

# **Agricultural Economic Analysis**

## **Ag Business 313**

**Instructor:** Dr. Sean Hurley  
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**Web Page:** <https://agb.calpoly.edu/agb-313-course-page>

**Class Meeting Time:** Section 1: MTWR 1:10 to 2:00 in 10-227  
Section 2: MTWR 2:10 to 3:00 in 10-227

**Office Hours:** MW 3:10 – 5:00 in 22-208, R 3:10 – 4:00 in 22-208, or by appointment

**Prerequisite:** AGB 212 and Math 221

### **Suggested Textbooks:**

- *The Economics of Production* by Beattie, Taylor, and Watts

### **Useful References:**

- Any textbook from AGB 212.
- Any basic Business Calculus text found in the bookstore.
- <http://www.khanacademy.org/>
- <http://academicearth.org/>

### **Course Learning Objectives:**

- Analyze agricultural business issues using economic principles
- Identify the important parts of a business problem
- Use calculus as an analytical tool for decision making
- Use analytical methods to build a fundamental understanding of economics
- Develop the ability to think through a problem logically and methodically
- Build strong problem solving skills
- Define and use the following economic terms: Profit, Total Costs, Fixed Costs, Variable Costs, Average Variable Cost, Lost Profit, Revenue, Production Function, Marginal Costs, Iso-cost, Iso-Revenue, Production Possibility Frontier, Isoquant, Marginal Rate of Product Transformation, Marginal Rate of Technical Substitution
- Develop and solve optimization problems for cost minimization and profit maximization using optimality conditions and Lagrange's Method
- Refine and strengthen core economic and algebraic skills

## Grading:

Grading Component:	Weight
Optimization Paper (Due 3/6/20)	20%
Problem Sets, Homework, Class Participation, and Other Effort	$\epsilon$
Midterm 1 (2/6/20 tentatively)	20%
Midterm 2 (2/27/20 tentatively)	20%
Cumulative Final Section 1: (3/18/20; 1:10 – 4:00 p.m.)	40%
Cumulative Final Section 1: (12/11/20; 1:10 – 4:00 p.m.)	

There are three exams for the course, two midterms and a cumulative final.

There will be approximately three homework assignments and four problem sets. The problem sets are meant to be more challenging and longer than the homework assignments, so you can expect that they should take **on average at least four to six hours of work**. You are allowed and encouraged to work on the problem sets and homework in groups. If you work in groups on the problem sets and/or homework assignments, make sure that you personally know how to do each problem. While problem sets and homework assignments have no specific weighting allocated to them, you are strongly encouraged to do them. If you would like feedback on your homework assignments or problem sets, you will need to submit them to the professor by the due date. Any homework assignment or problem set submitted after the due date and time may receive a 20% deduction at the discretion of the professor.

Since this course is about optimization and problem solving, you will need to write a **maximum** two-page paper with a **one-page maximum mathematical model** on a problem that you have encountered and explain how you solved it. Any papers over the page allotments will receive a 20 point deduction. This paper is meant to be a thought paper that will link what you are learning in class to your everyday life. Please make sure that your writing style is formal.

There are five major components you should discuss/have in the paper. The first component of the paper (first paragraph) will have you elaborate on what optimization problem you tried to solve, e.g., maximizing your score for a game, minimizing the amount of reading you did for a class, maximizing the number of events you participated in during the quarter, etc. Make sure in this paragraph you motivate why this optimization problem is important to you.

The next part of the paper (second paragraph) will have you discuss what the decision variables are for the problem you solved, and how they are related to your objective you tried to optimize. A decision variable can be defined as a choice that you get to make that either directly or indirectly affects your objective function. You should categorize the decision variables into constrained and unconstrained. A constrained decision variable is one that shows up in your constraints, while an unconstrained decision variable is one that does not. You should note that most if not all decision variables should be constrained. If any of these decision variables are directly in your objective function, then you need to explain whether they positively or negatively affect the objective function. To have a positive effect on an objective function means that when you increase the decision variable, it causes a positive effect on the objective function, e.g., more studying leads to higher GPA. For a decision variable to have a negative effect on the objective function means that increasing the decision variable will negatively affect

the objective function, e.g., increasing partying has a negative effect on GPA. For any decision variables that are unconstrained, you need to explain why they are unconstrained.

The third part of the paper (paragraph 3) will explain what constraints you encountered when trying to solve the problem. A constraint can be defined as something that holds back a decision variable or multiple decision variables from the optimal choice of it/them. This portion of the paper should explain which constraints are affecting which decision variables. You should explain how the constraint is affecting the decision variable from being optimal, e.g., a time constraint will not allow you to study more. You should note that if you have a constraint that has only one decision variable and is met with equality, then the decision variable is truly not a decision variable, i.e., if your constraint is sleep and you say that you must get exactly eight hours of sleep, then you would not consider sleep a decision variable because it is predetermined and already set to a value.

The fourth component of the paper (paragraph 4) will explain how you went about solving the problem. No mathematical discussion is needed in this paragraph. You should write about the thought process that you undertook or will undertake to solve the problem. Any discussion about solving the problem using a Lagrangian or any other mathematical means will get you a 10 point deduction. The first four components will be worth 75 points.

The last component of the paper, which will be on its own page, is a mathematical model of your problem. Your grading of this component will be based on how well you are able to capture in mathematical form what you have written in paragraphs 1 through 3. This model should use generalized notation for any types of functions (e.g., objective functions, constraint functions, etc.). A function, which is designated with parenthesis, could be a single letter like  $F(\cdot)$  or multiple meaningful letters like  $GPA(\cdot)$  where you will put the decision variables separated by a comma where the dot is. You need to define all the variables with letters or combination of letters as well as the functions (e.g.,  $T_s$  = time studying,  $T_w$  = time working,  $Q$  = quantity eaten,  $f_t(T_s, T_w)$  is a the time constraint, etc.). You will receive up to a 10-point deduction for not defining your variables or functions. You should make sure that each constraint is set to some value using an equality or inequality constraint (e.g.,  $f_t(T_s, T_w) = 24$  or  $f_t(T_s, T_w) \leq 24$ ). You are allowed to write each function out (e.g.,  $T_s + T_w = 24$ ), but you must also have the functional notation (e.g.,  $f(T_s, T_w) = T_s + T_w = 24$ ) or 5 points will be deducted. You will receive a 5-point deduction if your model and what is written in your paper do not align with each other (e.g., talking about a decision variable in the paper, but not having it in the mathematical model or vice versa). If you do not put the mathematical model in the paper you will receive a 25-point deduction. You must type out the mathematical model. If you do not type out the model, you will receive a 10-point deduction. Trying to solve the mathematical model will get you a 5-point deduction. I will discuss more about this modelling in class as we get closer to the due date of the paper. I would strongly encourage meeting with me to discuss this model if you need assistance.

The paper should be well written and is worth 100 points. It should be sent to me by email and a paper copy must also be submitted by 5:00 pm on the due date given above. Failure to send me an emailed copy will get you a zero for the assignment. A paper emailed or submitted late will receive up to a 20-point deduction. For every spelling and grammatical error that is found

written in the paper, up to 5 points will be deducted for each error up to 30 points. If you have more than six grammatical errors, you will need to resubmit the paper corrected for all the mistakes and you will receive at most the lowest score given to the other students. I would encourage you to write it well the first time. The second part of the grading will examine how well you discuss the four major components that are asked for in the paper, as well as development of the mathematical model. Make sure you thoroughly discuss how your decision variables are incorporated into your constraints and objective function. You should be able to easily make a mathematical model from what you have written in your four paragraph discussion.

If you decide to write the paper on any aspect of minimizing the amount of effort/time/space allocated to the paper, you will lose 25 points. I will discuss more about the paper in class. I encourage you to come to my office hours to discuss your paper. Early papers will be joyously accepted. Any paper that is submitted by a student that is similar to one that has been submitted in past quarters will be considered plagiarism and will receive a zero.

While this course is primarily lecture oriented, class participation is strongly encouraged. It is a minimum expectation of the professor that you will ask questions when you are confused on a topic being covered in the course.<sup>1</sup> To motivate class participation and give you incentive to do your problem sets and homework assignments, a value of  $\epsilon$  is being used. The term  $\epsilon$  in mathematics is often used to mean a small number. In the case of this course,  $\epsilon$  is being used as the professor's subjective measure that he will assign to each student for his/her participation and effort in the course. Note that turning in problem sets and homework assignments is one demonstration of effort. Going to tutoring hours is another. The value of  $\epsilon$  will be nonnegative and worth no more than 3%, i.e.,  $0\% \leq \epsilon \leq 3\%$ . It will only be given a positive value for extraordinary class participation and/or effort. Please note that  $\epsilon$  can take a student above 100% making this measure similar to extra credit. Also, you should expect the percentage of students getting a positive  $\epsilon$  will be no larger than 20% of the class. Please note that  $\epsilon$  is non-negotiable and any attempt to do so will guarantee that a zero for this value is assigned to the person that attempts to negotiate.

### Final Grade

Your final grade will be based on the weighted average of the grading components of the course that are listed above. Guaranteed grades will be issued on the following scale:

- 90% of weighted average guarantees an A-
- 80% of weighted average guarantees a B-
- 70% of weighted average guarantees a C-
- 60% of weighted average guarantees a D-
- Below 60% of weighted average guarantees an F

Straight grades and pluses, e.g., A, B, B+, etc., will be determined by natural breaks in the distribution of grades.

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<sup>1</sup> It is highly likely that the question you have is the same as many other students in class. Please do not hesitate to ask questions.

Since the final is cumulative for this course, if you do considerably better on the final than on a midterm, i.e., greater than 10%, then I will shift your homework and problem sets percentage worth of your midterm weighting to your final. If you do better on the midterm, then no shifting will occur.

### **Professor's Expectation**

*It is the expectation of the professor that you will spend approximately TWO hours outside of class for every hour you are supposed to spend in class working on problem sets, homework assignments, and studying. These hours may not be distributed uniformly. Please budget your time wisely.*

### **Course Policies**

#### **Right to Syllabus Change Policy**

The instructor reserves the right to make any changes to this syllabus at any time during the course. If a substantial change is made, a new syllabus will be handed out. All other changes will be verbal and written on the board.

#### **Students with Learning and/or Physical Disability Policy**

Any student with a learning and/or physical disability who needs accommodations or assistance in this course should make an appointment to speak with the instructor as soon as possible. You are also encouraged to contact the Disability Resource Center (located in Building 124) by phone at (805) 756-1395 as early as possible in the term to discuss your needs for the quarter.

#### **Cheating Policy**

Cheating/academic dishonesty will not be tolerated in the course. If you are discovered cheating or are an accomplice in helping someone cheat on an exam, quiz, homework, or the paper you will receive a zero on the respective item. You will also be reported to the dean's office for disciplinary matters. For a description on Cal Poly's cheating policy please go to the following web page: <http://www.academicprograms.calpoly.edu/content/academicpolicies/cheating>.

#### **Cell Phone and Texting**

Cell phones are strictly prohibited on exam days. If you are caught with one, you will receive a zero on the exam. ***During class time cell phones must be turned to silent mode.*** If you have a call, you must take it outside the classroom. If the instructor hears your cell phone and is able to identify you in class, he has the option of deducting up to 5% off your final grade for each occurrence. If the professor catches you texting in class, you will receive a 3% deduction from your final weighted grade for each occurrence.

If you do not wish to have the deductions from your grade for either your cell phone "ringing" or you texting, you will need to purchase a slice of pizza or its equivalent for each student in the class for the next class meeting. If you do not want to purchase pizza or its equivalent for texting, the professor will give you the option of reading your text out loud to the rest of the class or you can submit to the professor a written apology in professional business format explaining to him the importance of the text and why it could not wait until after class.

### **Make-Up or Early Exam Policy**

No make-up exams will be given in the course except for the final. If you miss a midterm for a valid reason, then the weighting for that midterm will be placed on the final. If you miss a final for a valid reason, you will receive an Incomplete grade in the course and will be required to take a make-up exam within the first four weeks of the next quarter you attend. The following are university acceptable reasons for missing class:

- ☐ Illness with a doctor's statement
- ☐ Serious illness or death of close relatives
- ☐ Active participation in university events (an instructor may require a statement from the adviser involved certifying that the student was actively participating in a recognized university event)
- ☐ Field trips
- ☐ Religious holidays
- ☐ Selective service and military reasons
- ☐ NCAA athletic competitions
- ☐ Instructionally Related Activities (IRA)/competitions
- ☐ Jury duty or any other legally required court appearances
- ☐ Job or internship interviews.

If a family member passes away, you will need to bring to the make-up exam the death certificate or some other corroborating information that the individual who died was close to you to be able to take it. Please note that the family pet is not considered a family member under this policy. If you are unexpectedly sick or injured to the point that you need to see a medical doctor the day of the exam, you will need to bring a note from the doctor that explains that the illness or injury was so bad that there would have been no way you could have taken the exam the day it was scheduled. Family vacations or any other type of vacations are not an acceptable reason for obtaining a make-up exam. No early exams will be given.

### **Classroom Civility Policy and University Diversity Statement**

It is expected that you will be respectful to both the professor and other classmates. If you choose to be disrespectful, you will either 1) be asked to leave and your total grade will be adjusted down by three percentage points, or 2) you will be required to come to the board and lecture on the concept being presented, and your total grade will be affected by zero to three percent dependent upon how well you present the material. Anything that is disruptive to the class is deemed disrespectful including the following behavior:

- ☐ Listening to your music player when lecture is in session
- ☐ Playing games on your mobile device/computer
- ☐ Talking loudly during lecture that is not related to the course
- ☐ Packing your bag before class is finished
- ☐ Consistently arriving late to class without providing a valid reason to the professor
- ☐ Verbally attacking a person rather than attacking the person's ideas
- ☐ Leaving early without telling the professor beforehand (The only exception to this is if you become ill during class. In this case, please email the professor afterwards.)
- ☐ Showing-up to class intoxicated
- ☐ Chewing tobacco
- ☐ Bringing your pet to class

## Cal Poly's Statement on Diversity and Inclusion

Cal Poly considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Cal Poly expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events. For more information on resources related to diversity and inclusion, please visit the Office of University Diversity & Inclusivity website at [diversity.calpoly.edu](http://diversity.calpoly.edu).

## FERPA Policies

The professor of this course respects your FERPA rights. **As a policy, the professor will only discuss your grades with you in person. No grades will be given over the phone or through email.** No student other than yourself will be allowed to pick up your homework, problem sets, or exams. To facilitate the class, the professor may call on you by name. If you would prefer your name not to be used in the course, it is your responsibility to notify the professor in writing by the end of the first week.

## Dr. Hurley's Keys to Success:

- 📖 Attend **ALL** classes!!!
- 📖 Do all the homework and problem sets
- 📖 **Understand** the homework and problem sets
- 📖 Work in groups to do the homework and problem sets
- 📖 Work on all previous finals posted on Dr. Hurley's website!!!
- 📖 Start all homework and problem sets on the day they are distributed
- 📖 Utilize Dr. Hurley's office hours or tutoring hours
- 📖 Ask questions in class
- 📖 Attend **ALL** classes!!!

## Topics for Ag Bus 313

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### Topic

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AGB 212 Review  
Math Review and Lessons in Calculus  
Unconstrained and Constrained Optimization  
Technology  
Cost Minimization  
Cost Curves  
Profit Maximization  
Game Theory and Game Applications  
Consumer Choice, Utility, and Revealed Preference (If time allows.)

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A Philosophy to live by: *Some of the things I understand were taught to me. Most of the things I understand I taught myself.*