WESTMONT COLLEGE

MATH 180 - Problem Solving - Spring 2023

Section 1 **Remove** (2 Credits) **Add** (4 Credits): Time TBA
Location: Winter Hall 311

Instructor: Dr. Anna Aboud

- Office: Winter Hall 302
- Office Hours: TBA
- Email: aaboud@westmont.edu
- Course page: Canvas

Catalog Description: Prerequisite: Senior standing or consent of instructor. At its heart, mathematics is problem solving. In most undergraduate courses, the problems assigned are intimately connected with the current topic of discussion in the class and in the text. This practice gives an unrealistic picture of the way the mathematics generally works. In most non-classroom situations, problems and questions are unstructured and come without external clues as to what approach will be useful or how difficult the problem is likely to be. In this course, students will be introduced to "context free" problems and will learn how to devise their own approaches to finding a solution. Students will submit their solutions to the mathematics journals in which these problems appeared and also present their solutions to an audience from the mathematics department. **Remove** In addition, you will produce an essay based in which you reflect on the discipline of mathematics, and how pursuing mathematics fits with your Christian calling and vocation. **Add** Through readings, reflections, and in-class discussions, students will also explore the role of mathematics within its historical, philosophical, and societal context. As a culmination of this exploration, students will produce an essay reflecting on the discipline of mathematics, and how pursuing mathematics fits within a Christian calling and vocation.

Texts:

- *Mathematics through the Eyes of Faith* by James Bradley and Russell Howell

- *Shape* by Jordan Ellenberg

Program and Institutional Learning Outcomes (PLO's): The mathematics department at Westmont College has formulated the following learning outcomes for all of its classes.

1. Core Knowledge: Students will demonstrate knowledge of the main concepts, skills, and facts of the discipline of mathematics.
2. Communication: Students will be able to communicate mathematical ideas following the standard conventions of writing or speaking in the discipline.
3. Creativity: Students will demonstrate the ability to formulate and make progress toward solving non-routine problems.
4. Christian Connection: Students will incorporate their mathematical skills and knowledge into their thinking about their vocations as followers of Christ.

In addition, the faculty of Westmont College have established common learning outcomes for all courses at the institution (ILO's). These outcomes are summarized as follows: (1) Christian Understanding, Practices, and Affections, (2) Global Awareness, (3) Diversity, (4) Critical Thinking, (5) Quantitative Reasoning, (6) Written Communication, (7) Oral Communication, and (8) Information Literacy.

Course Learning Outcomes (CLO's): The above outcomes are reflected in the particular learning outcomes for this course. In this course, you will

- Learn to work on mathematical problems in a general context rather in the context of a particular topic. (PLO3, ILO4, ILO5)
- Develop your skills in communicating mathematics both verbally and in written form. (PLO2, ILO6, ILO7)
- **Add** Demonstrate an understanding of the role of mathematics within its historical, philosophical, and societal context. (ILO1, ILO2, ILO3)
- Explain the connection between your personal mathematical development and your professional calling. (PLO 4, ILO 1)

You will make weekly reports on your progress with the problem you have selected. When you have developed a solution, you will present multiple drafts to the class for refinement. This process will not only improve you communication skills, but will also help you to understand the role of the mathematical community (in the form of your peers) in making mathematical progress.

Affective Goals: This course should develop your appreciation for the wide variety of approaches to mathematical problem solving and improve your skills in matching an approach to a particular problem.

Grading and Assignments

Grading Policy: Grades will be kept on Canvas. Final grades will be assigned according to the following percentages.

Written Weekly Reports	10%
In-Class Presentations	10%
Final Presentation	15%
Final Write-Up and Submission	15%
Reading Responses	20%
Discussion	10%
Integrative Essay	20%

The following gives the class percentage required to guarantee the described letter grade.

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
Percentage	93	90	87	83	80	77	73	70	67	63	60	0

Problem-Solving Components: You are expected to solve at least one problem from an appropriate source and produce a write up suitable for publication. You will work on problems from The College Mathematics Journal, Mathematics Magazine and The American Mathematical Monthly. Each week you should come to class with a written report (typeset) detailing the progress you have made on your problem. This report should clearly distinguish between collaborative work and your own work. In class, you will present your progress and questions to the class. In addition, you will carefully listen to the presentations of your classmates and offer suggestions and criticisms. During the final exam period each member of the class will make a 15-20 minute oral presentation of the work done and the results obtained over the course of the semester. This is a formal presentation to other members of the department (including faculty) and should use appropriate presentation materials (Beamer is suggested). The presentation will be recorded and will be evaluated for both content and quality of presentation. At the end of the semester, you will also submit your solution to the appropriate journal (most deadlines are at the end of April or beginning of May—check the deadline for your problem!).

Reading Responses: Reading critically and writing clearly, creatively, and concisely are skills that you should have significantly developed over your time at Westmont. In this course you will have the opportunity to fine tune these essential tools for school and life. Each ** Remove** week **Add** class you will have assigned readings and written response to a selection from the course texts or other pertinent materials. These readings will combine various topics which you may have encountered from previous math courses, as well as provide opportunity for reflection upon the connection between faith and mathematics. **Add** You will examine the part mathematics plays in decisions we make individually and as a society, and the impact of these decisions on the world and its people, both past and present. Finally, you will consider how mathematics can be used to improve the world and contribute to human flourishing.

Discussion: Each ** Remove** week **Add** class the class will have a discussion of the reading and your reactions to it. A member of the class will be assigned on a rotating schedule to provide a summary of the key points and ideas presented. Active participation in discussion contributes a significant portion to your grade.

Integrative Essay: The ability to articulate the interplay between Christian faith, academic learning, and vocational calling is an essential component of a Christian liberal arts education. In your integrative essay, you will explore these topics for yourself, combining the knowledge and insights gained over your entire experience at Westmont as well as this course. Your essay will be completed in several stages, including a proposal, draft, and final draft.

Add *Guiding Questions for your Integrative Essay* How does your identity as a mathematician relate to the Christian faith? What does it mean to be a mathematician and a Christian? What insight can mathematics offer to the Christian faith? What insight can the Christian faith offer to mathematics? What is the relationship between mathematics and God? What implications does this relationship have for how you practice your profession and interact with the world?

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Important Dates (from 2022*)

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January 18 – No Class (Monday schedule)

January 25 – Problem Choice Due

February 22 – No Class (President's Holiday)

March 15 – Spring Break

March 22 - First Solution Draft Due

April 5 – Integrative Essay Proposal Due

April 12 – Final Solution Draft Due

April 19 – Integrative Essay Draft 1 Due

April 26 – Practice Presentations In Class

April 29 – Integrative Essay Due

May 2 – Final Presentations (8 - 10 am)

Attendance and Missing or Late Work: Attendance is essential to success in this course. If you miss more than **Remove** two **Add** four without a valid excuse, I reserve the right to terminate you from the course with a grade of F. Throughout the semester, you may have 4 "grace" days for turning in assignments. Any work turned in after the beginning of the class period but before the end of the day will count as 1 day late. After all of the grace days have been used, work missed without a valid excuse will receive a zero.

Class Etiquette: It is expected that through your presence and participation you contribute to a vibrant, productive, and empathetic learning environment. Any persistent distracting behavior to either instructor or peers will result in dismissal from class. Your laptop, tablet, phone or calculator are necessary for many aspects of the course, but it is expected that they are used responsibly and in a way that does not distract you or your classmates.

Academic Integrity Learning communities function best when students have academic integrity. Cheating is primarily an offense against your classmates because it undermines our learning community. Therefore, dishonesty of any kind may result in loss of credit for the work involved and the filing of a report with the Provost's Office. Major or repeated infractions may result in dismissal from the course with a grade of F. Be familiar with the College's plagiarism policy, found here.

Communication I expect you to check your email on a regular basis. If you use a non-Westmont email account, please forward your Westmont email to your preferred account. If you send me an email, I will typically get back to you within 24 hours, excepting weekends.

Accommodations There are accommodations available for students with disabilities. If needed, students are strongly encouraged to contact the Office of Disability Services (ODS) as early as possible to discuss appropriate accommodations for this course. Formal accommodations will be granted for students through coordination with the ODS. These accommodations may be necessary to ensure your equal access to this course. Please contact Sheri Noble, Director of Disability Services. (310A Voskuyl Library, 565-6186, snoble@westmont.edu) or visit their website for more information.

Disclaimer: This syllabus is subject to reasonable change, provided I give you timely notice of such changes.