Shared Syllabus for Problem Solving

POINT 1902 LOMA NAZARENE UNIVERSITY	Mathematics, Information, and Computer Sciences College of Natural and Social Sciences MTH3003-3 Problem Solving 3 Units Pre – requisites: MTH0099 and 57 units completed
Spring 2024: January 8 – April 26	

Tuesday meeting: 1:00 pm – 2:15 pm	Instructor: Dr. Catherine Crockett, Professor of Mathematics	
Thursday meeting: 1:00 pm – 2:15 pm	Phone: 619-849-2723	
Meeting location: LBRT 203	Email: catherinecrockett@pointloma.edu	
Final Exam (Liberty Station) April 29th (Monday) 4:30 – 7:00 pm	Office hours: RS222 or Zoom	WMF 11:00 am – 12:00 pm, MW 1:30 pm – 2:30 pm, Thu 10:00 am – 12:00 pm or by appointment

PLNU MISSION: TO TEACH ~ TO SHAPE ~ TO SEND
Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

DEPARTMENT MISSION
The Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

FOUNDATIONAL EXPLORATION
PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

COURSE DESCRIPTION
A foundational exploration course whose major goal is to develop the ability to solve non-routine problems through dynamic processes of inquiry and exploration, logical reasoning, making and testing conjectures and investigating implications of conclusions. A study of quantitative reasoning with emphasis on active problem solving and developing connections with other disciplines. Not applicable toward a major in Mathematics.

PROGRAM AND COURSE LEARNING OUTCOMES
- Students will be able to formulate a mathematical model from a verbal description of a problem.
- Students will be able to solve non-routine problems using logic and quantitative techniques.
- Students will be able to construct solutions to problems using computational techniques

FOUNDATIONAL EXPLORATIONS LEARNING OUTCOMES
FELO 1e: Students will be able to solve problems that are quantitative in nature. A group project will be used to assess this learning outcome.

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES
Textbook: Excursion in Modern Mathematics, 10th Edition (Electronic Copy via My Lab and Mastering)

Author: Peter Tannenbaum
Publisher: PEARSON

COURSE CREDIT HOUR INFORMATION
In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 3-unit class delivered over 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 112.5 total hours meeting the course learning outcomes. The time estimations are provided in the Canvas modules. Specific details about how the class meets the credit hour is provided below.

Online Homework	20.00
Written Homework	20:00
Reading Text/ Watching videos	30.00
Group Project	6.00
Budget Project	4.00
Class meetings	30.00
Midterms	2.50
Final Exam	2.50
TOTAL	115.00

ASSESMENT AND GRADING
The grade components are written homework, online homework, projects, collaborative activities, midterm exams, and the final examination.

GRADING SCALE
A passing grade requires getting at least 60% in one of the two tests or on the final exam. Grades are based on the number of points accumulated throughout the course. Approximate minimal percentages required to obtain a given grade are:

Grading Scale in Percentages				
	A	B	C	D
+		(87.5, 90]	(77.5, 80]	(67.5, 70]
	(92.5, 100]	(82.5, 87.5]	(72.5, 77.5]	(62.5, 67.5]
−	(90, 92.5]	(80, 82.5]	(70, 72.5]	[60, 62.5]

GRADING DISTRIBUTION

Grade Distribution	
Two Mid Term score at 17.5%	35%
Final Exam (Cumulative)	25%
Online Assignments (OA)	10%
Group Project	5%
Individual Budget Assignment	5%
Written Homework	13%
Class Activities	7%
Total	100%

FINAL EXAMINATION POLICY
Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on the Class Schedules site. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for

one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

OTHER FACTORS THAT AFFECT GRADES

- **Online Assignments:** Online assignments (OA) will be completed in MyLab and Mastering website. This will be available by purchasing an access code.
- **Written Homework:** Assignments collected must be prepared in a style suitable for grading. The following guidelines are used to determine credit:
    - the organization must be easy to follow
    - the work must be legible
    - complete solutions must be written for problems (not just answers); answers must be clearly marked
    - use complete sentences to answer questions

- **Tests and Final Examination:** Tests and the final exam will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. No examination shall be missed without prior consent or a well-documented emergency beyond your control. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control. The examination schedule is included in the daily schedule. This instructor does not intend to accept excuses such as poor communication with parents, benefactors, surf team sponsors and/or travel agents. The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. Only in the case that a student is required to take three exams during the same day of finals week is an instructor authorized to change the exam date and time for that particular student. The student must contact each professor in order to work out an alternate time for one of those examinations. Department chairs/school deans and college deans need not be involved in the process of making this accommodation. Such accommodations and the negotiations necessary to arrange them must be completed at least four weeks prior to the official time of the final examination.

INCOMPLETE AND LATE ASSIGNMENTS

- All assignments are to be submitted/turned in by the beginning of the class session when they are due—including assignments posted in Canvas. Late work need not be accepted. Work accepted late may be assessed a penalty. Make-up tests will be given only by prior arrangement with the instructor for reasons of documented emergency.
- **Incomplete grade:** Incompletes will only be assigned in extremely unusual circumstances. You may request a grade of I (incomplete) only if you are having a passing grade an at least 70% of the course work is completed.

Written Homework AT – A – GLANCE

These assignments are to be written up on paper or a PDF uploaded to CANVAS on or before the due date.

Chapter	Page	Problems	Due Date
1	32-34	# 4, 16, 30, 38, 50, 52	1/26/2024
2	64-65	# 4, 18, 36, 58, 60, 64	2/2/2024
4	129	#4, 16, 20, 26, 34, 40	2/16/2024
5	168	# 6, 10, 30, 46, 54, 56	3/1/2024
6	199	#6, 14, 34, 40, 44, 52	3/15/2024
7	220	#6, 20, 26, 40, 42, 50	3/22/2024
8	253	# 30,36, 40, 54, 56, 58	4/12/2024
10	325	# 20, 36, 50, 60, 62, 70	4/26/2024

Comments on homework:

1. This is the minimum amount of homework that is required but you may need to do several odd numbered problems to make sure you get the answer in the textbook.
2. Be sure to upload a scanned copy of your homework before the deadline. No late homework will be accepted except by prior arrangement or with a documented emergency. Please be sure that your scanned homework is legible and not in HEIC format (PDF or JPEG are good).
3. Homework will be scored on a combination of completeness and correctness. All work necessary to complete a problem must be shown to earn credit.
4. Start working on your homework early. These problems are difficult and meant to be done a little at a time over the course of a few days.
5. When doing homework, please note it is normal to not be able to do every problem correct on the first attempt. Do not be discouraged, instead seek help.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the Office of Spiritual Life and Formation

STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on State Authorization to view which states allow online (distance education) outside of California.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.
Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

SEXUAL MISCONDUCT AND DISCRIMINATION
Point Loma Nazarene University faculty are committed to helping create a safe learning environment for all students. If you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that help and support are available through the Title IX Office at http://pointloma.edu/Title-IX . Please be aware that under Title IX of the Education Amendments of 1972, it is required to disclose information about such misconduct to the Title IX Office.
If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at mailto:counselingservices@pointloma.edu or find a list of campus pastors at http://pointloma.edu/Title-IX.

PLNU ATTENDANCE AND PARTICIPATION POLICY
Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university withdrawal date or, after that date, receive an **F** grade. See the Undergraduate Academic Catalog Class Attendance.
In some courses, a portion of the credit hour content will be delivered **asynchronously** and attendance will be determined by submitting the assignments by the posted due dates. See Academic Policies in the Undergraduate Academic Catalog. If absences exceed these limits but are due to university excused health issues, an exception will be granted.

CLASS ENROLLMENT
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

COURSE PHILOSOPHY
The general method of the course is to involve students in "dynamic processes of inquiry and exploration, logical reasoning, making and testing conjectures, and investigating implications of conclusions" [Catalog]. Specifically, the focus is on the processes and tools of quantitative problem solving. Learning what they are and developing ability to use them.
"Today's world is more mathematical than yesterday's, and tomorrow's world will be more mathematical than today's."
"...mathematics...serves as a key to opportunity and careers."[Everybody Counts, p.45, p.3]
"To participate rationally in a world where discussions about everything from finance to the environment, from personal health to politics, are increasingly informed by mathematics, one must understand mathematical methods and concepts, their assumptions and implications." [50 Hours, p.35]
In view of these statements and many other similar ones from national reports, this quantitative experience (MTH 303) has been included as part of the PLNU general education curriculum. Thus, all students will study "major concepts, methods, and applications of quantitative reasoning with emphases on active problem solving" [Catalog].

COURSE APPROACH

The ability to solve problems requires resourcefulness, flexibility, and efficiency in dealing with new obstacles. Research on
teaching and learning problem solving suggests that certain factors are critical to successful problem solving, including resources, heuristics, control, and belief systems [Schoenfeld, 1985].
Resources refer to whatever information problem solvers understand (or misunderstand) that might be brought to bear on a problem.
Heuristic refers to strategies and techniques problem solvers have (or lack) for making progress when working on non-routine problems.
Control refers to the way problem solvers use (or fail to use) the information at their disposal.
Belief systems refer to the problem solver's "world view" of the problem domain, which determines the ways they use the knowledge in the first three categories.
The approach in MTH 303 develops and uses these factors to increase your problem-solving ability. Classroom techniques used include:

- the teacher as role model
- whole-class problem solving with teacher as control
- small-group problem solving with teacher as coach

In addition, you are assigned readings and problems that will help you identify and make progress in the four areas discussed above.

COURSE METHODS

- *Use of groups:* There is almost a century of research showing that academic achievement, productivity, and self-esteem improve dramatically when students work together in groups. This method emphasizes teamwork, cooperation and support by others, rather than isolation and competition in learning.
- *Role of the classroom instructor:* There will be less direct "lecturing" in class than usual, with many questions "answered" by another question to help you work through your own questions and difficulties. You are expected to learn problem solving through active involvement - reading, writing, and explaining to others what you are thinking and doing.

This may require some adjustment in the way you think about teaching and learning. Initially, you may wish for more direct information and answers, but your patience and effort will be rewarded with a deeper understanding and increasing independence in problem solving, as well as confidence in your ability to tackle new problems.

THE FINAL EXAM IS A COMPREHENSIVE EXAMINATION. (April 29th, Monday, 4:30 – 7:00 pm LBRT Station)
Successful completion of this class requires taking the final examination on its scheduled day.
The final exam date, time and place is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

DAILY SCHEDULE

Week	Tuesday	In class- Thursday	Due this week
1 1/8 – 1/12	Introduction to the course and Chapter 1: Introduction to Voting	Chapter 1: Alternative Voting Methods	Obtain course materials: Register for MyLab and do **Intro OA**
2 1/15- 1/19	Chapter 1: Fairness of Voting Methods	Chapter 2: Introduction to Weighted Voting	**OA 1.1 -1.5**
3 1/22- 1/26	Chapter 2: Banzhaf Power Distribution	Chapter 2: Shapley- Shubik Power Distribution	**OA 1.6, 2.1** **Homework Chapter 1**
4 1/29 -2/2	Chapter 4: Introduction to Apportionment	Chapter 4: Modified Divisor Methods	**OA 2.2 – 2.4** **Homework Chapter 2**
5 2/5- 2/9	Chapter 4: Apportionment and Fairness	Review for Exam #1	**OA 4.1 -4.4**
6 2/12- 2/16	Optional: OPEN LAB Review for Exam 1	**EXAM 1: Chapters 1, 2, 4.**	**OA 4.5- 4.6** **Homework Chapter 4**
7 2/19- 2/23	Chapter 5: Introduction to Graph Theory	Chapter 5: Street Routing Problems	**OA 5.1 -5.2** *Begin Group Project
8 2/26-3/1	Chapter 5: Eulerizing and Solving SRP's	Chapter 6: Introduction to Traveling Salesman Problems	**OA 5.3 -5.4** **Homework Chapter 5**
Spring Break			
9 3/11- 3/15	Chapter 6: Algorithms to Solve TSPs	Chapter 7: Introduction to Networks and Trees	**OA 6.1 -6.5** **Homework Chapter 6**
10 3/18- 3/22	Chapter 7: Kruskal's Algorithm for MST's	Chapter 8: Introduction to Digraphs and Task Processors	**OA 7.1 -7.3** **Homework Chapter 7**
11 3/25- 3/29	Chapter 8: Priority Lists and Scheduling	No CLASS- EASTER BREAK	
12 4/1- 4/5	Chapter 8: Critical Paths and Backflow Algorithm	Chapter 8 Review and Prep for Exam #2	**OA 8.1 -8.3**
13 4/8- 4/12	Optional: OPEN LAB Review for Exam 2	**Exam 2: Chapters 5, 6, 7, 8**	**OA 8.4 -8.5** **Homework Chapter 8**
14 4/15- 4/19	Chapter 10: Introduction to Finance	Chapter 10: Interest and Retirement	**OA 10.1 -10.3** *Begin Budget Project*
15 4/22- 4/26	Chapter 10: Loan Payment and Amortization	Review	**OA 10.4 -10.5** **Homework Chapter 10**
Finals Week 4/29- 5/3	**Final Exam 4:30- 7:00 pm**		

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