

Course Outline

1. COURSE INFORMATION			
Session Offered	Fall 2017		
Course Name	Discrete Mathematics		
Course Code	ENG TECH 3DM3		
Date(s) and Time(s) of lectures	W-6.30pm-9.20pm ONLINE		
Program Name	Computing and Information Technology		
Calendar Description	Fundamental discrete mathematical concepts relevant to IT: sets, relations, functions, graphs, propositional logic. State machines. Input/output specifications. Invariants.		
Instructor(s)	Dr. Seshasai Srinivasan	E-Mail: ssriniv@mcmaster.ca Office Hours & Location: By appointment	
2. COURSE SPECIFICS			
Course Description	The course includes concepts and applications of discrete mathematical structures as opposed to continuous mathematics studied in algebra and calculus. The topics presented in the course focus on Logic: propositional equivalences, predicates, sets, set operations, functions. Algorithms: integers and division, search algorithms. Coding theory: congruence, Euclidian algorithms, RSA method. Method of proof: mathematical induction, recursive definition, statement and connectives, logical equivalence. Basics of counting: permutations and combination. Relations and their properties: representing relations, equivalence relations, recurrence relations, generating functions. Graphs and trees: representing graphs, isomorphism, connectivity, Euler and Hamilton paths and circuits, trees, tree traversals, search algorithms, binary search. Combinatorial circuits: logical gates, finite state machines.		
Instruction Type	Code	Type	Hours per term
	C	Classroom instruction	39
	L	Laboratory, workshop or fieldwork	
	T	Tutorial	
	DE	Distance education	
	Total Hours		39
Resources	ISBN	Textbook Title & Edition	Author & Publisher
	ISBN-10:0321305159 ISBN-13:978032130515	Discrete Mathematics, 5 th Edition	<i>Dossey, J.A., et al</i> Pearson Addison Wesley
	Other Supplies	Source	
Prerequisite(s)	<i>Registration in Computing and Information Technology</i>		
Corequisite(s)	<i>None</i>		
Antirequisite(s)	<i>None</i>		
Course Specific Policies	<ul style="list-style-type: none"> • Quizzes will be online and must be done before the deadlines. There will be no extensions. • The mid-term test and final exam is closed book. The use of a letter sized sheet of paper outlining the major formulas is allowed during testing. No worked examples with solutions are permitted. 		

	<ul style="list-style-type: none"> All work must be shown to get full credit. 	
Departmental Policies	<p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p>	
3. SUB TOPIC(S)		
Week 1	<p>Introduction to combinatorial problems and techniques</p> <ul style="list-style-type: none"> Critical path analysis: PERT Combinatorial analysis <p>Sets, relations and functions</p> <ul style="list-style-type: none"> Set operations Equivalence relations 	<p>Chapter 1</p> <p>Chapter 2</p>
Week 2	<p>Sets, relations and functions</p> <ul style="list-style-type: none"> Functions Mathematical induction 	Chapter 2
Week 3	<p>Coding theory</p> <ul style="list-style-type: none"> Congruence Euclidian algorithm Ciphering with the RSA method 	Chapter 3
Week 4	<p>Coding theory</p> <ul style="list-style-type: none"> Deciphering with the RSA method Error detecting and error correcting codes <p>Graphs</p> <ul style="list-style-type: none"> Graphs and their representations: adjacent matrix and list, isomorphism Paths and circuits Euler path and circuit Hamiltonian path and circuit 	<p>Chapter 3</p> <p>Chapter 4</p>
Week 5	<p>Graphs</p> <ul style="list-style-type: none"> Shortest paths and distance: breadth-first search algorithm Weighted graphs, Dijkstra’s algorithm Colouring a graph Directed graphs and multigraphs 	Chapter 4
Mid-term Recess: Monday, October 9 to Sunday, October 17, 2017		
Week 7	Mid-Term test	Chapter 1-4
Week 8	<p>Trees</p> <ul style="list-style-type: none"> Properties of trees 	Chapter 5

	<ul style="list-style-type: none"> ○ Spanning trees; breadth-first search algorithm. ○ Minimal and maximal spanning tree. Prim's algorithm ○ Depth-first search algorithm ○ Rooted trees 	
Week 9	Binary trees and traversals <ul style="list-style-type: none"> ○ Expression trees. Binary trees ○ Tree traversals: preorder, postorder, inorder algorithm ○ Binary search tree algorithm 	Chapter 5
Week 10	Recurrence relations <ul style="list-style-type: none"> ○ Recurrence relations ○ The method of iteration ○ Linear difference equations with constant coefficients 	Chapter 5
Week 11	Counting with generating functions <ul style="list-style-type: none"> ○ Generating functions ○ The algebra of generating functions Logic and proof <ul style="list-style-type: none"> ○ Statements and connectives ○ Logical equivalence 	Chapter 9 Appendix A
Week 12	Combinatorial circuits and finite state machines <ul style="list-style-type: none"> ○ Logical gates ○ Creating combinatorial circuits ○ Finite state machines 	Chapter 10
Week 13	Review	
Week 14	Review	
Classes end: Wednesday, December 6, 2017 Final examination period: Friday, December 8 to Thursday, December 21, 2017 All examinations MUST be written during the scheduled examination period.		
Note that this structure represents a plan and is subject to adjustment term by term. The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.		
4. ASSESSMENT OF LEARNING *including dates*		Weight
Quizzes		15%
Mid-term test (2 hours)		35%
Final examination (tests cumulative knowledge)		50%
TOTAL		100%
Percentage grades will be converted to letter grades and grade points per the University calendar.		
5. LEARNING OUTCOMES		
1. Analyse discrete data structures such as sets, relations, sequences, and discrete functions		
2. Compare discrete mathematics algorithms that solve engineering and technology problems		
3. Develop discrete structures such as finite graphs and trees		
4. Select appropriate discrete algorithms to represent and search data		
5. Derive formulas using recurrence relations and generating functions applied to sets of objects		
6. Use coding algorithms to encrypt and decrypt data for secure transfer on public networks		
6. POLICIES		
Anti-Discrimination		

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf

Academic Integrity

You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf>.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained
2. Improper collaboration in group work
3. Copying or using unauthorized aids in tests and examinations.

Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.)

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences **DUE TO MINOR MEDICAL SITUATIONS** that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period.

You may submit a maximum of 1 Academic Work Missed requests per term. It is YOUR responsibility to follow up with your Instructor immediately (**NORMALLY WITHIN TWO WORKING DAYS**) regarding the nature of the accommodation.

If you are absent **for reasons other than medical reasons**, for more than 3 days or exceed 1 request per term you **MUST** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation.

This form should be filled out immediately when you are about to return to class after your absence. <http://www.mcmaster.ca/msaf/>

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University

communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.

- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin (Optional)

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to

<http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>