

# INQ 241, Spring 2020: Running the World Efficiently

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Instructor                 Dr. Karin Saoub                                 *Phone: (540) 375-2348*  
                                  Trexler Hall 270F                                 *Email: saoub@roanoke.edu*

Class Meetings             Mondays, Wednesdays, Fridays: 12:00 – 1:00 PM in Miller 012

Expected Work Hours     This course expects you to spend at least 12 hours of work each week inside and outside of class.

Office Hours               By appointment only (see <https://saoub.youcanbook.me>), mainly during the times listed below.

                                Mondays, Wednesdays, Fridays     1:15 – 2:00 PM  
                                Tuesdays, Thursdays             11:00 – 12:00 PM

About the Course             An important aspect of mathematical reasoning is modeling real world problems with various mathematical methodologies. This course applies a specific mathematical discipline, Graph Theory, to problems concerning optimization and efficiency. The course is split into six units, each of which focuses on a specific question. The first three units focus on various routing problems, the fourth on maintaining connections, the fifth on pairings, and the sixth unit focuses on resource management. Graph theory provides an avenue for advancing critical thinking skills, formulating complex problems into a mathematical structure, and applying and understanding limitations of solution techniques.

Required Materials             *A Tour through Graph Theory; Saoub, Karin EasyWriter;*  
                                  Lunsford, Andrea A.  
                                A basic hand held calculator  
                                Recommended: Laptop computer

Intended Learning Outcomes     

- Students will be able to describe and apply methodologies of mathematics or computer science appropriate for the course’s discipline and topic.
- Students will be able to write about course topics clearly and effectively.
- Students will be able to interpret quantitative information related to the course topic.

Course Grades               The following table lists the weights for the various forms of assessment for this class.

Homework/Quizzes	15%
Paper	10%
Projects	25%
Tests (12% each)	36%
Final Exam	14%

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

		B+	87-89	C+	77-79	D+	67-69		
A	94-100	B	83-86	C	73-76	D	63-66	F	0-59
A-	90-93	B-	80-82	C-	70-72	D-	60-62		

## Academic Integrity

Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! No collaboration is allowed on quizzes or tests. Unless otherwise stated, you may work together on the homework, but should write up your solutions separately.

Cell phones must be turned off prior to entering the classroom. Laptops may be used for note-taking during regular class sessions, if this seems useful to you, but you may not log on to the internet or to an email server unless specifically told to do so. The use of laptops and other electronic devices, except for a calculator, during an exam is strictly prohibited. This includes tablets, smart phones, and iPods. Any use of such devices during a quiz or exam will be considered a breach of academic integrity. Note that looking at or using your cell phone during a test or quiz is considered a violation of Academic Integrity regardless of your purpose or intent in doing so.

## Attendance & Make-Up Work

Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. I will assume that if you accumulate 4 unexcused absences you are not interested in completing the course. After the 3rd unexcused absence, you, your advisor, and the registrar will be warned that another absence will result in your removal from the class (DF).

*When absent, excused or unexcused, you are responsible for all material covered in class. You will not be allowed to make up any work missed due to an unexcused absence.*

## Reading and Participation

The key to learning a topic in mathematics is participation. We will strive to have an active, rather than passive, classroom environment. The last page of the syllabus is a daily outline of the topics that will be discussed in class. You are fully expected to have read the appropriate section of the textbook **before** the class meeting! Lecture slides will also be available on Inquire. You should plan to print these out and bring them to class. Additional notes will be written on the board.

## Homework

Homework will be assigned regularly in this class (virtually every class period). You are expected to attempt every problem before the next class period and these will be due at the start of the class period immediately following the assigning of homework. Some problems will be graded for correctness (5 points), while the remainder will be graded for completion (5 points), for a total of 10 points.

If you will be absent, turn in your homework before the class period it is due, or have a friend turn it in for you. Late homework will only be accepted within 2 days of the original due date and will automatically lose the completion points.

## Quizzes

There may be quizzes in this class. They may either be in-class quizzes or take-home quizzes. I may occasionally warn you about an upcoming quiz but you should be prepared to take a quiz on any given day. These will generally test definition knowledge and recognizing main concepts.

Projects	Projects will be assigned throughout the term. Each project will apply the concepts from a class unit to a business scenario, and therefore are more in-depth and open ended than problems appearing in the homework and quizzes. Instructions will be handed out well in advance and I will gladly help you with the assignments up until the night before they are due. Projects will be graded on the correctness of the mathematics and models used, explanations of concepts, and the overall form of the document. A grading rubric will be provided along with the assignment instructions.
Paper	Even though this is a math course, we will be spending some time on written communication. Each project will contain a writing component, but the initial grade will primarily focus on the mathematics completed. By the end of the semester, four of the projects will be compiled into a longer paper whose grade will more heavily rely on the written portion, though the correctness of the mathematics will still be emphasized. The paper will be a formal report that could be submitted to a business, and therefore must be a polished document with all figures and tables labeled and referenced appropriately.
Tests & Final Exam	Three tests will be given (roughly according to the schedule on page 4) throughout the semester. Each test will focus on the material learned since the last test, but as with most mathematics classes, the exam will necessarily require you to understand and remember things from the past. If you miss or will be missing a test for reasons beyond your control (college sports team event, sickness, family tragedy, etc.), notify me as soon as possible. An appropriate letter of documentation will be required to make up a test.  <p style="background-color: yellow; margin: 10px 0;">The final exam will be comprehensive and given during the scheduled time for the final exam for Block 4: Monday, April 27th, 2:00 – 5:00 PM.</p>
Co-Curricular Engagement	The MCSP Department offers a series of talks (MCSP Conversation Series) that appeal to a broad range of interests related to these fields of study. These co-curricular sessions engage the community to think about ongoing research, novel applications and other issues that face our discipline.  Members of this class are invited be involved with all of these meetings. After attending, submit a one page paper reflecting on the discussion through Inquire. This should not simply be a regurgitation of the content, but rather a personal contemplation of the experience. These reflection papers earn extra credit, with .5% added to your course average for each attended, up to 2% total. In addition, individually you may request that other appropriate events count.
Subject Tutoring	Located on the lower level of Fintel Library (Room 5), Subject Tutoring is open 4 pm – 9 pm, Sunday – Thursday, and is a Level II Internationally Certified Training Center through the College Reading and Learning Association (CRLA). Subject Tutors are highly trained Roanoke College students who offer one-on-one tutorials in a variety of general education and major courses such as: Business, Economics, Mathematics, INQ 240, Modern Languages, Lab Sciences, INQ 250, and Social Sciences (see all available subjects at <a href="http://www.roanoke.edu/tutoring">www.roanoke.edu/tutoring</a> ). Tutoring sessions are available in 15, 30, or 45-minute appointments. Feel free to drop by for a quick question or make an appointment at <a href="http://www.roanoke.edu/tutoring">www.roanoke.edu/tutoring</a> for a longer one-on-one appointment. For questions or concerns, please contact us at 540-375-2590 or <a href="mailto:subject_tutoring@roanoke.edu">subject_tutoring@roanoke.edu</a>

Accessible Education  
Services

(AES) is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Laura Leonard, Assistant Director of Academic Services for Accessible Education, at 540-375-2247 or by e-mail at [aes@roanoke.edu](mailto:aes@roanoke.edu) to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Laura Leonard at your earliest convenience to schedule an appointment.

Week	Date	Section	Topic	Assignment Due	
1	Mon	Jan 13	1.1	Introduction	
	Wed	Jan 15	1.2	Königsberg Bridge Problem	
	Fri	Jan 17	1.3	Touring a Graph and Algorithms	
2	Mon	Jan 20	1.4	Eulerian Circuit Algorithms	
	Wed	Jan 22	1.5	Eulerizing a Graph	
	Fri	Jan 24	2.1	Hamiltonian Cycles	Project 1
3	Mon	Jan 27	2.1	HC Algorithms	
	Wed	Jan 29	2.2	HC Algorithms	
	Fri	Jan 31	2.2	HC Algorithms	
4	Mon	Feb 3		Additional Topics	Project 2
	Wed	Feb 5		<b>Review</b>	
	Fri	Feb 7		<b>Test 1</b>	
5	Mon	Feb 10	3.1	Shortest Paths	
	Wed	Feb 12	3.1	Shortest Paths	
	Fri	Feb 14	3.1	Dijkstra's Algorithm	
6	Mon	Feb 17	3.2	Project Scheduling	
	Wed	Feb 19	3.2	Project Scheduling	
	Fri	Feb 21		Additional Topics	
7	Mon	Feb 24	4.1	Trees	
	Wed	Feb 26	4.2	Spanning Trees	Project 3
	Fri	Feb 28	4.2	Spanning Trees	
<b>Spring Break</b>					
8	Mon	Mar 9	4.3	Shortest Networks	
	Wed	Mar 11	4.4	Shortest Networks & TSP	
	Fri	Mar 13	5.1	Bipartite Graphs	
9	Mon	Mar 16	5.2	Matching Strategies	
	Wed	Mar 18		<b>Review</b>	Project 4
	Fri	Mar 20		<b>Test 2</b>	
10	Mon	Mar 23	5.2	Matching Strategies	
	Wed	Mar 25	5.3	Stable Matching	
	Fri	Mar 27	5.4	Non-bipartite Matching	

Tentative  
Course  
Schedule

	Mon	Mar 30	6.1	Four Color Theorem	
11	Wed	Apr 1	6.2	Coloring Bounds & Strategies	Project 5
	Fri	Apr 3	6.3	Online Coloring	
	Mon	Apr 6	6.4	Interval and Tolerance Graphs	
12	Wed	Apr 8	6.5	Weighted Coloring	
	Fri	Apr 10		<b>No Class - Good Friday</b>	
	Mon	Apr 13		Additional Topics	
13	Wed	Apr 15		<b>Review</b>	Project 6
	Fri	Apr 17		<b>Test 3</b>	
	Mon	Apr 20		<b>Review for Final</b>	Final Paper
	<b>Mon</b>	<b>Apr 27</b>		<b>Final Exam: 2:00 - 5:00 PM</b>	

*Note: The dates for assignments are approximate and may change by  $\pm 1$  class period. See Inquire or assignment instructions for exact due dates.*