AUBURN UNIVERSITY

SYLLABUS

1. Course Number: CTSE 5110/6110

Course Title: Perspectives in Science

Credit Hours: 3 Semester Hours (LEC 3)

Prerequisites: None

Corequisites: None

2. Term: Fall 2024

Day/Time: TBA

Place: Haley 2462

Instructor: Dr. Christine Schnittka

Office Address: 5072 Haley Center

Contact Information: [schnittka@auburn.edu](mailto:schnittka@auburn.edu) or (334) 844-8277

Office Hours: By appointment. Email me and we will set something up. I will generally be in my office Monday and Tuesday afternoons in case you want to stop by. In case we need to have a Zoom meeting, meet me here: <https://auburn.zoom.us/my/schnittka>

**3.** Texts**: No specific text is required.**

Required primary and secondary source readings listed in the schedule below will

be posted on our course’s Canvas site, which can be accessed from the Auburn University website ([www.auburn.edu](http://www.auburn.edu)). An orientation can be provided if necessary.

We will also refer a free online handbook for students of history:

Rael, Patrick. Reading, Writing, and Researching for History: A Guide for College Students. Brunswick, ME: Bowdoin College, 2004. hcps://courses.bowdoin.edu/wri=ng-guides

1. **Course Description:**

Perspectives on Science is an overview and introduction to the scholarly field of science history with applications for embedding historical stories and discoveries into today’s secondary science classrooms. Whenever possible, we will read excerpts from texts that were formative in the development of the history of science (such as Kuhn’s widely read book, The Structure of Scientific Revolutions), as well as diaries, letters, and other primary sources that represent the various methods used by scientists across the world. Guest speakers who have expertise in various fields will add diverse perspectives to our study. We will investigate science around the world, throughout time, and in a variety of cultures. From paleobotany and alchemy to Darwin and Newton, from the Aztecs and Maya to India and the Levant, we will delve into many of the overarching themes in the history of science such as our place in the universe, the age of the Earth, electricity, the diversity of life on Earth, and human health. Our focus throughout the semester will be global, recognizing that our traditional exposure to science history has been profoundly selective. What is often left out is the science practiced by the unnamed “everyperson” throughout time.

1. **Student Learning Objectives:**

* SLO 1: Students will be able to articulate how scientific knowledge has developed over time and across the world in both formal and informal spaces.
* SLO 2: Students will be able to articulate the nature of science and how the nature of science relates to the processes and content knowledge of science.
* SLO 3: Students will be able to develop lesson plans which integrate the history of science into standards-based secondary science lessons.
* SLO 4: Students will participate in reenactments of historical discoveries, and be able to translate those reenactments into lab activities for secondary science students.

*CIEP Standards:*

AS 1.3

Show an understanding of state and national curriculum standards and their impact on the content knowledge necessary for teaching 6-12 students.

AS 2.3

Design instruction and assessment strategies that confront and address naïve concepts or preconceptions.

AS 5.2

Provide data to show that 6-12 students are able to distinguish science from non-science, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.

BIOL 3.7

Historical development and perspectives in biology including contributions of significant figures and underrepresented groups, and the development theories in biology.

CHEM 3.12

Historical development and perspectives in chemistry including contributions of significant figures and underrepresented groups, and the development of theories in chemistry.

PHYS 3.9

Historical development and cosmological perspectives in physics including contributions of significant figures and underrepresented groups, and development of theories in physics.

*Additional standards from the Alabama Quality Teaching Standards are as follows:*

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| **Standard 1: Content Knowledge** |
| 1.1  Demonstrate deep knowledge of subject-matter content and an ability to organize related facts, concepts, and skills |
| 1.3 Connect the curriculum to other content areas and real-life settings to promote retention and relevance |
| 1.4  Design instructional activities based on state content standards |
| **Standard 2: Teaching and Learning** |
| 2.6  Design coherent lessons that integrate a variety of instructional strategies |
| 2.8   Use formative assessments to adjust instruction |
| 2.9   Use summative assessments to measure learner attainment of specified learning targets |
| **Standard 3: Literacy** |
| 3.1   Demonstrate standard oral and written communications |
| 3.3  Use age-appropriate instructional strategies to improve learners’ skills in critical literacy components |
| 3.4  Integrate narrative and expository reading strategies across the curriculum |
| 3.7   Identify and integrate available emerging technologies into the teaching of all content areas |
| **Standard 4: Diversity** |
| 4.1 Develop culturally responsive curriculum and instruction in response to individual differences |
| 4.2  Communicate in ways that show sensitivity to diverse populations and respond appropriately to cultural, ethnic, and social differences. |
| 4.3  Demonstrate and apply to own practice an understanding of how biases can affect teaching |
| 4.7  Understand and recognize the characteristics of exceptionality |
| 4.8 Facilitate inclusive learning environments that support and address the needs of learners with learning differences and disabilities |
| 4.10 Design learning experiences that engage all learning **preferences** |
| **Standard 5: Professionalism** |
| 5.2   Participate in professional growth opportunities to improve teaching practice |
| 5.4  Promote professional ethics and integrity |
| 5.5  Comply with local, state, and federal regulations and policies |

1. **Course Content (subject to change!):**

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| --- | --- | --- |
| 1 | Histories of science: Who is telling the story? An overview of perspectives from around the world | The Structure of Scientific Revolutions by Thomas Kuhn  [Kuhn’s “The Structure of Scientific Revolutions” revisited by John A. Moore](https://www.jstor.org/stable/4446944?origin=JSTOR-pdf)  Zaman, Muhammad H. “[Why Science and Engineering Need to Remind Students of Forgotten](hcps://theconversa=on.com/whyscience-%20%20and-engineering-need-to-remind-students-of-forgocen-lessons-from-history-61356.)  [Lessons From History](hcps://theconversa=on.com/whyscience-%20%20and-engineering-need-to-remind-students-of-forgocen-lessons-from-history-61356.).” The Conversation, August 15, 2016.  Paradigm activity |
| 2 | Don’t look up: From Paleolithic and Mesoamerican astronomy to the modern day | [Cosmos: An illustrated history of astronomy and cosmology by John North](https://books.google.com/books?hl=en&lr=&id=qq8Luhs7rTUC&oi=fnd&pg=PP15&dq=paleolithic+astronomy&ots=51hqZ4Mzlt&sig=XxzTAdIfBe-MD_WK04Qe-A0zPgk#v=onepage&q=paleolithic%20astronomy&f=false)  Stone Circles around the world: Wurdi Youang, Carahunge, [Nabta Playa](https://www.astronomy.com/observing/nabta-playa-the-worlds-first-astronomical-site-was-built-in-africa-and-is-older-than-stonehenge/), Taosi, and more  Egyptian Astronomy  [Chinese Astronomy](https://www.skyatnightmagazine.com/space-science/chinese-astronomy)  Models of the Universe: Pythagoreus, Plato, Eudoxus, Aristotle, Aristarchus, and more  Galileo Galilei  Reconstructing stone circles and making telescopes  Reading Reflection 1 due |
| 3 | Go on a Mediterranean cruise: Discoveries made on all sides of the sea | Thales, Empedocles, Hippocrates, Aristotle, Aristarchus, Hipparchus, Pliny the Elder, Ptolemy, and Galen  Calculating Hipparchus’s Wobble of the Earth, Aristarchus’s size of the moon, and Hipparchus’s distance to the Moon. |
| 4 | Middle Eastern science in the Islamic world | House of Wisdom  Al-Jahiz, Al-Kindi, Al-Razi, Ibn Sina, Al-Tusi  Canon of Medicine by Ibn Sina: <https://archive.org/details/the-canon-of-medicine-volume-1>  Papermaking activity  Essay 1 due |
| 5 | Science in the Subcontinent: India’s role in scientific understandings | [What the Ancients Knew](https://youtu.be/BYliGp8FyHc)  [Aspects of prehistoric astronomy in India by Kameswara Rao](http://14.139.159.168/bitstream/handle/2248/796/3305499_511.PDF?sequence=1&isAllowed=y)  Indus Valley, Rigveda, Sushruta Samhita, Kanada, Charaka, Aryabhata, Varahamira, Brahmagupta, Rasayana  Indigo dyeing |
| 6 | Mother Earth, how old are you? Investigations into the age of the Earth | <https://www.jstor.org/stable/27848511>  Nicholaus Steno  Georges-Louis Buffon, Jean Fourier, Charles Lyell, Kelvin, Darwin, Becquerel, Joly, Rutherford, Boltwood, Holmes, and Clair Patterson  <https://archive.org/details/buffon0243fell/page/n5/mode/2up>  Reflection Questions 3 due |
| 7 | The Great Rift: History of science on the African continent | [What do science, technology, and innovation mean from Africa? By Clapperton Chakanetsa Mavhunga](https://mitpress.mit.edu/9780262533904/what-do-science-technology-and-innovation-mean-from-africa/)  Chemistry  Astronomy  Timbuktu  Traditional medicine  Agricultural discoveries  Reflection Questions 4 due |
| 8 | Medical mysteries and discoveries | Galen  William Harvey: <https://archive.org/details/worksofwilliamha01harv>  [A Short History of Medicine by Erwin Ackerknecht](https://books.google.com/books?hl=en&lr=&id=Mc3PCwAAQBAJ&oi=fnd&pg=PR7&dq=medicine+in+history&ots=R0DumdDnWu&sig=lzCjpZikIGuCcVLCjx7E_N-QMsM#v=onepage&q=medicine%20in%20history&f=false)  [A History of Medicine by Arturo Castiglioni](https://www.taylorfrancis.com/books/mono/10.4324/9780429019883/history-medicine-arturo-castiglioni) |
| 9 | European discoveries and innovations during the Renaissance | Alchemy  [Leeuwenhoek](https://www.jstor.org/stable/101758?origin=JSTOR-pdf#metadata_info_tab_contents)  Descartes, Renee. Discourse on the Method of Rightly Conducting one’s Reason and Seeking Truth in the Sciences (1637).  Hooke’s Micrographia: <https://archive.org/details/micrographia_1906_librivox>  Copernicus  Giordano Bruno: <https://archive.org/details/giordanobruno00mcinuoft>  Discourse on Method, Optics, Geometry, and Meteorology by Rene Decartes  Sidereus Nuncias by Galileo Galilei  Darwin, Charles. On the Origin of Species, 1st ed, v-6, 459-490. London: John Murray, 1859. |
| 10 | It’s electrifying: A history of electricity from Thales to Tesla | Thales of Miletus  William Gilbert  The Leyden Jar  Franklin’s kite  Luigi Galvani  Allesandro Volta  Humphrey Davy  Andre Ampere, Hans Christian Oersted Georg Ohm, and Joseph Henry |
| 11 | Miners, midwives, and crafters: Delving into the everyday science of people throughout history | Readings from: A people’s history of science: Miners, midwives, and “low mechanicks” by Clifford D. Connor (2005).  Soap, Candles, Pottery, Natural Dyes, and more |
| 12 | Coal in the 20th century: How coal fueled science, and how science fueled innovation | [Progress of coal science in the 20th century by van Heek](https://www.sciencedirect.com/science/article/pii/S0016236199001908?casa_token=DHg_mMyIcRAAAAAA:hhQyIDSX8qH8ORZYmCzvf_8lF3skfOrVgiIjBsF5OVWnVrOTbb_JO_hyUsXslzA5sJPGP0YNh80) |
| 13 | Confucius says: Early science in the East | [What the Ancients Knew: Japan](https://youtu.be/9RsMLlrXiOM)  [Chinese alchemy and the manipulation of time by Sivin](https://www.journals.uchicago.edu/doi/abs/10.1086/351666?casa_token=SksTM_LYyD8AAAAA:sNzsjxt230hendkt2HDTD5Oyp0SdijQw6h15hKfx-QwUXb0Vs-OG1wo3AVPxCrJSFj-QNrTCyOWS) |
| 14 | Unsung heroes: Uncovering the stories of women who contributed to scientific advancement | Descent of woman by Elaine Morgan  Silent Spring by Rachel Carson  Mary Anning  Caroline Herschel  Dorothy Hodgkin  Barbara McClintock  Lise Meitner  Rosalind Franklin  Jocelyn Bell Burnell |
| 15 | History of science meets history of education: How science history has been traditionally taught in schools | [Fostering the history of science in American science education by James Rutherford](https://link.springer.com/chapter/10.1007/978-94-010-0730-6_4)  [Science instruction with a humanistic twist by Wang and Marsh](https://link.springer.com/article/10.1023/A:1014455918130) |

**Final Exam: Tuesday, December 10th 1:30 – 3:30**

1. **Assignments/Projects**

*Participation*

Participation means active involvement in class discussion and activities, both in lecture and

discussion sections. To be prepared, you must actively read and take notes on the assigned

texts, as well as physically bring your notes to class. In class, good participation

means speaking up to ask and answer questions, taking notes, and collaborating with

classmates in group activities.

*Reading Comprehension/Reflection Questions*

Seven times during the semester you will respond to a set of questions to guide you active reading of course material. Some questions will assess your comprehension of assigned readings, others will ask you to reflect on and synthesize historical material. Questions may draw on readings up to and including those scheduled for the upcoming class day. In general,

these will be submitted on Canvas. A 5% deduction applies for each day late. SLO 1. SLO 2.

*Essays*

Throughout the semester, you will write 3 short (750-1,000 word) essays that will ask you to

apply historical research and thinking to a problem related to science teaching. In these, you

will demonstrate your historical skills in evaluating evidence and constructing sound

arguments, however these will not take the form of traditional history class essays. Rather,

they will be real-world writing assignments geared toward developing your ability to

communicate in public and professional contexts as a science educator. Essays will be

submitted on Canvas, due at the beginning of the class period. A 5% deduction applies for

each day late. SLO 1. SLO 2.

*Peer Review*

You will engage in peer review of others’ lesson plans or projects in order to help each other and provide evidence of validity, as well as practice reflecting on quality instruction.

*5E Lesson Plans*

A key take-away from this class will be two lesson plans. In them, you will apply an historical perspective to enhance public understanding of a science concept, the nature of science, and/or the role of science in society. This project includes a presentation to your classmates, with peer review and revisions. The lesson plans will demonstrate your mastery of the research, communication, and historical thinking skills developed throughout the course. SLO 3. SLO 4.

1. **Rubric and Grading Scale:**

Any assignment presented or turned in late will be penalized 5% for each day late. Late assignments presented or turned in late after two days will not be accepted without prior approval of the instructor. Why do teachers want assignments turned in on time? Grading each set all at once adds validity and reliability to the grades you receive.

Participation at 5 points per week = 75 points

Reading reflections at 10 points each = 70 points

Essays at 15 points each = 45 points

Lesson plan draft 1 = 25 points

Lesson plan draft 2 = 25 points

Peer review = 10 points

Final lesson plan 1 = 25 points

Final lesson plan 2 = 25 points

Final exam = 100 points

Total points = 400 points

The final grade will be determined by the following grading scale:

A = 360 – 400 points, B = 320 – 359 points, C = 280 – 319 points, D = 260 – 279 points, F = below 260 points.

Note: Although it is possible to make a grade of “D” in this class, a student receiving any grade below “C” must retake the class to matriculate through the program and gain certification.

1. **Class Policy Statements:**

A. Participation: Students are expected to participate in all class discussions and participate in all exercises.

B. Assignments: It is the student’s responsibility to contact the instructor if assignment deadlines are not met. Students are responsible for initiating arrangements for missed work, if extensions are given for very difficult situations. If work is not turned in on time, points will be deducted. Showing up to your teaching job without your lesson plans ready results in CHAOS! So, you have a week to get your assignments done. Do not wait until the day before they are due. Things always seem to happen the day before something is due. Plan ahead.

C. Excused Absences: Attendance is required at each class meeting. **If you cannot attend class, contact your instructor immediately** and explain the situation. Students are granted excused absences from class for the following reasons:  Illness of the student or serious illness of a member of the student’s immediate family, the death of a member of the student’s immediate family, trips for student organizations sponsored by an academic unit, trips for university classes or research presentations, trips for participation in intercollegiate athletic events, subp court appearance, and religious holidays.  Students who wish to have an excused absence from this class for any other reason must contact the instructor in advance of the absence to request permission. The instructor will weigh the merits of the request and render a decision. Students must arrange to have the class videotaped for later watching if any absence is planned, or if you are ill and cannot attend class in person, or out of town on a trip, you may virtually attend class via Skype, Zoom, FaceTime, etc. if at all possible and if the professor is notified in advance. Unexcused absences will result in points deducted from the participation grade. Appropriate documentation for all excused absences is required. Please see the [Student Policy eHandbook](http://www.auburn.edu/student_info/student_policies/) for more information on excused absences (<http://www.auburn.edu/student_info/student_policies/>). Email documentation to your professor as soon as it is acquired.

D. Make-Up Policy: If an exam or assignment is missed, a second chance will be given only for university-approved excuses as outlined in the Student Policy Handbook [www.auburn.edu/studentpolicies](http://www.auburn.edu/studentpolicies) . Arrangement to take the make-up exam or turn in assignments late must be made in advance or as soon as possible if illness occurs. Students who miss an exam or assignment because of illness need a doctor’s statement for verification of sickness and should clear the absence with the instructor the day they return to class. Late, unexcused assignments should be turned in for feedback, even when points are deducted.

E. Unannounced quizzes: There may be unannounced quizzes on the reading assignments. Quiz scores will be averaged in with Reflections on Reading Assignments. Why do teachers give pop quizzes? Motivation to stay up with the readings. Life is full of pop quizzes. It’s awful to be caught unprepared in life.

F. Disability Accommodations: Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged

To set up this meeting, please contact me by e-mail. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V/TT).

G. Honesty Code: All portions of the Auburn University student academic honesty code (Title XII) found in the [*Student Policy eHandbook*](http://www.auburn.edu/student_info/student_policies/) will apply to this class.  All academic honesty violations or alleged violations of the SGA Code of Laws **will** be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee. Assignments WILL be run through the university’s plagiarism detector. If you use someone else’s idea, cite and reference it. If you need to use someone else’s words, cite them, add a reference, and put the words in quotation marks. Plagiarism is a moral and legal minefield (Park, 2010). Plagiarism is a SERIOUS issue, and all incidents will be reported to the Office of the Provost. If you plagiarize, I can’t help you learn. My job is to help you learn. I hope you deal seriously with plagiarism with your own students someday. Don’t cheat. Don’t copy. Be honest. Have integrity. Do your own work. Neither one of us wants to deal with this. (What I put above in parentheses is a citation, and below, is a reference. Get used to doing this. Google Scholar makes it easy to copy and paste the APA reference.)

Park, C. (2003). In other (people's) words: Plagiarism by university students--literature and lessons. *Assessment & evaluation in higher education*, *28*(5), 471-488.

F. Course contingency: If normal class and/or lab activities are disrupted due to illness, emergency, or crisis situation, the syllabus and other course plans and assignments may be modified to allow completion of the course. If this occurs, and addendum to your syllabus and/or course assignments will replace the original materials. If class is cancelled, a notice will be sent out over Canvas, so make sure your settings route all announcements to your email.

G. Professionalism: As faculty, staff, and students interact in professional settings, they are expected to demonstrate professional behaviors as defined in the College’s conceptual framework. These professional commitments or dispositions are listed and paraphrased below. See the Lab Manual for more details:

* Engage in responsible and ethical professional practices in class, in schools, and in the community. *Behave yourself in the schools, and in the community. Follow the rules. Do not break laws. Be a role model.*
* Contribute to collaborative learning communities in class and in schools. *Get along with the teachers and staff at the schools you are in. Get along with your peers in THIS class, and your professors at THIS school.*
* Demonstrate a commitment to diversity in class, in schools, and in the community. *Respect each other. Celebrate our differences. Listen. Care.*
* Model and nurture intellectual vitality. *Care about learning. Show your students this! Demonstrate your curiosity!*

H.Health and Participation in Class

You are expected to monitor your health daily. Your health and safety, and the health and safety of your peers, are my top priorities. If you are experiencing any symptoms of COVID-19, or if you discover that you have been in close contact with others who have symptoms or who have tested positive, you must notify me. My hope is that if you are feeling ill or if you have been exposed to someone with the virus, you will stay home to protect others and arrange to participate in class virtually. Please do the following in the event of an illness or COVID-related absence:

● Notify me in advance of your absence, if possible

● Provide me with medical documentation, if possible

● Keep up with coursework as much as possible

● Participate in class activities and submit assignments remotely as much as possible

● Notify me if you require a modification to the deadline of an assignment or exam

● Finally, if remaining in a class and fulfilling the necessary requirements becomes impossible due to illness or other COVID-related issues, please let me know as soon as possible so we can discuss your options.