Week 1: Asynchronous Design Studio
Welcome to ENGINEER 2PX3!

Overview

Welcome to your first Asynchronous Design Studio for ENGINEER 2PX3! As implied by the course's name, your main goal for this one-semester course is to work and collaborate with your teammates on a design project of your choice. The course offers 4 design projects to pick from and provides you with the necessary tools and resources to guarantee your success and optimize your learning experience. Throughout this course, you will be dedicating an hour of your time every week to complete an activity prior to your Synchronous Design Studio (2-hour tutorials). Although these activities are marked for completion, it is highly recommended that you use your allocated hour to complete them to stay on track with the weekly schedule. For this week's activity, the focus will be on learning about the design projects, performing a personality assessment to better understand your personality preferences, and carry out team-building activities.

Stage 1: Project Exploration

At this stage, you are learning about the projects that you will be choosing from. The decision you make should be based on your prior experience and your field of interest among the 4 projects. Please watch the project videos found on Avenue to Learn under [Table of Contents → 5-Design Studios → Week1 → Project Exploration Video] and use the following questions to note down the relevant information on each of the projects.

Project 1: 3D Printed Housing for Canadian Neighbourhoods

Who are the key stakeholders? (i.e., *The Client*)

Canadian Families/Home buyers

What are the main objectives of this project?

The main objectives of this project are to investigate the 3D printed housing technology, find the ideal choice of material composition, determine the best technological approach: on-site printer or factory-based printing, as well as consider the key factors involved in the development of an entire neighbourhood.

What are the final deliverable expectations?

The final deliverable requires an executive summary and a table of decisions on the main elements of the design, an outline of the design process highlighting the decision-making process and a list of parameters, a technical overview of the conclusions of each objective, a comparative summary including simulated project time and printing throughput, and a document explaining the decisions made during this project to the "hypothetical community".

What area of expertise does this project need?

This project would benefit greatly from the expertise of a civil engineer, or an experienced professional in the construction/urban planning industries. This project would also greatly benefit from a materials science or chemical engineer (since a large portion of this project is determining the material to be used). In terms of the home manufacturing method, this project could benefit from a mechanical engineer to aid in finding the most efficient method of manufacturing the houses/parts of the houses.

What prior experience do you have related to this project? (e.g., Modelling, 3D Printing, Material Selection)

Like most people involved in this project, I have materials selection and python experience from 1p13. In addition to this, I have been 3D modelling and 3D printing since early high school, and I believe this additional experience is invaluable when exploring a project centered around 3D printing and modelling.

Project 2: Infrastructure for Self-Driving Vehicles

Who are the key stakeholders? (i.e., *The Client*)

Commuters, drivers, people who live in densely populated areas

What are the main objectives of this project?

The main goals of this project are to reduce greenhouse gas emissions from motor vehicles; make the roads safer for all drivers, vehicles, and pedestrians; reduce traffic congestion and travel times; to transform vehicles and traffic infrastructure to address the previously stated issues.

The objectives of the project are to design a busy intersection in an urban setting, and a heavily trafficked stretch of a major highway, using the emerging autonomous vehicle technology.

What are the final deliverable expectations?

The final deliverables include a description of several solutions and designs from the groups, a discussion of the strengths and weaknesses of each design, a simulation of each design in addition to an analysis.

What area of expertise does this project need?

This project would benefit from a civil engineer with experience in designing roads and urban areas. In addition, a computer/software engineer who has a deep understanding of simulation as described in the deliverables. Finally, this project would benefit from an industrial engineer with knowledge of optimizing traffic flow.

What prior experience do you have related to this project? (e.g., Programming languages, Machine Learning, Simulations, etc.)

I have experience coding in python, C, and C++, which could be very useful in this scenario. I don't know much about machine learning but I'd love to learn and gain some experience in this area.

Project 3: McMaster Recycling Plant Design

Who are the key stakeholders? (i.e., *The Client*)

McMaster Students and faculty, residents of Hamilton near campus

What are the main objectives of this project?

The main objective of this project is to design a state-of-the-art, on-campus recycling facility to reduce waste output. The goal is to design a sorting unit that can classify and distribute waste materials efficiently.

What are the final deliverable expectations?

The final deliverables include a schematic and flowchart of the recycling plant, discussion of the design process, the optical sorting unit design, the software side of this design, and a design report outlining the recycling process.

What area of expertise does this project need?

This project would greatly benefit from a software engineer, computer engineer, mechatronics engineer, or anyone with systems design and programming experience. This project would also benefit from a mechanical engineer for the mechanical parts of the recycling process, and a chemical engineer to outline the process of recycling each type of item.

What prior experience do you have related to this project? (e.g., Programming languages, Optical Sensors, Control Systems, etc.)

As a student in mechatronics engineering, I hope to specialize in control systems and combining software design with mechanical design to solve problems. That being said, my knowledge of C++ and python would be a great help to this project.

Project 4: Source Water Monitoring Project

Who are the key stakeholders? (i.e., *The Client*)

Residents of areas with poor water conditions

What are the main objectives of this project?

Design a machine learning framework to detect the presence of algae in water by analyzing images from drones. Also, design a flight path for the drones to optimize battery life and data collection points.

What are the final deliverable expectations?

The final deliverables must include a diagram describing the drone system, discussion of the design process, design recommendations for the drone, discussion of possible errors due to the machine learning component, and a design project report outlining the overall process.

What area of expertise does this project need?

This area of expertise would benefit greatly from a software engineer for the machine learning aspect, and an environmental engineer to reduce the environmental effect of the monitoring program.

What prior experience do you have related to this project? (e.g., Programming languages, Sensors, Machine Learning, Drone Control, etc.)

As mentioned previously, I have experience in python, which has many machine learning modules available and would be perfect for this task. I also have experience flying a drone and capturing images as a hobby.

Stage 2: Personality Test Preliminary Research

In order to function efficiently as a team player, you need to know your personality well. (What works best? What does not?) The Big Five Personality Test is the most reliable and valid assessment used in the recent years to measure personality. Please conduct preliminary research on The Big Five Personality Test and discuss your findings below before doing the test.

Please write down the 5 personality traits and brief description of each of them.

1.	Conscientiousness – someone who is conscious of their own feelings and the feelings of others around them, and is also detail oriented and organized
2.	Openness – Someone who is imaginative and not afraid of exploring new ideas
3.	Neuroticism – one's response to a stressful environment, characterized by overthinking and a lack of emotional stability
4.	Extraversion – someone who is outgoing, enjoys attention, and "high-energy" in social environments
5.	Agreeableness – someone who is compassionate and kind, tends to agree and settle to avoid conflicts, often seek to help others

What percentage of each personality trait do you think you have?

Trait	Percentage
Openness	69%
Conscientiousness	33%
Extraversion	50%
Agreeableness	48%
Neuroticism	37.5%

What characteristics do you think an ideal engineering design team should have?

> I think that an ideal team should have all these traits present. Ideally, when developing a new solution, it is good to have a lot of openness present. In terms of teamwork, conscientiousness, extraversion, and agreeableness are also very important to ensure a collaborative and creative environment. Also, a portion of the team should have a moderate amount of neuroticism, since sometimes it is important to overthink and ensure all bases are being covered properly.

Stage 3: Team Building

Now that you are familiar with your project choices, time to meet your team! You have been assigned to a group with other engineering students from different specializations. You can find your teammates' names and emails on the 2PX3 Team List on Avenue to Learn under [Design Studio → Week 1 → Team List]. You can also find them on your assigned private channel on MS Teams. Please use the following section to help you get acquainted with your teammates.

Who are your teammates? Please list out their contact details below.

Teammate	Full name	Preferred name	Email
Teammate 1	Thivean Uthayaharan	Thiv	uthayaht@mcmaster.ca
Teammate 2	Allison Suichies	Allison	suichiea@mcmaster.ca
Teammate 3	Stephanie Vo	Steph	vos2@mcmaster.ca
Teammate 4 (if applicable)	Nathan Chiem	Nathan	chiemn@mcmaster.ca

What specialization do they come from?

Name	Program
Thivean	Mechanical Engineering
Nathan	Mechanical Engineering + Management
Allison	Chemical Engineering

Stephanie	Engineering Physics

Background experience relevant to this course?

Name	Experience
Allison Suichies	Inventor, Granta, python, urban planning, process control knowledge
Thivean Uthayaharan	Inventor, Granta, python
Stephanie Vo	Inventor, Granta, python, java, C, 3d printing fundamentals
Nathan Chiem	Inventor, granta, python, solidworks, java

Any interests or hobbies? (i.e., the fun stuff)

Name	Interest, Hobby or Fun Fact
Allison Suichies	Playing guitar
Thivean Uthayaharan	Playing soccer
Stephanie Vo	Baking
Nathan Chiem	Hockey, soccer, basketball, tennis, videogames

And most importantly, which project are they most interested in? Please rank each project by order of preference.

Name	First Choice	Second Choice	Third Choice
Allison Suichies	3D Printed Housing for Canadian Neighbourhoods	Infrastructure for Self-Driving Vehicles	McMaster Recycling Plant Design
Thivean Uthayaharan	3D Printed Housing for Canadian Neighborhoods	Infrastructure for Self-Driving Vehicles	Source Water Monitoring Project

Stephanie Vo	3D Printed Housing for Canadian Neighborhoods	Source Water Monitoring Project	Infrastructure for Self-Driving Vehicles
Nathan Chiem	3D Printed Housing for Canadian Neighborhoods	Infrastructure for Self-Driving Vehicles	Source Water Monitoring Project

Stage 4: Project Decision

As you wrap up your first Asynchronous Design Studio activity, it is now time to decide which of the 4 projects are you most interested in. Please rank your choices below and provide justification.

Choice	Project
First Choice	3D Printed Housing for Canadian Neighborhoods
Second Choice	Infrastructure for Self-Driving Vehicles
Third Choice	Source Water Monitoring Project

Justification: I care deeply about the housing crisis in the GTA and am actively looking for ways to increase housing availability, reduce costs, and find alternatives to the solution that is condominiums. Next, I believe that self driving cars are an inevitability and will eventually take over the roads, I am also interested in this industry as well as machine learning. Once again, for the final choice, I desire to learn more about machine learning and applying my programming knowledge, this seems like a good way to do it.

Submission Instructions

1. Upload a *.PDF copy of the Wk-1 - Asynchronous Design Studio 1 Worksheet to the Avenue Dropbox titled Asynchronous Design Studio Week 1 by Friday, Jan 14th, end of day (5:30 pm)
   o Use the following naming convention: macID_AsynchDS1.pdf
2. Submit one MS form representing your team to the following line: Rank Your Group Project Choices to rank your project choices as a team and providing a short justification.
   o If multiple forms are submitted from different team members, the latest one will be accepted.