redX.

34-35 Hatton Garden
EC1N 8DX
London, United Kingdom
hello@redxresearch.com
redxresearch.com

redX.

RedX is a boutique network of students and professors from top US and UK universities to design and deliver courses that bring you the full favour of research in a wide range of disciplines. We help you stand out in applications to top US universities.

RESEARCH IS THE SECRET SAUCE.

- **Like Columbia and Harvard, most top universities in the US value research undertaken by applicants.**
- **Deep Research in your area of interest is the best way of showing admission officers that you are truly interested in what you seek to study at university.**

COLUMBIA | ENGINEERING
The Fu Foundation School of Engineering and Applied Science

Resume/CV

This document should outline clearly and briefly the following:

- Employment held (include title of jobs and start/end dates)
- Research activities
- Academic honors, including fellowships you have been awarded
- Volunteer or community service
- Extracurricular activities
- Honorary soc
- Publications

Application Requirements

gradengineering.columbia.edu/graduate-admissions/application-requirements

A few topics that you may want to address in your Personal Statement include:

- Describe how your background has prepared you to pursue an advanced degree in the field of engineering or applied science at Columbia University.
- Describe the reasons you are interested in this program and discuss any relevant past experience.
- If you have relevant work or research experience, please indicate how it helped you decide on your career path.
- What are your post-graduation plans or career goals?
- What do you hope to gain from this program?
- What about this program excites you?
- If there are any special circumstances that need to be brought to the attention of the Admission Committee, please include that information.

HARVARD COLLEGE
Admissions & Financial Aid

About

What courses should I take to prepare for applying to Harvard?

There is no "one size fits all" rule about which curriculum to study during secondary school years. Students should challenge themselves by taking courses deemed appropriate by their teachers and counselors. But some students believe that "more is always better" when it comes to AP, IB or other advanced courses.

While some students prosper academically and personally by taking large numbers of such courses, others benefit from a more balanced approach that allows them additional time for extracurricular and personal development. Even the best students can be negatively affected by taking too many courses at once, and might benefit instead from writing, reading or research projects on subjects of great interest to them.

GETTING ACCEPTED

JOHNS HOPKINS UNIVERSITY

What do you look for in letters?

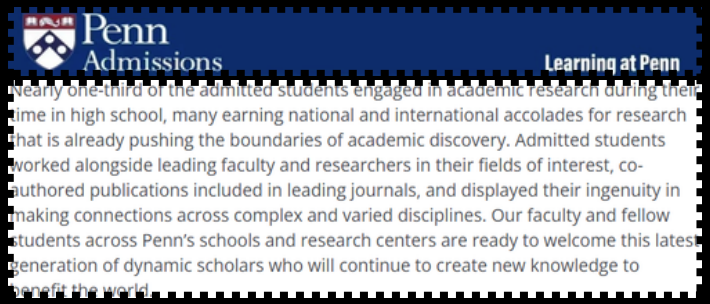
First we consider the source of the letter. A letter from your cousin who happens to teach at a two-year college is weighed significantly less than a letter from a researcher at a top computer science school! Next, we look for evidence of research potential. In particular, evidence of outstanding performance in past projects is of high importance. Somewhat less important is evidence of outstanding ability in the classroom. A good letter writer should know you well and be able to rank you very favorably in comparison with your peers.

With an incessant influx of applicants with stellar grades, top universities have come to value interest more than grades. They now expect applicants to write about academic endeavours outside of school to see if students are going above and beyond a set syllabi.

We offer exactly that experience.

"Nearly one-third of the admitted students engaged in academic research during their time in high school...worked alongside leading faculty and researchers in their fields of interest."

-University of Pennsylvania



Evaluation & Letter of recommendation

Students who participate in our programs will be issued an evaluation by the professor. This is in addition to the opportunity to receive a letter of recommendation, rooted primarily in the quality of their research.

Independent Research Program Student Evaluation

Subject: Linear Programming and Optimization
Independent Research

Professor:
Contact: berkeley.edu
Date: October 31, 2023

Student Name: Swaroop

Research & Course Description

Swaroop undertook an in-depth research project on Linear Programming and Optimization, exploring advanced mathematical concepts and developing innovative programming solutions. The project included a comprehensive study of linear algebra, optimization techniques, and their applications in mathematical finance.

Topics Covered

- Fundamental concepts in linear algebra including linear combinations, independence,
- rank, and subspace.
- Introduction and standardization in optimization and linear programming.
- Advanced techniques in quadratic programming and second-order cone programming.
- Exploration of factor models in mathematical finance.

Course Objectives and Assignments

This intensive program required to master complex mathematical principles, develop advanced programming skills, and apply these to real-world optimization problems. The course aimed to foster a deep understanding of optimization theory and its practical applications in finance.

Independent Research Program Student Evaluation

Subject: The Economics of Corporate Disclosure

Professor
MIT Sloan School of Management,
100 Main Street, E62-666,
Cambridge, MA 02142

Student Name:

Research & Course Description

This course is designed to (i) give students a perspective of the economics of accounting (and more broadly, corporate disclosure) in the capital markets, (ii) introduce students to academic research, particularly related to corporate disclosure, and (iii) give students firsthand experience conducting independent research.

To achieve the aforementioned objectives, this course is structured into three main modules: (i) An introduction of how financial statements are prepared and the role of discretion in financial reporting (ii) Agency theory and the need for accounting and disclosure, using examples of disclosure research, and (iii) A research project involving practical experience searching for US listed companies' financial statement and disclosures, and evaluating their earnings quality. The classroom approach is mainly discussion based.

Students are required to turn-in one written research report related to the material covered in class and present their findings on the last day of class. Broadly speaking, students have to collect financial statements and disclosure data for a sample of companies and conduct statistical analyses to test their hypothesis.

Evaluation of

I have had the opportunity to closely interact with over a period of 8 weeks. Unlike other classes I have taught, my interactions with were one-on-one and thus I got to know her better than I typically get to know my students from larger classes. In short, I am very impressed with . She consistently displayed a high level of competence, dedication, and attention to detail, which highlighted her ambition and desire to learn.

My course is designed to help students get a primer into academic research and the primary means to evaluate students is based on their research project. research paper is entitled "Research on the Market Reactions to HFCAA: Beneficial or Detrimental to Investors." In this paper, she examines the economic implications of the Holding Foreign Companies Accountable Act (HFCAA), which threatens to delist Chinese companies cross-listed in our U.S. stock exchanges whose auditors could not be inspected by the U.S. audit regulator.

When she first approached me with her research proposal, I could see that she was genuinely interested in exploring the impact of HFCAA on Chinese companies listed on U.S. exchanges. Her initial inquiries revolved around whether HFCAA would enhance financial reporting quality or prompt Chinese companies to exit the U.S. market. Finally, her interests settled on examining investor reactions to this regulation. Besides formulating her hypotheses using concepts related to agency theory that we covered in class, she also did a though job in her empirical analyses. One especially notable accomplishment was her entrepreneurial approach to data collection using the Wharton Research Data Services (WRDS) platform. WRDS is commonly used platform to collect large amounts of data by more advanced research but typically not used by a novice. Overall, work ethic and maturity were evident in her approach to the project.

Evaluation of

I also want to add that is very professional. She always arrived on time for our meetings, and was organized and prepared. Specifically, she would come to our meetings with a list of thoughtfully prepared questions and updates on her research progress, taking a proactive approach to our discussions. Her level of preparation allowed our meetings to be very productive and efficient. Also, she attentively absorbed my comments and suggestions regarding her work and was able to incorporate them into revising her research project. Her openness to feedback and her willingness to make improvements highlight her commitment to learn for the sake of learning.

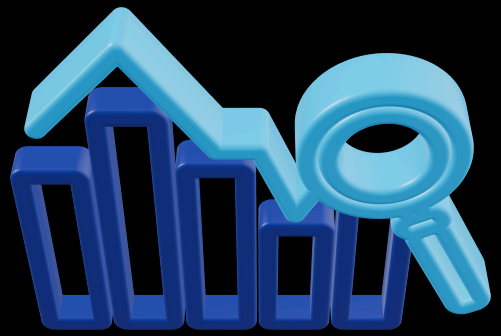
Overall, advising has been an enjoyable experience. Her professionalism, courtesy, and receptiveness to guidance have made our interactions seamless and productive. I have no doubt that exceptional qualities will continue to serve her well in her future academic and professional endeavors, and I wholeheartedly recommend her for any opportunities that come her way.

Based on final research paper and her overall performance, I will reward an A+ grade in my class.

Final Grade: A+

Applied Learning

RedX students will engage in group research projects that consolidate their understanding of the course material.

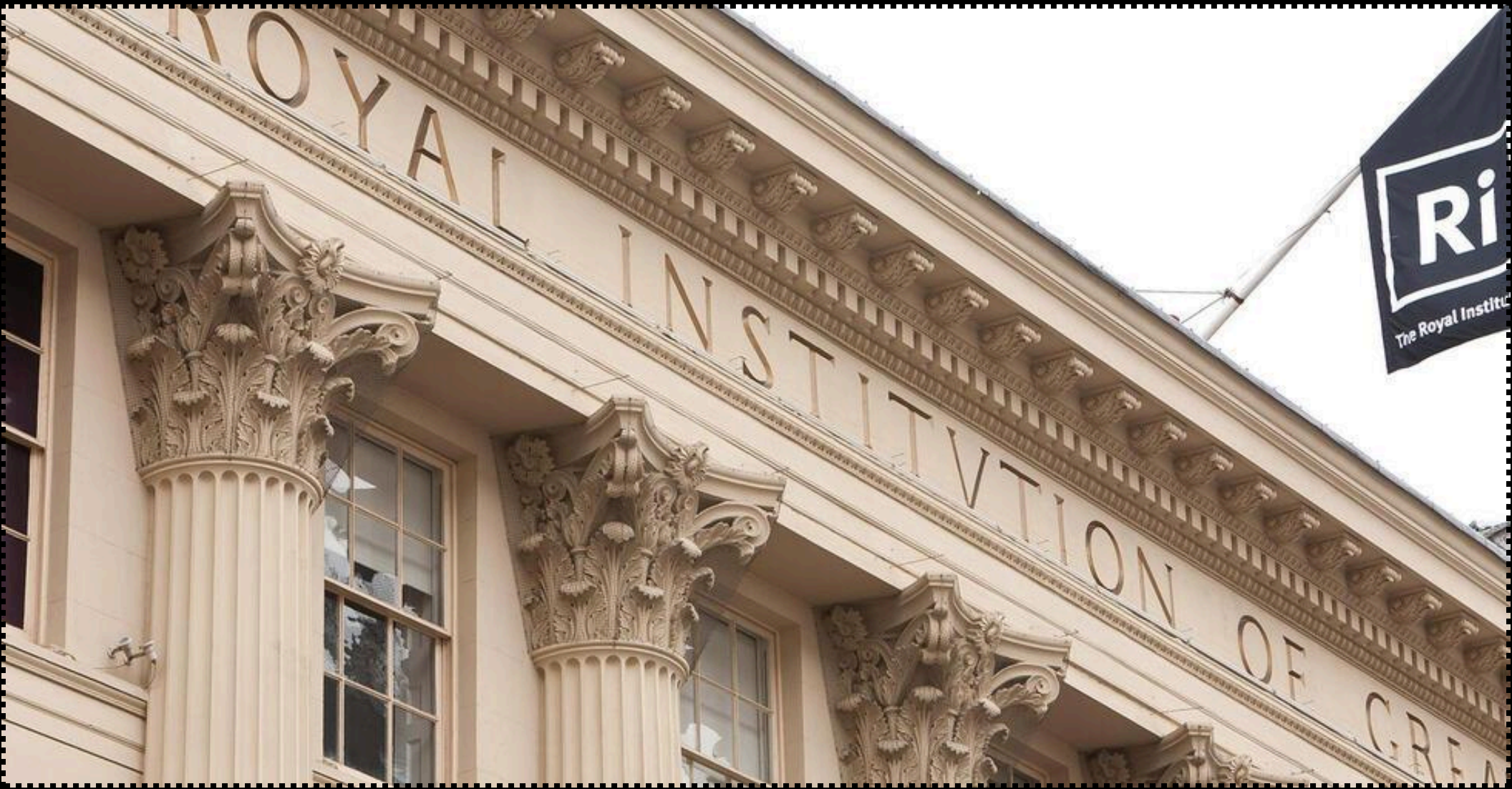


Flagship Seminars for the Summer in London; 1st to 10th July 2026

Applications are now being reviewed on a rolling basis.

Scroll down for information on the courses on offer this season. Apply on our website: redxresearch.com

The RedX Summer 2026 programme will be held at the Royal Institution (RI) in Mayfair, London.



Ri
The Royal Institution
Science Lives Here

Ri
The Royal Institution
Science Lives Here

Day	Professor + Tutor	Your course
Day 1 (evening)	3 hrs	Class 1; group banquet at the RI.
Day 2 (evening)	3 hrs	Class 2; group banquet at the RI.
Day 3 (evening)	3 hrs	Class 3; group banquet at the RI.
Day 4	3 hrs	Class 4; group lunch at the RI.
Day 5	3 hrs	Class 5; group lunch at the RI.
Day 6 (evening)	3 hrs	Class 6; group banquet at the RI.
Day 7 (evening)	3 hrs	Class 7; group banquet at the RI.
Day 8 (evening)	3 hrs	Class 8; group banquet at the RI
Day 9 (evening)	3 hrs	Class 9; group banquet at the RI.
Day 10 (evening)	3 hrs	Group Presentation (of initial research theses) judged by professor; group banquet at the RI.
Day 24		Research draft is due. It will be graded and returned to students in two weeks.

The Workings of Biological Imaging

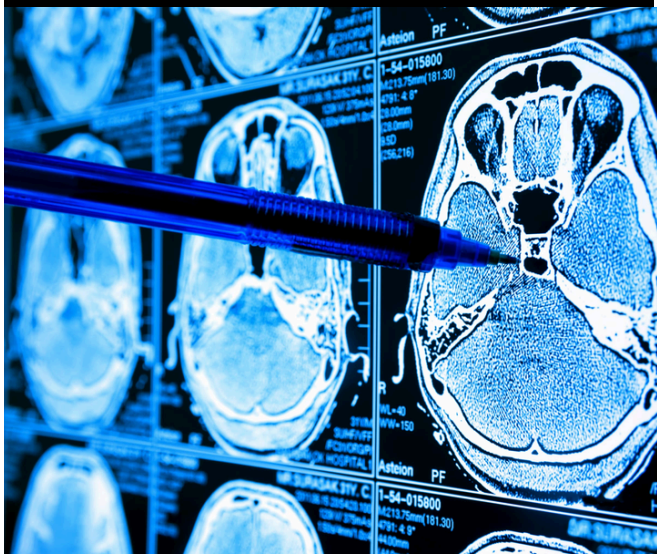
Professor Jens Rittscher; Department of Medicine at the Univerisity of Oxford

Holding Oxford's first joint appointment between Engineering and the Nuffield Department of Medicine, professor Rittscher builds AI foundation models that predict chemotherapy response and extract molecular features from tissue images invisible to the human eye. Rittscher teaches machines to see what pathologists can't at the Ludwig Institute and Target Discovery Institute.

Why choose this course?

Digital pathology and artificial intelligence are transforming cancer diagnosis and patient care. From analyzing tissue samples under the microscope to detecting subtle cellular changes invisible to the human eye, these technologies enable faster diagnosis, enhanced accuracy, and the ability to identify disease patterns at unprecedented scale. This course delves into the computational methods that power modern pathology: computer vision algorithms, image analysis techniques, and machine learning models trained on thousands of patient samples.

Students will probe into how AI systems analyze microscopic tissue images, distinguish cancerous from healthy cells, and support pathologists in making life-saving diagnoses.



What you will learn:

The curriculum will cover fundamental concepts of cellular biology and cancer pathology, the principles of microscopy and digital imaging, computer vision techniques for medical image analysis, convolutional neural networks and their application to tissue classification, methods for training and validating diagnostic AI models, performance metrics for assessing diagnostic accuracy and clinical utility, ethical considerations in deploying AI for patient care, and exploration of real-world case studies where computational pathology has improved cancer detection and treatment outcomes.

Focus

- Microscopic image analysis
- Cellular abnormality detection
- Neural network training
- Image pre-processing techniques
- Model performance evaluation
- Diagnostic accuracy metrics
- Clinical dataset handling
- Pathology case interpretation
- Ethical AI deployment

Professor Donald Robertson; Department of Economics at the University of Cambridge

Donald Robertson is professor of Econometrics at the University of Cambridge and a Fellow of Pembroke College, specialising in applied econometrics, business cycles, and macroeconomic analysis.

Applied Macroeconomics and Finance

Why choose this course?

Applied microeconomics and finance form the foundation of strategic decision-making in business, policy, and investment. From determining optimal pricing strategies to evaluating investment opportunities, these disciplines enable organizations to allocate resources efficiently, manage risk effectively, and maximize value creation. This course delves into the real-world application of microeconomic principles and financial tools: supply and demand analysis, market structures, valuation methods, and capital allocation frameworks.

Students will probe into how these concepts are employed to solve practical problems, from designing incentive systems to assessing project viability, and develop the analytical toolkit needed to make data-driven economic decisions.

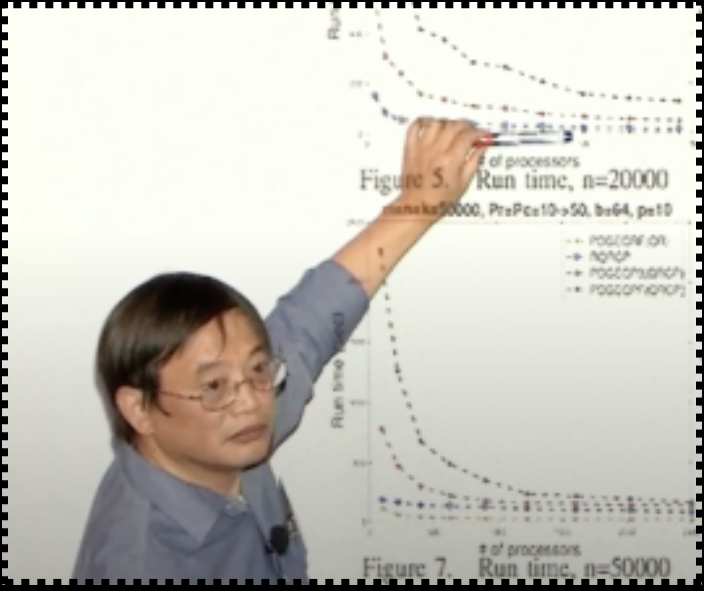
What you will learn:

The curriculum will cover fundamental concepts of consumer and producer behaviour, market equilibrium and efficiency, game theory and strategic interaction, time value of money and discounted cash flow analysis, portfolio theory and risk management, capital budgeting and investment appraisal techniques, pricing strategies and market design, and real-world case studies examining how firms, investors, and policymakers apply these frameworks to optimize resource allocation and evaluate economic trade-offs.

Focus

- Supply-demand analysis
- Game theory modeling
- Cost-benefit analysis
- Financial modeling
- Risk-return assessment
- Pricing strategies
- Investment appraisal
- Financial statement analysis
- Incentive design
- Case study application

The Mathematics Behind AI



Professor Ming Gu; Department of Mathematics at the University of California, Berkeley

Ming Gu is a UC Berkeley mathematics professor who creates absurdly fast algorithms for massive-scale numerical problems. The kind that make matrix computations 100x faster and let deep learning models actually run.

Why choose this course?

Optimization algorithms form the backbone of modern artificial intelligence and data science. From training neural networks to finding the best solutions in complex systems, these mathematical techniques enable machines to learn from data, make predictions, and solve problems at scale. This course delves into the computational methods that power machine learning: gradient descent, convex optimization, matrix factorization, and efficient numerical algorithms. Students will probe into how optimization problems are formulated, how algorithms converge to solutions, and how computational efficiency is achieved in large-scale data analysis.

What you will learn:

The curriculum will cover fundamental concepts of optimization theory, gradient-based methods for training machine learning models, numerical linear algebra techniques for efficient computation, convex optimization and its applications in AI, algorithm design principles for scalability, matrix decomposition methods for dimensionality reduction, convergence analysis of iterative algorithms, and hands-on implementation of optimization algorithms with performance evaluation on real-world datasets.

Focus

- Algorithm complexity analysis
- Matrix computation techniques
- Convex optimization methods
- Convergence analysis
- Computational efficiency
- Large-scale data processing
- Performance benchmarking
- Practical algorithm design

Lecturer Peter Bergamin; Department of History at the University of Oxford

Dr. Peter Bergamin is a lecturer at Oxford and teaches students to question power itself. His research explores how political movements justify their right to rule, from revolutionary ideologies to modern democratic states.

Justifying Political Authority

Why choose this course?

Political authority shapes every aspect of modern life, from laws we follow to taxes we pay, yet its legitimacy is far from self-evident. Why should citizens obey the state? What makes a government's power morally justified? From ancient debates about tyranny and democracy to contemporary questions about state surveillance and civil disobedience, these fundamental questions underpin all political systems. This course delves into the major theories of political legitimacy: social contract theory, consent-based justifications, democratic authority, and anarchist challenges to state power. Students will probe into how philosophers from Hobbes to Rawls have grappled with the puzzle of political obligation and develop the critical tools to evaluate competing claims about the foundations of governmental authority.

What you will learn:

The curriculum will cover classical social contract theories from Hobbes, Locke, and Rousseau, contemporary debates about democratic legitimacy and political obligation, anarchist critiques challenging the justification of state authority, the relationship between consent and coercion in political systems, theories of justice and their implications for legitimate governance, the limits of state power and individual rights, civil disobedience and when breaking the law might be justified, and comparative analysis of different political systems through the lens of legitimacy theory.

Focus

- Philosophical argumentation
- Critical text analysis
- Political theory frameworks
- Conceptual distinctions
- Evaluating normative claims
- Historical contextualization
- Comparative analysis
- Legal reasoning

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