Syllabus for IDS 4174 "Mathematics and Philosophy in Arts"
Class Number 82620, Fall Semester 2024

Designation of the course: This is a Discipline-specific Global Learning course. The relevant disciplines are math, philosophy, (history of visual) arts, and liberal arts. The course counts toward FIU Global Learning graduate requirements.

Motivation for the course

The modern world is a conglomerate of many different societies which, although geographically remote, have lives related in a variety of ways. This interrelation has become, in the last century, so intense, the influence so strong, that we observe today how the world is gradually developing into one global society. The culture as an aspect of a society's life is most mobile, transcends boundaries the easiest, and influences other societies most aggressively. It is of fundamental importance for the interacting in this process parties to understand, and appreciate, each-other's culture. Art, sciences, and philosophy, having developed within a society, interact further on a global level and form unique and rich mixtures. These developments and interactions are in the focus of this course's attention.

Synopsis of the course

The course provides a panorama of the ways the real life, and beyond, is depicted in visual arts (paintings). The main issue in this depiction is to represent, codify, the three dimensional world on the two-dimensional plane of the painting. Different peoples in different times had different ways of doing that. Not surprisingly, in any particular case, the depiction has its roots in the philosophical worldview of the respective people. The depiction was also based upon particular geometric constructions as well. The course reveals how Philosophy and Math blend in order to allow the most convincing images in the painting.

We begin our journey through Philosophy, Math and Art with a discussion what Art and Beauty is. We will make a review of how math was used in Europe to define, explain, and codify beauty (use of special numbers, figures, the method of linear perspective). This usage was rooted in the philosophical background of the historical periods discussed and actually influenced math back. Discussing Renaissance Europe and the methods of linear perspective, we will briefly review how visual Art led to development of Geometry itself. An important feature of the Eastern Orthodox Icons is the reverse (Greek) perspective they are painted in. This feature is also rooted in the Philosophy. We will discuss that method too. The course continues studying the development of perspective in visual arts of Egypt, China and Japan relating it to Math and to Philosophy. We will discuss how modern geometric objects, such as fractals, help make a math model of the drawing methods of ancient China and Japan. Our journey will conclude by considering prominent examples of modern (abstract art) depiction of images on canvas. This also has a background in Philosophy and Math, but is strongly influenced by the Eastern Philosophy (India, China, Japan) and Modern science as well. The course will conclude with a discussion of fractals: their mathematical and psychological importance, and use in computer graphic and design.

Prerequisites

The course is designed for students with little or no systematic knowledge in geometry, arithmetic, and philosophy. Most of the material included is accessible for students with elementary geometric intuition on Middle and High School level (points, lines, polygons, circles, straight edge, and compass). Some general acquaintance with (Greek) Philosophy, Architecture, and Visual Arts could be beneficial, but is

not necessary either: the needed facts and concepts are introduced in the course of the lectures/seminar discussions.

Assessment of students' knowledge

The participants in the course will do projects on different aspects of the interrelation of mathematics, philosophy, and visual arts. The students will be encouraged to do that working in groups showing this way willingness and ability to discuss, analyze, and explain what their thoughts in diverse groups. A variety of possible projects will be offered during the course. The overall grade will be decided on the results of three projects.

Topics to be chosen from

1) The School of Pythagoreans and the role of numbers and geometric figures in the philosophy of ancient Greece. The concept of beautiful based on that. About "the gems in Mathematics": the golden ratio.
2) Plato on Beauty, the Theory of Forms.
3) The Mimetic Theory and the Formalism in the Art (Aristotle and later). Parallel development of Mathematics influencing and influenced by those theories: the axiomatic method in Mathematics (Euclid, Archimedes).
4) The metaphysical aspect of the Platonic solids. Semi-regular solids of Archimedes.
5) The Roman Era. The Ten Books of Architecture by Vitruvius, and the role of Geometry in it.
6) The theory of perspective in the visual arts; projections in the space; the projective plane. Vanishing points and view points in one, two, and three point perspective.
7) The works of Albrecht Durer.
8) The mathematical background in the paintings of Leonardo.
9) Pre-linear perspective time drawings: the perceptual perspective versus the geometric (linear) perspective. The reverse (Byzantine) perspective.
10) The Expressive Theory and the Romantic Theory of Arts. The Fine Arts.
11) Multiple view point perspective, more about the perceptual perspective. The Ajanta cave paintings.
12) The Theory of Perception.
13) Taste and Beauty – a scientific approach to Aesthetics. Ramachandran's principles of Art.
14) Influence of Chinese and Japanese arts to forming the modern European art. Cubism, the art of Mark Chagall, more examples.
15) The form in Architecture: from ancient time to the modern days.
16) The Anamorphic Art.
17) Fractals – introduction and applications. Art-related examples from the East.
18) Fractals – applications to visual arts: computer graphics applications.
19) Modern Art Theories, and the Aesthetic of the Twentieth Century.

Suggested literature

1) D. Pedoe, *Geometry and the Liberal Arts*
2) K. Clark, *Civilization: a personal view*
3) M. Frantz and A. Crannell, *Viewpoints: Mathematical Perspective and Fractal Geometry in Art*
4) L. Gamwell, *Mathematics + Art a cultural history*
5) M Kline, *Mathematics in Western Culture*
6) *Public sources from the Internet*

Academic Misconduct Statement

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

Academic Misconduct includes: **Cheating** – The unauthorized use of books, notes, aids, electronic sources; or assistance from another person with respect to examinations, course assignments, field service reports, class recitations; or the unauthorized possession of examination papers or course materials, whether originally authorized or not. **Plagiarism** – The use and appropriation of another's work without any indication of the source and the representation of such work as the student's own. Any student who fails to give credit for ideas, expressions or materials taken from another source, including internet sources, is responsible for plagiarism.

To learn more about the academic integrity policies and procedures visit integrity.fiu.edu (Links to an external site.)

Accessibility and Accommodation

The Disability Resource Center collaborates with students, faculty, staff, and community members to create diverse learning environments that are usable, equitable, inclusive and sustainable. The DRC provides FIU students with disabilities the necessary support to successfully complete their education and participate in activities available to all students. If you have a diagnosed disability and plan to utilize academic accommodations, please contact the Center at 305-348-3532 or visit them at the Graham Center GC 190.

For additional assistance please contact FIU's Disability Resource Center

Important remark: *The Instructor reserves the right to make any changes he considers academically advisable. Any such changes will be announced in advanced in class or by posting them to the e-mail accounts of the students. The students are responsible to be aware of the changes announced this way.*