Term Information

Effective Term	Spring 2023
Previous Value	*Summer 2012*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Propose course for new GE theme of Number, Nature and Mind.

What is the rationale for the proposed change(s)?

This course fulfills the theme's goals and ELOs.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

We anticipate no programmatic implications.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Philosophy
Fiscal Unit/Academic Org	Philosophy - D0575
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	2660
Course Title	Metaphysics, Religion, and Magic in the Scientific Revolution
Transcript Abbreviation	Phil and Sci Rev
Course Description	A philosophical examination and critical exploration of the interconnection between the natural scientific, religious and magical traditions in the emergence of the Scientific Revolution.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster
Previous Value	*Columbus*

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	
Previous Value	280
Electronically Enforced	No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	38.0101
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore, Junior

Requirement/Elective Designation

General Education course:

Historical Study; Number, Nature, Mind

The course is an elective (for this or other units) or is a service course for other units

Previous Value

General Education course:

Historical Study

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students will understand the role of mathematics in the development and controversies that constitute the scientific revolution.

Previous Value

Content Topic List

- The scientific revolution
- Alchemy and science
- Religion and science
- Philosophy and science

Sought Concurrence No

Attachments

- PHILOS_2660_elos_NNM.docx: GE Theme NNM submission form

  (Other Supporting Documentation. Owner: Shuster,Amy Lynne)

- PHILOS_2660_syllabus as of 9.20.2022.docx: Syllabus

  (Syllabus. Owner: Shuster,Amy Lynne)

Comments

- Please see Panel feedback e-mail sent 09/29/22. *(by Cody,Emily Kathryn on 09/29/2022 03:36 PM)*
- Syllabus revised as per panel feedback (contingencies and recommendations). *(by Shuster,Amy Lynne on 09/20/2022 06:39 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Shuster,Amy Lynne	06/06/2022 10:50 AM	Submitted for Approval
Approved	Downing,Lisa J	06/06/2022 10:57 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	08/26/2022 10:04 AM	College Approval
Revision Requested	Cody,Emily Kathryn	09/20/2022 04:18 PM	ASCCAO Approval
Submitted	Shuster,Amy Lynne	09/20/2022 06:39 PM	Submitted for Approval
Approved	Lin,Eden	09/21/2022 09:00 AM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	09/21/2022 11:32 AM	College Approval
Revision Requested	Cody,Emily Kathryn	09/29/2022 03:36 PM	ASCCAO Approval
Submitted	Shuster,Amy Lynne	09/29/2022 04:07 PM	Submitted for Approval
Approved	Samuels,Richard	09/29/2022 04:19 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	09/29/2022 04:21 PM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	09/29/2022 04:21 PM	ASCCAO Approval

Syllabus: The Scientific Revolution and Modern Philosophy: Physics, Metaphysics, Method, Theology, and Magic

Philosophy 2660

Course Information

- **Assigned course times:**
- **Assigned classroom:**
- **Credit hours:** 3
- **Mode of delivery:** Hybrid

Instructor

- **Name:** Lisa Downing
- **Email:** downing.110@osu.edu
- **Office location:** UH 364

- **Office hours:** Zoom office hour, Friday 2:15 to 3:15, or by appointment
- **Preferred means of communication:**
    - My preferred method of communication for questions is **email.**
    - My class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Course Description

The seventeenth century saw revolutionary developments in natural science, specifically, in matter theory, mechanics, chemistry, and astronomy. These developments were intertwined with mathematical developments, magical traditions, religious doctrines and disputes, and, especially, philosophical theories and arguments. This course will examine some of these connections in the works of some of the most influential natural philosophers of the period. Our main goal is a richer understanding of this crucial period in the development of modern science. One recurring theme is the role of mathematics in developments in natural philosophy. In addition, as with any philosophy class, we will evaluate the cogency of the arguments and the consistency and plausibility of the views we encounter.

New General Education Goals and Expected Learning Outcomes

The Curriculum Committee of the College of Arts & Sciences requests that syllabi of all GE courses list the goals and learning objectives for the relevant category of the GE.

New GE Theme: Number, Nature and Mind

Overview: As described in this syllabus, Philosophy 2660 is concerned with the rich variety of intellectual factors propelling developments in natural philosophy (science) in the period of the seventeenth century typically referred to as the Scientific Revolution. The course considers the interplay of metaphysics, theology, methodology, and magical/experimental traditions in developments and debates about motion and matter, culminating in Newton's tremendously successful and extremely controversial *Principia Mathematica*. A strong theme throughout is the role of mathematics in science, which is newly highlighted and clarified in the early modern period. Specific issues include:

- Pythagoreanism as a key spur to scientific development: to what extent and under what conditions should we view this as a clarification of optimal scientific method or as quasi-mystical (numerology)?
- Mathematical vs physical astronomy (What is the distinction, why did it develop, what were the results?)
- Developments in mathematics and new appreciation of what Aristotle called the mixed mathematical sciences as a spur to revolutionary developments in the seventeenth century
- Mathematization in Galileo's mechanics (which helped vindicate Copernicanism)
- Descartes' geometrical conception of matter, which became a paradigm for modern mechanism
- Controversies over Newton's *Principia Mathematica*: Why did Newton's critics assert that Newton provided a mathematics but no physics?
- The role of mathematics in scientific methodology

Mastery of the material will be assessed on the basis of weekly discussion posts, wherein students engage with the reading, class participation (typically focused on the weekly discussion questions), two short papers, and a final exam.

Goal 1: **Successful students will analyze an important topic or idea at a more advanced and in-depth level than in the Foundations component.**

Expected Learning Outcomes: Successful students are able to...

1.1 Engage in critical and logical thinking about the number, nature and mind theme.

As described in this syllabus and overview statement, students will be engaged throughout the course in thinking about the role of mathematics in developments in natural science, especially in the seventeenth century. Salient examples include:

- Week 2 includes discussion of Aristotle on the difference between mathematics and physics.
- Week 3 considers the division between physical and mathematical astronomy created by the tension between Ptolemaic mathematical models and Aristotle's physics of the heavens.

- Week 5 requires students to consider how Galileo's mathematical science of motion helps address challenges to Copernicanism.
- Week 6 considers the role of Pythagoreanism/numerology in the scientific revolution, thus underlining the thought that the search for mathematical patterns in nature, while often productive, needn't always be so.
- Week 8 encourages analysis of what it means to regard bodies as the objects of geometry made real, as Descartes influentially did.
- Week 12 and following concludes the class with controversies surrounding Newton's *Principia Mathematica*, which again foreground the question of the distinction between (and relation between) physics and mathematics.

1.2 Engage in an advanced, in-depth, scholarly exploration of the number, nature and mind theme.
This course systematically engages with the application of mathematics in understanding the natural world. Students will engage with that application in an in-depth and scholarly fashion by reading original, primary texts (e.g. Aristotle, Galileo, Descartes, Newton), as well as discussions by scholars in the history of science and history of philosophy (Osler, Henry, Kuhn). They will engage critically with and evaluate the views they encounter, through discussion posts, in class discussion, papers, and the final exam.

***Goal 2*: Successful students will integrate approaches to number, nature, and mind by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in the future.**

Expected Learning Outcomes: Successful students are able to...
2.1 Identify, describe, and synthesize approaches or experiences of the number, nature and mind theme.
Students will be challenged to identify, compare, and evaluate different views, explicit or implicit, about the role of mathematics in science held by a variety of authors, both academic and non-academic.
2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.
This ELO will be met through the structure of the class, especially by in class discussions and activities that build on previously submitted discussion posts/reading responses, and by the two papers, which move from considering a single text in the first paper to analyzing relations among connected texts in the second paper.

***Goal 3*: Successful students will experience and examine mathematics as an abstract formal system accessible to mental manipulation and/or mathematics as a tool for describing and understanding the natural world.**

Expected Learning Outcomes: Successful students are able to...
3.1 Analyze and describe how mathematics functions as an idealized system that enables logical proof and/or as a tool for describing and understanding the natural world.

This course will analyze and describe how views about the place of mathematics in natural science have been debated and have evolved, with the seventeenth century being a key locus of controversy and change.

Legacy GE Expected Learning Outcomes: Historical Study
History courses develop students' knowledge of how past events influence today's society and help them understand how humans view themselves.

1. Students acquire a perspective on history and an understanding of the factors that shape human activity.
2. Students display knowledge about the origins and nature of contemporary issues and develop a foundation for future comparative understanding.
3. Students think, speak, and write critically about primary and secondary historical sources by examining diverse interpretations of past events and ideas in their historical contexts.

Among the issues we will track and explore throughout this course is the role of mathematics in the developments and controversies that constitute the scientific revolution. For example we will consider Pythagorianism/numerology as a spur to scientific theorizing, as well as reflecting on its roots in mystical traditions. We will consider the rising status of "mixed mathematical" sciences in the period leading up to the scientific revolution. We will examine mathematization in Galileo's mechanics, and Descartes' geometrical conception of matter. In considering the multi-faceted controversy surrounding Newton's Principia Mathematica, a crucial question will be: why did Newton's contemporary critics call this great achievement a mathematics but no physics? What conception of the relation between physics and mathematics does this reflect?

How This Hybrid Course Works

Mode of delivery: This course is partly online and partly in person. In a typical week, there will be a video lecture viewable online in Carmen, work due on Carmen, and an in person class. Check Carmen for announcements.

Pace of online activities: This course is divided into **weekly modules** that are released week to week. Students are expected to keep pace with weekly deadlines.

Credit hours and work expectations: This is a 3 credit-hour course. According to Ohio State bylaws on instruction (go.osu.edu/credithours), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework (reading and assignment preparation, for example) to receive a grade of C average.

Description of the structure of a typical week:
There will be a Carmen-based quiz (open book) on the week's reading, due by Wednesday at noon.
I will post a video lecture on Tuesday.
Discussion posts (responding to a prompt) will be due by Wednesday at 10pm. (You can earn extra credit points for commenting, in a substantive and helpful way, on someone else's discussion post).
Fridays from 12:45 to 2 we will usually have a discussion of the week's topic(s) and text(s), which will usually take place in person in our classroom. I will often use questions and issues from the discussion posts to structure these discussions.
(Thus, in a typical week it would be possible to do all your work for the course on Wednesdays and Fridays, except for the readings, which must be done before Wednesday.)

Course Materials, Fees and Technologies

Required Materials and/or Technologies

Books (will be available in the campus Barnes and Noble, or may be purchased on Amazon):

- Matthews, Michael R., ed. *The Scientific Background to Modern Philosophy.* Hackett. (An anthology of primary sources.)
- Osler, Margaret. *Reconfiguring the World: Nature, God, and Human Understanding from the Middle Ages to Early Modern Europe*. Johns Hopkins.
- G.W. Leibniz and Samuel Clarke (authors). Roger Ariew (editor). *Correspondence.* Hackett.

PDFs of more required *primary* and *secondary* sources will be made available on Carmen.

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet mic or external microphone
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

Required Software

Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the installing Office 365 (go.osu.edu/office365help) help article for full instructions.

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-device) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.

- Install the Duo Mobile application (go.osu.edu/install-duo) on all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- Navigating CarmenCanvas (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration and recording, editing and uploading video (go.osu.edu/video-assignment-guide)

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: go.osu.edu/it
- **Phone:** 614-688-4357 (HELP)
- **Email:** servicedesk@osu.edu

Digital Flagship

Digital Flagship is a student success initiative aimed at helping you build digital skills for both college and career. This includes offering an engaging collection of digital tools and supportive learning experiences, university-wide opportunities to learn to code, and a Design Lab to explore digital design and app development. Digital Flagship resources available to help Ohio State students include on-demand tutorials, The Digital Flagship Handbook (your guide for all things tech-related), workshops and events, one-on-one tech consultations with a peer or Digital Flagship staff member, and more. To learn more about how Digital Flagship can help you use technology in your courses and grow your digital skills, visit go.osu.edu/dfresources.

Grading

Major Course Assignments and their contribution to the final grade:

Weekly quizzes on the reading: 15%
Discussion board posts and comments: 20%
2 page paper: 20%
3 page paper: 25%
Final exam: 20%
You cannot pass the class without completing both papers and the final exam.
Participation in discussions will be noted and can boost your grade especially if your grade is on the border between two grades.

See Course Schedule for due dates.

Academic integrity and collaboration: Your written assignments, including discussion posts, must be your own original work. Make sure to properly attribute any ideas that you take from any sources, whether printed or online (using footnotes or parenthetical references), and use quotation marks where appropriate. Quizzes and the final exam are open book and open note, but they must be an individual effort, not a collaborative one. (Studying together in advance of the exam is fine, of course.)

Late Assignments

Late assignments will lose 1/3 of a grade (e.g. a B goes to a B-) for every day late, unless I have granted an extension in advance of the deadline. If you are having difficulties, please get in touch with me before the assignment is due.

Grading Scale

93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70–72.9: C-
67–69.9: D+
60–66.9: D
Below 60: E

Other Course Policies

Discussion and Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style**: Please remember to write using good grammar, spelling, and punctuation.
- **Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For our books or other course materials, list at least the title and page numbers. For any online sources, include a link.
- **Backing up your work**: Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

Academic Integrity Policy

See Descriptions of Major Course Assignments for specific guidelines about collaboration and academic integrity in the context of this online class.

Ohio State's Academic Integrity Policy

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's Code of Student Conduct (studentconduct.osu.edu), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by university rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the university's Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university.
If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

Copyright for Instructional Materials

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

Statement on Title IX

All students and employees at Ohio State have the right to work and learn in an environment free from harassment and discrimination based on sex or gender, and the university can arrange interim measures, provide support resources, and explain investigation options, including referral to confidential resources.

If you or someone you know has been harassed or discriminated against based on your sex or gender, including sexual harassment, sexual assault, relationship violence, stalking, or sexual exploitation, you may find information about your rights and options on Ohio State's Title IX website (titleix.osu.edu) or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Title IX is part of the Office of Institutional Equity (OIE) at Ohio State, which responds to all bias-motivated incidents of harassment and discrimination, such as race, religion, national origin and disability. For more information, visit the OIE website (equity.osu.edu) or email equity@osu.edu.

Commitment to a Diverse and Inclusive Learning Environment

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them.

We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, on-demand mental health resources (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at 614- 292-5766**. 24-hour emergency help** is available through the National Suicide Prevention Lifeline website (suicidepreventionlifeline.org) or by calling 1-800-273-8255(TALK). The Ohio State Wellness app (go.osu.edu/wellnessapp) is also a great resource.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. In light of the continuing pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of Course Technology

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- CarmenCanvas accessibility (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Collaborative course tools

Tentative Course Schedule

Refer to the CarmenCanvas site for up-to-date due dates.

Readings, topics, assignments:

Week 1: Introduction, Aristotelian physics
Readings: Selections from Aristotle's *Physics*, Matthews pp.4-15, Osler Introduction, pp.1-13.

Week 2: Aristotle's physics, teleology, system of the world. Ancient astronomy.
Readings: Matthews pp.15-19, Osler pp.13-23. [Recommended: PDF Shields esp. sections 2.7 & 2.9 (14pp.), PDF Aristotle on the universe (11pp.)]

Week 3: Ptolemy, the Copernican revolution in astronomy
Readings: Osler pp. 42-52, Copernicus in Matthews pp.33-44, PDF Osiander (2pp.)

Week 4: Copernicus to Galileo
Readings: Osler ch. 2 pp.52-60, Galileo in Matthews pp. 53-55, 61-76

Week 5: Galileo, mechanics, and motion
Readings: Osler ch. 3, PDF more Galileo from the Dialogues (6pp.)

Writing assignment #1 due on Monday Sept 27 by 10pm
Week 6 Role of magical traditions (numerology, sympathies…), overview of mechanism
Readings: PDF Henry on magic pp.56-65, Galileo's "The Assayer" in Matthews pp.56-61, Osler ch. 4 [Suggested: PDF Bayle contra astrology (4pp.)]

Week 7 Descartes: Introduction
Readings: Descartes in Matthews, pp.87-97, PDF Descartes' letter to Mersenne (1pp.), PDF Descartes Principles Part 1 (For Part 1 you can just read the section headings, except pay closer attention to sections 17, 18, 28, 30, 51-56, 63-72).

Week 8 Descartes: founding mechanism on metaphysics; geometrical matter, motion, method
Readings: PDF Descartes Principles Part 2 (Read all of Pt. 2 in the PDF, not just the section headings), Descartes in Matthews pp. 99-105, PDF Descartes gravity (4pp.), PDF Descartes hypotheses and elements (4pp.), Descartes in Matthews pp. 105-8, PDF end of Principles (2pp.)

Week 9 Boyle's articulation and defense of mechanism
Readings: PDF Boyle from Origin of Forms and Qualities, Matthews pp.109-111.

Week 10 Boyle; alchemy and chemistry
Readings: Osler ch. 6, Boyle in Matthews pp.111-123, PDF Boyle on final causes (3pp.)

Week 11 Anti-mechanism: More and Cavendish; beginning Newton

Readings: PDF Margaret Cavendish, PDF Henry More (6pp.), Newton in Matthews, pp.133-139, 146-158

Week 12 Newtonian gravity (Is the *Principia* a mathematics with no physics?) and the scientific revolution
Readings: PDFs of correspondence with Bentley (11pp.) and with Leibniz (12pp.), Osler ch. 8
Writing assignment #2 due Wednesday by 8pm

Week 13 Leibniz-Clarke correspondence (metaphysical, theological, physical disputes surrounding Newton)
Readings: Introduction plus pp.4-35 of the Leibniz-Clarke Correspondence.

Week 14 du Châtelet and review
Readings: PDF Émilie du Châtelet: hypotheses and scientific method

Final exam: according to the registrar's schedule

New Theme Course Submission Form

2660 The Scientific Revolution and Modern Philosophy

Submitted for approval for the new theme Number, Nature, and Mind

Background Statement

As described in the syllabus, Philosophy 2660 is concerned with the rich variety of intellectual factors propelling developments in natural philosophy (science) in the period of the seventeenth century typically referred to as the Scientific Revolution. The course considers the interplay of metaphysics, theology, methodology, and magical/experimental traditions in developments and debates about motion and matter, culminating in Newton's tremendously successful and extremely controversial *Principia Mathematica*. A strong theme throughout is the role of mathematics in science, which is newly highlighted and clarified in the early modern period. Specific issues include:

- Pythagoreanism as a key spur to scientific development: to what extent and under what conditions should we view this as a clarification of optimal scientific method or as quasi-mystical (numerology)?
- Mathematical vs physical astronomy (What is the distinction, why did it develop, what were the results?)
- Developments in mathematics and new appreciation of what Aristotle called the mixed mathematical sciences as a spur to revolutionary developments in the seventeenth century
- Mathematization in Galileo's mechanics (which helped vindicate Copernicanism)
- Descartes' geometrical conception of matter, which became a paradigm for modern mechanism
- Controversies over Newton's *Principia Mathematica*: Why did Newton's critics assert that Newton provided a mathematics but no physics?
- The role of mathematics in scientific methodology

Mastery of the material will be assessed on the basis of weekly discussion posts, wherein students engage with the reading, class participation (typically focused on the weekly discussion questions), two short papers, and a final exam.

Overview

Each category of the General Education (GE) has specific learning goals and Expected Learning outcomes that connect to the big picture goals of the program. Expected Learning Outcomes (ELOs) describe the knowledge or skills students should have by the end of the course. Courses in the GE Themes must meet the ELOs common for **all** GE Themes and those specific to the Theme, in addition to any ELOs the instructor has developed specific to that course.

The prompts below provide the goals of the GE Themes and seek information about which activities (discussions, readings, lectures, assignments) provide opportunities for students to achieve the ELO's associated with that goal. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The specifics of the activities matter—listing "readings" without a reference to the topic of those readings will not allow the reviewers to understand how the ELO will be met. However, the panel evaluating the fit of the course to the Theme will review this form in

conjunction with the syllabus, so if readings, lecture/discussion topics, or other specifics are provided on the syllabus, it is not necessary to reiterate them within this form.

Goals and ELOs shared by *all* Themes

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Goal 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

For each of the ELOs below, please identify and explain course assignments, readings, or other activities within this course that provide opportunity for students to attain the ELO. If the specific information is listed on the syllabus, it is appropriate to point to that document. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

ELO 1.1 Engage in critical and logical thinking.	This is a central goal of every philosophy class. Specifically, students will analyze and evaluate the scientific, philosophical, mathematical, and theological views that they encounter. This will be reinforced by all the components of the class, especially lecture, discussion posts/reading responses, in class discussions, and the two papers.
ELO 2.1 Identify, describe, and synthesize approaches or experiences.	This course in intrinsically synthetic, in that it is concerned to identify and analyze a period in history where a number of intellectual traditions intersected and produced dramatic developments. Students will be engaged in charactizing the theorizing and understanding their interactions.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	This ELO will be met through the structure of the class, especially by in class discussions and activities that build on previously submitted discussion posts/reading responses, and by the two papers, which move from considering a single text in the first paper to analyzing relations among connected texts in the second paper.

Course subject & number

Goals and ELOs of the GE Theme: Number, Nature, and Mind

GOAL 1: 1. Successful students will analyze the nature of mathematics and/or mathematical reasoning at a more advanced and in-depth level than in the Foundations component.
GOAL 2: Successful students will integrate approaches to number, nature, and mind by making connections to their own experience of mathematical thinking and its application in the world, and by making connections to work they have done in previous classes and/or anticipate doing in the future.
GOAL 3: Successful students will experience and examine mathematics as an abstract formal system accessible to mental manipulation and/or mathematics as a tool for describing and understanding the natural world or human cognition.

Enter your ELOs in the Table below, editing and removing rows as needed. There should be at least one ELO for each goal, and they should be numbered to correspond to the goal (e.g., ELO1.1 is the first ELO for Goal 1, ELO 2.2 would be the second ELO for the second goal).

For each ELOs, please identify and explain course assignments, readings, or other activities within this course that provide opportunity for students to attain the ELO. If the specific information is listed on the syllabus, it is appropriate to point to that document. The number of activities or emphasis within the course are expected to vary among ELOs. Examples from successful courses are shared below.

ELO 1.1 Engage in critical and logical thinking about the nature and/or application of mathematical reasoning.	As described in the syllabus and background statement, students will be engaged throughout the course in thinking about the role of mathematics in developments in natural science, especially in the seventeenth century. Salient examples include: Week 2 includes discussion of Aristotle on the difference between mathematics and physics. Week 3 considers the division between physical and mathematical astronomy created by the tension between Ptolemaic mathematical models and Aristotle's physics of the heavens. Week 5 requires students to consider how Galileo's mathematical science of motion helps address challenges to Copernicanism. Week 6 considers the role of Pythagoreanism/numerology in the scientific revolution, thus underlining the thought that the search for mathematical patterns in nature, while often productive, needn't always be so. Week 8 encourages analysis of what it means to regard bodies as the objects of geometry made real, as Descartes influentially did. Week 12 and following concludes the class with controversies surrounding Newton's *Principia Mathematica*, which again foreground the question of the

	distinction between (and relation between) physics and mathematics.
ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the philosophical and/or cognitive foundations of mathematics and/or the application of mathematics in understanding the natural world or human cognition.	As just detailed (in 1.1 above), the course systematically engages with the application of mathematics in understanding the natural world. Students will engage with that application in an in-depth and scholarly fashion by reading original, primary texts (e.g. Aristotle, Galileo, Descartes, Newton), as well as discussions by scholars in the history of science and history of philosophy (Osler, Henry, Kuhn). They will engage critically with and evaluate the views they encounter, through discussion posts, in class discussion, papers, and the final exam.
ELO 2.1 Identify, describe, and synthesize approaches to or experiences of the role of mathematics and mathematical reasoning in different academic and non-academic contexts.	Students will be challenged to identify, compare, and evaluate different views, explicit or implicit, about the role of mathematics in science held by a variety of authors, both academic and non-academic.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	This ELO will be met through the structure of the class, especially by in class discussions and activities that build on previously submitted discussion posts/reading responses, and by the two papers, which move from considering a single text in the first paper to analyzing relations among connected texts in the second paper.
ELO 3.1 Analyze and describe how mathematics functions as an idealized system that enables logical proof and/or as	This course will analyze and describe how views about the place of mathematics in natural science have been debated and have evolved, with the seventeenth century being a key locus of controversy and change.

a tool for describing and understanding the natural world or human cognition.	