

**Dynamic Schedule:** Visit [Minerva Class Schedule](#)[https://horizon.mcgill.ca/pban1/bwckschd.p\\_disp\\_dyn\\_sched](https://horizon.mcgill.ca/pban1/bwckschd.p_disp_dyn_sched) for course dates & times.McGill.ca (<https://www.mcgill.ca>) / Overview (/study/2022-2023/) / All Courses (/study/2022-2023/courses/search)

# MATH 133 Linear Algebra and Geometry (3 credits)

Offered by: Mathematics and Statistics ([Faculty of Science \(/study/2022-2023/faculties/science/\)](#))

## Overview

Mathematics & Statistics (Sci) : Systems of linear equations, matrices, inverses, determinants; geometric vectors in three dimensions, dot product, cross product, lines and planes; introduction to vector spaces, linear dependence and independence, bases. Linear transformations. Eigenvalues and diagonalization.

**Terms: Fall 2022, Winter 2023, Summer 2023**

Instructors: Bélanger-Rioux, Rosalie; Mazakian, Hovsep; Gerbelli-Gauthier, Mathilde; Alfieri, Antonio (Fall) Duchesne, Gabriel William (Winter)

- 3 hours lecture, 1 hour tutorial
- Prerequisite: a course in functions
- Restriction A: Not open to students who have taken [MATH 221 \(/study/2022-2023/courses/math-221\)](#) or CEGEP objective 00UQ or equivalent.
- Restriction B: Not open to students who have taken or are taking [MATH 123 \(/study/2022-2023/courses/math-123\)](#), except by permission of the Department of Mathematics and Statistics.
- Restriction C: Not open to students who are taking or have taken [MATH 134 \(/study/2022-2023/courses/math-134\)](#).

*This course may be used as a required or complementary course in the following programs:*

[Bachelor Engineering \(B.Eng.\) - Co-op in Software Engineering \(/https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-co-op-software-engineering\)](#)

[Bachelor of Arts \(B.A.\) - Honours Economics \(/https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-honours-economics\)](#)

[Bachelor of Arts \(B.A.\) - Joint Honours Component Economics \(/https://www.mcgill.ca/study/2022-2023/faculties/arts/undergradu](#)

[ate/programs/bachelor-arts-ba-joint-honours-component-economics](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics)).

[Bachelor of Arts \(B.A.\) - Joint Honours Component Economics](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics)

[2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics)).

[Bachelor of Arts \(B.A.\) - Joint Honours Component Economics / Joint Honours Component Accounting](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-accounting)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-accounting)

[2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-accounting](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-accounting)).

[Bachelor of Arts \(B.A.\) - Joint Honours Component Economics / Joint Honours Component Finance](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-finance)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-finance)

[2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-finance](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-economics-joint-honours-component-finance)).

[Bachelor of Arts \(B.A.\) - Joint Honours Component Mathematics](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)

[2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)).

[Bachelor of Arts \(B.A.\) - Joint Honours Component Mathematics](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)

[2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-joint-honours-component-mathematics)).

[Bachelor of Arts \(B.A.\) - Major Concentration Mathematics](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)

[2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)).

[Bachelor of Arts \(B.A.\) - Major Concentration Mathematics](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)  
([https://www.mcgill.ca/study/2022-](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)

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2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-major-concentration-mathematics)

Bachelor of Arts (B.A.) - Major  
Concentration Statistics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-major-concentration-statistics)

22-  
2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-major-concentration-statistics)

Bachelor of Arts (B.A.) - Major  
Concentration Statistics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-major-concentration-statistics)

22-  
2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-major-concentration-statistics)

Bachelor of Arts (B.A.) - Minor  
Concentration Mathematics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-minor-concentration-mathematics)

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2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-minor-concentration-mathematics)

Bachelor of Arts (B.A.) - Minor  
Concentration Mathematics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-minor-concentration-mathematics)

22-  
2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-minor-concentration-mathematics)

Bachelor of Arts (B.A.) - Minor  
Concentration Statistics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-minor-concentration-statistics)

22-  
2023/faculties/basc/undergraduate/programs/bachelor-arts-ba-minor-concentration-statistics)

Bachelor of Arts (B.A.) - Minor  
Concentration Statistics  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-minor-concentration-statistics)

22-  
2023/faculties/arts/undergraduate/programs/bachelor-arts-ba-minor-concentration-statistics)

Bachelor of Arts and Science  
(B.A. & Sc.) - Freshman  
Program  
([https://www.mcgill.ca/study/20](https://www.mcgill.ca/study/2022-2023/faculties/basc/undergraduate/programs/bachelor-arts-and-science-ba-sc-freshman-program)

22-  
2023/faculties/basc/undergraduate/programs/bachelor-arts-and-science-ba-sc-freshman-program)

Bachelor of Commerce  
(B.Com.) - Honours  
Economics  
(<https://www.mcgill.ca/study/2022-2023/faculties/desautels/undergraduate/programs/bachelor-commerce-bcom-honours-economics>)

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Bachelor of Commerce  
(B.Com.) - Joint Honours  
Economics and Accounting  
(<https://www.mcgill.ca/study/2022-2023/faculties/desautels/undergraduate/programs/bachelor-commerce-bcom-joint-honours-economics-and-accounting>)

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Bachelor of Commerce  
(B.Com.) - Joint Honours  
Economics and Finance  
(<https://www.mcgill.ca/study/2022-2023/faculties/desautels/undergraduate/programs/bachelor-commerce-bcom-joint-honours-economics-and-finance>)

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Bachelor of Education (B.Ed.)  
- Secondary Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/education/undergraduate/programs/bachelor-education-bed-secondary-mathematics>)

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Bachelor of Engineering  
(B.Eng.) - Bioengineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-bioengineering>)

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Bachelor of Engineering  
(B.Eng.) - Chemical  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-chemical-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Civil Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-civil-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Co-op in Materials  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-co-op-materials-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Co-op in Mining  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-co-op-mining-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Computer  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-computer-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Electrical  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-electrical-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Honours Electrical  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-honours-electrical-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Honours Mechanical  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-honours-mechanical-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Materials  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-materials-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Mechanical  
Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-mechanical-engineering>)

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Bachelor of Engineering  
(B.Eng.) - Mining Engineering  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-engineering-beng-mining-engineering>)

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Bachelor of Science (B.Sc.)  
(Architecture) - Architecture  
(<https://www.mcgill.ca/study/2022-2023/faculties/engineering/undergraduate/programs/bachelor-science-bsc-architecture-architecture>)

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Bachelor of Science (B.Sc.) -  
Freshman Program  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-freshman-program>)

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Bachelor of Science (B.Sc.) -  
Honours Applied Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-applied-mathematics>)

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Bachelor of Science (B.Sc.) -  
Honours Applied Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-science-bsc-honours-applied-mathematics>)

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Bachelor of Science (B.Sc.) -  
Honours Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-mathematics>)

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Bachelor of Science (B.Sc.) -  
Honours Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-science-bsc-honours-mathematics>)

science-bsc-honours-mathematics)

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Bachelor of Science (B.Sc.) - Honours Mathematics and Computer Science  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-mathematics-and-computer-science>)

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Bachelor of Science (B.Sc.) - Honours Mathematics and Computer Science  
(<https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor-science-bsc-honours-mathematics-and-computer-science>)

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Bachelor of Science (B.Sc.) - Honours Mathematics and Physics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-mathematics-and-physics>)

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Bachelor of Science (B.Sc.) - Honours Physics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-physics>)

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Bachelor of Science (B.Sc.) - Honours Physics and Chemistry  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-physics-and-chemistry>)

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Bachelor of Science (B.Sc.) - Honours Probability and Statistics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-probability-and-statistics>)

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Bachelor of Science (B.Sc.) - Honours Probability and Statistics  
(<https://www.mcgill.ca/study/2022-2023/faculties/arts/undergraduate/programs/bachelor>

science-bsc-honours-  
probability-and-statistics)

Bachelor of Science (B.Sc.) -  
Honours Statistics and  
Computer Science  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-honours-statistics-and-computer-science>)

Bachelor of Science (B.Sc.) -  
Liberal Program - Core  
Science Component  
Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-liberal-program-core-science-component-mathematics>)

Bachelor of Science (B.Sc.) -  
Liberal Program - Core  
Science Component Physics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-liberal-program-core-science-component-physics>)

Bachelor of Science (B.Sc.) -  
Liberal Program - Core  
Science Component Statistics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-liberal-program-core-science-component-statistics>)

Bachelor of Science (B.Sc.) -  
Major Mathematics  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-mathematics>)

Bachelor of Science (B.Sc.) -  
Major Mathematics and  
Computer Science  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-mathematics-and-computer-science>)

Bachelor of Science (B.Sc.) -  
Major Physics



<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-physics>

[Bachelor of Science \(B.Sc.\) - Major Physics and Computer Science](https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-physics-and-computer-science)  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-physics-and-computer-science>)

[Bachelor of Science \(B.Sc.\) - Major Physics and Geophysics](https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-physics-and-geophysics)  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-physics-and-geophysics>)

[Bachelor of Science \(B.Sc.\) - Major Statistics](https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-statistics)  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-statistics>)

[Bachelor of Science \(B.Sc.\) - Major Statistics and Computer Science](https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-statistics-and-computer-science)  
(<https://www.mcgill.ca/study/2022-2023/faculties/science/undergraduate/programs/bachelor-science-bsc-major-statistics-and-computer-science>)




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