

Mississippi Valley State University
Department of Mathematics/Computer and Informational Science
CS 455/MA 451 Senior Project, Fall 2022

Instructor	Class Meetings-Location/Time:	Office Location:
Dr. Xiaoqin Wu	MWF 2:00-2:50pm CRB 104	Science Side 148B
Office Phone:	E-mail Address:	Office Hours:
254 – 3402 254 – 3422 (main office)	xpwu@mvsu.edu	MWF 8:00 - 9:00, 10:00-12:00 TH 9:30 – 11:30 am

Course Textbook: None

Prerequisites: Senior Computer Science, Information Science, Mathematics or Mathematics Education major.

I. COURSE DESCRIPTION

This course is used to assess the student's or candidate's individual thinking skills and the ability to write and conduct an oral presentation of a formal mathematics project. The course currently carries 3 hour credit and usually offered during the fall semester only of the year.

II. PURPOSE

This course serves two purposes, one as a capstone for those students with a major in mathematics and one as preparation for post-graduate endeavors.

- To provide the necessary experience in the application of Mathematics, Computer Science, and a related knowledge of disciplines. More specifically this course aims to successfully wed intuition and rigor of some of the basic and advanced concepts introduced in the mathematics curriculum. Another aim is to help assess the mathematical sophistication of the student. Finally, this course aims to establish a true integration of mathematics with the ability to organize and write effectively. The student does an intensive study of a mathematics topic of his/her choice under a supervising professor. This study must involve a synthesis of available material on the topic to include (but not limited to): traditional books, journal articles, and web based materials. The student must write a research paper on the topic and present it to a faculty committee.
- The student will also produce an up-to-date resume and all accompanying materials for a job application of their choosing and for application to at least one graduate school.

III. Course Overview

The student does an intensive study of a mathematics topic of his/her choice under a supervising professor. This study must involve a synthesis of available material on the topic to include (but

not limited to): traditional books, journal articles, and web based materials. The student must write a research paper on the topic and present it to a faculty committee. The student will also produce an up-to-date resume and all accompanying materials for a job application of their choosing and for application to at least one graduate school.

IV. Course Rationale

This course will enable students to: a) obtain the necessary experience in the application of Mathematics, Computer Science, and a related knowledge of disciplines, b) to successfully wed intuition and rigor of some of the basic and advanced concepts introduced in the mathematics curriculum, c) assess mathematical sophistication, and d) establish a true integration of mathematics with the ability to organize and write effectively.

V. Course Outcomes and Learning Objectives

The objective of this course is to produce students who can bridge the gap between lower level mathematics and higher math. The students are then able to extend the concepts of elementary calculus to more advance topics in calculus; and are also able to understand the nature of logical proofs. Furthermore, the objectives are also reflective of those behaviors advocated by the National Council Teachers of Mathematics (NCTM), state and national standards we well as Praxis content teaching exam. Thus, class activities are centered around attainment of these goals by the course learning objectives listed below.

Students will meet these goals by achieving the following objectives:

- **Inquire:** frame questions that address issues and uncertainties across a range of disciplines. The student will
 - recognize precise and complete statements of problems.
 - recognize what information is necessary in order to solve given problems.
 - ask essential questions about given problems.
 - ask questions for further study regarding problems and reading assignments.
 - develop an interesting problem to investigate as a final project.
- **Explore:** investigate issues in depth and detail. The student will
 - think creatively about possible solutions to problems.
 - employ knowledge and techniques of Mathematical problem solving to explore problems.
 - comprehend given problems, reading assignments, and the arguments of others.
 - investigate a chosen final project independently.
- **Conclude:** develop informed responses to issues. The student will
 - marshal evidence in support of a solution to a problem or conclusion in an argument.
 - articulate an appropriate conclusion based on the evidence.
- **Persuade:** convince others of the validity and value of conclusions. The student will
 - produce precise and complete statements of solutions to problems.
 - construct effective written arguments based in evidence, reason and understanding.
 - deliver effective oral arguments based in evidence, reason and understanding.

- **Engage:** use knowledge and abilities for the good of self and society.
The student will
 - describe applications of problem solving techniques in other disciplines.
 - value achievements in Mathematics for their intrinsic worth.
 - work effectively with other members of a group to solve problems and present their solutions.

RELATIONSHIP WITH THE HOLISTIC TRANSFORMER MODEL (HTM)

Due to the nature of this and other computer technology courses, the student is forced to use the scholarly approach to critically reflect upon their thinking to solve problems. Technology is constantly changing and students of this course are made aware of this. To keep abreast of technological advances, learning has to take place continuously. Students are shown how computers and application software are used to facilitate learning. Finally, students of computer science and mathematics have to be scholars to combat the goals and objectives set forth for this and other courses in their curriculum.

VI. Outline of Course Content

Tentative Schedule:

Week	Dates	Topic	Assignment
1	Week 1	Introduction to Class Syllabus What is Senior Project? Orientation to Research <i>Senior Project Advisor Agreement Form</i>	(Find research advisor and topic)
2	Week 2	Ethical and Moral Issues in Research (IRB)	Bring in Senior Project Advisor Agreement Form
3	Week 3	(Work on completing project)	
4	Week 4	Literature Review 1 presentation POWERPOINT Required	Bring in 4 articles you plan to use in your literature review
5	Week 5	(Work on completing project)	
6	Week 6	Literature Review 2 presentation POWERPOINT Required	Bring in 4 more articles you plan to use in your literature review Turn in Journal #1
7	Week 7	(Work on completing project)	
8	Week 8	Senior Project Proposal POWERPOINT Required	Bring in Senior Project Proposal Form Present Senior Project Proposal
9	Week 9	(Work on completing project)	

10	Week 10	(Work on completing project)	
11	Week 11	Discussion on Presenting Research	Mathematics Journal submission info and Graduate School Application (Postal receipt needed or email verification) Turn in Journal #2
12	Week 12	(Work on completing project)	
13	Week 13	(Work on completing project)	
14	Week 14	Fall Break/Thanksgiving Holidays	No class
15	Week 15	Important DATE	Senior Project Final Presentation Form Weekly Log Report Turn in Journal #3 Final Paper & Oral Presentation
16	Week 16	FINAL EXAM WEEK	Final Written Research Report Due before 5:00pm 11/18/2021

All CS/Mathematics Senior Projects students **MUST** present by **November 18, 2022**

:No exceptions

VII. Learning Activities

General Requirements

The requirements for successful completion of CS 455/MA 451 include several sets of criteria. Your final grade will be based on each of these:

- (a) sufficient time in the library researching the primary literature about your topic
- (b) when applicable, sufficient time spent constructing proofs or models
- (c) completion of a journal containing weekly reports and meetings logs
- (d) a final report and oral assessment.

This is a 3 credit hour course. As such, students are expected to spend at approximately 6 hours a week working on their research projects. This is in addition to weekly faculty meetings. You will be required to track time actually spent working on your project. Your final grade may be lowered for failure to spend the required amount of time on your project. **Failing to attend scheduled meetings will result in an F in the course.**

Specific Requirements

Weekly Reports An important part of the class is weekly meetings with faculty mentors and other students. Students must come with documentation of their work since the last

meeting. This should be appended weekly and will be turned at the end of the semester and/or upon request by the faculty mentor.

Meeting Logs Maintaining a healthy dialogue throughout the semester is a vital component of the student-faculty mentorship. The weekly meetings are designed to promote such a relationship by sharing ideas, discussing problems, and focusing on the next steps. A log of the meetings should be kept by the student. **This log should be appended weekly and will be turned at the end of the semester**

Final Report The final report is the resulting document of the semester's efforts. It should be written in APA/IEEE format (to be agreed upon by the student and faculty). In order to achieve the necessary high quality, several drafts are usually required; these should be turned in well before the end of the semester. **Each draft should be submitted to the Writing Center located in the Industrial Technology Building Room 143(Tuesdays and Thursdays, 11am-12pm) before submission to instructor of record.**

*** *An English Instructor/Professor should sign each draft before submission to CS 455/MA 451 Senior Project instructor.****

Three (3) Journals You are expected to keep a reflective research journal over the course of this semester. This journal is intended to be a reflection of your experiences, perceptions, and feelings about the research experience. Reflection provides you with the opportunity to make sense of and learn from your research. You will need to consider:

What you know about the topic you want to pursue (personal experience, not from the literature)

The different perspectives of people within the research setting

Connections you identify to relevant theories and the literature

Personal emotional reactions to the experiences you are describing

What have you learned

Implications of your ideas with respect to the “big picture”

These suggestions are meant as a start point. Feel free to express other thoughts beyond those prompted.

VIII. Technology Infusion

The students use the graphing calculators, PowerPoint and Mathematica software to assist with many of the in-class and take home assignments. Additionally, demonstrations are often given in class with PowerPoint.

IX. Methods of Assessing Objectives/Grading

	<u>% of Grade</u>
Weekly Log Report	10%
Coursework (Forms/Assignments)	10%
Journals (3)	10%
Literature Review/Presentation	20%
Research Proposal/Presentation	20%

X. Grading Scale

Letter grade for the semester will be assigned as follows:

90 - 100	points A
80 - 89	points B
70 - 79	points C
60 - 69	points D
Below 60	points F

The paper and oral presentation will be scored using a rubric. We will ask at least three faculty members to sit in on the presentation and the grading. We will try to include faculty who will represent diversity in mathematics interest. Such as algebra, statistics, analysis etc.

XI. Plagiarism Policy

Academic Honesty: Students are expected to adhere to the highest standards of academic honesty as outlines in the MVSU Student Handbook. Any information that is copied from another source must be noted as such in student materials. Page number or Internet references must appear in the text and full bibliographic references must appear in the reference section of the paper/assignment. Sources must be in quotes and include author(s), year of publication or reference notes as required by the college department format (e.g., APA, Chicago). Other forms of academic dishonesty include, but are not limited to buying papers, copying paragraphs/pages of text/whole papers off the Internet, copying another student's answers, etc. Academic dishonesty will result in the grade of a "0" on the assignment and/or in the course and/or the student may be reported to the Chair of the Department for further action.

XII. Attendance Policy

It is necessary for students to attend every class meeting and lab sessions. Any student who misses more than the allowed number (**3**) of absences will be subject to a decrease in their final grade.

XIII. ADA/STUDENTS WITH SPECIAL NEEDS:

Mississippi Valley State University is committed to providing reasonable accommodations for students with a documented disability. If you feel you are eligible to receive accommodations for a covered disability (medical, physical, psychiatric, learning, vision, hearing, etc.) and would like to request it for this course, you must be registered with the Services for Students with Disabilities (SSD) program administered by University College. It is recommended that you visit the Disabilities Office located in the Social Science Building Office 105 to register for the program at the beginning of each semester. For more information or to schedule an appointment, please contact Mrs. Kathy Brownlow, via phone or email at 662-254-3443 or kbrownlow@mvsu.edu.

Further guidance regarding the major assignments (e.g., Literature Review, Research Proposal, and Final Presentation) will be provided in class.

All written assignments should follow APA guidelines (6th edition)

- Times New Roman (12pt font) or Arial (11pt font)
- 1” Margins
- Double Spaced Text (unless instructed otherwise)
- Submission in hard copy by the due date. Scores for assignments turned in after the specified time will be reduced three points for each day late (including weekends). If you are not going to be in class you are still responsible for submitting your assignment on time.

**Note: Research proposal may be turned in via email.*

Writing the Paper

1. The paper should include a title page and a bibliography in the standard scientific format/APA style (will be more specific after the 2nd week of class)
2. The body of the paper should be from ten to fifteen pages long.
3. The paper begins with an introduction that describes the material to be presented, the objective of the paper, and any special technique to be used. Following the introduction, the paper has an identifiable body that focuses on the main points with clear transitions between them.
4. Bibliographic and equation number references are cited as needed.
5. There should be a conclusion that, as appropriate, describes specific applications, related problems, or directions for future development.

***** Plagiarism will result in course failure *****

XIV. BIBLIOGRAPHY

Schick, W., (1995), Fortran 90 and Engineering Computation. New York, John Wiley & Sons, Inc.

Bunch, B.,(1982), Mathematical Fallacies and Paradoxes. Van Nostrand Reinhold.

“Writing a SENIOR PROJECT in MATHEMATICS”. (August 10, 2003). The Mathematics Program, Bard College. <http://math.bard.edu/bloch/seniorproj.pdf>

THE SENIOR PROJECT FOR MATHEMATICS/Computer Science

In order to do a senior project, you must first find a faculty member who will agree to supervise the project. Often, students ask a professor that they already know (a former instructor or advisor). As early as possible in the semester, you should meet with the professor to discuss possible topics for the project. A suitable topic can be just about anything, as long as it relates to mathematics in a reasonable way. It can be something that shows an application of mathematics to science, politics, sports, the arts, medicine, entertainment, etc. It can be an expository piece, which means that you learn about some mathematical concept and explain it in some appropriate way. It can be something about the history of mathematics, or about teaching mathematics, or about the role of mathematics in society, etc. The level of the material should be consistent with the usual level expected in 4xxx math/CS courses. Most senior projects result in a written paper, roughly 10-15 pages in length. This work includes background reading and other information gathering, meeting with the professor, and creating the actual product (written paper, computer program, etc.). Although the project should be completed during the fall semester, all projects **MUST** be presented on the Thursday of the week following Spring Break!

CS 455/MA 451– Senior Project Assignment

All degree-seeking students are required to complete a senior assignment that demonstrates academic breadth attained through general education courses and proficiency in their academic majors. In the Department of Mathematics, Computer and Information Science, this requirement is satisfied by successfully completing CS 455/MA 451 (Senior Project), which carries three credit hours and a grade of A-C (satisfactory) or D-F(unsatisfactory). The requirements of CS 455/MA 451 are:

1. An in-depth study of a topic in senior level mathematics, statistics, or operations research.
2. Documentation of that in-depth study.
3. An oral presentation of the in-depth study to members of the Department of Mathematics, Computer, and Information Sciences faculty.

To start on a senior project, the student will consult with a member of the Department of Mathematics, Computer, and Information Sciences faculty, referred to herein as instructor of record, to prepare a proposal for the senior project. The project will vary with the student's interest and declared options. In both the Mathematics and Mathematics Education Options, one possibility would be an expository paper on the history of a theorem or problem in mathematics or mathematics education, describing the various efforts to prove the theorem or resolve the problem along with a detailed presentation and analysis of the ultimately successful proof or resolution.

Procedure:

1. The student will seek a faculty member who will agree to supervise the project.
2. Once a faculty advisor agrees to supervise the project, then the student and advisor will sign an **Senior Project Advisor Agreement Form** and submit it to the Instructor of Record.
3. The student will complete and submit to the Department of Mathematics, Computer, and Information Sciences the departmental **Senior Project Proposal Form**, which requires a brief but clear description of the proposed project.
4. The proposal is considered APPROVED if it is approved by the instructor of record and by a majority of the members of the departmental Undergraduate Program Committee (UPC). Otherwise, the student will confer with the chair of the UPC and the CS 455/MA 451 Instructor for future action.
5. Upon completion of the project, the student will submit documentation of his/her study to the CS 455/MA 451 Instructor of Record the **Senior Project Final Presentation Form**, which will allow the student to present their final presentation to the faculty.
6. Upon approval of the documentation portion of the project, the CS 455/MA 451 Instructor will schedule and publish to the faculty a time and place for the presentation portion of the project. This presentation is open to all members of the Department.
7. Upon completion of the oral presentation, the members of the UPC will vote for approval or disapproval of the presentation. The oral presentation is considered APPROVED if it

has earned a satisfactory score. Otherwise, the student will confer with the UPC members for future action.

8. The student will be required to turn in a final copy of the written portion of the project after all requested revisions are made.
9. The student's Senior Project is considered complete and a satisfactory score is issued for CS 455/MA 451 when both the documentation and the oral presentation portions are approved.
10. Students who do not complete CS 455/MA 451 during the semester of registration will be given the grade of I for that course, provided that both the student and the instructor of record complete and turn in the "Agreement on Completion of "I" Grade" form before the end of final examination week.
11. Any appeals related to the above procedure or to any component of the senior assignment should be directed to the Policy Committee. Additional appeals, if necessary, should be directed to the Chair of the Department of Mathematics, Computer, and Information Sciences.