

The Fusion of Math and Art

Professor: Dr. Joanna Bieri joanna_bieri@redlands.edu	Class: Fall 2021 Tuesday and Thursday 11:00am - 12:20pm	Office Hours: Email for an appointment or chat with me after class.
Contact Numbers: Dr. Joanna Bieri	847-404-4299	Cell Phone - Emergency Only

About This Course

This course is an introduction to mathematical ideas that can be experienced through art, architecture, and music. During the course, we will discuss how mathematical concepts can be used not only to create artistic form but also how we can see the development of these mathematical ideas in the history of artwork, architecture, and music. We will work to understand the mathematics behind basic perspective drawing and proportions in sketching. We will investigate the mathematics behind mirror projection drawings and attempt our own sketches. We will work to understand symmetry, ratios, platonic solids, and proportion in architecture. Finally we will investigate how mathematical concepts are part of basic music theory and how we might attempt to mathematically generate music.

Course Learning Objectives

By the end of the semester your contributions to discussion, teams posts, written, and artistic work must reflect your ability to:

1. Describe the mathematical concepts behind ratios, perspective, symmetry, geometric shapes and solids, tessellations, and rhythm.
2. Recognize the above mathematical concepts in art, architecture, and music.
3. Communicate your understanding of mathematical ideas in writing by developing your course portfolio.

4. Work on engaging your community and learning all you can about opportunities for students at the University of Redlands.

Required Texts

Please ensure that you have full-time access to all texts for the duration of the course. All of these books are available at doover.com as e-books..

- Frantz, Marc and Crannell, Annalisa. *Viewpoints: Mathematical Perspective and Fractal Geometry in Art*. Princeton Univ. Press (ISBN: 9780691125923) Hardcover Price \$32.64
- Seymore, Dale and Britton, Jill. *Introduction to Tessellations..* Dale Seymour Publications. (ISBN: 9780866514613) Price: \$29.99
- Sutton, Andrew. *Ruler and Compass: Practical Geometric Constructions (Wooden Books)* Walker Books. (ISBN: 9780802717764) Price: \$8.83
- Other texts and articles made available via our course website and Moodle.

Classwork

Consistent attendance and participation are crucial to your success in the class. Please read the following carefully:

- i. **Participation and Preparation:** It is imperative that students arrive to class on-time and every-day. Class participation for all courses at the university level is vital to learning and understanding. It is also helpful to our fellow students, with whom we will collaborate. Aim to bring a positive and excited attitude to class each day and be prepared to engage in the course material. Daily homework is intended to help you have more fun in class. It will primarily consists of practice with drawing and mathematical techniques. It is not handed in, but rather counts toward part of your participation grade. Your daily homework will be posted on our class Teams site and available for peer comments and interaction.
- ii. **Writing Assignments - Essay Projects:** We will complete three writing and portfolio design projects as part of the class. These will consist of highlights taken from your Teams posts. Students are expected to expand upon the writing and ideas from the Team's posts to create an essay project aimed at a more academic audience. Each student will create, and revise based on feedback, the following projects:

1. **Essay Project 1: Geometric Constructions and the Greeks + Life Weeks 1-4**
2. **Essay Project 2: Perspective Drawing and Fractals + Life Weeks 4-8**
3. **Essay Project 3: Tessellations and Tilings + Life Weeks 8-12**

iii. **Peer Feedback:** Each class member will comment on posts by their peers, read and comment on selected essay projects, and work to discuss how successfully the ideas from the class are being demonstrated and analyzed. You will be graded on the quality and promptness of your feedback.

iv. **Final Portfolio:** Instead of a final exam you will be submitting a final portfolio of your work. This will include your three revised essay projects and a reflective essay that provides a summary of your experience and growth in understanding of mathematics in art, architecture, and music. The final submitted portfolio will include:

1. The collection of your previously submitted essays, each of which has been updated and revised based on peer and instructor comments.
2. Your final reflective essay, summarizing your course experience.
3. Pictures you would like to share, or descriptions of events/exhibits that you attended, drawings you completed with explanations, and/or additional mathematical topics that you investigated.

Evaluation Procedures

There are six elements of the course which contribute to your overall grade, as follows:

Participation (10 points per day)	10%
Essay Project 1	15%
Essay Project 2	15%
Essay Project 3	15%

Feedback (10 points each)	10%
Revisions and Final Portfolio	35%

Grading Criteria

All work for the course will be graded according following criteria.

4.0 **Exceptional:** diligently completes assignments, and participates fully during lecture and discussion. The student explains ideas fully, connects a broad range of mathematics to experiences, expands ideas fully, and exhibits a commitment to improving understanding. The student offers valuable critical advice and support to his/her fellow classmates.

3.0 **Very Good:** completes work on time, and usually participates during lecture and discussion. The student presents an understanding of ideas (but it may be unfocused or unclear occasionally), is able to connect some mathematics to experiences, expands some ideas, and exhibits a want to improve understanding. The student offers critical, if occasionally unclear, advice to his/her fellow classmates.

2.0 **Acceptable:** completes work on time, and sometimes participates during lecture and discussion. The student presents unclear ideas or ideas taken directly from texts, connects a limited range of mathematics to experiences, rarely expands ideas, and exhibits an apathetic attitude to engaging in understanding concepts. The student offers inconsistent advice to his/her fellow classmates.

1.0 **Unacceptable:** does not complete work on time, and rarely participates during lecture and discussion. The student presents very few ideas, cannot connect the mathematics to experiences, does not expand ideas, and exhibits no improvement of understanding. The student offers no advice, or unhelpful advice.

Grading Scales:

4.0	95-100%
3.7	90-94%
3.3	87-89%
3.0	83-86%
2.7	80-82%
2.3	77-79%
2.0	73-76%
1.7	70-72%
1.3	67-69%
1.0	63-66%
0.7	60-62%

Please note: According to the University Course Catalog (p. 13) 3.7 and 4.0 are reserved for “outstanding” work; 3.3 and 3.0 are both defined as “excellent,” not mediocre.

Other helpful information:

- Writing and subject tutors are available: make an appointment online at <https://redlands.mywconline.com/>
- If you need extra help with writing you can enroll in a weekly lab ENGL X04 Writing Studio to workshop writing from any of your classes.
- Free drop-in mathematics tutoring is available for many of our math classes, schedules are posted around Appleton Hall.

Course Policies

Absence and Tardiness

Class discussion and participation is vital for a successful learning experience. If a student foresees any reason for an absence or tardy, the student should contact the instructor as soon as he or she can. I am going to try to record lectures so that if you feel sick you can stay home, but the best way to learn this material is to be in class with everyone.

Technology

- a. You will need access to a laptop, computer, or tablet capable of interacting with the Internet and it is helpful if you can bring these to class occasionally when we interact with programs. All course materials will be posted on the course website and can be accessed during class. However, cell phone ringers should be turned off during class and you should not be texting or accessing websites that are not productive to your learning.
- b. You will use Moodle to access your grades and hand in all work for the class.
- c. Class announcements, posting questions, and some office hours will happen on Teams.
- d. All class materials, daily homework, lecture notes, etc are posted on our class website:

PDE.JoannaBieri.com

Covid-19 Protocols

These protocols are designed to keep all members of the community as safe as possible, including those who are immunocompromised, high risk, or a caretaker for a child too young to be vaccinated. Your cooperation with these guidelines will help give us all the best chance of continuing face to face instruction for the entire term. For additional details please check the COVID Information for Students and Families

- a. Students may be asked at any time to verify, via their digital id, that they are in compliance with vaccination/testing policies.
- b. All faculty and students, regardless of vaccination status, must wear appropriate face coverings while indoors. Those without masks will be asked to leave the classroom and obtain one before returning.
- c. Students unwilling to wear a mask or to wear one properly (covering both nose and mouth) will be asked to leave immediately. If they resist, appropriate security protocol (including class cancellation) may occur at the discretion of the faculty. Students who are removed from class for refusing to wear a mask will be marked absent, incurring any relevant penalties.
- d. Students who have a positive test or are exhibiting COVID-like symptoms should **not** attend class. If they do, they will be asked to leave immediately; faculty will follow up regarding make-up work and accommodations at a later time.
- e. Students who need to quarantine or isolate due to their own exposure or that of a family member should communicate as soon as possible with their faculty to make arrangements for necessary accommodations. In the event of illness, keep faculty informed so that they can work with you about making up missed work.
- f. There will be no eating in classes, and drinking should be kept to a minimum so that masks stay in place.

Academic Honesty

The University of Redlands enforces strict standards as regards academic honesty, and students may be dismissed for breaches of these standards. To learn these standards,

please look at the relevant section of the University Course Catalog, pp. 17–24. See in particular Section III, Paragraph B (p. 19), which states that it is an offense to offer “as one’s own work the words, ideas, or arguments of another person without appropriate attribution by quotation, reference, or footnote.” In light of this, please note that:

- a. intentional plagiarism—i.e. piecemeal or wholesale appropriation of text from one or more printed or internet source—will result in a **fail** grade for the course.
- b. plagiarism by default—i.e. uncredited adoption of ideas from source texts due to carelessness in citation—will result in a **fail** grade for the project.

If you are still in any doubt about what constitutes plagiarism, please ask me before you undertake any written work. If you do not ask, I shall not accept a plea of ignorance after the fact.

Communication

Communication in this course is paramount. Please feel free to bring to me any concerns and/or questions you have regarding the course. The most reliable way to reach me is by email or Teams. Please note that my normal working hours are 9 a.m. to 4 p.m., Monday to Thursday. I do not respond to emails after 4 p.m. or on weekends, except in an emergency. I am happy to meet with you via Teams in lieu of traditional office hours. You may also utilize Teams to discuss class work with your peers.

Intellectual Property and Privacy

- a. The content of the course is the intellectual property of the instructor and should not be disseminated or reproduced without explicit consent.
- b. All work and content created by students is the intellectual property of the student and will not be disseminated or reproduced beyond the purview of the course and semester without explicit consent.
- c. To protect the privacy of all class members, no screenshots, still images, video, or audio recordings of any part of video and/or audio conferences should be made without the explicit prior consent of all students and the instructor.

Accommodations

- a. If a student has a disability that qualified for accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act, he/she/they should contact Academic Success & Disability Services (ASDS). ASDS is located on the ground floor of the Armacost Library across from Human Resources and down the hall from the Jones Computer Center. The primary contact person is:

Amy Wilms

Assistant Dean of Academics and Student Life:

Phone: (909) 748-8069

amy_wilms@redlands.edu.

- b. Please let me know *by the end of the second session at the latest* if you have a learning or physical disability which will require accommodation. Disability Services (Tel: 909-748-8069)

will assist you in documentation and help to ensure that all needs are met

Discrimination, Harassment, Sexual Misconduct and Retaliation

The University of Redlands is committed to providing a safe learning environment for all students that is free of all forms of discrimination, sexual misconduct, and sexual harassment, including sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone. The University of Redlands has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, no contact orders, and more. Please be aware all University of Redlands faculty members are “responsible employees,” which means that if you tell me about a situation involving any of the above, I must share that information with the Title IX Coordinator. Although I have to make that notification, you will control how your case will be handled, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

The person to contact with Title IX Concerns:

Erica Moorner

Deputy Title IX Coordinator

Title IX Office, Hunsaker Center 220

Phone: (909) 748-8916

erica_moorner@redlands.edu

Mental Health

- a. The Counseling Center provides free and confidential mental health services to students including short-term individual therapy, group therapy, single session therapy, consultations, and urgent appointments. Please call 909-748-8108 to schedule an appointment. If you are in crisis please call 909-748-8960 for the 24/7 mental health crisis line.
- b. The University CARE Team exists to help provide support and resources to students that are overwhelmed, experiencing significant distress, or possibly present some risk to themselves or others. As a faculty member, I may reach out to students about whom I am concerned to talk individually, and/or refer them to the CARE Team. If you have concerns about a fellow student, consider sharing your concern with the CARE Team via their online form. This is part of who we are as a caring, proactive community where we all look out for one another.

Course Schedule

Schedule is subject to change as we progress through the semester. You will be notified of any changes in class.

FYS - MATH and ART - CLASS SCHEDULE

DATE	DAY	TOPIC	ASSIGNED	DUE	LIFE AT REDLANDS
09/02/21	Thursday	Introduction to drawing - Ruler and Compass	HW1 READ - Rhythmic Form in Art Chapter 1		Practice using a personal schedule with time for studying and fun
09/07/21	Tuesday	More Ruler and Compass drawing - The golden Ration and Egyptian Pyramids	HW 2 READ Rhythmic Form in Art Chapter 2	HW1	
09/09/21	Thursday	Golden Ratio, Rectangle, Spiral	HW 3 READ Rhythmic Form in Art Chapter 3	HW2	impression on professors and get help. What the heck does my professor mean by this?
09/14/21	Tuesday	Pythagoras - Pentagon and Star	HW 4 READ Rhythmic Form in Art Chapter 4	HW3	
09/16/21	Thursday	Golden Ratio Art Start working on Essay Project 1	HW 5 READ Rhythmic Form in Art Chapter 5	HW4	How to get more involved on campus. Clubs and Organizations
09/21/21	Tuesday	Mathematics of the Greeks	HW 6 READ Rhythmic Form in Art Chapter 6	HW5	
09/23/21	Thursday	Library visit to help with Essay Project 1	HW 7 READ Online Article	HW6	Figuring out your learning style. LIBRARY CLASS
09/28/21	Tuesday	Platonic Solids and Polyhedra in Art and Architecture	HW 8 = COMPILE HW 1 - 7 into your Essay Project 1	HW7	
09/30/21	Thursday	Introduction to Perspective	HW 9 READ Viewpoints Chapters 1-3	HW8 =Essay Project 1 DUE	Getting help with stressful times.
10/05/21	Tuesday	One point perspective drawing	HW 10 READ Viewpoints Chapter 4	HW9	
10/07/21	Thursday	Two point perspective drawing	HW 11 READ Viewpoints Chapter 5	HW 10	

10/12/21	Tuesday	FALL BREAK	FALL BREAK	Peer Feedback for Project 1 DUE	FALL BREAK
10/14/21	Thursday	QPR Training Two point perspective drawing	HW 12	HW 11	What if my grades are not what I expected? How do I improve or get help?
10/19/21	Tuesday	Three point perspective drawing	HW 13 READ Viewpoints Chapter 5	HW 12	
10/21/21	Thursday	Three point perspective drawing	HW 14	HW 13	Picking Classes for next semester - when to start thinking about a major and a 4-year plan
10/26/21	Tuesday	In class time to finalize Essay Project 2	HW 15 = COMPILE HW 9 - 14 into your Essay Project 2	HW 14	
10/28/21	Thursday	Optics and Photography	HW 16 READ: Online Article	HW15 = Essay Project 2 DUE	What to do for fun in Redlands.
11/02/21	Tuesday	Camera Obscura	HW 17	HW 16	
11/04/21	Thursday	Introduction to Fractals	HW 18 READ: Viewpoints Chapter 8	HW 17 Peer Feedback for Project 2 DUE	Thinking long term and setting manageable goals
11/09/21	Tuesday	Fractal dimension	HW 19 READ: Viewpoints Chapter 9	HW 18	
11/11/21	Thursday	Reviewing Fractals and Optics			Study spots and developing good study habits
11/16/21	Tuesday	Tessellations - Polygons	HW 20 READ: Tessellations Chapter 3	HW 19	Study spots and developing good study habits
11/18/21	Thursday	No Class	No Class	No Class	No Class

11/23/21	Tuesday	THANKSGIVING BREAK	THANKSGIVING BREAK		THANKSGIVING 11/22-11/24
11/25/21	Thursday	Tessellations - Symmetry and Translations	HW 21 READ: Tessellations Chapter 4	HW 20	What should I expect from final exams week? How to prepare yourself
11/30/21	Tuesday	Tessellations - General Techniques and MC Escher	HW 22 READ: Tessellations Chapters 5 and 7	HW 21	
12/02/21	Thursday	Tessellations and Final Class Reflections- Overview	HW 23 = COMPILE HW 14 - 21 into your Essay Project 3	HW 22	Final Reflections - setting yourself up for seven more fantastic semesters.
12/07/21	Tuesday	Class T-shirts - FUN DAY!	course reflection essay and compiling your revised work into a Final Portfolio.	HW23 = Essay Project 3 DUE	LAST DAY OF CLASS
12/08/21	Wednesday			Peer Feedback for Project 3 DUE	
12/09/21	Thursday	STUDY DAY			
12/10/21	Friday	Hand in Final Portfolio by 5pm	FINAL PORTFOLIO DUE	FINAL PORTFOLIO DUE	FINAL PORTFOLIO DUE