Instructor Contact Information

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Course Objectives
This course exposes students to key topics in energy finance including: discount rates and discounted cash flows, valuation approaches, project finance, option pricing, real options, ratios analysis, energy derivatives, venture capital, corporate acquisitions, the business case for clean energy, energy access, carbon pricing, and green building finance. The goal of the course is to increase your understanding of financing, investment, and hedging decisions as they relate to energy companies and energy-related projects.

Organizational Matters
The Sakai site contains links to all of the course materials.

Class Meetings and Attendance:
We expect you to attend all classes regularly and on time, having prepared beforehand all assignments and readings. If you are unable to attend class on a given day (and this should not be a regular occurrence), you will not be permitted to make-up that participation in some other way. During class, all electronic communications devices (e.g., laptops, phones) should be turned off.

Assignments and grading:
Your course grade will be based on a final exam, individual and team assignments, and class participation. The following weights will be used in calculating your final grade:

- Final Exam: 30%
- Individual Assignments: 30%
- Team Assignments: 30%
- Class Participation: 10%
The final exam reflects your individual effort, is cumulative, and is *open-book, open-notes*.

Class participation is an individual effort. It is critical that you attend class and come prepared to participate actively in the discussion. The questions provided for cases and readings will help you prepare for class. Learning for everyone in this class is enhanced through debate, different perspectives, and new insights. Keep in mind that your goal should be to contribute high *quality* comments, *not* high *quantity*.

There will be a number of individual and group assignments over the course of the semester. Students should form their own teams for each group project (you may remain with the same group throughout the semester, or switch groups as you wish). For group assignments, students will provide assessments of peers’ quality and quantity of work via confidential scores (sent as an email to the professors) where 1 = below expectations, 2 = met expectations, and 3 = above expectations.

Students may submit at most one late assignment during the semester, and must notify the professor before the assignment’s due date with a reasonable explanation for why the assignment is late, and when it will be delivered (certainly no more than a very few days after the official due date). Other late assignments will not be graded.

Students are also highly encouraged to subscribe and listen to these podcasts from Greentech Media, which frequently cover energy finance trends: [Energy Gang](https://energygang.com/) and [Interchange](https://interchange.greentechmedia.com/).

**Duke University Honor Code:**
The Duke University Honor Code applies to all aspects of this course. We will not tolerate any infraction of the Honor Code. The nature of each assignment indicates the type of communication and consultation that is permitted. Work that is described as an individual effort is to be your work alone, without consultation or assistance from any other person. Work that is described as a team effort is to be your team’s effort alone, again without consultation or assistance from anyone else. If you are uncertain about the nature of collaboration for any assignment, please ask us.
**Course Schedule**

**Weeks 1-2**

*Topics:* The Net Present Value (NPV) formula and incremental cashflows. Equivalence between NPV and IRR. Leverage and tax shield on debt. Weighted Average Cost of Capital (WACC). Worked examples.

*In class:* NPV exercise

*Assignment:* Saito Solar case

**Week 3**

*Topics:* Introduction to real options; From NPV to option-adjusted PV; expansion, timing and learning options; case study for electricity generator project; delay and abandonment options.

*In Class:* Electricity Generator problem, Part 2

*Assignment:* Read Amaranth case study

**Week 4**

*Topics:* Forwards and futures; spot vs futures markets; hedging vs. speculation; futures pricing using no-arbitrage; exceptions in the commodities futures markets; contango and backwardation

*In Class:* Amaranth case study discussion

*Assignment:* Jetfuel hedging

**Weeks 5-6**

*Topics:* Financial Options. Option pricing: Binomial model; relationship between options and futures; options for hedging and speculation. The “greeks” and risk analysis.

*Assignment:* Options Problem Set

**Week 7**

*Topics:* More on real options; extracting the value of the real option through dynamic hedging

*In class:* Rigby Oil

*Assignment:* Real Options Valuation of Oil Field Concession in the North Sea (team-based)
Week 8

Topics: Overview of global Investment in clean energy (finance and non-financial drivers)

In class: Discussion of readings from Bloomberg; Guest lecture

Assignment: None

Week 9

Topics: Cleantech venture capital

In class: Discussion of readings from MIT and Brookings; How to build an investment pipeline; Guest lecture

Assignment: [individual] Write an Executive Briefing re: a clean energy investment opportunity

Week 10

Topics: Energy access (i.e., addressing energy poverty in developing countries)

In class: Discussion of reading from Bloomberg and Blue Haven Initiative case study; Guest lecture

Assignment: None

Week 11

Topics: Project finance for renewable energy and energy storage; Investment due diligence

In class: Discussion of readings from Lazard

Assignment: [team] Create the criteria and process for an investment committee

Week 12

Topics: Green building finance; Pitching to investors (internal or external)

In class: Discussion of reading from Morgan Stanley and Edward Lundberg case study

Assignment: None
Week 13

Topics: Corporate acquisitions; Fundamental (ratios) analysis; Corporate reporting (10-K)

In class: Discuss Namaste Solar case study

Assignment: [individual] In which company should you invest -- Tesla or First Solar?

Week 14

Topics: Pricing carbon; Oil & gas majors’ investment activity

In class: Discussion of readings from CDP and IronOak Energy Capital

Assignment: [team] Create an investor pitch deck for a company in this list: Global Cleantech 100