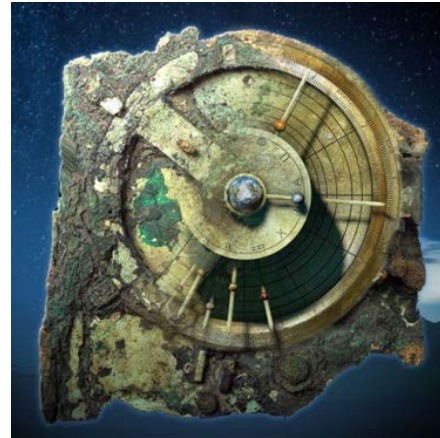
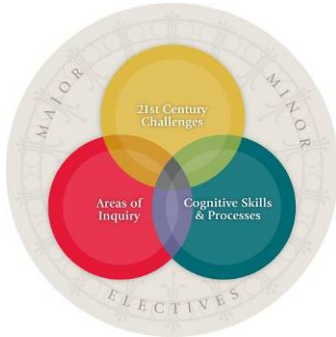


Science and Technology in Ancient Greece and Rome

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The Antikythera Mechanism

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Course description

STAGR is an introduction to the foundations of science and technology in the West. It is a course that fulfills the Core Curriculum's requirement in Historical Analysis (HST), specifically goals i and k:

HST GOAL i – *Student is able to...* Explain and be able to assess the relationship among assumptions, method, evidence, arguments, and theory in social and historical analysis.

HST GOAL k – *Student is able to...* Explain the development of some aspect of a society or culture over time, including the history of ideas or history of science.

The primary focus of the course will be on the scientific knowledge and technological skills of the Ancient Greeks and Romans and their importance for the development of science and technology from the medieval period through to today.

We will explore the foundations of Western science and technology within their cultural context to examine the impetus for them and explore them within their professional context to explain the development of science and technology as professions, their division into disciplines, and the development of scientific methods and approaches.

We will examine how and why ancient science and technology have often been (and sometimes have not been) adopted and revered in later periods, what led to criticism and development of them, and how and why knowledge, ideas, and skills travel across time and cultures. We'll also be interested in the conflict and cooperation between the scientific/technical worlds and political/cultural worlds.

The sources for ancient science and technology pose challenges: ancient scientists did not follow modern conventions of publishing and they did not use consistent or precise terminology; much of our textual evidence is fragmentary, and texts have not always been translated satisfactorily (if translated at all). Physical evidence, which has often suffered over several millennia, can be used only with caution in conjunction with texts. We will analyze the evidence for ancient science and technology along with modern scholarship in order to evaluate scholarly and popular understanding of these topics and the social significance of that understanding over time.

This course does not aim to offer a comprehensive history of science and technology, but rather an overview of key ideas and discoveries, their intellectual & cultural origins, and their subsequent impact. The broad topics we'll cover include geometry & mathematics, astronomy, physics, biology, medicine, and engineering, as well as agriculture, architecture, and warfare.

The course will be focused on Ancient Greece and Rome, but we'll necessarily look back to Babylonia and Ancient Egypt and look forward, especially to the Islamic Golden Age and frequently to the 21st century. Classes will be devoted to lecture and discussion, while course readings will comprise original sources (all translated into English) and academic and popular journal articles.

No prior knowledge of the ancient world or the history of science is expected, and no college-level science courses are required. There are no prerequisites for this course.

Required texts

None! Currently there is no textbook suitable for this course. Lectures will take the place of a textbook (and attendance is therefore necessary for a good grade) and will be supplemented by readings, comprising mostly primary sources in translation supplemented by modern scholarly and popular studies. Primary sources will come from, for example, the surviving works of Aristotle, Euclid, the Hippocratic Corpus, Galen, Ptolemy, Theophrastus, Lucretius, Vitruvius and Hero of Alexandria, and will be accompanied by questions that facilitate comprehension and encourage reflection. All readings will be accessible through Sakai. Images from the lectures will also be posted on the course's Sakai site.

Learning goals and assessment

The assignments in this course will require you to develop and demonstrate the skills necessary to fulfil the two Core Curriculum goals i and k (see above).

Facts and concepts quizzes (25%)

Two brief quizzes will test your knowledge of key facts and concepts from the semester. The questions will be a mix of multiple choice and short-answer. Successful preparation for and performance in these quizzes will ensure that you have basic knowledge and understanding of the key names, dates, terms and developments in ancient science and technology and that you understand key concepts.

If you choose to make an astrolabe (instructions and templates will be provided) there will be an opportunity to earn extra credit by answering correctly a series of related questions included on the first quiz.

Project 1 (25%)

You will make a model of an object that demonstrates a concept or discovery in ancient science or recreates ancient technology. Previous successful examples include a *ballista*, battering ram, constant-level bowl, ancient meal, cross-section of a Roman road, *groma*, and sheet of papyrus. You must produce an accompanying presentation that brings together text, image, video and physical materials with your oral commentary and that explains the evidence for your object, the materials and techniques you employed, and the functioning of the object. You should also discuss changes to the design of the object in the ancient world and, if applicable, thereafter.

The model will be evaluated on its relevance to the course and the success and authenticity of its construction and the authenticity of its materials (as far as is reasonable). The complexity of the object will be factored into the evaluation. Presentations should run at least five minutes and no more than twenty minutes and will be evaluated on your effective synthesis of materials, the accuracy and relevance of their content and the clarity of your ideas and delivery. Presentations must be rehearsed and polished.

Project 2 (25%)

You will produce a two-part project that discusses a topic relevant to our course. Previous successful examples include the lighthouse of Alexandria, triremes, the development of ancient weaponry, Aristotelian logic, sundials, knowledge and treatment of cancer, and ancient kitchens. The first part of your project (which will most likely be in “paper” format) will apply historical research methods and reasoning to the ancient evidence for your topic. (You may also consult modern scholarship.) The second part will survey the development of the topic through to today. You are encouraged to include images and video and may format it as a Voice-Thread presentation, though a “paper” is also acceptable.

Voice-Thread Presentations should run at least five minutes and no more than twenty minutes; papers should be at least two pages in length and no more than five (excluding images, links to videos, notes and bibliography). Your project will be evaluated on the appropriate theme and scope of your topic; the accuracy of and relevance of your factual content; the relevance and range of your evidence, your ability to apply historical research methods and reasoning to it, your synthesis and analysis of it; your ability to consider your topic and its development over time and in different contexts. Your project must be polished—free from typos and errors of syntax, well-written, and professionally presented.

Project 3 (25%)

You will compile an anthology of ancient texts, modern scholarship, images and artifacts about a key figure in the history of ancient science and technology and weave these into a narrative. For each element in your anthology, you should justify its inclusion, pick out its most important features, describe its historical, social and intellectual context, and explain how it illustrates an important aspect, idea or approach to your figure. You must be sure to offer a critical commentary on each element, explaining its shortcomings or advantages as evidence. You may format this assignment as a regular text-focused “paper” or as a Voice-Thread presentation that combines text, image and video and includes voice annotations to those elements. In either case, your work must be polished and well prepared—free from typos, rehearsed, and professionally formatted.

Voice-Thread Presentations should run at least ten minutes and no more than thirty minutes; papers should be at least four pages in length and no more than ten (excluding images, links to videos, notes and bibliography). Your project will be evaluated on the appropriate theme and scope of your figure; the accuracy of and relevance of your factual content; the relevance and range of your evidence, your ability to apply historical research methods and reasoning to it, your synthesis and analysis of it, and your critical evaluation of it. Your project must be polished—free from typos and errors of syntax, well-written, and professionally presented.

Additional learning goals

Students successful in this course will also meet several of the Classics Department’s learning goals, including the ability to

- “form, through the study of the ancient languages and of ancient culture and civilization, a broad and critically informed understanding of major events, concepts, documents, and material artifacts of ancient Greece and Rome, and of their continuing influence on and connections to the modern world”
- “produce culturally and historically informed analyses of Roman and/or ancient Greek ideas, texts and artifacts”
- “acquire necessary analytical, research and thinking skills to read critically”
- “read and understand a variety of literary forms, including primary sources (speeches, plays, novels, histories), as well as secondary sources written in academic prose”

A complete list of learning goals in Classics can be found at <http://classics.rutgers.edu/learning-goals-for-classics-majors>

Additional learning goals specific to this course are to

- Acquire a knowledge of the key scientific and technological knowledge, ideas, theories and methods of Ancient Greece and Rome and their subsequent development
- Read and evaluate primary source texts and documents
- Develop a methodology for analyzing ancient artifacts
- Understand the cultural, political and intellectual forces that have shaped reactions to developments in science and technology

Your success in the course assignments and therefore the course depends on your regular presence, both physical and mental, at our class meetings and on completing the readings carefully and in a timely manner. You are expected to attend every class; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

I will not offer a make-up exam without evidence of an incapacitating illness from the Health Center or your family doctor or of a personal emergency verified by a school official, such as dean or academic adviser.

Academic integrity

As a student in this course, you must abide by Rutgers' rules on academic integrity. Information can be found at <http://academicintegrity.rutgers.edu/>

Violations of academic integrity include cheating, plagiarism, and facilitating violations of academic integrity.

Further information can be found at <http://academicintegrity.rutgers.edu/resources>, and I recommend that you take this useful interactive tutorial on plagiarism and academic integrity: <http://www.scc.rutgers.edu/douglass/sal/plagiarism/intro.html>

If you have any questions about academic integrity, especially as it pertains to this course and its exams, please do contact me.

Accommodations for disabilities

Full disability policies and procedures are at <http://disabilityservices.rutgers.edu/>

Students with disabilities requesting accommodations must follow the procedures outlined at <http://disabilityservices.rutgers.edu/request.html>

Schedule

The following is a list of the topics that we will cover over the semester.

1. Introduction to the course
2. Units of measure and alphabets
3. Time and weather
4. Dissemination of knowledge
5. Scientific methods
6. Mathematics
7. Cosmology
8. Astronomy
9. Astrology

10. Alchemy
11. Natural history, pt. I (flora)
12. Natural history, pt. II (fauna)
13. (Midterm exam)
14. Medicine, pt. I (the medical profession)
15. Medicine, pt. II (anatomy)
16. Medicine, pt. III (pathology)
17. Medicine, pt. IV (pharmacy)
18. Medicine, pt. V (public health)
19. Agriculture
20. Food
21. Hydraulic engineering
22. Travel and transportation
23. Architecture and construction
24. Warfare
25. Craft and workshops
26. Gadgets
27. Legacy
28. Wrap-up and selected student presentations