# Course Outline

**MECHENG/SEP 735**
**Additive Manufacturing**
**Fall 2023**

## Course Description

This course covers basic overview of the additive manufacturing (AM) technology, focusing on metal AM processes including powder bed fusion (PBF), and direct energy deposition (DED) processes. The course will also cover design for additive manufacturing, applications, microstructure, mechanical properties and future trends in the AM field.

## Instructor Contact Information

Course instructor: Dr. Eskandar Fereiduni
Email address: fereidue@mcmaster.ca
Office hours: Online or in-person at JHE 312

## Course Topics

| Week | Topic |
|---|---|
| 1 | Introduction to AM, classification, opportunities, and applications |
| 2 | AM categories |
| 3 | Feedstock: Production routes, characteristics, and properties |
| 4 | Heat source-material interaction: Absorption, Melting, and Solidification |
| 5 | Design for AM |
| 6 | Defects in metal AM |
| 7 | Microstructure evolution in metal AM |
| 8 | Mechanical properties and their correlation to the process and structure |
| 9 | Post-processing of AM parts |
| 10 | Applications, recent trends, opportunities, and future of AM |
| 11 | Presentation of projects |

## Schedule and Mode of Delivery

Lectures: Wednesdays 6:30 p.m. - 9:30 p.m. ET
Mode of delivery: In-person
Classroom: BSB 121

This course will be delivered in-person. The information in this course outline is based upon the current University and Public Health guidelines and may be subject to changes during the term. Any changes to the schedule or course delivery will be communicated on the course announcements section on Avenue to Learn. Please check the announcements prior to attending class.

**Course Evaluation**

| Component | Tentative Due Date | Weight |
|---|---|---|
| Assignments | TBA | 40% |
| Project Report [1] | Dec 08, 2023 | 40% |
| Project Presentation [2] | Dec 13, 2023 | 20% |
| **Total** | | **100%** |

- [1] Several projects will be suggested- Each group consists of four members
- [2] Presentation will be 20 mins for each group

**Optional Course Readings**


[1] Gibson, I., Rosen, D., Stucker, B., Khorasani, M. *Additive Manufacturing Technologies*. Third Edition. Springer 2021.
[2] DebRoy T, Wei HL, Zuback JS, Mukherjee T, Elmer JW, Milewski JO, Beese AM, Wilson-Heid AD, De A, Zhang W. Additive manufacturing of metallic components–process, structure and properties. Progress in Materials Science. 2018 Mar 1;92:112-224.
[3] Bourell D.L., Frazier, W., Kuhn, H., Seifi, M. (editors). *ASM Handbook, Volume 24: Additive Manufacturing Processes*. ASM International 2020.
[4] Yadroitsev, I., Yadroitsava, I., Du Plessis, A., MacDonald, E. (editors). *Fundamentals of Laser Powder Bed Fusion of Metals*. First Edition. Elsevier 2021.
[5] Askeland, D.R., Wright, W.J. *Essentials of Materials Science and Engineering*. Fourth Edition. Cengage Learning 2019.
[6] Toyserkani, E., Sarker, D., Ibhadode, O.O., Liravi, F., Russo, P., Taherkhani, K. *Metal Additive Manufacturing*. First Edition. John Wiley & Sons 2022.
[7] Standards under the Jurisdiction of the ASTM Committee F42 on Additive Manufacturing Technologies, as well as selection of published articles.


**Policy Statement**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. Academic dishonesty includes, but not limited to, plagiarism and improper collaboration in group work.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf

## Conduct Expectations

As a McMaster graduate student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

## Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

## Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical, and artistic work, **including lectures** by university instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

## Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labor disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.