

McCormick School of Engineering and Applied Science  
**Master of Product Design & Development**  
**Financial Issues for Product Development Syllabus**

**Course Description:**

I will cover the fundamental finance concepts necessary to run a firm in this class. The firm can range from a multi-billion international conglomerate to a three person entrepreneurial firm. The material is valuable if you want to have a say in how the firm's capital is spent and whether your ideas get funded. Below is a list of lecture topics and a brief description of what I expect to cover in each session. The required reading, which I expect you to do prior to coming to class is listed after each description in italics. This is an intense class, but if you keep on top of the work, plan ahead, and use me as a resource, you can do this.

**Course Readings:**

Berk and Demarzo, Corporate Finance, 3<sup>rd</sup> Edition, 2013, Prentice Hall (BD)  
Course Packet for Financial Issues in Product Development - Petersen.

## **Valuation and Capital Budgeting**

### **Lecture 1: Corporate Finance Overview**

Week 1

We will discuss the fundamental questions of corporate finance. This will provide a road map for the rest of the course. Next, students are expected to explain what the objective of a corporation is. This sets the foundation for answering the fundamental questions. Finally, we will discuss the idea of efficient markets. This discussion will include what it means for a market to be efficient and what this does and does not imply about the world. We will also discuss why we should expect markets to be efficient and when we should expect efficiency to fail.

*Berk and Demarzo: Chapter 4*

### **Lecture 2: Cash Flow Forecasting**

The most fundamental way to value a project or asset is to discount the expected cash flows at the risk adjusted rate. The first building block of valuation is expected cash flows. We will discuss how expected cash flows are derived from financial numbers such as the income statement and the balance sheet. We will then discuss the intuition of how to derive and evaluate cash flow forecasts in an uncertain world. You will then use this knowledge when you forecast cash flows and value the Energy Gel expansion in Week 4.

*Berk and Demarzo: Chapter 7 and 8*

### **Lecture 3: Cost of Capital**

Week 2

The second building block of valuation is the discount rate. Students will develop a basic understanding of the capital asset pricing model. This is the model which is used to calculate firm's cost of capital. We will discuss the intuition of what is meant by systematic risk and how to determine if discount rates and measures of systematic risk are reasonable. We will also discuss how to derive the numbers necessary to calculate discount rates, even when we have limited or imperfect data.

*Berk and Demarzo: Chapter 10 and Chapter 12*

## Lecture 4: Financial Options

Week 3

This session will introduce the concepts of options (calls and puts). We will start to learn the basics of how options are constructed and what are the determinants of their value. We will use payoff diagrams to understand how to construct complex portfolios or securities from basic building blocks and how to break complex securities down into their simple pieces. An understanding of options and derivatives is important in finance for valuation (real options), risk management, and capital raising.

*Berk and Demarzo: Chapter 20 and Chapter 21 (skim if curious)*

## Lecture 5: Real Options

Traditional NPV assumes that the decision to invest or not is made up front and no further modification of the project will be necessary or possible. In practice, the scale of projects, the mix of inputs and outputs, or even whether to continue a project can be changed in the future as new information becomes available. Real options is a version of NPV that includes the value of flexibility. In this session, we will use a numerical example to compare a simple NPV analysis to a real options analysis and thus value the flexibility embedded in the project.

*Berk and Demarzo: Chapter 22*

## Energy Gel: Valuation of a New Product

Week 4

This case will let you apply your knowledge of discounted cash flow valuation to a product launch by a firm. It will give you practice in constructing your own DCF spreadsheet.

*Energy Gel case*

*Energy Gel case questions*

# Capital Structure

## Lecture 6: Capital Structure Relevance

Week 5

The capital structure decision of a firm is both its choice of how it should finance its projects as well as how it should manage or distribute the risk of these projects. We will start our study with the Modigliani-Miller capital structure irrelevance theorem. We will build a world (a set of assumptions) where how the firm finances itself has no effect on the value of the firm or the wealth of shareholders. This should strike you as insane at first. My objective is not to convince you that capital structure is irrelevant. Capital structure decisions can both create and destroy significant amounts of value. However, the world of finance is very complex. You need a simple guide to the issues which make capital structure relevant and the M&M theorem gives you this guidance. Finally, we will work through an example of a leverage increasing transaction in a M&M world. We will then examine the benefits of debt financing (the debt tax shield) and the costs of debt (costs of financial distress). These are several of the factors that form the basis of firm's decision of how to finance their projects.

*Berk and Demarzo: Chapters 14, skim Chapters 15 and 16 if interested*

## Final Exam

## ASSIGNMENTS

Deadlines for this class are non-negotiable. If you have a question about a deadline, you should resolve your question prior to the deadline. Under special circumstances you may arrange to turn in assignments early. Assignments will not be accepted after the due date and exams may not be taken late. Turning in assignments after the due date or taking an exam later than your scheduled time may provide a student with an "unfair advantage over other students." Students that do not complete and hand in all assignments by the due date will not pass the class.

Your answers to the homework and cases must not only be numerically correct, but also be clear. Handing in an excel spreadsheet is not considered a sufficient answer and I will take points off even if the numeric answer is correct. It should be clear to me (your audience) both what your answer is and how you arrived at it. Finance is partially an exercise in math and numbers, but it is also an exercise in communication. I should understand your numerical answer, your logic and methods, and why the numbers lead to your conclusion.<sup>1</sup>

### *Homework Assignments:*

Homework assignments are due on the day specified (see the syllabus). There are two homework assignments.<sup>2</sup> They are worth 25 points. Doing the homework will make the concepts much clearer and will help you immensely when it comes to the exams. I will distribute answers to the homework on the due date.

### *Online Quizzes:*

Some of the concepts I want to teach you are numeric, for example, discounting a given set of cash flows at a specified discount rate. These questions have a single correct answers. Many of the concepts I want to teach you are less concrete. It isn't that there is no right answers, but there may be a range of correct answer. There are also a large number of incorrect answers. Since class time is scarce, I have carved out many of the computational exercises and have incorporated these in to three online quizzes. We are going to use technology to leverage the scare resource of time and hopefully give you real time feedback outside of class.

The online quizzes will be completed though Blackboard. You may try the quiz as many times as you like, but I will grade only your final attempt. You can verify your current score prior to the due date by looking it up in the Blackboard grade book. You must compete the quiz prior to the due date to receive credit. Please pay careful attention to the due date and time as the quizzes are not due in class. You should read and work on the questions prior to sitting down at the computer. The full text of the quiz questions are in your packet. I have also posted a spreadsheet you will need for several of the quizzes on blackboard. Although you may work with your group on the quizzes, when you sit down at the computer everyone should enter their own answers. I would recommend you try the quiz on your own and enter your first guesses into blackboard before talking to your group. Then as a group, you can work on the questions that you got wrong and do not understand. There are three quizzes and I will drop your lowest quiz score. Since you can take the quiz several times, I recommend you start them well before the due date. It would also be wise to look through them early in the quarter so you know when we are covering material which is useful.

Since the quizzes can be taken multiple times, I will count only your last attempt. The

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<sup>1</sup> I will provide you with data in Excel format for many of the assignments. The spreadsheets are available on the corporate finance web page or on Blackboard in the case of the quizzes.

<sup>2</sup> Homework 1 can and should be completed and handed in as a group. Homework 2 should be done "individually." I will explain Homework 2 in greater detail in class and what I mean by individually.

computer will tell you whether your answer is right or wrong, but not what the correct answer is.

*Case Assignment:*

The case memo should be three to five written pages plus tables. Brevity is a virtue. Do not repeat the facts of the case, I have read it. The case questions are in your packet. They should be a guide to your answer. Do not submit a case memo with an answer to each question. This looks unprofessional. Instead, you should write a persuasive document that convinces me your solution is correct. You should support your answer with logic, facts, numbers from the case, and intuition from class. I expect the answers to be both well reasoned and well presented. The cases are your opportunity to apply the concepts you have learned to messy, real world problems. In the real world, understanding the concepts is important; being able to explain them to your boss and colleagues is equally important. I will thus grade your case memos based on both your answers as well as how well you defend your proposed solution. The case memo is due the day we discuss the case at the beginning of class. You should keep a copy of your answers as you will be expected to contribute to the class discussion based on your written answers.

*Exams:*

In addition to the homework, quizzes, and case, there will be a final exam. The final exam will be given as a take home. The final will be worth 240 points.

## GRADING AND DUE DATES

Assignments are due at the beginning of class unless otherwise noted. Homework 2 and the quizzes are due prior to class and so pay close attention to when they are due. Your total score is based on the sum of the points you earn.

Assignment	Due Date	Points
Quiz 1	Wed, February 12 <sup>th</sup> @ 6pm	25
Quiz 2	Wed, February 19 <sup>th</sup> @ 6pm	25
Homework 1	Fri, February 28 <sup>th</sup>	25
Energy Gel Case	Sat, March 8 <sup>th</sup>	60
Homework 2	Wed, March 12 <sup>th</sup> @ 6pm	35
Final	Tue, March 18 <sup>th</sup> , 11:30pm <sup>3</sup>	200
Total		370

Total score = Homework 1 + Homework 2 + Quiz<sub>1</sub> + Quiz<sub>2</sub> + Energy Gel case + Final Exam

## OTHER ADMINISTRATIVE DETAILS

### *Intellectual Property:*

The class notes, assignments, answers, and past exams are the intellectual property of the instructor. You may not distribute class notes electronically or in any form to any one outside the class or outside Kellogg. You may not duplicate these notes for use by your employers after graduating from Kellogg without my written consent.

### *Appointments and Help Outside of Class:*

I am very willing to meet with you outside of class to discuss anything related to the course. We can do this in person, by email or phone. I also strongly encourage you to use the class discussion group so your classmates can benefit from your brilliant questions. You can call my office at 847-467-1281 or email me at [mpetersen@northwestern.edu](mailto:mpetersen@northwestern.edu). My office is in the finance department at Kellogg [fourth floor of Leverone].

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<sup>3</sup> The final exam will be available after class on the 15<sup>th</sup> of March.

## Supplementary Readings

These are not readings which I want you to complete during the course. These are books which I have found interesting as well as informative. If after my class you are interested in additional reading, this list is meant to be my suggestions of where you can start looking.

*Valuation: Measuring and Managing the Value of Companies*, by Tom Copeland, Tim Koller, and Jack Murrin, John Wiley, 1991. This is a practitioners guide to valuation, and is on the whole correct.

*The New Market Wizards*, by Jack Schwager. This book is a series of interviews with very successful traders. These are people who have beaten their respective markets.

*Liar's Poker: Rising through the Wreckage of Wall Street* by Michael Lewis. Lewis is a good story teller and this is his first story. It traces his experience right out of college working on Wall Street. He is at Salomon Brothers at the time the mortgage market was born. Many of the institutional details in the book are dated now. However, his comments on the Wall Street (especially traders) culture are very interesting. Plus, several of the people you will meet in this book will reappear over the next several decades in the world of finance.

*Merchants of Debt*, by George Anders. This is a about the leveraged buyout firm of Kohlberg Kravis Roberts and Company.

*Capital Ideas*, by Peter Bernstein. This book is a history of modern finance. If you read this book you will notice how closely academic and practical finance are intertwined.

*Investment Under Uncertainty*, by Avinash Dixit and Robert Pindyck. This book is a very in depth look at what we referred to as asset or real options (Session 5). If you are interested in learning more, this book may become the most important book in the field.

*A Piece of the Action: How the Middle Class Joined the Money Class*, by Joseph Nocera. This book traces the history of consumer finance in the U.S. from the fifties through the nineties. Its relevance goes beyond consumer finance in the U.S. Many of the financial structures that our generation takes for granted were created during this period. Thus to understand where we are today, this history provides an excellent background. I think you will find the discussion of credit card drops fascinating.

*When Genius Failed: The Rise and Fall of Long-Term Capital Management*, by Roger Lowenstein. Of the many books written on LTCM and its collapse, I found this one to be the most useful. The events surrounding LTCM's incredible success and dramatic destruction are a lesson in the incredible value of models of economic activity and financial markets – it is also a lesson on their danger – which I hope you learn in class.

*Moneyball: The Art of Winning an Unfair Game* by Michael Lewis. Technically this is a book about baseball in general, and the strategy used by the Oakland A's to win. At a deeper level, it is a wonderful description of the efficient market theory. When is it possible for you to develop a strategy that beats the market (i.e. the other players in the market). If you have developed such a strategy, and used it successfully, why don't others imitate you and thus compete away the effectiveness of your strategy. If you can't get your head around the infamous Efficient Market's Hypothesis, but love baseball, this book may be for you.

*The Essays of Warren Buffet: Lessons for Corporate America*, by Warren Buffet and Lawrence

Cunningham. Warren Buffets annual letters to shareholders, which are part of Berkshire Hathaway's annual report, are his commentary on what is wrong with Corporate America (and right with Berkshire Hathaway). This book is a compilation of these letters organized by topic. Notice that the issues, if not the point of view, examined in this book are the same issues we have been grappling with in class.

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