MATH 461   Senior Project I

1. <u>Catalog Description</u>

    MATH 461   Senior Project I   (2)

    Selection and development of a mathematics project under faculty supervision. Minimum 60 hours total time. Prerequisite: Senior Standing.

2. <u>Required Background or Experience</u>

    Senior standing in the university.

3. <u>Learning Objectives</u>

    The student should:

    a. Reduce a general problem to specific points of analysis.
    b. Organize points of analysis into a logical sequence.
    c. Apply competencies acquired in other courses to the successful completion of a specific project.
    d. Obtain information necessary to the solution of a problem by library study, experimentation, and/or correspondence and personal contact with individuals who have had experience in the field.
    e. Follow a work proposal without overlooking any major points or significant details.
    f. Organize, illustrate, and write a clear, concise, and correct report of the investigation.
    g. Work for a supervisor who desires quality performance with a minimum of supervision.

4. <u>Text and References</u>

    Journals, books, and texts relevant to the topic.

5. <u>Minimum Student Materials</u>

    Varies with each project.

6. <u>Minimum University Facilities</u>

    Library and computer labs.

7. <u>Content and Method</u>

    a. The student must find a project advisor and work with the advisor to define a project. The final project should be of such scope as to require 120 hours to complete.

        A student may choose to work with an advisor outside of the Mathematics Department but must first obtain approval from the Math 461/462 course supervisor and department chair.

    b. Selection of a topic and a senior project advisor must be made before the last day to add courses for the quarter enrolled so that the student can enroll in section of Math 461 assigned to the project advisor.

    c. The student should meet regularly with his/her advisor.

d. By the end of the fifth week of Math 461, the student must turn in a Senior Project Completion Contract to the Senior Project Coordinator. The contract must be signed by the senior project faculty advisor and the student must include a project proposal (see Attachment), schedule, and plan for completion. The advisor will assign a grade in Math 461 based on the completion of a significant portion of the senior project, as determined by the advisor.

(Attachment)

PROJECT PROPOSAL

Math 461, 462

My proposed research project is in the area of differential geometry. In particular, I will focus on the Gauss and Codazzi-Mainardi equations, the Fundamental Theorem of Surfaces, and the theory of isometric immersions of low-dimensional manifolds. I will use the coordinate approach to differential geometry, allowing for a different perspective from Math 404. The project will culminate with the understanding of an older research paper and work towards a new proof on the classification of isometric immersions of the Euclidean plane into hyperbolic 3-space.

Winter Quarter:

Week 1: Logistics.

Week 2-6: Read past senior project on the coordinate approach to differential geometry, geodesics, and introduction to the Fundamental Theorem of Surfaces.

Week 7-10: Work to understand the Fundamental Theorem of Surfaces. Immerse the plane into $\mathbf{R}^3$ with restrictions from the Gauss' and Codazzi-Mainardi equations. Understand and present the Gauss-Bonnet Theorem for the differential geometry seminar. Begin reading the research paper by Volkov and Vladimirova.

Spring Quarter:

Week 1-3: Introduction to hyperbolic space and the geometry of horospheres.

Week 4-6: Read and understand the research paper by Volkov and Valdimirova.

Week 7-9: Work towards new proof of result using an alternate perspective.

Week 9-10: Finalize summary paper for the senior project.

Student

Senior Project Advisor

Date: _____

Mathematics Department Chair