

CIS 205 – Discrete Mathematics I

Course Syllabus and Calendar – Winter 2013

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Brigham Young University–Hawai‘i

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Scientists. Like us.

Discrete Mathematics 1 introduces many of the underlying mathematical principles used by computer scientists. While the usefulness may not always be immediately apparent, these concepts will be integral to our understanding of the principles of computing. Where possible, we will discuss the immediate application.

Although the word Mathematics is in the course title, this is basically a computer science course. Mathematical concepts are the focus of study, but they are reinforced through several programming projects and exams. Other activities may also be assigned to support those concepts that are not otherwise adequately reinforced or measured.

<http://byuh.doncolton.com/cis205/2131/sguide.pdf> is my study guide for this course.

1.1 So, What *is* Discrete Math?

Discrete means chunks, as opposed to Calculus, which is continuous.

With discrete, we are dealing with things like the natural numbers: 1, 2, 3, 4, 5, and so on. We are not dealing with things like $\pi = 3.1415\dots$ and $e = 2.71828\dots$ and natural logarithms.

So, it's whole things. Things that are either totally present or totally absent. Ones and zeros. True and false. Six sides on dice. Two sides on coins. Branches in trees. Nodes and edges in graphs.

Like I said, it's kind of fun.

1.2 Preparation

We assume you passed CIS 101 with a grade of C or better, or that you have other programming background in one of the languages I allow for this class (C, C++, Java, Perl, Python, Ruby, and Tcl).

1.3 There May Be Changes

Like all courses I teach, I will be keeping an eye out for ways this one could be improved. Changes generally take the form of opportunities for extra credit, so nobody gets hurt and some people may be helped. If I make a change to the course and it seems unfair to you, let me know and I will try to

correct it. If you are brave enough, you are welcome to suggest ways the class could be improved.

I may digitally record the audio of my lectures some days. This is to help me improve my teaching materials.

2 Course Details

2.1 About the Course

- **Course Number:** CIS 205
- **Title:** Discrete Mathematics I
- **Course Description:** Functions, relations, and sets; basic logic; proof techniques; basics of counting. (Prerequisites: CIS 101).
- **Textbook (Rental):** Mathematical Structures for Computer Science (6th Edition), by Judith L. Gersting. ISBN 071676864X.
- **Classroom:** GCB 111
- **Start/End:** Mon Jan 7 to Mon Apr 8, 2013
- **Class Time:** MWF 2:30 to 3:30 PM
- **Final Exam:** Fri, Apr 12, 4:00 to 6:50 PM

2.2 My Websites

Here is a list of my other websites that you may encounter this semester.

- <http://byuh.doncolton.com/cis205/> is my course homepage. It has links to everything else, including the study guide.
- <https://dcquiz.byuh.edu/> is the learning management system for my courses.
- <http://byuh.doncolton.com/> is my campus homepage. It has my calendar and links to the homepages for each of my classes.
- <http://doncolton.com/> is my off-campus homepage.

2.3 About the Instructor

- **Instructor (me):** Don Colton
- **My email:** doncolton2@gmail.com
- **My Office:** GCB 128
- **Office Hour:** MWF 11:00 to 12:00. GCB 111 is reserved this hour so my students can study in a lab setting and meet with me and each other. During this hour I am almost always in GCB 111 or across the hall in my office (GCB 128).

2.4 Emailing Me

At times you may want to email me, or I may ask you to email something to me. Here are the rules.

You can email to doncolton2@gmail.com or to don.colton@byuh.edu. They both end up the same place.

The subject line is important.

For email in general, it looks like this:

```
cis205 (normal subject line of your choice)
```

The cis205 gets it past my spam filter and helps me organize my work flow.

The (normal subject line of your choice) is whatever you want it to be.

For email I requested, it looks like this:

```
cis205 (item) (lastname firstname)
```

The (item) is usually a program identifier, or the words “study time”.

The (lastname firstname) is the name by which you are known on my roll sheet. We will agree on that name early in the semester.

I will reply within 24 hours to every email I receive, unless it clearly does not need a reply.

I may reply initially with something like “received” so you know I got it. This generally means I have not been able to do whatever was requested, but it is in my queue.

I often reply with “done” so you know I updated your study points.

I often reply with “success” so you know your program received full credit.

Email is not 100% reliable. Maybe your email was lost. Maybe my reply was lost. If you do not receive a reply within a day, it may mean I did not get it. Check your sent mail, fix if necessary, and try again. Do you have the correct email address for me? Did you put “cis205” at the start of the subject line?

3 Learning Objectives

By the conclusion of this course, students will understand:

- Formal Logic. (We learn modus ponens, modus tollens, and resolution. There is an exam.)
- Recursion and Memoization. (We write a recursive Fibonacci program that relies on memoization to save time.)
- Proofs and Induction. (We discuss proofs and how they relate to formal logic.)
- Big Oh Analysis. (We do simple big-oh analysis, no recursion. There is an exam.)
- Set Theory. (We do union, intersection, and counting. There is an exam on counting.)
- Conditional Probability. (Given certain probabilities, calculate related probabilities. There is an exam.)
- Functions and Relations. (We talk about it.)
- Graphs and Trees and Recursion. (We learn to construct binary search trees. We learn to traverse trees depth first and breadth first. Recursion is explained. There is an exam.)
- Decision Trees. (We learn to do Huffman coding. There is an exam.)
- Euler Path and Hamiltonian Circuit. (We discuss them. We show EP is easily solvable, and HC is really hard.)
- Minimum Spanning Trees. (We learn how. There is an exam.)

These support and roughly correspond to the following higher-level outcomes.

- Demonstrate the ability to understand and apply knowledge appropriate for Computer Science.
- Understand and be able to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

4 Grading

Here is the actual grade distribution from Fall 2012: (17 students): grade average 3.65, 4.0x14 3.4 2.7 0.0.

Grading is based on Effort (30%), Programming (28%), and Exams (42%). I have built in about 10% extra credit.

4.1 Grading Scale

I use a 60/70/80/90 model based on 1000 points.

Grading is based on 1000 points

930+	A	900-929	A-	870-899	B+
830-869	B	800-829	B-	770-799	C+
730-769	C	700-729	C-	670-699	D+
630-669	D	600-629	D-	0-599	F

4.2 Tracking Your Grade

I keep an online gradebook so you can see how your points are coming along. It also lets you compare them with other students in the class (without seeing their names).

<https://dcquiz.byuh.edu/> is my personal Learning Management System. That is where I maintain my online grade book.

Your points are organized into two grade books: Overall and Effort.

CIS 205 Overall: The Overall imports the total Effort and adds your programming and exam performance. It also shows your final grade.

CIS 205 Effort: The Effort points track the daily updates and study time.

4.3 Effort: (50 points) Daily Update

Each day in class starts with the “daily update” (DU). It is my way of reminding you of due dates and deadlines, sharing updates and news, and taking roll. It is your way of saying something anonymously to each other and to me. It must be taken in class during the 10-minute window of time that starts 5 minutes before class and ends 5 minutes into class.

The DU is worth two points per class period, with 50 points expected (for 25 out of 38 class periods), and 76 points possible. Anything beyond 50 is extra credit. It is also a reward for coming on time, or close enough that you can do the update.

As part of the Daily Update, once a week I will ask you how much time you spent studying the previous week. I will use your report to update your study time points.

4.4 Effort: (250 points) Study Time

We award points for study time (ST), which is time spent engaging with materials directly related to this course.

Each week you are invited to report, on your honor, how many hours you studied during the previous week, Sunday morning through Saturday night. We award two “effort” points per hour of “study,” for a goal of 18 points (9 hours, including class time) and a maximum of 20 points (10 hours) per week, whether there is a holiday or not.

There are 14 weeks. $14 \times 18 = 252$. $14 \times 20 = 280$ (max). Anything beyond 250 points is extra credit.

Most students max out the study time points each week. This provides them with extra credit that helps ensure they get a good grade in the class.

Reporting Your Study Time

Once a week I will ask for your study time as part of the daily update.

For study during the very last week, which includes the final exam, you can report on the day of the final exam.

If you do not report in some other way, you can report by sending me the details by email.

Inside the email, say something like: “For the week of (starting month and day) to (ending month and day), I studied (how many) hours.” Be specific about which week it is.

4.5 Effort Points are Optional

The effort points (daily update and study time) are there as a safety net. They are easy to earn. They help to make sure you will pass the class.

But when I calculate your final grade, I do it two ways:

- (a) Counting every point, based on 1000 total points.
- (b) Counting all but daily update and study time, based on 700 total points.

Last semester, about 90% of my students did better when I counted their effort points. About 10% did better without.

I use whichever method gives you the best grade.

4.6 Skill: (280 points) GBot Lite

During the semester we will do nine computer programs. Supported languages include Perl, which is taught in the CIS 101 class, as well as C, C++, Java, Python, Ruby, and Tcl.

<http://gbot.dc.is2.byuh.edu/> has more.

GradeBot Lite (or GBot for short) will accept your program and test it. When it finds an error, it will inform you so you can fix it. When it runs all its tests without finding any errors, it will inform you so you can turn it in to me.

Regular Credit (280 pts): The tasks 205.p01 through 205.p15 are assigned to everyone. We will talk about these in class, and they are described in the study guide. assistance. There are nine tasks worth 30 or more points each.

Extra Credit: The tasks 205.p21 and higher, listed on the GBot website, are available for 30 points of extra credit each. They are substantially harder than the required programs.

Time you spend working on these programs also counts as study time.

GBot Lite: How To Submit

When you have a program working, email it to me. You are encouraged to work ahead. You do not need to wait until it is due.

Your subject line must be:

`cis205 (program) (lastname firstname)`

For example, John Doe should submit program p01 using this subject line:

`cis205 p01 Doe John`

The body of your email must be your program, in-line, plain text, not as an attachment. That way I can see it and respond to it directly, or cut-and-paste it into GBot to verify that it works.

The first line of your program must be a comment line repeating the subject line.

The second line of your program must be a comment line specifying what language you are using.

If your program does not comply, I am likely to reply saying “wrong format see syllabus”.

GBot Lite: Helping Others

I encourage you to help other students complete the GBot labs.

You are allowed to let them look at your program, on your computer. You can talk about it and how it works.

You are not allowed to let them copy it or even write notes. They need to program it themselves.

I am also okay with you looking at their program and pointing out ways it could be improved. But please let them do their own work.

4.7 Skill: (420 points) Exams

During the semester we will do in class, a number of “skills” exams that test your skill with certain concepts and procedures. Each exam will be available for practice, and will be given at least once for credit. On the final exam day, each exam will be available again to let you try to improve your grade.

- S1 q41 Res: Propositional Calculus Resolution
- S2 q13 BO: Big Oh Analysis of Algorithms
- S3 q31 Ct: Counting Comb, Permutations
- S4 q45 CP: Conditional Probability
- S5 q36 BST: Binary Search Tree
- S6 q35 Huf: Huffman Coding
- S7 q18 MST: Minimum Spanning Tree

Most of the exams are designed on an 80/40 model, where the first 80% of the questions are of normal

difficulty, and the last 40% of the questions are somewhat harder. Yes, that adds up to 120%. The other 20% is extra credit for those that can do it.

4.8 Other Extra Credit

Report an error in the published materials I provide. In this class, they include the following:

- The course website, parts relating to this semester.
- The course syllabus.
- The course study guide.

Each error reported can earn you extra credit. (Typos in my email messages are common and do not count.)

5 Calender

We meet about 38 times plus the final.

The due date and deadline for each activity will be mentioned in class and published in the course study guide, which will be updated regularly throughout the semester.

5.1 Special Dates

Mo Jan 07 First Day of Instruction
 Mo Jan 21 No Class: Human Rights Day
 Mo Feb 18 No Class: Presidents Day
 Mo Apr 08 Last Day of Instruction
 Tu Apr 09 GBot Late-Work Deadline
 Fr Apr 12 Final Exam

5.2 Excused Absences

You can see that I have build a bit of slack into the grading so you can miss a few days (or assignments) if you need to, and still earn an A. Taking a friend to the airport? Taking your spouse or child to the doctor? Taking a field trip for another class? No problem. You are excused.

Class activity assignments are due soon after they are assigned, but I normally allow late work at full

credit for two more weeks (except at the end of semester).

Every exam is given at least twice and I keep your highest score, so if you have to miss an exam, my advice is to study harder for when I offer it again. If you miss all the times I give a certain exam, you can make it up during the final exam time.

The scheduled final exam consists of an opportunity to retake **any** exam that was offered during the semester. If you are happy enough with your previous scores, **you can skip the final.**

Beyond that I do not offer special treatment to anyone except in **HIGHLY** unusual situations.

6 Support

The major forms of support are (a) open lab, (b) study groups, and (c) tutoring.

If you still need help, please find me, even outside my posted office hours. My door is often open.

6.1 Office Hour / Open Lab

This semester during my “office hours” I operate an open lab (a study hall) MWF from 11:00 AM to 12:00 noon in GCB 111. I will be present in GCB 111 or in my office to assist students that come. The room is available for your use in working on your projects, either individually or in groups.

The CIS department operates an open lab with tutors, also in GCB 111, most afternoons and evenings.

6.2 Study Groups

You are encouraged to form a study group. If you are smart, being in a study group will give you the opportunity to assist others. By assisting others you will be exposed to ideas and approaches (and errors) that you might never have considered on your own. You will benefit.

A good time for your study group to meet is during the study hall. Eat lunch together (carefully) and work on the class activities.

If you are struggling, being in a study group will give you the opportunity to ask questions from someone

that remembers what it is like to be totally new at this subject. They are more likely to understand your questions because they sat through the same classes you did, took the same tests as you did, and probably thought about the same questions that you did.

Most of us are smart some of the time, and struggling some of the time. Study groups are good.

6.3 Tutoring

The CIS department provides tutoring in GCB 111, Monday through Friday, typically starting around 5 PM and ending around 11 PM (but earlier on Fridays). Normally a schedule is posted on one of the doors of GCB 111.

Tutors can be identified by the red vests they wear when they are on duty.

Not all of the tutors know about everything. But all of the tutors should know which tutors do know about whatever you are asking about, so they can direct you toward the best time to get your questions answered.

The best way to use a tutor is to show them something that you have written and ask them why it does not work the way you want. This can open the door to a helpful conversation.

Another good way to use a tutor is to show them something in the textbook and ask about it.

The worst way to use a tutor is to plunk down next to them and say, "I don't understand. Can you teach me?" If you did not try hard to read carefully, you are wasting everybody's time.

If you still need help, please come and see me, even outside my posted office hours. My door is open.

7 BYUH Learning Framework

I believe in the BYUH Framework for Learning. If we follow it, class will be better for everyone.

7.1 Prepare for CIS 205

Prepare: Before class, study the course material and develop a solid understanding of it. Try to con-

struct an understanding of the big picture and how each of the ideas and concepts relate to each other. Where appropriate use study groups to improve your and others' understanding of the material.

In CIS 205: Make reading part of your study. There is more than we could cover in class because we all learn at different rates. Our in-class time is better spent doing activities and answering your questions than listening to me lecture.

7.2 Engage in CIS 205

Engage: When attending class actively participate in discussions and ask questions. Test your ideas out with others and be open to their ideas and insights as well. As you leave class ask yourself, "Was class better because I was there today?"

In CIS 205: Participate in the in-class activities. Those that finish first are often requested to help those that want assistance. It is amazing what you can learn by trying to help someone else.

7.3 Improve at CIS 205

Improve: Reflect on learning experiences and allow them to shape you into a more complete person: be willing to change your position or perspective on a certain subject. Take new risks and seek further opportunities to learn.

In CIS 205: After each exam, with possible rare exceptions, I allow you to see every score and every comment and every answer submitted for every question. Review your answers and those of other students. See how your answers could be improved. If you feel lost, study the readings again.

8 Standard Statements

All syllabi are encouraged or required to address certain topics. These are generally considered to be common sense, but we find that it is useful to mention them explicitly anyway.

8.1 Dress and Grooming Standards

The dress and grooming of both men and women should always be modest, neat and clean, consis-

ment with the dignity adherent to representing The Church of Jesus Christ of Latter-day Saints and any of its institutions of higher learning. Modesty and cleanliness are important values that reflect personal dignity and integrity, through which students, staff, and faculty represent the principles and standards of the Church. Members of the BYUH community commit themselves to observe these standards, which reflect the direction given by the Board of Trustees and the Church publication, "For the Strength of Youth." The Dress and Grooming Standards are as follows:

Men. A clean and neat appearance should be maintained. Shorts must cover the knee. Hair should be clean and neat, avoiding extreme styles or colors, and trimmed above the collar leaving the ear uncovered. Sideburns should not extend below the earlobe. If worn, moustaches should be neatly trimmed and may not extend beyond or below the corners of mouth. Men are expected to be clean shaven and beards are not acceptable. (If you have an exception, notify the instructor.) Earrings and other body piercing are not acceptable. For safety, footwear must be worn in all public places.

Women. A modest, clean and neat appearance should be maintained. Clothing is inappropriate when it is sleeveless, strapless, backless, or revealing, has slits above the knee, or is form fitting. Dresses, skirts, and shorts must cover the knee. Hairstyles should be clean and neat, avoiding extremes in styles and color. Excessive ear piercing and all other body piercing are not appropriate. For safety, footwear must be worn in all public places.

8.2 Accommodating Special Needs

Brigham Young University–Hawai'i is committed to providing a working and learning atmosphere which reasonably accommodates qualified persons with disabilities. If you have any disability that may impair your ability to complete this course successfully, you are invited to contact the Students With Special Needs Coordinator at 808-675-3518. Reasonable academic accommodations are made for all students who have qualified documented disabilities.

8.3 Plagiarism

<http://en.wikipedia.org/wiki/Plagiarism> has a wonderful article on plagiarism. Read it if you are not familiar with the term. Essentially, plagiarism is when you present the intellectual work of other people as though it were your own. This may happen by cut-and-paste from a website, or by group work on homework. In some cases, plagiarism may also create a violation of copyright law. If you borrow wording from someone else, identify the source.

Intentional plagiarism is a form of intellectual theft that violates widely recognized principles of academic integrity as well as the Honor Code. Such plagiarism may subject the student to appropriate disciplinary action administered through the university Honor Code Office, in addition to academic sanctions that may be applied by an instructor.

Inadvertent plagiarism, whereas not in violation of the Honor Code, is nevertheless a form of intellectual carelessness that is unacceptable in the academic community. Plagiarism of any kind is completely contrary to the established practices of higher education, where all members of the university are expected to acknowledge the original intellectual work of others that is included in one's own work.

CIS 205: In this course group discussion of labs is permitted and encouraged but you are not allowed to turn in work that is beyond your understanding, whether you give proper attribution or not. Make sure you understand what you are submitting and why each line is there.

CIS 205: On exams you are required to work from personal memory, using only the resources that are normally present on your computer. This means the exams are closed book and closed notes. Students caught cheating on an exam may receive a grade of F for the semester, no matter how many points they may have earned, and they will be reported to the Honor Code office.

Faculty are responsible to establish and communicate to students their expectations of behavior with respect to academic honesty and student conduct in the course. Observations and reports of academic dishonesty shall be investigated by the instructor, who will determine and take appropriate action, and report to the Honor Code Office the final disposition

of any incident of academic dishonesty by completing an Academic Dishonesty Student Violation Report. If the incident of academic dishonesty involves the violation of a public law, e.g., breaking and entering into an office or stealing an examination, the act should also be reported to University Police. If an affected student disagrees with the determination or action and is unable to resolve the matter to the mutual satisfaction of the student and the instructor, the student may have the matter reviewed through the university's grievance process.

8.4 Sexual Harassment

BYUH's policy against sexual harassment complies with federal Title IX of the Education Amendments of 1972 to protect university students from student-to-student sexual harassment both in and out of the classroom setting. Any incidents of such student-to-student harassment should be reported to either the Director of Human Resources (808-675-3713) or the Honor Code Office (808-675-3531). Allegations of sexual harassment are taken seriously. Upon receiving a report of sexual harassment, the Director of Human Resources will take appropriate action to resolve and correct conditions resulting from individual perceptions or from inappropriate behavior.