

BME510: Bioprinting and 3D Printing Human Body Parts

Course Dates

CRN(s):	Section A01 CRN: 14158
Term:	2022
Course Start:	2022-09-07
Course End:	2022-12-21
Withdrawal with 100% reduction of tuition fees:	2022-09-20
Withdrawal with 50% reduction of tuition fees:	2022-10-11
Last day for withdrawal (no fees returned):	2022-10-31

Scheduled Meeting Times (M=Mon, T=Tue, W=Wed, R=Thu, F=Fri)

Section:	Location:	Classes Start:	Classes End:	Days of week:	Hours of day:	Instructor:
A01		2022-09-07	2022-12-05	NULL		Karolina Papera Valente
B01	CLE A207	2022-09-07	2022-12-05	T	09:30-10:20	

Instructor(s)

Name: **Karolina Papera Valente**
 Office: EOW 331
 Phone: (250) 721-8696
 Email: kvalente at uvic dot ca

Office Hours: Comments
 Mon 12:00pm-01:00pm

Prerequisites & Co-requisites

Prerequisites:

Pre- & Co-requisites: BME350 or MECH350 or ECE399 along with ENGR002

TA Information

TA Name	E-mail	Office
TBD	TBD	TBD

Textbooks

No textbooks are required. If you are interested in learning more about the topic, I would recommend the following book:

Reference Materials	
Title:	Bioprinting: Principles and Applications
Author:	Chee Kai Chua
Publisher/Year:	World Scientific Publishing/2013

Course Objectives

This course shows the ways that 3D printing and 3D bioprinting are revolutionizing the available treatments available for medical needs. 3D bioprinting requires collaboration between biomedical engineers, scientists, and critically - clinicians. The clinician identifies the medical need for a 3D printed structure. As this course introduces different projects, a clinician's needs will drive each particular project by identifying the potential advantages of using 3D printing technology to deliver a personalized treatment. During these four modules, the student will learn about how 3D printing has developed into 3D bioprinting. The student will start by learning about 3D printed prosthetics and implants. Next they will be introduced more specifically to 3D bioprinting technologies. This course will encourage thought about ethical considerations and ramifications of these technological advances and the student will complete a design project to at the end of the course to synthesize what they have learned.

Learning Outcomes

Learning Outcomes for the course.

1. Identify the four major steps in bioprinting a 3D structure and explain how bioprinting can be used to address medical needs
2. Differentiate the advantages and limitations of 3D modelling software for bioprinting
3. Identify the ethical and regulatory issues involved in new medical treatments and the future of 3D bioprinting
4. Evaluate the nature and variation of materials for prosthetics and structural supports used in 3D bioprinting
5. Apply the 3D printing process to case studies of biomaterials enhancing lives

Assessment

Weight & Date(s) of Assessment	Weight	Date
Assignments	15%	9/26, 10/24, 11/28 at 5 pm PST
Critiques	25%	11/7, 11/21 at 5 pm PST
Project	25%	10/3, 12/5 at 5 pm PST
Lab Experiment	10%	TBD
Midterm	25%	11/24 6 pm to 8 pm PST

Assignments

All assignments, papers, critique instructions, and project instructions will be posted to Brightspaces.

Project

Project groups should be selected on Brightspaces by September 19. A preliminary design and outline will be due 10/3 at 5 pm PST. The final report is due the 12/5/2022 at 5 pm PST. A detailed project description and project rubric will be posted to Brightspaces.

Notes

NOTES ON WORK COMPELETION Failure to complete the final project will result in a grade of N.

NOTES The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.

COURSE LECTURE NOTES Unless otherwise noted, all course materials supplied to students in this course are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.

SUPPLEMENTAL EXAM There will be no supplemental examination for this course.

Course Schedule

Module	Topics	Date/Week
1	3D Printing and Bioprinting	Completed by 9/24
2	Implants	Completed by 10/15
3	Tissue Regeneration	Completed by 11/5

Module	Topics	Date/Week
4	Future Application	Completed by 11/14

Grading System

The University of Victoria follows a percentage grading system in which the instructor will submit grades in percentages. The University will use the following Senate approved standardized grading scale to assign letter grades. Both the percentage mark and the letter grade will be recorded on the academic record and transcripts.

Passing Grades	GPA	Percentage	Description
A+	9	90 - 100	Exceptional work. Technically flawless and original work demonstrating insight, understanding and independent application or extension of course expectations; often publishable.
A	8	85 - 89	Outstanding work. Demonstrates a very high level of integration of material demonstrating insight, understanding and independent application or extension of course expectations.
A-	7	80 - 84	Excellent work. Represents a high level of integration, comprehensiveness and complexity, as well as a mastery level of relevant techniques/concepts.
B+	6	77 - 79	Very good work. Represents a satisfactory level of integration, comprehensiveness and complexity; demonstrates a sound level of analysis with no major weakness.
B	5	73 - 76	Acceptable work that fulfills the expectations of the course. Represents a satisfactory level of integration of key concepts/procedures. However, comprehensiveness or technical skills may be lacking.
B-	4	70 - 72	Unacceptable work revealing some deficiencies in knowledge, understanding or techniques. Represents an unacceptable level of integration, comprehensiveness and complexity. Mastery of some relevant techniques or concepts lacking.
C+	3	65 - 69	Unacceptable work revealing some deficiencies in knowledge, understanding or techniques. Represents an unacceptable level of integration, comprehensiveness and complexity. Mastery of some relevant techniques or concepts lacking.
C	2	60 - 64	Unacceptable work revealing some deficiencies in knowledge, understanding or techniques. Represents an unacceptable level of integration, comprehensiveness and complexity. Mastery of some relevant techniques or concepts lacking.
D	1	50 - 59	Unacceptable work revealing some deficiencies in knowledge, understanding or techniques. Represents an unacceptable level of integration, comprehensiveness and complexity. Mastery of some relevant techniques or concepts lacking.
F	0	0 - 49	Failing grade. Unsatisfactory performance. Wrote final examination and completed course requirements.

Note: Every grade of 4.0 (B-) or lower in a course taken for credit in the Faculty of Graduate Studies must be reviewed by the supervisory committee of the student and a recommendation made to the Dean of Graduate Studies. Such students will not be allowed to register in the next session until approved to do so by the Dean.

Course Experience Survey (CES)

I value your feedback on this course. Towards the end of term you will have the opportunity to complete a confidential course experience survey (CES) regarding your learning experience. The survey is vital to providing feedback to me regarding the course and my teaching, as well as to help the department improve the overall program for students in the future. When it is time for you to complete the survey, you will receive an email inviting you to do so. If you do not receive an email invitation, you can go directly to the [CES site](#)

You will need to use your UVic NetLink ID to access the survey, which can be done on your laptop, tablet or mobile device. I will remind you closer to the time, but please be thinking about this important activity, especially the following three questions, during the course.

- What strengths did your instructor demonstrate that helped you learn in this course?
- Please provide specific suggestions as to how the instructor could have helped you learn more effectively.
- Please provide specific suggestions as to how this course could be improved.

General Information

Note to Students: Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Assistant to the Chair to set up an appointment.

Centre for Accessible Learning (CAL) <https://www.uvic.ca/services/cal/>

[Discrimination and Harassment Policy \(GV0205\)](#)

Sexualized Violence Prevention and Response at UVic: UVic takes sexualized violence seriously, and has raised the bar for what is considered acceptable behaviour. We encourage students to learn more about how the university defines sexualized violence and its overall approach by visiting <https://www.uvic.ca/sexualizedviolence/>. If you or someone you know has been impacted by sexualized violence and needs information, advice, and/or support please contact the sexualized violence resource office in Equity and Human Rights (EQHR). Whether or not you have been directly impacted, if you want to take part in the important prevention work taking place on campus, you can also reach out:

Where: Sexualized violence resource office in EQHR; Sedgewick C119 **Phone:** 250.721.8021 **Email:**

svpcoordinator@uvic.ca **Web:** <https://www.uvic.ca/sexualizedviolence/>

Office of the Ombudsperson: The Office of the Ombudsperson is an independent and impartial resource to assist with the fair resolution of student issues. A confidential consultation can help you understand your rights and responsibilities. The Ombudsperson can also clarify information, help navigate procedures, assist with problem-solving, facilitate communication, provide feedback on an appeal, investigate and make recommendations. **Phone:** 250-721-8357 **Email:** ombuddy@uvic.ca **Web:** <https://uvicombudsperson.ca/>

Electronic devices in labs and lectures: No unauthorized audio or video recording of lectures is permitted.

Electronic devices in midterms and exams: Calculators are only permitted for examinations and tests if explicitly authorized and the type of calculator permitted may be restricted. No other electronic devices (e.g. cell phones, pagers, PDA, etc.) may be used during examinations or tests unless explicitly authorized.

Faculty of Engineering, University of Victoria Standards for Professional Behavior

It is the responsibility of all members of the Faculty of Engineering, students, staff, and faculty, to adhere to and promote standards of professional behavior that support an effective learning environment that prepares graduates for careers as professionals... You are advised to read the Faculty of Engineering document [Standards for Professional Behavior](#) which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Graduate Students' Society The Graduate Students' Society (GSS) serves all students registered in an Graduate degree program. For information on GSS activities, events and services navigate to <https://gss.uvic.ca/> .

Attendance

Students are expected to attend all classes in which they are enrolled. An academic unit may require a student to withdraw from a course if the student is registered in another course that conflicts with it in time. An instructor may refuse a student admission to a lecture or laboratory because of lateness, misconduct, inattention or failure to meet the responsibilities of the course. Students who neglect their academic work, including assignments, may be refused permission to write the final examination in a course. Instructors must inform students at the beginning of term in writing of the minimum attendance required at lectures and in laboratories in order to qualify to write examinations. Students who are absent because of illness, an accident or family affliction should report to their instructors upon their return to classes.

https://www.uvic.ca/calendar/future/grad/index.php#/policy/SJJ2lif_V?bc=true&bcCurrent=09%20-%20Attendance&bcGroup=Faculty%20Academic%20Regulations&bcltemType=policies

Academic Integrity

Academic integrity is intellectual honesty and responsibility for academic work that you submit individual or group work. It involves commitment to the values of honesty, trust, and responsibility. It is expected that students will respect these ethical values in all activities related to learning, teaching, research, and service. Therefore, plagiarism and other acts against academic integrity are serious academic offences.

The responsibility of the institution Instructors and academic units have the responsibility to ensure that standards of academic honesty are met. By doing so, the institution recognizes students for their hard work and assures them that

other students do not have an unfair advantage through cheating on essays, exams, and projects.

The responsibility of the student Plagiarism sometimes occurs due to a misunderstanding regarding the rules of academic integrity, but it is the responsibility of the student to know them. If you are unsure about the standards for citations or for referencing your sources, ask your instructor. Depending on the severity of the case, penalties include a warning, a failing grade, a record on the student's transcript, or a suspension.

It is your responsibility to understand the University's policy on [Academic Integrity](#).

Equality

This course aims to provide equal opportunities and access for all students to enjoy the benefits and privileges of the class and its curriculum and to meet the syllabus requirements. Reasonable and appropriate accommodation will be made available to students with documented disabilities (physical, mental, learning) in order to give them the opportunity to successfully meet the essential requirements of the course. The accommodation will not alter academic standards or learning outcomes, although the student may be allowed to demonstrate knowledge and skills in a different way. It is not necessary for you to reveal your disability and/or confidential medical information to the course instructor. If you believe that you may require accommodation, the course instructor can provide you with information about confidential resources on campus that can assist you in arranging for appropriate accommodation. Alternatively, you may want to contact the Centre for Accessible Learning (formerly the Resource Centre for Students with a Disability) located in the Campus Services Building.

The University of Victoria is committed to promoting, providing, and protecting a positive, and supportive and safe learning and working environment for all its members.