



GEORGETOWN UNIVERSITY
School of Continuing Studies

BLHS-031-101 – Fundamental Concepts of Modern Science

- A Historical Review of Key Concepts in Physics, Cosmology and Biology and their Interactions with Theology and Philosophy –
Provisional Syllabus

Dates: Aug 28 – Dec 20, 2019

Location: This course takes place online. Georgetown University School of Continuing Studies (SCS) uses Canvas as its Learning Management System. This course will be taught entirely through the Canvas platform. To learn more about Canvas, please go through the [Canvas Guide for Students](#).

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COURSE DESCRIPTION

Welcome to Fundamental Concepts of Modern Science (FCMS)!

Considered as a professional activity, science and technology are relatively recent products of Western European culture. In this course, we will examine the intellectual and theological developments of High Middle Ages and how the Catholic Church dogma evolved under the influence of scholasticism and in particular of great thinkers like Albertus Magnus, Roger Bacon and especially Thomas Aquinas that were able to integrate the Greek antiquity philosophy of Aristotle with the Patristic Christian metaphysics, thus creating a new understanding of the world with the confidence in human reason being brought up to its proper importance. These medieval philosophers described convincingly a view that we lived in an ordained universe based on laws that waited to be discovered and encouraged people to go out, research and study nature, use mathematics and perform experiments, thus creating an intellectual environment that helped the birth of the modern science.

Few centuries later, starting in the mid-seventeenth century a new generation of remarkable natural philosophers like Descartes, Galileo and later Newton have brought about a dramatic change in the way we understand the world and our place in it. How can we best explain why modern science began when and where it did? What forces formed it, and how - in turn - has it become a powerful agent in shaping modern life? Tackling these questions requires a historical approach, and also a view that integrates developments in science, theology and philosophy since all these domains are interrelated.

Later on, in the successful march of science, we will analyze how key discoveries/developments of Albert Einstein (relativity theory and cosmology), Niels Bohr and Werner Heisenberg (Quantum Mechanics) will bring to question the limits of understanding, and how changing views of nature have delivered new perspectives on the relationship between science, philosophy and theology.

This course will help students grasp fundamental scientific concepts developed over more than eight hundred years; these concepts are essential in the understanding of our contemporary world. The students will also have an opportunity to understand how and when the so-called “conflict between science and religion” originated and its evolution through the Galileo conflict until present. Through classroom lectures and discussions, reading assignments, student presentations and issues debates, we will address the complex evolution of arguments at every step of discoveries of scientific concepts about our world and in the process we will review and gain appreciation of one of the most exciting intellectual endeavors ever. This extraordinary display of substantive and original ideas which this debate generated for centuries continues today and allows us to enrich the understanding of our present universe from the smallest subatomic particle to the Big Bang expansion of the cosmos and challenges us to make our own judgment about the meaning of it all

COURSE LEARNING OBJECTIVES

See below the objectives of the course. By the end of the course, students will be able to:

1. Analyze and discuss why and how science has become such a powerful component of modern culture;
2. Perform diligently and complete the assignments (required readings, essays, debates) and in this way demonstrate the ability to describe and analyze the fundamental scientific concepts and advances made from the High Middle Ages until present time, which will enrich their knowledge of the world.
3. Analyze and evaluate the fundamental concepts in the knowledge of the world created during the Scientific Revolution by science giants like Copernicus, Galileo, Kepler and Newton; as such, students should be able to argue and defend the decisions made by creators of new concepts and theories in those very complex and contradictory social and political environments.
4. Analyze and differentiate the subtle aspects of the relationship between science and technology.
5. Summarize and explain the major modern scientific discoveries about the micro (atomic theory) and macro (cosmology) structure of the fabric of the world including the Big Bang concept of our universe and describe and compare different models developed by the great scientists of the time .
6. Examine, analyze and debate the essence of contemporary controversies between theistic and materialist/physicalist interpretations of major discoveries in physics and cosmology of the last hundred years (relativity theory, quantum realities, Big Bang theory about the origin of the universe, multiverses, anthropic principle, etc.) and develop the ability to separate within the debating parties the arguments based on real physical measurements from the purely speculative ones

In addition to the previous objectives, students will further develop their writing, oral communication, and analytical skills. Specifically, students will be expected to:

1. Write clear, precise papers that develop stringent arguments and provide solid evidence for their claims.
2. Orally present their ideas in a logical and cogent style; develop and exercise debate skills.
3. Examine historical explanations, perform a thorough evaluation of facts and exercise critical judgments about science developments in the context of the social, political and religious environment (see the Galileo trial)
4. Develop the skills of oral communication, writing, and critical thought
5. Foster an environment where ideas might be shared and discussed openly and cogently

REQUIRED READINGS

The following are the required reading material for this course:

1. Peter J. Bowler and Iwan Rhys Morus, Making Modern Science, A Historical Survey (**MMS**), 2005, The University of Chicago Press, ISBN-13: 978-0-226-06861-9, ISBN10: 0-226-06861-7
2. Gary Ferngren (editor), Science and Religion; A Historical Introduction (**SAR**), The John Hopkins University Press, 2002, ISBN-10: 0-8018-7038-0
3. All other required readings (both primary and secondary sources) will be provided (as .pdf files) on Canvas as part of the weekly packets

COURSE REQUIREMENTS

Technical Requirements

As an online student your "classroom" experience will be very different than a traditional student. As part of your online experience, you can expect to:

1. Communicate via email including sending attachments.
2. Navigate the internet using a Web browser.
3. Use office applications such as Microsoft Office or Google Docs to create documents..
4. Learn how to submit assignments in Canvas.
5. Communicate with peers using discussion boards and other platforms.
6. Upload and download saved files.
7. Have easy access to the Internet.
8. Navigate Canvas, including using the email component within Canvas.
9. Use a microphone to record audio through your computer.
10. Use an internal or external camera to record video through your computer.

In this course we will use VoiceThread, TurnItIn and Zoom.

- VoiceThread is a tool that enables teachers and students to upload and asynchronously present images, video, and/or other media and respond to others presentations with audio, video, and/or text comments. [Instructions for VoiceThread are available here.](#)
- TurnItIn is a writing assessment tool that is used to detect plagiarism and allows teachers to provide assignment feedback to students. [Instructions for TurnItIn are available here.](#)
- Zoom enables users to conduct synchronous ("real-time") conferences, presentations, lectures, meetings, office hours and group chats via audio, video, text chat and content sharing. [Instructions for Zoom are available here.](#)

Computer Requirements

Students need to have sufficient technology and Internet access to complete this course. The requirements are listed by [Canvas in the Instructure Guides.](#)

Audio and Video Capability

- You will need an internal or external microphone. Most computers now come with them built in.
- You will need an internal or external camera. Most computers now come with them built in.

COURSE EXPECTATIONS

This course is conducted entirely online, which means students do not have to be on campus to complete any portion of it. Students will participate in the course using Georgetown University's online learning management system called Canvas.

Student Expectations

This course consists of 15 weeks. You are expected to do the readings, watch the lecture videos, and to engage with the course material in depth. Your responsibilities include completing all the assignments. Participation is essential to your success in this class. In order to get full credit for participation, you will have to complete all of your discussions.

Time Expectations

Our online classes are designed to meet the same academic standards as our place-based (face-to-face) courses. You can think of each module equal to the same level of participation, commitment, and academic rigor as a face-to-face class. Students should plan on spending approximately 2-5 hours per week on the work for each online module.

ACADEMIC INTEGRITY

All students are expected to maintain the highest standards of academic and personal integrity in pursuit of their education at Georgetown. We assume you have read the honor code material located at <http://scs.georgetown.edu/academic-affairs/honor-code>, and in particular have read the following documents: Honor Council Pamphlet, What is Plagiarism, Sanctioning Guidelines, and Expedited Sanctioning Process. Papers in this course will all be submitted to turnitin.com for checking. Academic dishonesty in any form is a serious offense, and students found in violation are subject to academic penalties that include, but are not limited to, failure of the course, termination from the program, and revocation of degrees already conferred. All students are held to the Honor Code.

The Honor Code pledge follows:

In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Georgetown University Honor System: To be honest in any academic endeavor, and To conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.

Plagiarism

Stealing someone else's work is a terminal offense in the workplace, and it will wreck your career in academia, too. Students are expected to work with integrity and honesty in all their assignments. The Georgetown University Honor System defines plagiarism as "the act of passing off as one's own the ideas or writings of another." More guidance is available through the [Gervase Programs](#). If you have any doubts about plagiarism, paraphrasing, and the need to credit, check out [Plagiarism.org](#).

COURSE ACTIVITIES AND ASSIGNMENTS

Written work is due by the assigned due date on Canvas. **DO NOT SEND YOUR PAPERS TO OTHER PERSONAL OR PROFESSIONAL EMAIL ADDRESSES.** Follow-ups and class participation are contingent on the timely submission of your initial responses.

Late Submission Policy:

As stated in the [Student Handbook](#), you must notify me and obtain my approval if you are unable to complete any assignment by the published submission deadline. I will gladly consider granting extensions for assignments as long as the request is made at least 24 hours before the due date/time. The request must include the date and time when you intend to submit the assignment. If you fail to give both a date and a time, however, the request will not be honored. However, no late submissions or extensions are available for the last week of class or for any missed lectures. Late responses with no previous arrangements for all assignments will be penalized by 10% for each day or portion of a day that the assignment is late, unless previous arrangements have been made.

Discussions and Assignments

Assignment1 is 10% of final grade: Essay: The Role of St Thomas Aquinas in the birth of the Modern Science Due week4
Assignment 2: is 15% of final grade: Test1: material covered in wk1 - 3 Due week 4
Assignment3: is 15% of final grade Essay: The Galileo Affair – debate Due: week6
Assignment4: is 15% of final grade Test2: wk4 -6

Due wk7
Assignment 5: is 15% of final grade Essay: The Darwinian Debates Due week 9
Assignment 6: is 15% of final grade Test3: 20 th century physics and cosmology Due week 12
Assignment 7: is 15% of final grade Essay: Historical overview of the relationship between science and Church doctrine Due week 15

Citation Style

This course uses APA or Chicago style for all writing and research assignments. Resources for this citation style are available through

[Georgetown Library Citation Guide](#)

[APA Style Guidebook](#)

GRADING

Grading in this course will be determine by the following grading scale:

- A: 93% to 100%
- A-: 90% to 92%
- B+: 87% to 89%
- B: 83% to 86%
- B-: 80% to 82%
- C+: 77% to 79%
- C: 73% to 76%
- C-: 70% to 72%
- D+: 67% to 69%
- D: 63% to 66%
- F: 62% and below

ACCOMMODATIONS

Under the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, individuals with disabilities are provided reasonable accommodations to ensure equity and access to programs and facilities. Students are responsible for communicating their needs to the Academic Resource Center,

the office that oversees [disability support services](#), (202-687-8354; arc@georgetown.edu;) before the start of classes to allow time to review the documentation and make recommendations for appropriate accommodations. The University is not responsible for making special accommodations for students who have not declared their disabilities and have not requested an accommodation in a timely manner. Also, the University need not modify course or degree requirements considered to be an essential requirement of the program of instruction. For the most current and up-to-date policy information, please refer to the [Georgetown University Academic Resource Center website](#). Students are highly encouraged to discuss the documentation and accommodation process with an Academic Resource Center administrator.

STUDENT SUPPORT SERVICES

Support Services

SCS offers a variety of support systems for students that can be accessed online, at the School of Continuing Studies downtown location, and on the main Georgetown campus:

- [Academic Resource Center](#)
- 202-687-8354 | arc@georgetown.edu
- [Counseling and Psychiatric Services](#)
- 202-687-6985
- [Institutional Diversity, Equity & Affirmative Action \(IDEAA\)](#)
- (202) 687-4798

Georgetown Library

Students enrolled in online School of Continuing Studies SCS coursework have access to the University Library System's eResources, including 500+ research databases, 1.5+ million ebooks, and thousands of periodicals and other multimedia files (films, webinars, music, and images). Students can access these resources through the [Library's Homepage](#) by using their University username (NetID) and password (this is the same login information used to access email, BlackBoard, etc.). The Library does not mail physical items to students.

SCS students may make an appointment with a librarian to discuss a research topic, develop a search strategy, or examine resources for projects and papers. Librarians offer an overview of and in-depth assistance with important resources for senior or master's theses, dissertations, papers and other types of research. Appointments are conducted using Google Hangout (video-conferencing function) through the Georgetown Gmail System or by telephone. This service is available to currently enrolled students who need assistance with Georgetown-assigned projects and papers. Please review the [Services & Resources Guide for Online Students](#) for additional information.

Research Guide

The Project Management program has an extensive online [Library Research Guide](#) designed for the subject and research specifications of our program. This Guide will give you direct access to the library resources central to your course research work.

Learning Resources

SCS offers a host of [learning resources](#) to its students. Two that you might find particularly helpful in this course are the [Writing Center](#) and [Refworks](#).

- The [Writing Center](#) offers professional writing support through its online peer tutoring service.
- [Refworks](#) is an online research management tool that aids in organizing, storing, and presenting citation sources for papers and projects.

Technical Support

Click on the Help link (on the bottom-left corner in Canvas) to reach Canvas Support, including the [Canvas Student Guide](#) and 24 hour Canvas Support Hotline at 855-338-2770.

In this course we will use VoiceThread, TurnItIn and Zoom.

- VoiceThread is a tool that enables teachers and students to upload and asynchronously present images, video, and/or other media and respond to others presentations with audio, video, and/or text comments. [Technical support for VoiceThread is available.](#)
- TurnItIn is a writing assessment tool that is used to detect plagiarism and allows teachers to provide assignment feedback to students. [Technical support for TurnItIn is available.](#)
- Zoom enables users to conduct synchronous (“real-time”) conferences, presentations, lectures, meetings, office hours and group chats via audio, video, text chat and content sharing. [Technical support for Zoom is available.](#)

COMMUNICATIONS GUIDELINES

Netiquette Guidelines

To promote the highest degree of education possible, we ask each student to respect the opinions and thoughts of other students and be courteous in the way that you choose to express yourself. The topics in this course can be controversial and promote debate. Students should be respectful and considerate of all opinions.

In order for us to have meaningful discussions, we must learn to genuinely try to understand what others are saying and be open-minded about others’ opinions. If you want to persuade someone to

see things differently, it is much more effective to do so in a polite, non-threatening way rather than to do so antagonistically. Everyone has insights to offer based on his/her experiences, and we can all learn from each other. Civility is essential.

Statement of Student Conduct, Civility, and Engagement

The School of Continuing Studies offers students the opportunity to engage with faculty, staff, and peers in ways that foster intellectual growth and development in their chosen field of study. It is important to recognize that each member of our community brings his or her own values, thoughts, perspectives, and experiences into each interaction. We expect students to behave in a manner that is civil and respectful of others, and appreciate the learning opportunities that come from engaging pluralistic perspectives in a dynamic educational environment.

Engagement within the SCS Georgetown community takes places in on-campus meeting spaces and classrooms, and extends to online learning platforms and forums. Students should be particularly mindful that participation in class discussions, group assignments, emails, blogs, and social media reflect upon them personally, academically, and professionally. All viewpoints, editorials, and opinions expressed by students represent those students exclusively – and not the students' instructors, classmates, academic program, School, or University – even in cases when students are using Georgetown-affiliated systems like email, blogs, and online portfolios. The expectations for respect and civility are consistent for on-campus classes and spaces, as well as cyber, virtual, and online environments. Thus, civility and cybercivility are expected of all students, in all campus spaces.

SCS students are expected to adhere to the SCS guidelines for student conduct and the University Code of Student Conduct. In the event that a student's behavior is perceived to fall outside the stated SCS guidelines or may be a violation of the Code of Student Conduct, the matter may be referred to the Office of Student Conduct for further review and possible sanctioning. Such instances can include but are not limited to: disruption of official university functions (including teaching, research, administration), failure to comply with a directive issued by a University official, harassment and bullying, and incivility. For questions regarding the SCS student conduct expectations please review the policy in-full found in the [Bachelor of Arts in Liberal Studies Undergraduate Bulletin](#). For questions about the Code of Student Conduct, please review the information provided by the [Office of Student Conduct](#).

Communication with Peers

Notifications

In this course we will use Canvas to send email for private messages. You can either check your messages in the Canvas system or set your notifications to your preferred method of contact. Please check your messages at least once per day. When submitting messages, please do the following:

- Put a subject in the subject box that describes the email content with your name and module.
- Do not send messages asking general information about the class, please post those in the General Questions Discussion Board Forum.

Questions Forum

In online courses, everyone will likely have many questions about things that relate to the course, such as clarification about assignments and course materials. Please post these in the General Question Discussion Board Forum, which you can access by clicking Discussions in the course navigation menu. This is an open forum, and you are encouraged to give answers and help each other.

Turnaround and Feedback

If you have a concern and send me a message, you can expect a response within one business days. Please allow two business days for assessment submission feedback.

Extreme weather, Emergencies, and Instructional Continuity

During inclement weather or other emergencies on a day when we are scheduled to meet face-to-face, check the university's Web site or call (202) 687-7669 for information on whether the university is open. If the university is open, this class will meet. If the university is closed, this class will meet through distance means such as online videoconferencing; check your e-mail for a message from me on how we will proceed in that situation. Due dates for written assignments submitted through Canvas will not be changed due to campus closings.

The university recently has acquired the capability to send text messages and recorded messages about emergencies to cell phones and other mobile devices. Sign up on MyAccess.

Copyright

The materials used in Georgetown University courses ("Course Materials") generally represent the intellectual property of course instructors which may not be disseminated or reproduced in any form for public distribution (e.g., sale, exchange, etc.) without the written permission of the

course instructor. Course Materials include all written or electronic documents and materials, including syllabi, current and past examination questions/answers, and presentations such as lectures, videos, PowerPoints, etc., provided by a course instructor. Course Materials may only be used by students enrolled in the course for academic (course-related) purposes.

Published course readings (book chapters, articles, reports, etc.) available in Canvas are copyrighted material. These works are made available to students through licensed databases or fair use. They are protected by copyright law, and may not be further disseminated or reproduced in any form for distribution (e.g., uploading to websites, sale, exchange, etc.) without permission of the copyright owner.

More information about intellectual property and copyright can be found here:

<https://www.library.georgetown.edu/copyright>

More information about computer acceptable use policy and intellectual property can be found here: <https://security.georgetown.edu/it-policies-procedures/computer-systems-aup>

Policy Accommodating Students' Religious Observances

The following is university policy:

Georgetown University promotes respect for all religions. Any student who is unable to attend classes or to participate in any examination, presentation, or assignment on a given day because of the observance of a major religious holiday or related travel shall be excused and provided with the opportunity to make up, without unreasonable burden, any work that has been missed for this reason and shall not in any other way be penalized for the absence or rescheduled work. Students will remain responsible for all assigned work. Students should notify professors in writing at the beginning of the semester of religious observances that conflict with their classes.

Title IX at Georgetown

<https://titleix.georgetown.edu/>

Sexual Misconduct

Title IX of the Education Amendments of 1972 ("Title IX") prohibits discrimination based on sex in any educational programs, which includes sexual harassment or any acts of sexual misconduct. Title IX requires the University, upon becoming aware of any incident of sexual harassment and misconduct to respond appropriately to protect and maintain the safety of the University community, including students, faculty, and staff.

Georgetown University prohibits sexual misconduct, including sexual harassment, sexual assault, domestic/dating violence, and stalking.

Discrimination based on sex, including sexual misconduct and discrimination based on pregnancy or parenting status, subverts the University's mission and threatens permanent damage to the educational experience, careers, and well-being of students, faculty, and staff. Please know that as a faculty member I am committed to supporting survivors of sexual misconduct, including relationship violence and sexual assault. However, University policy also requires me to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct.

Georgetown has a number of fully confidential professional resources who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. These resources include:

Jen Schweer, MA, LPC

Associate Director of Health Education Services for Sexual Assault Response and Prevention
(202) 687-0323
jls242@georgetown.edu

Erica Shirley

Trauma Specialist
Counseling and Psychiatric Services (CAPS)
(202) 687-6985
els54@georgetown.edu

More information about campus resources and reporting sexual misconduct can be found at:

<https://sexualassault.georgetown.edu/get-help>

Pregnancy Adjustments and Accommodations

Georgetown University is committed to creating an accessible and inclusive environment for pregnant and parenting students. Students may request adjustments based on general pregnancy needs or accommodations based on a pregnancy-related complication. Specific adjustments will be handled on a case by case basis and will depend on medical need and academic requirements.

Students seeking a pregnancy adjustment or accommodation should follow the process laid out at: <https://titleix.georgetown.edu/student-pregnancy>.

COURSE SCHEDULE

Week	Topic	Required Reading	Assignments
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1	Introductions and orientation; The Axial Age- Beginnings of Reason – Science in Antiquity	- MMS-Chapter1 - Plato Dialogues - Republic	
2	The Birth of Modern Science; The Role of Scholastics and the Masterful Synthesis of Thomas Aquinas	- Lindberg, The Beginnings of Western Science, Ch. 10 , 225-248 - Thomas Aquinas, Summa Theologiae, On the existence of God	Essay: The Role of St Thomas Aquinas in the birth of the Modern Science
3	The Scientific Revolution (Galileo, Brahe, Kepler, Newton)	MMS Chapter 2	
4	Church and Science in the Time of Galileo	- Descartes, Discourse on the Method, 51-63 -Galileo, Letter to Grand Duchess Christina	Test1: Wk1 - 3
5	Science and Enlightenment: The Challenges to Church Doctrines	E. A. Burtt, The Metaphysics of Modern Science 1-22, ChVII	Essay: The Galileo Affair - debate
6	The Chemical Revolution The Conservation of Energy and The Industrial Revolution	MMS Chapter3 and Chapter4	
7	Fundamental Concepts in: Geology and Biology	MMS Chapter 5	Test2: wk4 -6
8	The Darwinian Revolution and Its Theological Implications	MMS Chapter 6	
9	Genetics and The New Darwinian Synthesis	MMS Chapter 7 and 8	Essay: The Darwinian Debates
10	20 th century physics: Discovery of elementary particles (Rutherford, Bohr); Einstein Relativity Theory	MMS Chapter 11 and 12	
11	New discoveries in cosmology (Generalized Relativity, Big-Bang Universe, Multiverses) Inside the atom: standard model	MMS Chapter 12 Einstein, Relativity Theory, Part III	
12	Quantum Mechanics; Uncertainty Principle The Breakdown of Newtonian Physics	MMS Chapter 11 Heisenberg, Physics and Beyond, 70-82	Test3: 20 th century physics and cosmology
13	Historical Overview of Science and Religion Relationship from 17 th century to present time Church doctrine after the Council of Trent	Ferngren (SAR) Ch. 19 MMS Chapter 15	

	* Catholicism and Modern Science: Popes' Encyclicals		
14	Historical Overview of Science and Religion Relationship from 17 th century to present time The Relationship between Science and Philosophy – The Role of Scientism Contemporary debates: Theism vs. Physicalism	Ferngren (SAR) Ch. 19 MMS Chapter 15	Essay: Historical overview of the relationship between science and Church doctrine
15	Wrap-up and Concluding Thoughts		