FIRST YEAR SEMINAR COURSE PROPOSAL
UNIVERSITY OF MARY WASHINGTON

Use this form to submit **FSEM 100 topics** courses for review **or** any **other existing course** that you wish to have designated to meet the first year seminar requirement.

COURSE NUMBER:	**FSEM 100**			
COURSE TITLE:	**ESCHER MATH: THE MATHEMATICS OF ART AND DESIGN**			
SUBMITTED BY:	Debra Hydorn	**DATE:**	Sept 5, 2008	
This course proposal has the department's approval. (Put a check in the box to the right.)				**X**

NOTE: Click on the link for "first year seminar" at www.jtmorello.org/gened to see the criteria used to evaluate courses proposed to meet the first year seminar requirement. See the report entitled "General Education Curriculum as Approved by the Faculty Senate" for additional details.

COURSE DESCRIPTION. In the space below, provide a one to two sentence description of this class. The description will be entered in Banner, and will also be used in other publications about the first year seminar program (such as the "Eagle Essentials" booklet).

Through examining works of art by M.C. Escher and other artists, students will explore the mathematics of symmetry and tessellations, non-Euclidean geometry and perspective in art. Students will use the mathematics they have learned to analyze works of art as well as to produce their own mathematical artworks.

RATIONALE. Using only the space provided in the box below, **briefly** state why this course should be approved as a first year seminar course.

Through the use of guided discovery activities, students will learn about the mathematics of pattern and design. (Example activities are provided with the syllabus.) These activities provide students with the opportunity to develop their own understanding of the mathematics and how it is used in works of art. They will then apply what they have learned and share their discoveries with each other through papers and presentations about specific works of art. A portion of their grade for these assignments will be based on their written and oral presentations. For example, they might analyze one of Escher's tessellations and explain how the pattern was produced. Students will conduct research about artists and famous works of art and also about the mathematics involved. Some of this research will be conducted at the library or on line, but they will also be encouraged to explore their community for examples of math and art.

SYLLABUS. *Attach a course syllabus***.**

SUBMIT this form and attached syllabus electronically as one document to Warren Rochelle (wrochell@umw.edu) or Maya Mathur (mmathur@umw.edu). All submissions **must** be in electronic form.

FSEM 100 Escher Math: The Mathematics of Pattern and Design
Proposed Syllabus for Spring 2009

Instructor: Dr. Debra L. Hydorn

Office: 132 Trinkle Hall, 654-1330, dhydorn@umw.edu

Office hours: MTWRF 9 to 10 am and by appointment.

Readings: Class readings will come from books such as *M.C. Escher: Visions of Symmetry*, by Doris Schattschneider, The Magic of Escher by J.L. Locker, or Flatland: A Romance of Many Dimensions, by Edwin A. Abbot, or from web pages such as the Escher Wiki http://math.slu.edu/escher/index.php/Main_Page

Grading:

Weekly Explorations	20%
Tesselation Project	15%
Exams	30%
Final Project	25%
Participation	10%

Weekly Explorations – After each in-class group exploration students will summarize what they learned and apply their new skills individually. These explorations will consist of similar activities to those done as a group and will give students the opportunity to solidify their understanding of the mathematics involved. Most likely these explorations will occur on a weekly basis.

Tesselation Project – This project is the culmination of the first part of the course, allowing students to apply the mathematics of pattern and design to create their own Eshcer-like tessellation. In addition to the work of art students will present their tessellation to the class and write a paper describing how it was created.

Exams – There will be three in-class exams for which students will demonstrate their understanding of the mathematics they have learned.

Final Project – This will be a "student's choice." Possibilities include creating a work of art using fractals or non-Euclidean geometry, exploring other types of math used to create works of art (e.g., knot theory, optical illusions), or researching the works of an artist and how that artist employs perspective. Students can also suggest some other math and art project that brings together different elements of the course.

Participation – Students will be expected to participate in the group explorations in class, to share and learn from each other. Each student will note on their weekly explorations who they worked with. Students who miss the group explorations can complete the weekly explorations on their own but will not get credit for the group work.

Tentative Syllabus:

Week	Topics
1	Euclidean Geometry
2	Symmetry of Rosettes (Point Groups)
3	Border Patterns (Line Groups)
4	Wallpaper (Plane) Groups
5	Algebra of Symmetry Groups – Exam I
6	Basic Tesselations
7	More Tesselations
8	Escher's Tesselations
9	Tesselation Art Project
10	Non-Euclidean Geometry – Exam II
11	Spherical Geometry
12	Hyperbolic Geometry
13	Similarity and Fractals
14	Depth and Perspective
15	Summaries and Conclusions