**1. Course number and title:**

CTSE 5040/6040, Technology and Applications in Secondary Mathematics Education (4 credit hours)  
Fall 2024

**2. Class Meetings:**

Monday/Wednesday, 8:00 a.m.-9:50 a.m., Friday, 8:00 a.m.-8:50 a.m.,

Haley Center 2456

**3. Instructor:**

| **Mrs. Lizzy Harkey**  ekb0054@auburn.edu  662.802.4023  Office hours: MW 10:00-11:30, LRC  Or [by appointment](https://meeting.boomerangapp.com/ekb0054.auburn.edu/meeting2) |  |
| --- | --- |

**4. Texts or Major Resources:**

Alabama Department of Education. (2019). *Alabama college and career ready standards for mathematics*. [https://www.alabamaachieves.org/wp-content/uploads/2021/03/2019-Alabama- Mathematics-COS-Rev.-6-2021.pdf](https://www.alabamaachieves.org/wp-content/uploads/2021/03/2019-Alabama-Mathematics-COS-Rev.-6-2021.pdf)

Dick, T., & Hollebrands, K. F. (Eds.) (2011). *Focus in high school mathematics: Technology to support reasoning and sense making*. National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*.

Other course readings as assigned.

**5. Course Description:** Use of technological tools to enhance mathematics teaching and learning.

**6. Course Objectives.** By the end of this course,

**Standard 1: Knowing and Understanding Mathematics.** Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications within and among mathematical domains.

**Standard 2: Knowing and Using Mathematical Processes.** Candidates demonstrate, within or across mathematical domains, their knowledge of and ability to apply the mathematical processes of problem solving; reason and communicate mathematically; and engage in mathematical modeling. Candidates apply technology appropriately within these mathematical processes.

**Standard 3: Knowing Students and Planning for Mathematical Learning.** Candidates use knowledge of students and mathematics to plan rigorous and engaging mathematics instruction supporting students’ access and learning. The mathematics instruction developed provides equitable, culturally responsive opportunities for all students to learn and apply mathematics concepts, skills, and practices.

**Standard 4: Teaching Meaningful Mathematics.** Candidates implement effective and equitable teaching practices to support rigorous mathematical learning for a full range of students. Candidates establish rigorous mathematics learning goals, engage students in high cognitive demand learning, use mathematics specific tools and representations, elicit and use student responses, develop conceptual understanding and procedural fluency, and pose purposeful questions to facilitate student discourse.

**Standard 6: Social and Professional Context of Mathematics Teaching and Learning.** Candidates are reflective mathematics educators who collaborate with colleagues and other stakeholders to grow professionally, to support student learning, and to create more equitable mathematics learning environments.

*See Appendix A for a detailed list of objectives aligned to the NCTM 2020 Standards for the Preparation of Secondary Mathematics Teachers.*

**7. Course Content and Schedule:**

| WEEK OF | MAJOR TOPIC | MAJOR ASSIGNMENTS |
| --- | --- | --- |
| 19-Aug | Introduction/ Dynamic Geometry |  |
| 26-Aug | Dynamic Geometry |  |
| 2-Sep | Dynamic Geometry |  |
| 4-Sep | (Labor Day) Dynamic Geometry |  |
| 9-Sep | Dynamic Geometry |  |
| 16-Sep | Spreadsheets | Exam 1 |
| 23-Sep | Spreadsheets | Project 1 |
| 30-Sep | Spreadsheets |  |
| 7-Oct | Spreadsheets |  |
| 14-Oct | Graphing Applications | Exam 2 |
| 21-Oct | Graphing Applications | Project 2 |
| 28-Oct | Graphing Applications |  |
| 4-Nov | Data Analysis |  |
| 11-Nov | Data Analysis | Exam 3 |
| 18-Nov | Data Analysis | Lab Experience Reflections Completed |
| 25-Nov | Thanksgiving |  |
| 2-Dec | Synthesis | Project 3 |
| 9-Dec | Monday, Dec. 9, 8:00-10:00 | Final Exam |

*NOTE: This calendar is presented for illustrative purposes only and is subject to change.*

**8. Course Requirements/Evaluation:** In achieving the goals of this course, students will:

1. **Reflections.**
   * Complete readings and assignments and participate in class and on-line forums.
   * Maintain a personal blog developed for the course, including regular reflections on assigned prompts.
   * Evaluation: (five; 15% of the total grade) -- Quality of reflections and blog
2. **Projects.**
   * Prepare detailed lesson plans on selected mathematics problems or topics that incorporate proficient use of technological tools, including detailed possible solutions from a student’s point of view.
   * Evaluation: (three; 30% of the total grade) -- A format and rubric will be given for each project
3. **Field Experiences.**
   * Participate in scheduled field experience placement (6 three-hour blocks), including the following activities:
     + Conduct a review of your teacher’s use of both conveyance and mathematical action technologies in instruction, in maintaining contact with parents and students, and in continued professional growth. Include a review of the school’s learning management system and technical architecture to support the instructional program.
     + Develop and present or co-present a lesson or activity to a secondary mathematics classroom using technology. A lesson plan should be prepared according to the [format required by the Secondary Mathematics Education Program](https://docs.google.com/document/d/1bFVew0xlLUYHE20A2WoftobjXA-WmyENhO6X_qyDn8Y/edit?usp=sharing), approved at least two days in advance.
   * Evaluation: (20% of grade)
     + Detailed journal of activities, including reflection on what you have learned.
     + Lesson plan taught, along with reflection on what happened and what you learned from the experience.
4. **In-class Assessments.** Take written assessments to show progress of knowledge (3 exams and a final; 35% of the total grade)

**NOTE:** All posted reflections should follow legal and ethical guidelines, including proper citation of sources using APA style.

**Grading.** All assignments will be graded on a 5-point scale (5=A; 4=B; 3=C; 2=D; 1=F; 0=not turned in) and weighted averages will be computed following the percentages given in the previous sections. Final grades will be assigned by rounding to the nearest whole number; i.e., 4.5 and up is an A, 3.5 and up is a B, and so forth. As percents: 90%=A; 70%=B; 50%=C; 30%=D; below 30%=F.

**9. Class Policy Statements.**

* **Attendance.** Students are granted excused absences from class for the following reasons: Illness of the student or serious illness of a member of the student’s immediate family, death of a member of the student’s immediate family, trips for student organizations sponsored by an academic unit, trips for University classes, trips for participation in intercollegiate athletic events, subpoena for a court appearance and religious holidays.

Students who wish to have an excused absence from this class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of the request and render a decision. When feasible, the student must notify the instructor prior to the occurrence of any excused absences, but in no case shall such notification occur more than one week after the absence. **Appropriate documentation for all excused absences is required.**

The second non-approved absence from class and each succeeding unapproved absence from class will result in a lowering of the student's final grade by one letter grade.

Students are also expected to attend all scheduled field experiences. An unexcused absence may also lead to action as a violation of the Standards of Professional Conduct, as outlined below, with resulting actions impacting their continuation in the program.

* **Late Assignments.** Any assignment that is submitted after the announced due date will have one letter grade deducted from it per day late. Students should reach out to their instructor immediately to discuss any concerns. It is the student’s responsibility to contact the instructor if assignment deadlines are not met. Students are responsible for initiating arrangements for missed work.
* **Make-up Policy.** Except in unusual circumstances, such as continued absence of the student or the advent of University holidays, a make-up exam will take place within two weeks from the time the student initiates arrangements for it. Except in extraordinary circumstances, no make-up exams will be arranged during the last three days before the final exam period begins.

The format, questions and difficulty-level of make-up exams are not guaranteed to be the same as the normal exam, which are at the discretion of the instructors. Students are not allowed to choose the make-up dates or formats on their own.

* **Unannounced Quizzes.** The instructor may give unannounced quizzes as deemed necessary, to be included as a part of the exam score.
* **Faculty Communication and Feedback.** Any communications should be directed to the instructor’s Auburn email address. Responses will be provided within 24 hours whenever possible. If students have concerns about communication or feedback, they should always contact their instructor first. Students should explain their concerns as clearly as possible without judgment or emotion. Effective communication is an important skill, and every interaction in their program is an opportunity to develop this skill.

***Your Auburn University email address is the university-approved form of communication between instructors and students.*** Please ensure that your notifications are set correctly to ensure timely delivery. Additionally, it is your responsibility to read course announcements sent by your instructor. These are posted in Canvas, and you can configure your notification preferences to receive an email each time a new announcement is posted.

* **Emergency Contingency Statement.** If normal class and/or lab activities are disrupted due to illness, emergency, or crisis situation, the syllabus and other course plans and assignments may be modified to allow completion of the course. If this occurs, an addendum to your syllabus and/or course assignments will replace the original materials.

* **Accommodations.** Students who need accommodations should submit their approved accommodations through the AIM Student Portal on AU Access and follow-up with the instructor about an appointment. It is important for the student to complete these steps as soon as possible; accommodations are not retroactive. Students who have not established accommodations through the Office of Accessibility, but need accommodations, should contact the Office of Accessibility at: ACCESSIBILITY@auburn.edu or (334) 844-2096 (V/TT). The Office of Accessibility is located in Haley Center 1228.
* **Academic Integrity.** All portions of the Auburn University Student Academic Honesty code (Title XII) found in the [Student Policy eHandbook](https://auburnpub.cfmnetwork.com/B.aspx?BookId=12839) will apply to this class. All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.
* **AI Policy.**  In this course, it is expected that all submitted work is produced by the students themselves, whether individually or collaboratively. Students must not seek the assistance of Generative AI Tools like ChatGPT or Copilot for graded assignments. Use of a Generative AI Tool to complete an assignment constitutes academic dishonesty. Students may use Generative AI tools as a study tool or resource, but be forewarned that AI tools are not trustworthy.
* **Standards of Professional Conduct.**As faculty, staff, and students interact in professional settings, they are expected to demonstrate professional behaviors as defined in the College’s conceptual framework. These professional commitments or dispositions are listed below:
  + Engage in responsible and ethical professional practices
  + Contribute to collaborative learning communities
  + Demonstrate a commitment to diversity
  + Model and nurture intellectual vitality

Students will be asked to sign a contract affirming Standards of Professional Conduct for the secondary mathematics program. Failure to comply with those standards may lead to actions including dismissal from the lab experience, the course, and/or the Secondary Mathematics Education Program.

* **Mental Health.**
* If you are experiencing stress that feels unmanageable (personal or academic) during the semester, Auburn University’s Student Counseling & Psychological Services (SCPS) offers a variety of services to support you. The mission of SCPS is to provide comprehensive preventive and clinical mental health services to enhance the psychological well-being of individual students, as well as the broader campus culture.
* As an instructor, I am available to speak with you regarding stresses related to your work in this course, and I can assist in connecting you with the SCPS network of care. You can schedule an appointment yourself with the SCPS by calling (334)844-5123 or by stopping by their offices on the bottom floor of Haley Center or the second floor of the [Auburn University Medical Clinic.](https://nam11.safelinks.protection.outlook.com/?url=http%3A%2F%2Fauburn.edu%2Fmap%2F%3Fid%3D150&data=05%7C01%7Cmartiwg%40auburn.edu%7Cc323d2deb53a444b59c208da7d629e3b%7Cccb6deedbd294b388979d72780f62d3b%7C1%7C0%7C637960159754549133%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=VaXNIG1Gje4%2BfsY2lA9%2F7gwwekkCIdtJ6q4hAkNC%2Ffo%3D&reserved=0)
* If you or someone you know needs to speak with a professional counselor immediately, the SCPS offers counseling during both summer term as well as the traditional academic year. Students may come directly to the SCPS and be seen by the counselor on call, or you may call 334.844.5123 to speak with someone. Additional information can be found at [http://wp.auburn.edu/scs](https://nam11.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwp.auburn.edu%2Fscs%2F&data=05%7C01%7Cmartiwg%40auburn.edu%7Cc323d2deb53a444b59c208da7d629e3b%7Cccb6deedbd294b388979d72780f62d3b%7C1%7C0%7C637960159754549133%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=t47toSYPS4graM6GEM1%2FHZvMCJB0D%2FNsSIxvxx2tBho%3D&reserved=0) **.**
* **AU Evaluate.** Students are encouraged to provide feedback on their experiences in the course using AU eValuate. The link is provided on Canvas.

**Appendix A. Detailed Course Objectives**

| **Objectives** | **Indicators** |
| --- | --- |
| 1: Knowing and Understanding Mathematics. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications within and among mathematical domains. | 1a) Essential Concepts in Number. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of number including flexibly applying procedures, using real and rational numbers in contexts, developing solution strategies, and evaluating the correctness of conclusions. |
| 1b) Essential Concepts in Algebra and Functions. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of algebra and functions including how mathematics can be used systematically to represent patterns and relationships including proportional reasoning, to analyze change, and to model everyday events and problems of life and society. |
| 1c) Essential Concepts in Calculus. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of calculus including the mathematical study of the calculation of instantaneous rates of change and the summation of infinitely many small factors to determine some whole. |
| 1d) Essential Concepts in Statistics and Probability. Candidates demonstrate and apply understandings of statistical thinking and the major concepts, procedures, knowledge, and applications of statistics and probability, including how statistical problem solving and decision making depend on understanding, explaining, and quantifying the variability in a set of data to make decisions. They understand the role of randomization and chance in determining the probability of events. |
| 1e) Essential Concepts in Geometry, Trigonometry, and Measurement. Candidates demonstrate and apply understandings of major mathematics concepts, procedures, knowledge, and applications of geometry including using visual representations for numerical functions and relations, data and statistics, and networks, to provide a lens for solving problems in the physical world. |
| 2: Knowing and Using Mathematical Processes. Candidates demonstrate, within or across mathematical domains, their knowledge of and ability to apply the mathematical processes of problem solving; reason and communicate mathematically; and engage in mathematical modeling. Candidates apply technology appropriately within these mathematical processes. | 2a) Problem Solving. Candidates demonstrate a range of mathematical problem-solving strategies to make sense of and solve nonroutine problems (both contextual and noncontextual) across mathematical domains. |
| 2b) Reasoning and Communicating. Candidates organize their mathematical reasoning and use the language of mathematics to express their mathematical reasoning precisely, both orally and in writing to multiple audiences. |
| 2c) Mathematical Modeling and Use of Mathematical Models.Candidates understand the difference between the mathematical modeling process and models in mathematics. Candidates engage in the mathematical modeling process and demonstrate their ability to model mathematics. |
| 3: Knowing Students and Planning for Mathematical Learning. Candidates use knowledge of students and mathematics to plan rigorous and engaging mathematics instruction supporting students’ access and learning. The mathematics instruction developed provides equitable, culturally responsive opportunities for all students to learn and apply mathematics concepts, skills, and practices. | 3a) Student Diversity. Candidates identify and use students’ individual and group differences to plan rigorous and engaging mathematics instruction that supports students’ meaningful participation and learning. |
| 3b) Students Mathematical Strengths. Candidates identify and use students' mathematical strengths to plan rigorous and engaging mathematics instruction that supports students' meaningful participation and learning. |
| 3c) Positive Mathematical Identities. Candidates understand that teachers’ interactions impact individual students by influencing and reinforcing students’ mathematical identities, positive or negative, and plan experiences and instruction to develop and foster positive mathematical identities. |
| 4: Teaching Meaningful Mathematics. Candidates implement effective and equitable teaching practices to support rigorous mathematical learning for a full range of students. Candidates establish rigorous mathematics learning goals, engage students in high cognitive demand learning, use mathematics specific tools and representations, elicit and use student responses, develop conceptual understanding and procedural fluency, and pose purposeful questions to facilitate student discourse. | 4a) Establish Rigorous Mathematics Learning Goals. Candidates establish rigorous mathematics learning goals for students based on mathematics standards and practices. |
| 4b) Engage Students in High Cognitive Demand Learning. Candidates select or develop and implement high cognitive demand tasks to engage students in mathematical learning experiences that promote reasoning and sense making. |
| 4c) Incorporate Mathematics-Specific Tools. Candidates select mathematics-specific tools, including technology, to support students’ learning, understanding, and application of mathematics and to integrate tools into instruction. |
| 4d) Use Mathematical Representations. Candidates select and use mathematical representations to engage students in examining understandings of mathematics concepts and the connections to other representations. |
| 4e) Elicit and Use Student Responses. Candidates use multiple student responses, potential challenges, and misconceptions, and they highlight students’ thinking as a central aspect of mathematics teaching and learning. |
| 4f) Develop Conceptual Understanding and Procedural Fluency. Candidates use conceptual understanding to build procedural fluency for students through instruction that includes explicit connections between concepts and procedures. |
| 4g) Facilitate Discourse. Candidates pose purposeful questions to facilitate discourse among students that ensures that each student learns rigorous mathematics and builds a shared understanding of mathematical ideas. |
| 6: Social and Professional Context of Mathematics Teaching and Learning. Candidates are reflective mathematics educators who collaborate with colleagues and other stakeholders to grow professionally, to support student learning, and to create more equitable mathematics learning environments. | 6a) Promote Equitable Learning Environments. Candidates seek to create more equitable learning environments by identifying beliefs about teaching and learning mathematics, and associated classroom practices that produce equitable or inequitable mathematical learning for students. |
| 6b) Promote Mathematical Identities. Candidates reflect on their impact on students’ mathematical identities and develop professional learning goals that promote students’ positive mathematical identities. |