topics and Chapters in the book

Math Modeling: Learning computational efficiency techniques
Error Consideration, Taylor Series, Polynomials

Methods for finding roots of equations:
Bisection, False-Position, Fixed-Point, Newton, Secant

Matrix applications to Linear systems:
Systems of linear Equations, Gaussian Elimination, Pivoting, LU-Decomposition, Cholesky,
Jacobi and Gauss-Seidel

Interpolation techniques:
Interpolation Techniques: Least Squares Regression (Linear & Multiple), Logistic Regression,
Interpolating Polynomials, Newton, Lagrange, and Splines

Integration Techniques:
Trapezoid, Simpson, Richardson, Romberg

Differentiation,
Differential Equations, Euler's, Huen's, Runge-Kutta, Multi-Step

Handouts, Assignments, Examinations
are posted on Canvas
<http://Canvas.mst.edu/>

Read the book for details on lectures, handouts will serve as a guide for the lectures. The class Lectures will be supplemented with information not in the book and handouts.

Exams:

Exam1: 15% February 12, 2019
Exam2: 15% March 12, 2019
Exam3: 15% April 11, 2019
Exam4: 15% May 07, 2019
HW/Quizzes 40% (Each HW/Quiz 10 points)

Criteria for Grading

A: [86-100]% B: [76-85]% C: [66-75]% D: [51-65]% F:[0-50]

- Attendance is Required, Roll call will be taken. Absence from class beyond three lectures is not permitted. Unless there is an university acceptable documented emergency and is reported immediately, the registrar will drop you from the class on 4th absence.
- Homework is essential for your comprehension and to do good on the exams. Expect Homework assignment every week. Scheduled Homework will be posted on the Canvas. Homework is graded and grades posted on canvas.

- No late submitted work will be graded for grading everyone uniformly on homework,
- No Makeup quiz/homework/exams will be given unless the student contacts the instructor before the quiz/homework/exam, and has MS&T-acceptable documented reason (i.e. illness, death in the family, etc).
- Assignment/Examination/Homework grades will be recorded on my excel as soon as they are graded. Any discrepancies on feedback must be reported and resolved within *one week* of assignment grade announcement. *No correction* will be made after one week. The corrections will not be reflected on canvas. My excel will be updated for discrepancies. All scores count towards the final grade.
- Matlab is the Programming language for this course.
The programs will be graded for accuracy, efficiency, originality, Graphical User Interface.
- For each written homework, turn in hard copy at the beginning of the class to mark it as feedback.
- For each programming assignment, post the code on Canvas and turn in program & its output hard copy in the class for feedback.
- Your Home works/ exams will be kept in the dept for ABET purposes.

From Office of Undergraduate Studies • 105 Norwood Hall • 320 West 12th Street • Rolla, MO 65409-1520

If you have any questions about the information listed below, please contact the Office of Undergraduate Studies at **Phone: 573-341-7276 • Email: ugs@mst.edu** •

Classroom Egress Maps:

Faculty should explain where the classroom emergency exits are located. Please include a statement in your course syllabus asking the students to familiarize themselves with the classroom egress maps posted on-line at: <http://designconstruction.mst.edu/floorplan/>.

Student Honor Code and Academic Integrity:

Please take a few minutes to stress the importance of academic integrity in class. Discuss why it should matter to the student, why it matters to you and your discipline, why it matters to Missouri S&T, and why it matters to future employers. Include a statement on your syllabus about the Honor Code developed and endorsed by the Missouri S&T Student Council: the Honor Code can be found at this link: <http://stuco.mst.edu/about/honor.shtml>. Encourage students to read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT.

Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage (<http://registrar.mst.edu/academicregs/index.html>). Additional guidance for faculty, including the University's Academic Dishonesty Procedures, is available on-line at <http://ugs.mst.edu>. Other informational resources for students regarding ethics and integrity can be found online at <http://ugs.mst.edu/academicintegrity/studentresources-ai> .

S&Tconnect: <https://canvas.mst.edu/> (S&Tconnect tab)

S&Tconnect provides an enhanced system that allows students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the faculty or staff member's Outlook Exchange calendar. S&Tconnect will also facilitate better communication overall to help build student academic success and increase student retention. S&Tconnect Early Alert has replaced the Academic Alert system used by Missouri S&T. If training is needed, please contact Rachel Morris at rachelm@mst.edu or 341-7600.

Disability Support Services: <http://dss.mst.edu>

Any student inquiring about academic accommodations because of a disability should be referred to Disability Support Services so that appropriate and reasonable accommodative services can be determined and recommended. Disability Support Services is located in 204 Norwood Hall. Their phone number is 341-4211 and their email is dss@mst.edu. Instructors may consider including the following statement on their course syllabus as a means of informing students about the services offered:

"If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the semester. You will need to request that the Disability Services staff send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation."

LEAD Learning Assistance <http://lead.mst.edu>

The Learning Enhancement Across Disciplines Program (LEAD) sponsors free learning assistance in a wide range of courses for students who wish to increase their understanding, improve their skills, and validate their mastery of concepts and content in order to achieve their full potential. LEAD assistance starts no later than the third week of classes. Check out the online schedule at <http://lead.mst.edu/assist>, using zoom buttons to enlarge the view. Look to see what courses you are taking have collaborative LEAD learning centers (bottom half of schedule) and/or Individualized LEAD tutoring (top half of the schedule). For more information, contact the LEAD office at 341-7276 or email lead@mst.edu.

The Burns & McDonnell Student Success Center

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the B&MSSC at 198 Toomey Hall; 573-341-7596; success@mst.edu; facebook: www.facebook.com/SandTssc; web: <http://studentsuccess.mst.edu/>

Fall Semester 2018
Numerical Methods for Computer Science

TextBook

Numerical Methods for Engineers, 7th Edition,
Steven C Chapra and Raymond P Canale,
Current edition is ISBN: 978 0073397924
McGraw-Hill Publishers, 2015.

Prerequisites: Calc II, and Programming Competency

COMP SCI 3200 Introduction To Numerical Methods (LEC 3.0)

Finite difference interpolation, numerical differentiation and integration, linear systems of equations, solution of nonlinear equations, numerical solution of ordinary differential equations, computational techniques and the programming of a large number of problems on digital computers. Prerequisites: Programming competency and a "C" or better grade in either Math 1215 or Math 1221

Topics and Chapters in the book

Math Modeling: Error Consideration, Taylor Series, Polynomials

Methods for finding roots of equations: Bisection, False-Position, Fixed-Point, Newton, Secant

Matrix applications to Linear systems: Systems of linear Equations, Gaussian Elimination, Pivoting, LU-Decomposition, Cholesky, Jacobi and Gauss-Seidel

Interpolation techniques: Interpolation Techniques: Least Squares Regression (Linear & Multiple), Logistic Regression, Interpolating Polynomials, Newton, Lagrange, and Splines

Integration Techniques: Trapezoid, Simpson, Richardson, Romberg

Differentiation, Differential Equations, Euler's, Huen's, Runge-Kutta, Multi-Step

Course Objective and Outline

Learning computational efficiency techniques

Math Modeling Parachutist example 1.1
Matlab 2.5, matlab GUI,
Error Consideration
Taylor Series, Polynomials, and truncation

Methods for finding roots of equations

Bisection & False-Position
Fixed-Point iteration, Newton's Method,
Secant Method, Modified Secant, Dynamic Modified Secant.

Matrix applications to Linear systems

Gaussian Elimination w/ Pivoting Techniques
LUP-Decomposition
Gauss-Seidel and Jacobi Iteration

Interpolation Techniques

Least Squares Regression (Linear & Multiple)
Interpolating Polynomials: Newton, Lagrange
Interpolating Polynomials: Splines

Numerical Integration,

Numerical Integration Techniques: Trapezoid, Simpson(1/3,3/8),
Richardson, Romberg Techniques

Numerical Differentiation,

Numerical Differentiation, FDF,BDF,CDF methods for first and second order derivatives

Numerical Solution of Differential equations.

Methods for Solving Differential Equations
Taylor's, Euler's, Huen's -Modified Euler, Midpoint, Modified MidPoint, , Runge-Kutta RK3, RK4
Multi-Step Methods to Solve D.E.'s

Stability of Numerical solutions

MATH 1215 Calculus For Engineers II (LAB 1.0 and LEC 3.0)

Continuation of Math 1214. Transcendental functions, techniques of integration, sequences, series including power series, polar coordinates, polar and parametric equations. Applications in physical science and engineering. Credit will be given for only one of Math 1215 or Math 1221. Prerequisites: Math 1160 and either Math 1208 or Math 1214 both with a grade of "C" or better; or by placement exam.

MATH 1221 Calculus With Analytic Geometry II (LEC 5.0)

A continuation of Math 8; differentiation and integration of elementary transcendental functions, integration techniques, improper integrals, conic sections, polar coordinates, introduction to sequences and series. Credit will only be given for one of Math 1221 or Math 1215. Prerequisites: Math 1160 and either Math 1208 or Math 1214 both with a grade of "C" or better; or by placement exam.