

# PHYSICS IN THE ARTS

ART 216 F (UH code = PHYS 109)

Fall 2021

Day/Time TBA

Credit hours: 3

Contact hours: 45

Additional costs: approx. 2 Euro (details at point 10)

Prof. Veronica Bindi

Teacher availability/contact: TBA

## **1 - DESCRIPTION**

Introduction to the physics of sound and light, with applications to music and visual arts: sound perception, harmony, musical scales, instruments, lenses, cameras, color perception and mixing. This course presents science through art and art through science. The wisdom and perfection that underlie the structure and the laws of the universe have inspired generations of artists especially in the Renaissance. Leonardo da Vinci epitomized the Renaissance man – a creative artist who painted Mona Lisa, an architect, an inventor and an investigative scientist of the natural world – who made no distinction between these roles. Science and Arts are two different faces of the same coin, and many scientists and artists have the common aim of describing nature. This course offers a wonderful insight into how science and art are deeply interconnected. It shows us how scientific principles are used in art and how art is hidden in science. The course uses algebra and geometry; intended primarily for non-science majors.

## **2 - OBJECTIVES, GOALS and OUTCOMES**

Students, thanks to this course, to the field visits and the help of guest speakers, should be able:

1. To discover the many links between science and arts. Students will perceive arts from a different perspective and they will be able to find the links with science to get a more complete vision of the arts. The visit and the guest speakers will help in achieving this goal.
2. To demonstrate how scientific principles are used in art and how art is hidden in science, especially in Renaissance arts and in artists such as Leonardo da Vinci.
3. To develop an understanding of proportion, symmetries, perspective, light, colors and architecture and technologies seen through science and viewed in the arts.
4. To understand the work performed in a physics laboratory.
5. Upon completion of the project, to demonstrate an ability to work independently and cooperatively in a team, to synthesize information from a range of primary sources and explain it in a written and oral form.

## **3 - PREREQUISITES**

None. Students may benefit from having a basic knowledge in mathematics and arts, but no previous knowledge is required although not compulsory. This course is taught in English.

## **4 - METHOD**

Classroom activities will be a combination of: slides and short videos related to lectures, visits and guest speakers (a specialist of renaissance art, an architect) to contribute a better understanding of the major topics, followed by active involvement and discussion in class. A different project will be assigned to each student to be presented in class.

## **5 - ASSESSMENT**

1. Exams - two written test exams will be given (1 midterm and 1 final).
2. Individual project – distinct projects will be assigned to each student; in all of them, student, research, adopting a personal and critical approach, needs to address the relationship between science and arts.
3. Oral presentation of the project - students will present the outcomes of their project in an oral presentation and a 4 page written article.
4. Participation in class (including outside visits) is part of the evaluation.

Once all course tasks have been defined and scheduled, deadlines must be respected, so please organize your personal schedule accordingly.

## **5.1 - WRITTEN ESSAY and ORAL PRESENTATION**

Essay:

- shows your thinking.
- extends beyond class discussion and resolves problems we raise.
- shows what you have learned.

### **An ideal essay:**

- is concise (min of 4 pages, max 8 pages), while expressing substantive ideas.
- may be informal in tone, but communicates clearly.
- reflects thoughtful consideration of the issue(s) behind the writing.
- uses several **concrete and specific examples** (or one extended example) linked to a general theme.

**Topics:** a list of topics relevant to the course will be provided in class

**Sources:** You will be expected to use different kinds of source material and to develop an argument.

You are expected to use at least SIX sources, including books, journal articles, online-journals and primary source material. At least ONE of the sources should be a primary source, at least ONE a book and at least ONE a journal article. Be judicious in the use of Web resources. Wikipedia, Sparknotes, Encarta and similar sites DO NOT count as acceptable sources.

**Deadline and submission:** When submitting work via email, please label your file with your last name.

**The essay should be submitted by November 26, 2021**

## **6 - EXAMS**

**One written final exam** will be given consisting of multiple choice and short answer questions.

Please remember that the dates of the exams cannot be changed for any reason, so please organize your personal schedule accordingly.

## **7 - EVALUATION and GRADING SYSTEM**

15% Participation

25% Midterm

15% Project written paper

15% Project oral presentation

30% Final exam

The following grading system will be observed:

**A** = 100 - 93,    **A-** = 92 - 90,    **B+** = 89 - 87,    **B** = 86 - 83,    **B-** = 82 - 80,  
**C+** = 79 - 77,    **C** = 76 - 73,    **C-** = 72 - 70,    **D** = 69 - 60,    **F** = 59 - 0

## **8 - ATTENDANCE and BEHAVIOR**

**Mandatory attendance** is a primary requirement for a responsible learning experience at LdM. Please note that:

- If the student misses **THREE** classes, the **Final grade** will be lowered by one full letter grade.
- If more than **THREE** classes are missed, the final grade will be "**F**" and **NO credits** will be given for this course.

**Punctuality is mandatory.** Students must arrive in class on time:

- Any lateness, leaving class during the lesson without notice, not showing up on time after the break, or leaving earlier, will impact the participation grade and the Final Grade. In addition:
- Three late arrivals or the equivalent (10 to 20 minutes) result in one absence in the attendance count.
- Missing more than 20 minutes will be considered tantamount to one full absence.

It is the responsibility of the student to **catch up on any missed work** and to **keep track of his or her absences** and cases of tardiness.

Missed in-class activities (including but not limited to tests, etc.) cannot be made up. Be informed in advance about how to submit assignments in case of absence.

Make-up classes are always mandatory since they are part of the course program.

**Scheduling conflicts:** If on occasion a class creates a scheduling conflict with another class (due to a

clashing make-up, class trip, etc.), the student is **required to inform both instructors IN ADVANCE**, allowing the two instructors to share a written excuse for the class going to be missed. Even though an absence may be excused, students must be aware that there will be **no possibility** to make up any assessed in-class activities they have missed (including, but not limited to tests, etc.) and **no refund** can be given for pre-paid visit/field trip fees. Keep this in mind in order to make a responsible decision about which class to attend.

Classes with **visits** are considered regular classes to all effects: absence or lateness rules will be applied as for lessons that meet in class, without excuses.

All students are requested to **be 5 to 10 minutes early** at the meeting point, so that the class can promptly enter at the specified entry time. If a student is late, **the class cannot wait** for him/her and the student will be responsible for paying for his/her entry.

Please be aware of any **changes to visit location/time/day**; get to know the meeting point and any relevant details before the class.

### **Behavior / Academic Dishonesty:**

Active and responsible participation is insisted on. Students are required to **behave** properly within the school premises and during class.

Proper behavior and **dress code** must be observed in class and during out-of-class sessions. For example, no food or drinking is allowed in museums; in religious places, shoulders and knees must be covered.

Classrooms are to be left **neat and clean**. Students must take proper **care** of available equipment and materials and promptly report any damage and loss.

Drinking/eating during class is not allowed. **Electronic devices (cell phones, Blackberry, iPod, laptops, etc.) must be switched off** during class, unless otherwise instructed.

Instructors who find that a student's behavior is inappropriate will seek to talk with him/her promptly; if the issue continues, the instructor is required to contact the pertinent LdM authority.

Should issues of academic dishonesty arise, the faculty member will adhere to the relevant LdM policy and report suspected instances to the LdM Dean of Students for disciplinary review. According to the LdM Rules of Conduct, "Violations include cheating on tests, plagiarism, inadequate citation, recycled work, unauthorized assistance, or similar actions not explicitly mentioned".

Assignments and projects are specific to individual courses; presenting the same work in two different courses (including previous courses) is considered recycling and is unacceptable.

Students with **learning disabilities** are required to contact their LdM Advisor or LdM Dean of Students.

## **9 - READINGS & SOURCES**

### **Readings:**

1. **COURSE PACK: SLIDES SHOWN IN CLASS WILL BE PROVIDED ONLINE AS REFERENCE. ARTICLES ABOUT SPECIFIC TOPICS COVERED IN CLASS WILL ALSO BE MADE AVAILABLE.**

### **Additional Optional Readings:**

**Art and Physics: parallel visions in space, time and light, L. Shlain, Harper Collins**

**Physics in the Arts P.U.P.A Gilbert and Willy Haerberli, revised edition, Elsevier (eTextbook \$25)**

### **Online Resources:**

## **10 - ADDITIONAL COSTS**

For this course students must expect to spend approx. 40 Euro as follows:

- Tot. 9 Euro (approx.) for a visit to the Gallium museum (details at point 11)

## **11 - VISITS and TRIPS**

The following visit is planned (see point 13A for dates and details):

- 1) Museo Archeologico Nazionale [http://musei.firenze.it/museo\\_archeologico\\_nazionale.htm](http://musei.firenze.it/museo_archeologico_nazionale.htm) (requires Euro entry fee)

### **NOTE:**

- Consider, generally, that professors organize visits to museums, galleries and to churches whenever pertinent and fundamental for the course. They must be considered mandatory and count as regular attendance. They usually take place during regular class time (unless specified differently)

due to specific time schedules).

- These visits require students to pay regular entry. LdM and its faculty do the best to get free or reduced entrance for visits that are part of academic courses. However, the state museums in Florence don't grant free or reduced admission. Students will be responsible of paying any required entry fee, including additional class reservation fee when required.
- Acquisition of any type of museum membership or city discount card is entirely up to the individual student. Any problems with entry fees in connection with personal membership cards can't be resolved by the professor.
- Make sure you know the exact meeting point each week and how to get there; be aware that there might be changes in the visit schedule
- Please don't be late at the meeting point as the class cannot wait for you to enter the museum at the reserved time.
- If you have been absent please find out what to do and where to meet for the next lesson.
- A late show will be treated as an absence.
- Ticket costs are subject to change, and may be higher for some museums if a special exhibition is on show.

## **12 - MATERIALS**

Not applicable.

## **13A- CLASS SCHEDULE**

*Reminders: the schedule is subject to change with notice; the contents of individual lessons may vary; all visit dates are to be confirmed; exam dates are final.*

<b>1) Sept X</b>	Presentation of the course; introduction to the class syllabus and course reader. Information on assignments and visits. Student introductions. Presentation about my research work: "What are cosmic rays and how and why do we study them". Michio Kaku's video about physics.
<b>2) Sept X</b>	Influence of science in the arts: Ancient Babylonian, Greek and Roman science, Cartography, Study on the Earth's shape
<b>3) Sept XX</b>	Influence of science in the arts: perspective, proportions, symmetries. Science and the Arts in the Florence Renaissance and in artists such as Leonardo da Vinci (Guest speaker - specialist on renaissance art).
<b>4) Sept XX</b>	Science and Arts in Renaissance and in Baroque. Light and its nature.
<b>5) Oct X</b>	Visit to Museo Archeologico Nazionale.
<b>6) Oct X</b>	Optics, Eye and lenses/ Photography
<b>7) Oct XX</b>	<b>MIDTERM</b>
	<b>Mar. 28 to Apr. 1 MIDTERM BREAK</b>
<b>8) Oct XX</b>	Women in science and women in arts.

<b>9) Nov X</b>	Visit to various churches and locations in Florence to identify examples of the liaisons between arts and science.
<b>10) Nov X</b>	<b>Individual project</b>
<b>11) Nov XX</b>	Computers, Robots and Artificial Intelligence in science and in arts.
<b>12) Nov XX</b>	Movie "Ex machina". Discussion about artificial intelligence.
<b>13) Dec X</b>	Space architecture (Guest speaker - Architect). Preparation for the final.
<b>14) Dec X</b>	<b>FINAL EXAM</b>

### **13B- ALTERNATIVE LESSON**

Should the instructor be unavailable or otherwise unable to attend, a substitute teacher will conduct the scheduled or a pre-prepared alternative lesson, at the regular class time. Continuation of ongoing project or of a question sheet related to a visit may also be required of the students.