



COURSE SYLLABUS

COURSE TITLE:	Human-Centered Creative Design		
COURSE CODE:	ME 898.x	TERM:	Winter
COURSE CREDITS:	3	DELIVERY:	Lecture and workshop
CLASS SECTION:	NA	START DATE:	January 10, 2023
CLASS LOCATION:	TBD	LAB LOCATION:	TBD
CLASS TIME:	2-5 pm (every Thursday)	LAB TIME:	TBD
WEBSITE:			

Course Description

The objective of this course is to improve design innovation in medical devices or systems, especially towards a systematic way to make device or systems innovative. The innovation includes designs incorporating social and cultural factors of users (especially Indigenous community). The main subjects of the course are (a) general knowledge architecture, (b) the tool called TRIZ to assist in finding device concepts, (c) cognitive skills: generalization, aggregation, analogy, and imagination, (d) function decomposition, (e) Indigenous community knowledge of medicine and healthcare along with devices, and (f) group decision making with multi-criteria or in conflict management, (g) design innovation practices especially design with consideration of regulatory in light of safety.

Prerequisites

Nil

Learning Outcomes

By the completion of this course, students will be expected to:

1. Able to analyze a device comprehensively with (namely with the help of FCBPSS).
2. Able to write design requirements formally and compare naively, including social and cultural aspects.
3. Able to apply the data abstractions to analyze the design problem.
4. Able to use TRIZ to seek design principles and solutions.
5. Able to formulate a mathematical model for conflicts.

6. Know the general principle for conflict management
7. Know cultural and social knowledge of Indigenous communities on healthcare systems and devices
8. Know regulation management for medical devices

Information on literal descriptors for grading at the University of Saskatchewan can be found at: <https://students.usask.ca/academics/grading/grading-system.php#GradingSystem> Please note:

There are different literal descriptors for undergraduate and graduate students.

More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:

<http://policies.usask.ca/policies/academic-affairs/academic-courses.php>

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: http://www.usask.ca/university_secretary/LearningCharter.pdf

University of Saskatchewan Grading System (for graduate courses)

The following describes the relationship between literal descriptors and percentage scores for courses in the College of Graduate Studies and Research:

90-100 Exceptional

A superior performance with consistent strong evidence of

- a comprehensive, incisive grasp of subject matter;
- an ability to make insightful, critical evaluation of information;
- an exceptional capacity for original, creative and/or logical thinking;
- an exceptional ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently;
- an exceptional ability to analyze and solve difficult problems related to subject matter.

80-89 Very Good to Excellent

A very good to excellent performance with strong evidence of

- a comprehensive grasp of subject matter;
- an ability to make sound critical evaluation of information;
- a very good to excellent capacity for original, creative and/or logical thinking;
- a very good to excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently;
- a very good to excellent ability to analyze and solve difficult problems related to subject matter.

70-79 Satisfactory to Good

A satisfactory to good performance with evidence of

- a substantial knowledge of subject matter;
- a satisfactory to good understanding of the relevant issues and satisfactory to good familiarity with the relevant literature and technology;
- a satisfactory to good capacity for logical thinking;
- some capacity for original and creative thinking;
- a satisfactory to good ability to organize, to analyze, and to examine the subject matter in a critical and constructive manner;
- a satisfactory to good ability to analyze and solve moderately difficult problems.

60-69 Poor

A generally weak performance, but with some evidence of

- a basic grasp of the subject matter;
- some understanding of the basic issues;
- some familiarity with the relevant literature and techniques;
- some ability to develop solutions to moderately difficult problems related to the subject matter;
- some ability to examine the material in a critical and analytical manner.

<60 Failure

An unacceptable performance.

Program Requirements

- Percentage scores of at least 70% are required for a minimal pass performance in undergraduate courses taken by graduate students;
- Percentage scores of at least 70% are required for a minimal pass performance for each course which is included in a Ph.D. program;
- Percentage scores of at least 70% are required for a minimal pass performance in all courses used toward JSGS Public Policy and Public Administration programs and all core courses for Master of Public Health students, whether included in a Ph.D. program or a Master's program;
- For all other graduate courses, percentage scores of at least 60-69% are required for a minimal pass performance for each course which is included in a Master's program, provided that the student's Cumulative Weighted Average is at least 70%;
- Graduate courses for which students receive grades of 60-69% are minimally acceptable in a Postgraduate Diploma program, provided that the Cumulative Weighted Average is at least 65%;
- Students should seek information on other program requirements in the Course & Program Catalogue and in academic unit publications.

Course Overview**Class Schedule**

Week	Module	Readings	Evaluation Due Date
1	System and general knowledge architecture of FCBPSS	Handout and research paper	
2	Design phase theory, design requirement specification and documentation	Handout and research paper and past graduate thesis	
3	Function decomposition and its evaluation (Axiom I of ADT)	Handout and texts and graduate thesis	
4	Finding design solution with TRIZ – tool for searching design solutions	Handout and software manual	
5	Finding design solution with cognitive skills – data abstraction	Handout	
6	Design communication skill and conflict management	Handout	

7	Indigenous culture and knowledge for healthcare systems and devices	Textbook, research papers, handouts	
8	Medical device regulation	Handout	
9	Device invention case study 1	Handout	
10	Device invention case study 2	Handout	
11	Device invention case study 3	Handout	
12	Device invention case study 4	Handout	
	FINAL EXAM		TBD

Midterm and Final Examination Scheduling: No

Midterm and final examinations must be written on the date scheduled.

Final examinations may be scheduled at any time during the examination period (INSERT FIRST AND LAST DAY OF CURRENT EXAM PERIOD); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures: <https://students.usask.ca/academics/exams.php>

Instructor Information

Contact Information

Email: chris.zhang@usask.ca
Office: 2b34 Engineering Building

Office Hours

Every Thursday, 1 – 2 pm

Instructor Profile

Professor at the Department of Mechanical Engineering, University of Saskatchewan
Homepage: <https://engineering.usask.ca/people/mech/Zhang,Chris.php>
Google Scholar: <https://scholar.google.ca/citations?user=sE7TBcEAAA&hl=en>

Required Resources

TRIZ Software and its manual (available)

Readings/Textbooks

Nil.

Other Required Materials

Nil

Electronic Resources

Nil

Downloads

Nil

Supplementary Resources

Nil

Grading Scheme

Assignment	10%
Case study	20%
Project with TRIZ	30%
Final exam	40%
Total	100%

Evaluation Components**Assignment 1: Domain analysis with FCBPSS****Value:** 2% of final grade.**Due Date:** See Course Schedule & TBD.**Type:** The assignment is related to Learning Outcome (LO)-1.**Description:** The expectation is that the student is able to make a complete domain model of a device.**Assignment 2: Requirement specification development****Value:** 2% of final grade.**Due Date:** See Course Schedule & TBD.**Type:** The assignment is related to LO-2, LO-7.**Description:** The expectation is that the student can write a complete design requirement specification based on the learned requirement specification model.**Assignment 3: Seek for design solution with data abstractions****Value:** 2% of final grade.**Due Date:** See Course Schedule & TBD.**Type:** The assignment is related to LO-3.**Description:** The expectation is that the student can master the generalization technique to find design solution to the existing design problem at hand.**Assignment 4: TRIZ: idea and principle.**

Value: 2% of final grade.
Due Date: See Course Schedule & TBD.
Type: The assignment is related to LO-4.
Description: Description: the expectation is that the student knows the idea, principle of TRIZ.

Assignment 5: Mathematical model of conflicts in decision making

Value: 2% of final grade.
Due Date: See Course Schedule & TBD.
Type: The assignment is related to LO-5, LO-6.
Description: The expectation is that the student can master the generalization technique to find design solution to the existing design problem at hand.

Project

Value: 30% of final grade
Due Date: See Course Schedule & TBD
Type: Group-based design of medical devices, which may be past design project patented. The project is related to all the learning outcomes.
Description: The expectation is that the student should practice from writing design requirement specification to the detailed design of the device, verified by the simulation at least, and with consideration of regulatory approval road map.

Final Exam

Value: 50% of final grade.
Date: See Course Schedule & TBD.
Length: _3_ hours.
Type: Open book.
Description: Descriptive question. Relevant to all the learning outcomes.

Submitting Assignments

Electronic way to submit the work for assignments.

Late Assignments

Not accepted unless with cause.

Criteria That Must Be Met to Pass

Total grade only.

Attendance Expectations

80% attendance required; 100% attendance for case studies.

Participation

Case study, Peer evaluation.

Student Feedback

SLEQ (final)

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (<https://secretariat.usask.ca/documents/student-conduct-appeals/StudentAcademicMisconduct.pdf>) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (<http://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf>)

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at: <http://www.usask.ca/secretariat/student-conduct-appeals/index.php>

Examinations with Access and Equity Services (AES)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Access and Equity Services (AES) if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals. In order to access AES programs and supports, students must follow AES policy and procedures. For more information, check www.students.usask.ca/aes, or contact AES at 306-966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Student Supports

Student Learning Services

Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site <http://library.usask.ca/studentlearning/>.

Student and Enrolment Services Division

The Student and Enrolment Services Division (SESD) focuses on providing developmental and support services and programs to students and the university community. For more information, see the students' web site <http://students.usask.ca>.

Financial Support

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact Student Central (<https://students.usask.ca/student-central.php>).

Aboriginal Students Centre

The Aboriginal Students Centre (ASC) is dedicated to supporting Aboriginal student academic and personal success. The centre offers personal, social, cultural and some academic supports to Métis, First Nations, and Inuit students. The centre is also dedicated to intercultural education, bringing Aboriginal and non-Aboriginal students together to learn from, with and about one another in a respectful, inclusive and safe environment. Students are encouraged to visit the ASC's Facebook page (<https://www.facebook.com/aboriginalstudentscentre/>) to learn more.

International Student and Study Abroad Centre

The International Student and Study Abroad Centre (ISSAC) supports student success in their international education experiences at the U of S and abroad. ISSAC is here to assist all international undergraduate, graduate, exchange and English as a Second Language students and their families in their transition to the U of S and Saskatoon. ISSAC offers advising and support on all matters that affect international students and their families and on all matters related to studying abroad. Please visit students.usask.ca for more information.

College Supports

OTHER SUPPORTS OFFERED BY THE COLLEGE OR DEPARTMENT

Some of the mentors of the UnLIMITED (NSERC Create Program) may involve in the teaching of this course. Their teaching method is in a workshop manner.

Acknowledgements

Course Contributor(s)