Discrete Mathematics I Math 2305 (Math 2305.021)
Department of Mathematics and Statistics
Spring 2018

A. COURSE INFORMATION

Course number/section: Math2305.021
Class meeting time: TR 12:30-1:45 pm.
Class location: IH 157
Course Website: bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Jose H. Giraldo
Office location: CI 317
Office hours: TR 10:00 am-12:00 am, MW 12:50-1:50 pm
Telephone: 361-8255827
e-mail: jose.giraldo@tamucc.edu
Appointments: Contact me through email to arrange meetings outside office hours.

C. COURSE DESCRIPTION

Catalog Course Description
An introduction to topics in Discrete Mathematics with an emphasis on applications in Mathematics and Computer Science. Topics include formal logic, graphs, trees and related algorithms, and combinatory and discrete probability.

Extended Course Description
After reviewing the key concepts on sets, logic concepts are introduced. Then, each of the key concepts will be revisited in a more formal manner. Attention will be placed into making conjectures, and verifying or rejecting them with solid arguments.

D. PREREQUISITES AND COREQUISITES

Prerequisites
MATH 1314 and 1316, or MATH 2312, or placement beyond MATH 2312

Corequisites
None

E. REQUIRED TEXTBOOK, READINGS AND SUPPLIES

Required Textbook
There is not a required textbook but a recommended one.

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of the course, a student should be able to

1. Demonstrate knowledge of elementary formal logic.
2. Apply knowledge of general-purpose proof methods, including direct proof, proof by contradiction, and mathematical induction to construct or understand elementary proofs in discrete mathematics.
3. Demonstrate knowledge of fundamental properties of graphs and trees.
4. Apply elementary combinatorial methods to the solution of counting and discrete probability problems.
5. Exhibit knowledge of other topics to include (as time permits) the asymptotic functional notations \( \theta \), BIG-O, and \( \Omega \), sequences, and relations on sets.

**The student should achieve the following general goals in this class:**

1. Improve his attitude toward:
   - Appreciation and value of mathematics
   - The likelihood of success and satisfaction
   - Ways to learn math effectively
   - The link between math and the student’s discipline
2. Strengthen his general academic skills in:
   - Critical thinking
   - Writing
   - Giving clear verbal explanations
   - Working collaboratively
   - Assuming responsibility
   - When and how to use technology.
3. Improve his quantitative reasoning skills:
   - Ability to translate a word problem into a math statement, and back again to words.
   - Ability to form reasonable descriptions and judgments based on quantitative information.
G. INSTRUCTIONAL METHODS AND ACTIVITIES

The class instruction will be based on lecturing and class discussions. Students are expected to read assigned material before coming to class. Students are expected to be active learners and not spectators.

In general each meeting is structured to have three parts:

I. Group discussion of homework or other assignments within your group, and then extended discussion to the whole class. 10-15 minutes max
II. Presentation of new concepts and activities aimed to the understanding of the new concepts. 20-25 minutes
III. Work in groups on problems dealing with the new concepts discussed in class. 20-25 minutes
IV. Evaluation of new concepts using “voting systems” 10 minutes

Group work and working on homework are the essential component of this class. These are the key components for you to understand the concepts and leading to your success.

*Keep in mind that you CAN ONLY REMEMBER*

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<tbody>
<tr>
<td>10% of what you read</td>
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<tr>
<td>20% of what you hear</td>
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<td>30% of what you see</td>
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<td>50% of what you see and hear</td>
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<tr>
<td>70% of what you discuss with others</td>
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<tr>
<td>90% of what you teach someone else</td>
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In this course YOU will be an active participant in the learning process. *I expect you to be a scholar, not a spectator.*

You will work in groups of three or four. Research shows that students who *work* in groups tend to be more successful. From participating actively in the activities/problems assigned, you will reach the level that enables you to discuss the concepts with others, or teach those concepts to someone else. Writing and explaining to others are important component of this approach. For this reason, numerical answers without an accompanying explanation or interpretation are meaningless.
H. MAJOR COURSE REQUIREMENTS AND GRADING

All the activities leading to accomplishing the goals for this class will be considered for your final grade. The table below shows the instruments that will be used to determine your grade.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>Mid term Assessments (20%, 20%)</td>
<td>40%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<tr>
<td>Quizzes</td>
<td>15%</td>
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<tr>
<td>End of the semester problems and Interview</td>
<td>15%</td>
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<tr>
<td>Homework</td>
<td>10%</td>
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Grading

All your grading will be done using the scale 0-4 on the topic assessed.

4: Excellent. You show full understanding of all the concepts and your computational work has minor problems.

3: Good. You show understanding of the concepts but there is some lack of clarity on some of them. There are problems on your computational work but easy to be fixed so you can get mastery of it.

2: Average. You show a general understanding of the concepts that prevent proper application of them. The computational work has problems that require a significant amount of work to be fixed/mastered.

1: Deficient. You show lack of understanding of the key concepts and poor computational ability that impedes your ability to solve problems.

Your final grade is to be determined according to the scale

A: 3.2-4.0  B: 2.5-3.2  C: 1.7-2.5  D: 0.5-1.6  F: 0.0-0.5

Midterm Assessments

There will be two midterm assessments. Each assessment has two parts: Basics, and Essay. The part on Basics will assess the basic concepts you are expected to master in this class, including definitions. This part on basics is closed notes, closed book, and counts as 70% of the test grade. For the solutions in the Essay part you have to include full explanation of your work and principles used to receive credit. It counts as 30% of the test grade.

For the essay part of each test you are allowed to use standard note card with information you
consider necessary. Examples and solutions to problems are not allowed in the note card.

To see what is to be assessed in each midterm and the corresponding dates for them visit the calendar for the course. Review questions for each of the test will be available to the students and I DO EXPECT YOU TO WORK ON THE REVIEW. About 40% of the questions in the test will are similar to the review questions for the test.

In each test you are expected to show you know definitions and examples showing when the conditions are met and they are not met.

**FINAL EXAM**

The final exam also has the basic and essay parts. The part on basics will cover all the topics included in the midterms. The essay part will be on particular topics to be announced during the review.

**QUizzes**

There will be at least ten quizzes during the semester. I will drop the two lowest scores. These quizzes are formative assessments and will tell you how well you are getting the key concepts for this course. Topics and rubric for them will be available in Black Board. The questions for the quiz will come directly out of the homework assigned.

**HOMEWORK**

There is homework assigned in each class either from the book or extra problems posted on Black Board. You have to have a spiral devoted only to homework. It is important that you have the spiral with the homework available for each class and whenever you visit with me. *You need to show evidence of your work when you ask questions about homework.* The grade from your homework will come from homework quizzes you will have in class, almost every meeting. For those quizzes I will choose one or two of the assigned homework problems and ask you to write their solution or part of their solution. You can use your homework notebook to copy the solution.

**PROBLEMS AND INTERVIEW**

You will receive a set of problems the second week of the semester. You have the whole semester to work on those. The solutions and defense of the solution through an interview will happen toward the end of the semester. Full details in Black Board.

I. **COURSE CONTENT/SCHEDULE**
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction. The Tower of Hanoi and Strings</td>
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<td>1.1 Logical Form and logical Equivalence</td>
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<td>2</td>
<td>1.2 Conditional Statements</td>
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<td>3</td>
<td>1.3 Valid and Invalid arguments</td>
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<td>1.4 Introduction to Predicates</td>
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<td>4</td>
<td>2.1-2 Introduction to Predicates and Quantifiers</td>
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<td>2.3 Statements with multiple quantifiers</td>
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<td>2.4 Arguments with quantified Statements</td>
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<td>5</td>
<td>3.1-5 Direct Proof</td>
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<td>3.6 Indirect argument, contradiction and contraposition</td>
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<td>6</td>
<td>3.8 Applications</td>
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<td>5.1 Basics on sets</td>
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<td>5.2 Properties of sets</td>
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<td>5.3 Algebraic proofs</td>
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<td>8</td>
<td>6.1 Introduction to counting and probability</td>
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<td>6.2 Multiplication rule</td>
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<td>6.3 Addition rule</td>
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<td>6.4 combinations</td>
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<td>6.5 r-combinations</td>
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<td>6.7 Binomial theorem</td>
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<td>11</td>
<td>10.1 Relations on sets</td>
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<td>10.2 Properties of relations</td>
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<td>12</td>
<td>10.3 Equivalence relations</td>
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<td>10.5 Partial ordered relations</td>
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<td>13</td>
<td>7.1 Functions</td>
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<td>7.2 One to one, onto, inverse functions</td>
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<td>14</td>
<td>7.3 The pigeon hole principle</td>
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<td></td>
<td>4.1 Sequences</td>
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<td>15</td>
<td>4.2 Mathematical Induction</td>
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<td></td>
<td>8.1 Functions defined recursively</td>
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<td>8.2 Solving Recursive relations</td>
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**Final Exam Thursday, May 10th, 11:00 am-1:30 pm**

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

More details available in Black Board
J. COURSE POLICIES

Attendance/Tardiness
The attendance to class and participation in the class discussions are paramount for you to understand the subject matter. Attendance to class is optional but I will keep track of it.

Late Work and Make-up Exams
I will not collect any late work. No makeups unless there is an extreme situation fully justified. Do not ask for exceptions.

Extra Credit
There is no extra credit in this class. You have plenty of opportunities to show your understanding of the material throughout different assessments.

Cell Phone Use
Only allowed to deal with class related issues: surveys in class, Google searches for class discussions, or info needed for a problem, etc. Use of cell for personal purposes is not authorized.

Laptop Use
You are encouraged to bring your laptop to class. However, you are expected to use it only for class related activities. Social media, mail, or personal searches are not allowed while we are in class.

Food in Class
No food please.

Missed Exam
No makeups.

Participation
Your participation in any class discussions is highly encouraged.

Others

- Use the resources you have available: your classmates, the SI leader or the mentor, the Teaching Assistant, the professor, the Center for Academic Student Achievement (CASA). All of this will lead to our main objective, which is YOUR LEARNING.
- The course requires a solid and continuous effort. Since this is a four-credit course, you are expected to devote for each hour of class between two and three hours outside the class working on the subject. Some people need more time than others. Each individual has a different way to learn. All of us are different.
• I do expect that you come to each class prepare to talk about any assigned work and readings. One of the best ways to learn any subject and specially mathematics is by talking to others about a problem after you have read and attempted the problems on you own. Listening to a solution without attempting to solve it and struggling through the process will not benefit you very much. Be aware that reading the solutions and be able to follow the explanation does not mean that you know how to do the problem and understand all what is involved in it.
• At the beginning of each class you have the opportunity to ask questions about the homework. Use that time wisely. Remember that making a serious attempt to solve a problem and later discuss your solution or to clarify doubts is key in the learning process.
• Feel absolutely free to ask any questions. Your question will benefit you and most likely others around you. One of the driving forces of mathematics is the questioning part. Why? Why? Why? Rote memorization is not a great help here but is needed too at some point.
• Do not hesitate to contact me in case you want to discuss your performance in the class. I am here to lead your learning but you are the one responsible for it. I AM THE COACH AND YOU ARE THE PLAYER.
• After you receive s grade you have up to the next class meeting to dispute it. I am the only person you can dispute your grade with. After the two days I assume that you accepted your grade. NO EXCEPTIONS. Grades are posted on the web immediately after I return a graded paper.
• You are expected to be on time for class. Arriving late or leaving the classroom before the end of the period will be considered impolite, and rude to your classmates and professor. BE ON TIME FOR EACH MEETING. Your attendance will be monitored. The attendance sheet will be in the front of the classroom for each meeting. Make sure you check it on daily basis.
• If at any point in the semester you are considering to drop the class, talk to me before you do it. I am here to help you in your learning experience and to help you to succeed in your college career.
• The most basic rule to work as part of a group is the respect to others. I will appreciate all your effort to make it the golden rule. Refer to others with respect.

K. COLLEGE AND UNIVERSITIY POLICIES

• Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.
• **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

• **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

• **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. **Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course.** Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation **WILL NOT automatically result in your being dropped from the class.** Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

• **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of
days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

**Disability Services**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816. [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

**Statement of Academic Continuity**

In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

I. **OTHER INFORMATION**

**Academic Advising**

The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.
GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.