



**GEORGETOWN UNIVERSITY**  
**School of Continuing Studies**  
*Bachelor of Arts in Liberal Studies*

## Church and Science: A Historical Perspective

Provisional Syllabus  
Summer Semester 2017

**Notice: Please make sure to read carefully the Attendance paragraph and to contact the instructor before signing up (email: [dc1164@georgetown.edu](mailto:dc1164@georgetown.edu))**

**This is a course with most lectures being taught remotely using teaching tools like: Blackboard Zoom**

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Office Hours: TBA and by appointment (as described in detail in the Attendance paragraph of this syllabus)

### Course Description

This course explores the history of sciences and the relationship with Church theology from the High Middle Ages through modern times. We will review historical developments, which are disproving the myth that Middle Ages were a period of stagnation and lack of scientific progress; quite the contrary it was a time of significant advances including the birth of the scientific methodology, which paved the way for the "Scientific Revolution" of the seventeenth century. Beginning with philosophical foundations and the development of new institutions like the universities and the scientific societies, we move on to study methods in practice across the different fields of mechanical philosophy, and the physical sciences. Students will be introduced first to the works of bishop Grossetese, Roger Bacon and Albertus Magnus who early on were the first ones to develop the basis of the scientific method, emphasizing experimental methods and the role of mathematics in natural philosophy thus starting the intellectual process which eventually lead to the remarkable achievements of Galileo Galilei, Kepler and Isaac Newton. Later on, in the successful march of science, we will analyse 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 with church teachings and on what it means to be human. 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 Church's interpretation of them 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 Goals:

This course is intended to give students a strong understanding of the relationship between the church and science developments from the High Middle Ages through present time. Specifically, by the end of this course, students should be able to:

1. Have a good understanding of the fundamental scientific concepts and advances made from the High Middle Ages until present time, which will enrich their knowledge of the world.
2. Learn that Middle Ages was not a dark ages period without any scientific progress but quite the contrary was a time of major discoveries and increase in knowledge (including the birth of the scientific method) and had a significant contribution to what was later called the Scientific Revolution of the seventeenth century.
3. Discover that during Middle Ages the Church not only wasn't opposed to science, but also was actually encouraging it and was the key sponsor financially and educationally through the creation of universities and placing science on the curriculum.
4. Understand and discuss the major concepts in the knowledge of the world created during the Scientific Revolution by science giants like Copernicus, Galileo, Kepler and Newton.
5. Describe the relationship between science and technology.
6. Analyze, discuss and debate when the concept of conflict between science and religion was initiated and under which historical circumstances.
7. Get a good understanding (without the use of mathematical equations) of 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.
8. Get a solid grasp of the essence of contemporary debates 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 (this is especially important today when so many sophisticated arguments are wrapped in hard to understand mathematical lingo; the fact that a large number of these arguments are not only purely speculative mathematical constructions but in many cases untestable makes many of these important debates very hard to follow for most people)

In addition to these substantive goals, 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. Develop their understanding of historical explanation and evaluation of facts

### Evaluation

Students are expected to attend lectures, read assigned texts, submit term paper & essays, and participate in discussion and debates, as well as display an ability to absorb, comprehend, and analyse the course material.

### Course Requirements

§ Reading Assignments

§ Submit two analytical essays (4 to 5 pages each, max) on assigned readings. (Topics will be distributed in advance.)

Notice: The first essay will be due within the first two weeks of the semester

§ Submit one 10-15 page term paper at the end of the semester

§ Oral Presentation: a 10-15 minute review of your semester paper

### Citation System

An important aspect of academic integrity is using an acknowledged system of bibliographical references to document the sources of ideas and quotations in one's work. Please use the Turabian style of citation in your essays.

### Study Groups

Depending on class size, study groups will be formed to prepare class presentation(s) and defend (at least) one debate on assigned topics

### Grading Policy

Final grade for the course will be based on the following:

1. Class Participation (including tests, quizzes, debate participation) 25%
2. Analytical Essays 30% (15 X 2)
3. Final Exam Paper 30%
4. Oral Presentation 15%

### Grade Table

- 93-100 % = A (superior)
- 90 - 92 % = A-
- 87 - 89 % = B+ (very good)
- 83 - 86 % = B (good)
- 80 - 82 % = B-
- 77 - 79 % = C+

73 - 76 % = C (fair)  
70 - 72 % = C-  
67 - 69 % = D+  
60 - 66 % = D (poor), minimum passing (60-65%)  
Below 60 % = F (failing) <64%

#### Disabilities Statement

If you believe you have a disability, then you should contact the Academic Resource Center ([arc@georgetown.edu](mailto:arc@georgetown.edu)) for further information. The Center is located in the Leavey Center, Suite 335. The Academic Resource Center is the campus office responsible for reviewing documentation provided by students with disabilities and for determining reasonable accommodations in accordance with the Americans with Disabilities Act (ADA) and University policies.

#### Georgetown Honor System

All students are expected to follow Georgetown's honor code unconditionally. We assume you have read the honor code material located at [www.georgetown.edu/honor](http://www.georgetown.edu/honor), and in particular have read the following documents: Honor Council Pamphlet, "What is Plagiarism?", "Sanctioning Guidelines", and "Expedited Sanctioning Process." Submitting material in fulfillment of the requirements of this course means that you have abided by the Georgetown Honor Pledge:

*In the pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and uphold the Georgetown 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.*

Work that appears to have been plagiarized or otherwise violated the Honor Code will be reported to Georgetown's Honor Council. If the Council finds that the work violates the university's standards of academic honesty, the work will receive a grade of zero for the assignment for the first offense; a second infraction will earn an F for the course. The Honor Council may impose sanctions of its own as well.

#### Devices

The use of electronic devices (mobile phones for calls/texting, games, pagers, etc) during class is strictly forbidden. Anyone text-messaging or emailing in class will be asked to leave and will be listed as absent. Audio/video recording of classroom lectures and discussions is not permitted. Laptop computers may be used for *note-taking, without internet surfing.*

#### Readings Assignments

Required readings for each class are listed below, and should be completed before the class period. All others are highly recommended, and may be referred to in class. Other articles and supplemental materials will be uploaded to Blackboard and/or will be made available in class. Students are responsible for accessing articles, other materials and assignments on Blackboard and/or reserves (regular and electronic) at Lauinger Library

#### **!!!! Important Information about Attendance !!!!**

Attendance is mandatory and the schedule will be needs to be discussed and agreed with the instructor.

However, this is an Internet based course where classes will be taught using remote teaching tools we have at our disposal: Blackboard Zoom. It is necessary that students should be able to possess and use during lectures adequate laptops and standard audio headphones.

It is important to notice that this presents some advantages for students; if they have good bandwidth Internet connections at home they will be able to attend the lecture from home (except for the two "face to face" classes as described above). If they don't have adequate bandwidth for their home Internet connections, they still could attend the remotely taught lectures by going to the classroom assigned (at 640 Mass Ave) where there is a good network connection (SaxaNet - provided by the university) that allows them to follow the lecture.

Also, there are going to be weekly, individual, video, one-on-one sessions with every student (again, using remote teaching tools) that will help with personal guidance in answering questions and clarifying issues related to the material taught and to the essays and examinations subjects.

**!!! Due to the fact that this course has a heavy scientific content students who attend will need to spend sufficient individual efforts to make sure they can master the concepts; to make sure they understand what is required they are advised to contact the instructor prior to signing up to discuss (and better understand) the necessary workload. (Please send an email to the instructor at [dc1164@georgetown.edu](mailto:dc1164@georgetown.edu)) !!!**

If you miss a class it is your responsibility to make up any assignments on time and obtain class handouts. Students are expected to behave during class in accordance with the Code of Campus Conduct.

#### Late Assignments

No credit will be given for any assignment that is submitted late without the prior approval of the instructor. Prior approval means the student has communicated with the instructor before the assignment deadline. An assignment that is submitted late with the instructor's approval will have its grade reduced by 10 percent for every day it is late.

### Instructional Continuity Policy

We will follow the university policy on Instructional Continuity, which states: "Instructional activities will be maintained during University closures. Faculty members should prepare for the possibility of an interruption of face-to-face instruction by establishing a policy within the course syllabus to maintain instructional continuity in the case of an unforeseen disruption. During a campus "closure," the regular class time schedule must be honored by all campus departments so that students will remain available for those faculty members who wish to maintain continuous academic progress through synchronous distance instruction". In case of disruption students will be required to call a telephone bridge number, which will be announced during first lecture, and use one the tools as assigned by the instructor. (either Zoom or Blackboard Collaborate)

It is important to notice that the Instructional Continuity policy of the university will be helped by the fact that most of the lectures are taught using these remote teaching tools (and the unforeseen disruptions will be minimized); clearly, during inclement weather students don't need to be travelling to 640 Mass Ave since the lecture will be taught using remote teaching tools.

### Texts (required) placed on reserve

- \* Peter J. Bowler and Iwan Rhys Morus, Making Modern Science, A Historical Survey, 2005, The University of Chicago Press, ISBN-13: 978-0-226-06861-9, ISBN10: 0-226-06861-7
- \* Gary Ferngren (editor), Science and Religion; A Historical Introduction, The John Hopkins University Press, 2002, ISBN-10: 0-8018-7038-0

### Texts (not required, but recommended)

- \* David C. Lindberg, The Beginnings of Western Science, Second Edition, The University of Chicago Press, 1992, 2007, ISBN-13: 978-0-226-48205-7 (paper) ISBN-10: 0-226-48205-7 (paper)
- \* John Hedley Brooke, Science and Religion, Cambridge University Press, 1991, ISBN10: 0-521-23961-3 (hardback), ISBN10: 0-521-28374-4 (paperback)

Other materials (including primary texts) will be available as part of the course packet and will be distributed in time before lectures:

- \* on Blackboard and/or distributed for the class (on paper or electronically)
- \* or as electronic resources on GU Library: GEORGE (<http://www.library.georgetown.edu/>)

## **Course Outline**

### **Part1. Natural Philosophy from Antiquity to Early Medieval**

Week1: - Introductions and orientation

Week2:

#### Topics:

- \* Greek Philosophy of Nature. Plato/Aristotle/Roman and Early Medieval Science
- \* Role of Christianity/Islamic Science

#### Readings:

**Primary texts:** (in the packet)

Plato Dialogues: The Republic and Timaeus

#### **Secondary texts:**

Ferngren Ch3, Lindberg, Ch.2 , pages 21-44, 52-56, 65 , 86-105

### **Part 2: The Road to the Scientific Revolution**

Week3:

#### Topics:

- \* Revival of Learning/Carolingian Reforms.The New Learning in the 13<sup>th</sup> century
- \* The Birth of the Scientific Method/Grosseteste/Roger Bacon/Thomas Aquinas

#### Readings:

**Primary texts:** (in the packet)

Bacon: The Opus Majus, pages 627-634 (in the packet)

**Secondary texts:**

Lindberg, The Beginnings of Western Science, Ch. 10, 225-248 (in the packet)

#### Week4:

Topics:

- \* The Scholastic Synthesis of Aristotelianism and Church Dogma
- \* Aristotelian Physics and Metaphysics; Thomas Aquinas and the Medieval Metaphysics

Readings:

**Primary texts:** (in the packet)

- \* Thomas Aquinas, Summa Theologiae, On the existence of God (in the packet)

**Secondary texts:**

- \* Ferngen Ch. 5

#### Week5:

Topics:

- \* Radical Aristotelianism/The Condemnations of 1270 and 1277
- \* The Relationships Between Church Theology and Natural Philosophy after 1277
- \* The Assault on the Middle Ages

Readings:

**Primary texts:**

- \* Thomas Aquinas, On the Eternity of the World (in the packet)

**Secondary texts**

- \* Lindberg, The Beginnings of Western Science, Ch.10-11, 250-262 (in the packet)
- \* Edward Grant, God and Reason in the Middle Ages 283-348 (Electronic Resources on GEORGE)

#### Week6:

Topics:

- \* Cosmology through 17<sup>th</sup> Century:(Eudoxus, Ptolemy, Copernicus, Galileo, Tycho Brahe/Kepler)
- \* The Road to the Scientific Revolution; Descartes
- \* Galileo (the conflict with the Church)

Readings:

**Primary texts:** (in the packet)

Descartes, Discourse on the Method, 51-63

Galileo, Letter to Grand Duchess Christina (Electronic Resources on GEORGE)

**Secondary texts:**

- Ferngren Ch. 7,8
- Bowler and Morus, Ch. 2, pages 23-33
- Materials necessary for debate preparation

#### Week7:

Topics:

- \* Newton and The Coronation of New Science
- \* The role of Newton (the positivist) in the success of the mechanical philosophy

Readings:

**Primary texts:** (in the packet)

- \* Newton, Philosophical Writings, 94-106, The General Scholium 369-372 (in the packet)

**Secondary texts:**

- \* Ferngren, Ch. 12
- \* Bowler and Morus, 34-55, (Articles in the packet)

Week – ---- .....

#### Week8:

Topics:

- \* Changes in natural philosophy and science metaphysics from 13<sup>th</sup> to 17<sup>th</sup> Centuries/
- \* Summary of Church and Science Relationship through 17<sup>th</sup> Century
- \* Conflict Science-Church (Draper-White)

Readings:

**Primary texts:** (in the packet)

Secondary Texts: E. A. Burtt, The Metaphysics of Modern Science 1-22, ChVII (in the packet)

### Part3. Modern Physics and Its Implications on the Understanding of the World

#### Week9:

##### Topics:

- \* Review of the significant progress of science between 17<sup>th</sup> and 19<sup>th</sup> century and the success of the Galileo-Newton mechanical philosophy
- \* Understanding the world of classical physics at the end of 19<sup>th</sup> century
- \* 20<sup>th</sup> century physics: Discovery of elementary particles (Rutherford, Bohr); Einstein Relativity Theory

##### Readings:

##### **Secondary texts:**

Bowler and Morus, Ch. 11 and 12

#### Week10:

##### Topics:

- \* New discoveries in cosmology (Generalized Relativity, Big-Bang Universe, Multiverses)
- \* Inside the atom: standard model, string theory
- \* Anthropic Principle (many domains, many universes)
- \* Theistic and materialistic arguments for the Anthropic Coincidences

##### Readings:

##### **Primary texts:** (in the packet)

- \* Einstein, Relativity Theory, Part III (in the packet)

##### **Secondary texts:**

- \* Bowler and Morus, Ch. 12
- \* Stephen M. Barr, Modern Physics and Ancient Faith Ch. 15-17 (in the packet)

#### Week11:

##### Topics:

- Quantum Mechanics; Uncertainty Principle; Planck, Heisenberg
- Quantum Realities; the breakdown of the Newtonian physics

##### Readings:

##### **Primary texts:** (in the packet)

- \* Heisenberg, Physics and Beyond, 70-82

##### **Secondary texts:**

- \* Bowler and Morus, Ch. 11

### Part.4 Contemporary Aspects of the Relationship between Church and Science

#### Week12:

##### Topics:

- \* New insights brought on by Quantum Mechanics (Theistic and naturalistic view of the world, Determinism and Free Will, Human Mind and computers)
- \* Quantum Mechanics and the breakdown of the Galilean-Newtonian metaphysics

##### Readings:

##### **Secondary texts:**

Barr Ch. 19 – 24 (in the packet)

#### Week13:

##### Topics:

- \* Historical Overview of Science and Religion Relationship from 17<sup>th</sup> century to present time

- \* Church doctrine after the Council of Trent
- \* Catholicism and Modern Science: Popes' Encyclicals
- \* Contemporary debates: Theism vs. Physicalism

Readings:

**Primary texts:** *(in the packet)*

- \* Heisenberg, *Physics and Beyond*, 82-93

**Secondary texts:**

- \* Ferngren Ch. 19
- \* Bowler and Morus, Ch. 15

Week 14:

Topics:

- \* Wrap-up and Concluding Thoughts

Final Exam: The final presentations will be made at the time for the final exam, to be announced by the Registrar

This syllabus is subject to revision at the discretion of the instructor