



Mathematics in Art

FA 1020 / MATH 1020

3 credit hours

Summer Session 2015

6:00 – 8:30 PM, Tuesdays and Thursdays, Art Lab 136

Instructors:

Jaya Beange (Art Component) beangejc@cc.umanitoba.ca

Darja Kalajdziewska (Math Component) kalajdzi@cc.umanitoba.ca

Please email instructors to arrange office hours.

Course Description:

This course examines specific theory, structuring systems, mathematical methods and mathematical principles evident in works of art from various historical periods and contexts. The course explores these concepts in relation to Euclidean and non-Euclidean geometries. Topics include Euclidean constructions, golden ratio, Fibonacci sequences, symmetries and other organizing principles, fractals, tilings and tessellations, string art and conics, perspective drawing, hyperbolic art, Platonic solids and topology. The purpose of this course is to enable students to observe the ways in which mathematics helps to interpret the visual order which surrounds us, to explore the ways in which this natural aesthetic can be faithfully reproduced as art using mathematics as a guide, to examine the ways in which “beauty” might be quantified or generated, and to demonstrate the visual beauty of mathematics and the mathematical undercurrents in visual arts.

Course Objectives/Outcomes:

At the conclusion of this course, it is hoped that students will have learned how to reproduce basic mathematical constructions used in visual arts, will have gained a deeper appreciation of the way in which mathematics shapes our aesthetic environment.

Instructional Methods:

The instructors will communicate the course content through lectures and demonstrations complemented with selected images and videos, workshops and analysis of artworks and texts.

Required Readings:

Math and Art: An Introduction to Visual Mathematics by Sasho Kalajdzievski and P. Padmanabhan.

Note: the royalties for the books sold in the U of M bookstore return to students through scholarship funds.

Materials List:

All students will need:

- a compass that will hold a pencil or pen securely
- a supply of 8.5 x 11” unlined paper
- a metal ruler
- other art materials as required (please see attached list from U of M bookstore)

Grading/Evaluation Criteria used for Course Credit (Total 100%):

Quizlets on JUNE 30, JULY 9, 16, 23, AUGUST 4: Best 4/5 Quizlets x 2.5% = **10%** (set by Jaya Beange)

Midterm Exam (one hour) JULY 14: **25%** (set by Darja Kalajdziewska)

Art Assignment 1 Logo Design due JULY 16: **10%** (set by Jaya Beange)

Art Assignment 2 Perspective Analysis due JULY 23: **10%** (set by Jaya Beange)

In-Class Scavenger Hunt AUGUST 4: **10%** (set by Jaya Beange)

Final Exam (two hours) AUGUST 8: **35%** (set by Darja Kalajdziewska)

Return of Student Work:

All work will be returned to students during class time. Any work that is not retrieved will be disposed of if no alternate arrangements are made.

Statement on Student Participation in the Presentation or Discussion of Art

At the School of Art, numerous required and elective courses contain content that includes working from the nude model and some language, imagery, or dialogue that may offend students. In particular, the School of Art provides comprehensive art training that requires use of the nude model in some courses. In viewing and discussing works of art, the School of Art encourages the broadest possible tolerance consistent with Canadian law.

Class Attendance Policy

The School of Art supports and follows the University of Manitoba policies on attendance and withdrawal found in Section 7.1 of the General Calendar (General Academic Regulations) which states that regular attendance is expected of all students in all courses. Grade reductions could occur if a particular course has an attendance or participation percentage as specified on the course outline given to students at the beginning of each course. If students miss a class, they are responsible for getting notes from another student to catch up on the material they missed while away. Students who have unexcused absences for more than three classes will receive a reminder letter from the instructor about attendance. Students who fail to attend a class but do not withdraw by each term's stated VW deadline will receive a grade of F.

Plagiarism and Cheating Policy

To plagiarize is to take ideas or words of another person and pass them off as one's own. In short, it is stealing something intangible rather than an object. Obviously, it is not necessary to state the source of well-known or easily verifiable facts, but students are expected to acknowledge the sources of ideas and expressions they use in their written work, whether quoted directly or paraphrased. This applies to diagrams, statistical tables and the like, as well as to written material, and materials or information from Internet sources. To provide adequate and correct documentation is not only an indication of academic honesty but is also a courtesy which enables the reader to consult these sources with ease. Failure to do so constitutes plagiarism. It will also be considered plagiarism and/or cheating if a student submits a term paper written in whole or in part by someone other than him/herself, or copies the answer or answers of another student in any test, examination, or take-home assignment. Plagiarism or any other form of cheating in examinations or term tests (e.g., crib notes) is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

Similarly, to copy parts or to reproduce everything from an artist's individual artwork and pass it off as one's own is considered a form of plagiarism. When completing assignments or presenting work done in self-directed studio art projects, students should be avoiding this practice, since what is expected is that they will originate the 'look or 'style' of the work from their own responses to the subject or ideas in question. To do otherwise, through the knowing use of printed or internet reproductions of published artists work, would be academically dishonest, except in cases where to make a direct copy is a requirements of the assignment by an instructor or your idea requires such a response. In such cases the intent to copy must be clear.

Letter Grade System

The grade of 'D' is regarded as marginal in most courses by all faculties and schools. It contributes to decreasing a sessional or cumulative Grade Point Average to less than 2.0. The course in which 'D' standing is obtained need not be repeated except by probationary students in certain faculties or where a grade of 'C' or better is required in a prerequisite subject. It may be repeated for the purpose of improving a grade point average. Students in doubt as to the status of their record should consult an advisor in their faculty or school.

Letter Grade	Grade Point Value	
A+	4.5	Exceptional
A	4.0	Excellent
B+	3.5	Very Good
B	3.0	Good
C+	2.5	Satisfactory
C	2.0	Adequate
D	1.0	Marginal
F	0	Failure
P		Pass
S		Standing

**Final grades will be awarded on a curve, after the final exam.*

Schedule of Art Content:

**Subject to modifications with prior notice.*

Art Lecture 1 (Tuesday, June 30):

Guest Speaker: Steven Leyden Cochrane, Intro to Art Theory

Quizlet: Initial Course Content

Lecture: Ratio, Proportion and Aesthetics

Art Lecture 2 (Thursday, July 9):

Lecture: Symmetry and Fractals

Quizlet: Ratio, Proportion and Aesthetics

Workshop: Tour of the Faculty of Architecture Fab Lab with Jason Hare

Art Lecture 3 (Thursday, July 16)

** Due: Assignment 1*

Lecture: Linear Perspective

Quizlet: Symmetry and Fractals

Film: *The Day The Universe Changed, Point of View: Scientific Imagination in the Renaissance (52 min)*

Art Lecture 4 (Thursday, July 24)

** Due: Assignment 2*

** Scavenger Hunt logistics distributed*

Lecture: Maurits Cornelis Escher: symmetry, tilings, hyperbolic geometry and topology

Quizlet: Linear Perspective

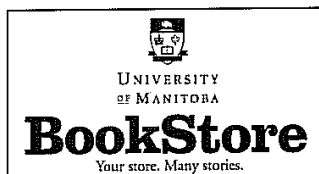
Film: *The Fantastic World of M.C. Escher (50 min)*

Art Lecture 5 (Tuesday, August 5)

** In-class Scavenger Hunt Downtown*

Quizlet: Maurits Cornelis Escher

Field Trip/Scavenger Hunt: Finding examples of Math in Art in the real world



University of Manitoba Bookstore
 140 University Centre, Fort Garry Campus
 Phone (204) 474-8321
 Fax (204) 474-7555

Date Req'd:	June 20 – August 10, 2015	To receive 20% OFF Reg. Priced ART SUPPLIES this list must be authorized by the professor and by the BookStore PRIOR to distribution.
Professor:	Jaya Beange	
Dept:	School of Art	
Course:	Math in Art	
BookStore:	Authorized by Linda Rock - U of M BookStore <i>[Signature]</i>	
No. of Students	70	

CASHIERS USE DISCOUNT PLAN 2

Sketch Book Bienfang "Take me Along" or other			8.5x11
Watercolour Paper, sold in pads of 9x12 sheets			8.5x11
Fabiano Paper, sheets are 19x25			8.5x11
Transparency Sheets			8.5x11
Construction Paper of Assorted Colours, sold in packages of 9x12			8.5x11
Markers Artist Quality (Staedtler etc.)			
Pencils Artist quality (Staedtler, Derwent, Lyra etc.)			
Staedtler Pigment Liners			
Coloured Pencils			
Acrylic Paint			
Watercolour Paint			
Oil Pastels			
Conte, Charcoal			
Watercolour Pencils			
Paintbrushes			
Staedtler white vinyl eraser			
Kneadable Eraser			
Eraser Shield			
Rotary Cutter or Compass Knife			
X-Acto Knife and Replacement Blades			
Compass, Rulers, Stencils, Lettering Guide			
Matte Spray Finish			
White Glue			

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Art Assignment 1: Logo Design

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Due Date: Thursday, July 16

**No exceptions can be made for late work without appropriate documentation, so please plan ahead.*

Objective:

- Use Euclidean constructions and knowledge of symmetry to create a design that depicts a theme of your own interest.
- Your final design could be a logo, an ambigram or other symmetrical object of your choosing.

Format:

- 3 sheets of 8.5 x 11 (letter size) paper
- Name and student number in the top right hand corner of each sheet
- Must be original work
- You should use tools (ruler, compass, stencils, lettering guide) to be as precise as possible

Sheet 1:

- One paragraph explanation of your theme describing why it is important to you and how you attempt to communicate that theme in your design (why you chose certain shapes, colours, materials etc.)
- One paragraph with the mathematical description of the symmetry group or frieze group that you used

Sheet 2:

- Rough sketch of your design, clearly drawing and labelling any Euclidean construction marks, vectors of translation, lines of reflection or points of rotation

Sheet 3:

- Your final design

Advice:

- Be mindful of negative space. Logos often consist of bold and consistent areas of colour. Fill the page with your design, but leave space around the edges to maximize the impact.
- Choose your materials and surface carefully. Buy extra materials so you can experiment, and in case you make a mistake. Make sure you are satisfied with the final product! Consider using poster board, fabriano paper, fabric, markers, pigment liners, cutouts from magazines etc.

Meeting the Criteria:

10% of total mark for the course

Rough sketch: includes all Euclidean construction marks, vectors of translation, lines of reflection and points of rotation, clearly drawn and labelled

Written description: theme is unique and reasons for choosing it are thoughtful, includes discussion of design elements and materials chosen to communicate the theme visually, symmetries are correctly identified

Final design: symmetries are carefully and precisely reproduced, materials and design elements are appropriate to communicate the theme, final design is compelling and effective

Art Assignment 2: Analysis of 1 and 2 Point Perspective

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Due Date: Thursday, July 23, at the beginning of class

**No exceptions can be made for late work without appropriate documentation, so please plan ahead.*

Objective:

- Choose two artworks from art magazines with strong examples of linear perspective.
- Annotate them to demonstrate a clear and precise comprehension of 1 and 2 Point Perspective.

Format:

- 2 sheets of 8.5 x 11" (letter size) paper
- Name and student number in the top right hand corner of each sheet
- Sheet 1 includes an example of 1-point perspective
- Sheet 2 includes an example of 2-point perspective
- On each sheet, include the name of the artist, the title of the work and the year the work was created
- Each image can either be printed on or glued on the sheet of paper.
- Be as precise and accurate as possible (use rulers)!

Annotation:

Draw and label all: Converging lines, horizon lines and vanishing points using either Option 1 or Option 2:

Option 1: Analogue Notation

- Attach an 8.5x11" sheet of transparent (clear) paper to each sheet using a piece of tape to create a hinge at the top of the sheet.
- On the transparency, clearly and accurately (use a straight edge and ultra-fine tipped marker) annotate as described above.
- Use 3 different colours for the 3 types of labels.
- Be careful of smudging!

Option 2: Digital Notation

- If you are comfortable using Photoshop or other appropriate digital editing software, digitally annotate the image as described above.
- Use 3 different colours for the 3 types of labels.
- Print each image out on an 8.5x11" sheet of paper.

Advice:

- Look for unique images in art magazines such as Canadian Art, Border Crossings
- Choose artworks that show highly realistic perspective (avoid distorted images like fish-eye photos)

Criteria for evaluation:

10% of total mark for the course

Research: sufficient research conducted to find appropriate and unique images for the assignment

Annotation: all converging lines, horizon lines and vanishing points are correctly and carefully identified