

DEREE COLLEGE SYLLABUS FOR:

US CREDITS: 3/1.5/4

HNS 2250 LE DEBUNKING PSEUDOSCIENCE: A SCIENTIFIC APPROACH

(Fall 2018)

PREREQUISITES:

WP 1010 Introduction to Academic Writing
WP 1111 Integrated Academic Writing and Ethics

CATALOG DESCRIPTION:

A provoking and integrative examination of introductory natural science and the application of its principles in the debunking of popular conspiracies and controversies. Combining physics, chemistry and biology, the seminar applies theoretical and laboratory practices to put to rigorous testing pseudo-scientific beliefs and disciplines. Engaging in interdisciplinary explorations of historical, philosophical and social perspectives on scientific methodology, the course aims to develop students' awareness of the dangers of pseudo-scientific thought and assist them in the making of rational and healthy decisions in their everyday life.

RATIONALE:

This seminar aims to introduce the process of the scientific method through explorations of current understandings of physical laws, chemical analytical methods and biological principles. Concepts like climate-change denialism, astrology, moon-landing denial, anti-vaccination trends, cryptozoology and the flat-earth hypothesis, among many others, will be evaluated and tested experimentally against current scientific knowledge. The seminar will equip students both theoretically (through treatments of introductory physical and biochemical concepts), as well as practically (through experimental awareness and techniques), with the necessary tools for testing causal vs. casual relationships and falsifiability, in order to put pseudoscientific claims to the test and understand the history, attraction and dissemination of pseudoscientific beliefs across societies and eras.

LEARNING OUTCOMES:

As a result of taking this course, students should be able to:

1. Develop understanding of basic principles of physical, chemical, and biological sciences, and learn to apply experimental and theoretical techniques, protocols and principles in the context of the course;
2. Engage in interdisciplinary explorations of historical, philosophical and social perspectives on scientific methodology;
3. Understand the evolution of scientific thought through exploration of different sociocultural perspectives and constructs;
4. Identify pseudoscientific principles in commonly held beliefs, activities and practices, with emphasis on the ethical impact of pseudoscience.

<p>METHOD OF TEACHING AND LEARNING:</p>	<p>In congruence with the teaching and learning strategy of the college, the following tools are used:</p> <ul style="list-style-type: none"> • Interactive learning through workshop-based modelling and activities, extensive class discussion and problem-solving; • Laboratory instruction and practical engagement in a working teaching laboratory • Case-studies that facilitate investigative and critical thinking that distinguish between causality and correlation. • Student presentations of learning material to encourage involvement in the learning process; • Extensive instructor feedback on assignments and activities; • Individualized assistance during office hours for further discussion of lecture material, additional reading, and assignments; • Additional print and audiovisual educational material posted on the Blackboard course template; • Other relevant educational material placed on reserve in the library.
<p>ASSESSMENT:</p>	<p>Summative</p> <p>Portfolio 40% Students will submit a personalized and individual “science portfolio”. The portfolio should not exceed in text 2000 words. Individual entries should be of a diverse nature. Eligible work, besides an obligatory laboratory report , may include a short essay, a reflection, homework or classroom assignments, a commentary on a research article, etc.</p> <p>Creative Project 40% Students will deploy a creative medium of their choice to apply their insights on concepts and ideas explored in the course. The creative project includes a 500-word self-reflective essay (which articulates the concepts that inform the creative project and relates them clearly to the content of the course), as well as an oral presentation of the creative project.</p> <p>Participation 20% Each student will be evaluated according to his/her contribution in the class, the preparation of the material and his/her critical ability. Furthermore, each student will be assessed in regards to his/her participation in group activities and discussions that will arise throughout the course.</p> <p>The Portfolio tests Learning Outcomes 1 and 3. The Creative Project tests Learning Outcome 2 and 4.</p> <p>Formative</p>
<p>INDICATIVE READING:</p>	<p>REQUIRED READING:</p> <p>Critical Thinking, Science, and Pseudoscience: Why We Can't Trust Our Brains 1st Edition (2016). Caleb W. Lack PhD, Jacques Rousseau MA,</p>

	<p>Springer Publishing.</p> <p>RECOMMENDED READING:</p> <ul style="list-style-type: none"> • Bad Science, Ben Goldacre, Fourth Estate (GB); Reprint edition • A Short History of Nearly Everything, Bryson Bill, Black Swan; 01 edition (2016) • The Demon-Haunted World: Science as a Candle in the Dark, Sagan Carl Ballantine Books; Reprint edition
<p>INDICATIVE MATERIAL: (e.g. audiovisual, digital material, etc.)</p>	<p>REQUIRED MATERIAL:</p> <p>RECOMMENDED MATERIAL:</p>
<p>COMMUNICATION REQUIREMENTS:</p>	<p>Written reports in Word, using proper English. Knowledge of Excel and PowerPoint an advantage, as they may be required in either the report-writing or oral presentation phase. Oral presentation using proper English.</p>
<p>SOFTWARE REQUIREMENTS:</p>	<p>Word; Excel & PowerPoint recommended.</p>
<p>WWW RESOURCES:</p>	<p>The course will use a number of materials via the internet, which will be available to the students via the Blackboard template.</p> <p>More Pending</p>
<p>INDICATIVE CONTENT:</p>	<ol style="list-style-type: none"> 1. Introduction to the Scientific method <ul style="list-style-type: none"> • Causation vs Correlation • Falsifiability • Scope and limitations of the scientific method 2. Factual and data analysis <ul style="list-style-type: none"> • Data retrieval techniques • Laboratory Investigative techniques • Laboratory protocol evaluation 3. Emergence, general themes and impact of pseudoscience and urban legends <ul style="list-style-type: none"> • Astrology • “Alternative medicine” • Flat Earth Hypothesis • Climate Change Denialism • Anti-vaccination 4. Principles of physical, chemical and biological thought vs pseudoscientific claims. <ul style="list-style-type: none"> • Classical physics

- Newtonian mechanics
- Thermodynamics and Energy
- Principles of General and Special Relativity
- Atomic Theory and Chemical Bonding
- Principles of Quantum Mechanics
- Cell theory Evolution

5. Indicative lab content:

- Data retrieval and analysis skills
- Free Fall and Reflex Arcs
- Universal Gravitation (2D and 3D motion)
- Dilutions and Concentration
- Fuels and Combustion
- The Electromagnetic Spectrum
- Introduction to Microscopy
- Fossil Analysis