

EDUC 535.07/.15/.22: Specialization II - Mathematics
Summer, 2021

Section	Instructor	Time	Location	Email
01	Armando Paulino Preciado Babb	1 to 2:30 pm	Zoom	apprecia@ucalgary.ca

Class Dates: Tuesdays and Thursdays, from July 5 to 29. (These dates are for the Zoom session; the semester ends on August 11).

Last Day to Add/Drop/Swap: Due to the non-standard dates associated with this program, please check your Student Centre for the important dates pertaining to your section.

Pre-requisite: Due to the multiple pathways in the Bachelor of Education, please consult Undergraduate Programs in Education for questions related to pre-requisite courses.

Office Hours: By appointment only

Email: Students are required to use a University of Calgary (@ucalgary.ca) email address for all correspondence.

You may be invited to participate in a research study related to this course, which may include sharing your assignments and been contacted for an interview. However, the instructor will not know who decides to participate in the study until final grades have been submitted and approved. Further details will be provided in class or at the end of the course.

COURSE DESCRIPTION:

The intent of the Specialization Seminar II is to deepen students' understanding of the practical aspects of teaching within the specialization and to connect this practice with specific theoretical concepts. While this second specialization course focuses more on practical knowledge, students will also refine their knowledge of discourse and theory within the discipline and develop a deeper understanding of ways to enact this theory in a classroom context. Students will additionally become familiar with any relevant Ministry documents associated with the Alberta Curriculum and draw on practical classroom observation from the field experience to participate in meaningful discussion and to connect these observations with a vision for their own teaching. The emphasis of the course is on designing for student learning (subject-specific; assessment to strengthen student learning and improve instruction; and designing for inclusion, differentiation, and project).

LEARNER OUTCOMES:

Over the course of the semester, students will:

- 1) Further develop a deeper conceptual understanding of the historical, socio-cultural, political contexts of the discipline, and relate this to curriculum planning in the specialization areas;
- 2) Identify and critique the key learning perspectives (as outlined in the front matter of the Program of Studies) and intentions (learning objectives) across the units in a grade from the Alberta Program of Studies;
- 3) Successfully apply theoretical knowledge to the design of a longer-term unit and assessment plan.

COURSE DESIGN AND DELIVERY: Students are expected to participate in synchronous meetings organized as ZOOM seminar and in asynchronous conversations through Desire2Learn (D2L) discussion forums. While many devices can be useful for online communication, a desktop or personal computer is preferable to be able to work simultaneously with different programs during synchronous sessions. Your electronic device should support at least audio communication (microphone and speakers or headset).

REQUIRED RESOURCES:

- Marton, F. (2015). *Necessary conditions of learning*. Routledge. Access through the UofC library: <https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=1715781>
- Alberta Education (2017). Programs of Study. <https://www.education.alberta.ca/programs-of-study/programs-of-study/>
- Alberta Education (2016). Streamlined expression of competencies – descriptions, indicators and examples. <https://education.alberta.ca/media/3272998/competency-indicators-september-30-2016.pdf>
- Davis, B., Francis, K., Friesen, S., & ProQuest. (2019). *STEM education by design opening horizons of possibility*. Routledge. <https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=5763030>
- Francis, K., & Davis, B. (2021). Computational thinking and experiences of arithmetic concepts. In C. Buteau, G. Gadanidis, S. Gannon, S., & A. Figov (Eds.), *Online Seminar Series on Programming in Mathematics Education* (pp. 11 - 20). SSRCH. <http://mkn-rcm.ca/online-seminar-series-on-programming-in-mathematics-education/>
- Martinez, A. A. (2006). Chapter 3. History: Much ado about less than nothing. In A. A. Martinez, *Negative math: How mathematical roles can be positively bent*, (pp. 18-42). Princeton, NJ: Princeton University Press. <https://www-degruyter-com.ezproxy.lib.ucalgary.ca/document/doi/10.1515/9780691187822-004/html>
- Marton, F. (2015). *Necessary conditions of learning*. Routledge. Access through the UofC library: <https://ebookcentral-proquest-com.ezproxy.lib.ucalgary.ca/lib/ucalgary-ebooks/detail.action?docID=1715781>
- Preciado Babb, A. P. (2012). Incorporating the iPad2 in the mathematics classroom: Extending the mind into the collective. *International Journal of Engineering Pedagogy* 2(2), 23-29. <https://online-journals.org/index.php/i-jep/article/view/2084>

ADDITIONAL RESOURCES:

- Kullberg, A., Runesson Kempe, U., & Marton, F. (2017). What is made possible to learn when using the variation theory of learning in teaching mathematics? *ZDM: The International Journal on Mathematics Education*, 49(4), 559-569. <https://link-springer-com.ezproxy.lib.ucalgary.ca/article/10.1007/s11858-017-0858-4>
- Mason, J., Burton, L., & Stacy, K. (2010). *Thinking Mathematically* (2nd Edition, chapters 1, 2). New York: Prentice Hall. First two chapter available online: <https://www.pearsonhighered.com/assets/samplechapter/m/a/s/o/Mason - Chapter 1.pdf>
<https://www.pearsonhighered.com/assets/samplechapter/m/a/s/o/Mason - Chapter 2.pdf>
- Math Minds (2021). Math Minds online course. <https://www.structuringinquiry.com>

LEARNING TASKS OVERVIEW

LEARNING TASK	DESCRIPTION OF LEARNING TASK	GROUP / INDIVIDUAL	WEIGHT	DUE DATE
LT 1: Engagement in course activities	This learning task comprises two components: 1. Synchronous: Engagement in different tasks during the Zoom seminar sessions. 2. Asynchronous: Posting and replying every week in a discussion forum.	Individual	30%	Ongoing
			15%	Ongoing
LT 2: Mathematical Explorations	This learning task comprises two components: 1. Engagement in mathematical inquiry 2. Analysis of mathematical concepts	Individual Group	30%	Ongoing
			15%	Ongoing
LT3: Unit Analysis and Design	This learning task comprises two components: 1. Collective analysis of mathematics unit. 2. Design of a Unit Plan.	Group Individual	40%	Ongoing
			20%	July 11

WEEKLY COURSE SCHEDULE:

Date	Topic	Readings and Tasks	Due Dates
Week 1 Jul 5 to 9	Necessary conditions of learning	<p>Read Chapter 1 from Mason et al. (2010) and Chapters 1 from Marton (2014).</p> <p>LT 1: Post and Replay</p> <p>LT 2: Mathematical explorations Select one of the problems from Mason et al. (2010) and identify what can be learned and what would be the critical features related to such learning.</p> <p>LT 2: Analysis of mathematical concepts Focus on the three ways of explaining the multiplication algorithm in Marton (2014). Analyze another algorithm for multiplication and explore its corresponding critical features.</p> <p>LT 3: Collective analysis of mathematics unit plans Search for a unit related to a multiplication algorithm. Analyze the unit in terms of its critical features.</p>	All the submissions are due on July 9

Date	Topic	Readings and Tasks	Due Dates
Week 2 Jul 12 to 16	The role of variation in teaching and learning	<p>Read Chapter 2 and 3 from Marton (2014)</p> <p>LT 1: Post and Replay</p> <p>LT 2: Mathematical explorations Explore different formulas and algorithms for calculating the area of a triangle.</p> <p>LT 2: Analysis of mathematical concepts Explore the critical discernments to measuring surface area</p> <p>LT 3: Collective analysis of mathematics unit plans Search for a unit related to measurement (distance, area, volume, etc.). Analyze the unit in terms of critical features and variation.</p>	All the submissions are due on July 16
Week 3 Jul 19 to 23	Extending the concept of number	<p>Read Francis and Davis (2020) and Chapter 4 in Davis et al. (2019)</p> <p>LT 1: Post and Replay</p> <p>LT 2: Mathematical explorations Explore the meaning of multiplication as geometric transformation (with complex numbers)</p> <p>LT 2: Analysis of mathematical concepts Explore different meanings of number and their implications for teaching and learning.</p> <p>LT 3: Collective analysis of mathematics unit plans Analyze the workshop described in Chapter 4 of Davis et al. (2019) and elaborate on critical discernment involved in the project.</p>	All the submissions are due on July 23

Date	Topic	Readings and Tasks	Due Dates
Week 4 Jul 26 to 30	Extending the concept of number and operations	<p>Read Chapter 3 from Martinez (2004)</p> <p>LT 1: Post and Replay</p> <p>LT 2: Mathematical explorations Explore the constructions of integers and compare different justification of why the product of two negative numbers is negative.</p> <p>LT 2: Analysis of mathematical concepts Analyze the concept of negative numbers from historical, cultural, and linguistic perspectives. Discuss implications for teaching.</p> <p>LT 3: Collective analysis of mathematics unit plans Search for a unit related to negative numbers. Analyze the metaphors and justifications for the operations with these numbers.</p>	All the submissions are due on July 30
Week 5 Aug 2 to 6		<p>Read: Preciado Babb (2012)</p> <p>Watch: “The expanding cube” https://galileo.org/classroom-example/expanding-cube/</p> <p>LT 1: Post and Replay</p> <p>LT 2: Mathematical explorations Select a mathematical problem or task that could be used in a unit plan. Elaborate on potential extensions or generalizations of the problem or task</p> <p>LT 2: Analysis of mathematical concepts Analyze the critical features related to the problem or task selected for the mathematical exploration.</p> <p>LT 3: Collective analysis of mathematics unit plans Analyze the project described in Preciado Babb (2013a) and the video following the link. Elaborate on the assessment strategies during the project.</p>	All the submissions are due on August 6
Week 6 Aug 9 to 11		<p>LT 3: Unit Design</p>	August 11

CHANGES TO SCHEDULE:

Please note that changes to the schedule may occur to meet the emerging needs and dynamics of the participants in the course.

LEARNING TASKS AND ASSESSMENT

There are three required Learning Tasks for this course. Successful completion of each task is required for a passing grade in this course.

Assessment criteria are described up to excellent performance (A). For an outstanding performance (A+), participants have to go well beyond expectations in each assignment in terms of content and quality (e.g. drawing from multiple resources for the assignment, consistently responding to several peers in discussion topics, showing a critical and informed use of relevant literature and resources) and contribute to the community in this course (e.g. providing effective peer feedback, constantly supporting classmates, and volunteering to take a specific role for the class). Additionally, an outstanding grade should reflect superior performance compared to the rest of the class.

1. LEARNING TASK 1: Engagement in course activities - DUE: Ongoing

This learning task comprises two components: (1) activities during synchronous online sessions (15%); and (2) participation in weekly asynchronous discussions (15%). For the synchronous zoom seminar sessions, participants are expected to engage in the activities and tasks during the session: If you are not able to attend the session, please contact the instructor in advance. For the asynchronous discussions, participants are expected to contribute with weekly posts, based on selected readings or additional materials and the ongoing conversation during the course. These conversations comprise:

Initial post (up to 250 words) addressing guiding questions or topic for the week, and

Response to at least one peer (up to 250 words) in the corresponding discussion topic.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 1

The following criteria will be considered for assessing the synchronous Zoom seminar sessions.

- **Excellent performance (A):** The student engages in all the session tasks.
- **Good performance (B):** The student engages in at least 80% of the session tasks.
- **Satisfactory performance (C):** The student engages in at least 60% of the session tasks.

The following criteria will be considered for assessing the asynchronous discussion in D21.

- **Excellent performance (A):** All the posts (initial posts and responses to peers) are submitted on time, address succinctly the guiding question or topic of the week, adhere to the word limit, are eloquently and clearly written, include references to consulted material (APA citation style), and insightfully employ key terminology and ideas within the field of mathematics education.
- **Good performance (B):** At least 80% of the posts (initial posts and responses to peers) are submitted, address the guiding question or topic of the week, adhere to the word limit, are clearly written, include references to consulted material (APA citation style) and use key terminology and ideas within the field of mathematics education.
- **Satisfactory performance (C):** At least 60% of the posts (initial posts and responses to peers) are submitted, address the guiding question or topic of the week, adhere to the word limit, are clearly written, include references to consulted material (APA citation style) and loosely use key terminology and ideas within the field of mathematics education.

2. LEARNING TASK 2: Mathematical Explorations – DUE: Every Friday

This task involves two types of explorations, each one worth 20% of the final mark. Details about the exploration will be provided in class.

Engagement in Mathematical Inquiry. The purpose of this inquiry is to explore classical problems and approaches in mathematics, including content that complements and extends the common content in the mathematics program of studies. The result of the explorations will be submitted individually in a media of your choice (e.g. word document, PPT, video, etc).

Analysis of Mathematical Concepts. Mathematical concepts will be discussed and analyzed through historical, cultural, and linguistic perspectives. The purpose of this analysis is to identify critical features of mathematical concepts that support (or hinder) understanding in mathematics. The result of the explorations will be submitted as a team in a media of your choice (e.g. word document, PPT, video, etc).

CRITERIA FOR ASSESSMENT OF LEARNING TASK 2

The following criteria will be used for assessing the Engagement in Mathematical Inquiry.

- **Excellent performance (A):** All the reports are submitted showing an insightful exploration of the problems or approaches, appropriate justifications for the conclusions and generalizations that extend the original ideas. The reports are well organized with proper use of English language, including visuals to enhance communication, and proper references to the consulted material (if used).
- **Good performance (B):** At least 90% of the reports are submitted showing an exploration of the problems or approaches, justifications for the conclusions and generalizations that extend the original ideas. The reports are well organized with proper use of English language, including visuals to enhance communication, and references to the consulted material (if used).
- **Satisfactory performance (C):** At least 80% of the reports are submitted showing a superficial exploration of the problems or approaches and lacking justifications for the conclusions and generalizations that extend the original ideas. The reports may have some issues in organization, use of English language, use of visuals for communication, and lack to references to the consulted material (if used).

The following criteria will be used for the Analysis of Mathematical Concepts.

- **Excellent performance (A):** All the reports are submitted showing an insightful exploration of historical, cultural and linguistic elements related to the targeted mathematical concepts. Implications for teaching and learning are thoughtfully discussed. The reports are well organized with proper use of English language, including visuals to enhance communication, and proper references to the consulted material.
- **Good performance (B):** At least 90% of the reports are submitted showing an exploration of historical, cultural and linguistic elements related to the targeted mathematical concepts. Implications for teaching and learning are discussed. The reports are well organized with proper use of English language, including visuals to enhance communication, and proper references to the consulted material.
- **Satisfactory performance (C):** At least 80% of the reports are submitted showing a superficial exploration of historical, cultural and linguistic elements related to the targeted mathematical concepts. Implications for teaching and learning are barely addressed. The reports may have some issues in organization, use of English language, use of visuals for communication, and lack to references to the consulted material.

3. LEARNING TASK 3: Unit Analysis and Design – DUE: Ongoing for Part 1, July 11 for Part 2

This task comprises two parts worth 20% of the final grade each.

Part 1: Unit analysis and discussion – Participants will submit a report on their conclusions after analyzing mathematics units or projects on a weekly basis. The reports can be submitted in different formats, such as text, up to 1000 words, or an equivalent extension for video or other type of media. The analysis of the unit should reflect the discussion and materials covered in the course.

Part 2: Unit Design and Rationale – Participants will design a mathematics unit plan and prepare a rationale for the decisions made for the plan. Participants are recommended and from different resources for the unit.

CRITERIA FOR ASSESSMENT OF LEARNING TASK 3

The following criteria will be used for assessing Part 1 of the task.

- **Excellent performance (A):** All the reports are submitted showing an insightful analysis of the corresponding units based on the material covered in the course. The reports are well organized with proper use of English language, including visuals to enhance communication, and proper references to the consulted material.
- **Good performance (B):** At least 90% of the reports are submitted showing a comprehensive analysis of the corresponding units based on the material covered in the course. The reports may have minor issues regarding organization, proper use of English language, use visuals to enhance communication, and proper references to the consulted material.
- **Satisfactory performance (C):** At least 80% of the reports are submitted with an analysis of the corresponding units based on the material covered in the course. The quality of the reports may be compromised due to issues regarding organization, proper use of English language, use visuals to enhance communication, and proper references to the consulted material.

The following criteria will be used for assessing Part 2 of the task.

- **Excellent performance (A):** The unit plan is well designed, including nuanced details guiding teaching and drawing from well-developed educational resources. The rationale is well informed by current insights from educational research and emerging perspectives and draws from credible sources. The presentation of both the unit plan and the rationale shows a proper use of English language and includes proper references to consulted materials.
- **Good performance (B):** The unit plan is well designed, including enough details guiding teaching and drawing from credible educational resources. The rationale is informed by current insights from educational research and emerging perspectives. The presentation of both the unit plan and the rationale may show minor issues with the use of English language and references to consulted materials.
- **Satisfactory performance (C):** The unit plan submitted with lacking some details for its implementation or missing references to educational resources. The rationale loosely reflects current insights from educational research and emerging perspectives. The presentation of both the unit plan and the rationale presents some issues regarding the use of English language and references to consulted materials.

THE EXPECTATION OF EXCELLENCE IN PROFESSIONAL WORK

Please review the Academic Calendar carefully. It describes the program and provides detailed schedules and important dates. It contains information on expectations for student work and professional conduct. In addition, procedures are described regarding concern about student performance in the program. Please pay especially careful attention to details and descriptions in the following topic areas:

- *The Importance of Attendance and Participation in Every Class*

As this is a professional program, experiences are designed with the expectation that all members will be fully involved in all classes and in all coursework experiences. As you are a member of a learning community your contribution is vital and highly valued, just as it will be when you take on the professional responsibilities of being a teacher. We expect that you will not be absent from class with the exception of documented instances of personal or family illness or for religious requirements.

- *Engagement in Class Discussion and Inquiry*

Another reason for the importance of attendance and participation in every class is that the course involves working with fellow students to share ideas and thinking. For example, each class you will work with a small group to engage fellow students in discussions on work being considered in class. You will also help other groups by providing ideas for scholarly inquiry in assignments. If you find that you are experiencing difficulties as a group collaborating, please inform the instructor.

EXPECTATIONS FOR WRITING

All written assignments (including, to a lesser extent, written exam responses) will be assessed at least partly on writing skills. Writing skills include not only surface correctness (grammar, punctuation, sentence structure, etc.) but also general clarity and organization. Sources used in research papers must be properly documented. If you need help with your writing, you may use the writing support services in the Learning Commons. For further information, please refer to the official online University of Calgary Calendar, Academic Regulations, E. Course Information, E.2: Writing Across the Curriculum: <http://www.ucalgary.ca/pubs/calendar/current/e-2.html>

LATE SUBMISSIONS

All late submissions of assignments must be discussed with the instructor **prior to the due date**. Students may be required to provide written documentation of extenuating circumstances (e.g. statutory declaration, doctor's note, note from the University of Calgary Wellness Centre, obituary notice). A deferral of up to 30 days may be granted at the discretion of the Associate Dean of Undergraduate Programs with accompanying written evidence.

ISSUES WITH GROUP TASKS

With respect to group work, if your group is having difficulty collaborating effectively, please contact the instructor immediately. If a group is unable to collaborate effectively or discuss course materials online in a timely manner, the instructor may re-assign members to different groups or assign individual work for completion.

GRADING

Grade	GPA Value	%	Description per U of C Calendar
A+	4.0	95-100	Outstanding
A	4.0	90-94	Excellent – Superior performance showing comprehensive understanding of the subject matter
A-	3.7	85-89	
B+	3.3	80-84	
B	3.0	75-79	Good - clearly above average performance with knowledge of subject matter generally complete
B-	2.7	70-74	
C+	2.3	65-69	
C	2.0	60-64	Satisfactory - basic understanding of the subject matter
C-	1.7	55-59	
D+	1.3	52-54	Minimal pass - Marginal performance
D	1.0	50-51	
F	0.0	49 and lower	Fail - Unsatisfactory performance

Students in the B.Ed. program must have an overall GPA of 2.5 in the semester to continue in the program without repeating courses.

Academic Accommodation

Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services; SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at <http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf>.

Academic Misconduct

For information on academic misconduct and its consequences, please see the University of Calgary Calendar at <http://www.ucalgary.ca/pubs/calendar/current/k.html>

Attendance/ Prolonged Absence

Students may be asked to provide supporting documentation for an exemption/special request. This may include, but is not limited to, a prolonged absence from a course where participation is required, a missed course assessment, a deferred examination, or an appeal. Students are encouraged to submit documentation that will support their situation. Supporting documentation may be dependent on the reason noted in their personal statement/explanation provided to explain their situation. This could be medical certificate/documentation, references, police reports, invitation letter, third party letter of support or a statutory declaration etc. The decision to provide supporting documentation that best suits the situation is at the discretion of the student.

Falsification of any supporting documentation will be taken very seriously and may result in disciplinary action through the Academic Discipline regulations or the Student Non-Academic Misconduct policy.

<https://www.ucalgary.ca/pubs/calendar/current/n-1.html>

The Freedom of Information Protection of Privacy Act prevents instructors from placing assignments or examinations in a public place for pickup and prevents students from access to exams or assignments other than their own. Therefore, students and instructors may use one of the following options: return/collect assignments during class time or during instructors' office hours, students provide instructors with a self-addressed stamped envelope, or submit/return assignments as electronic files attached to private e-mail messages.

For additional resources including, but not limited to, those aimed at wellness and mental health, student success or to connect with the Student Ombuds Office, please visit

<https://www.ucalgary.ca/registrar/registration/course-outlines>

Education Students Association (ESA) President for the academic year is Kyle Corry,
esa@ucalgary.ca.

Werklund SU Representative is Dwani Joshi, educrep@su.ucalgary.ca.