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Professor Jan S. Sneep, P.Eng.
McLaughlin Hall, Room 323A
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Kingston, ON, K7L 3N6

Dear Prof. Sneep,

I am writing to apply for a design project under MECH460. I will briefly introduce my own history and interests before discussing my top project choices.

I have a previous degree in Sociology and Computer Science, and work experience as a deck officer aboard ship. These positions exposed me to naval architecture which led me to pursue a mechanical engineering degree. My interest in ship design guided the choices for my summer work experience as a student. During the first two summers of my engineering degree I undertook research in experimental fluid mechanics under Dr. Rival; this summer past I worked for a ship design and marine consulting office. My computer science background has given me a comfort with coding and scripting languages, while my history with sociology has improved my writing and critical analysis.

I have leveraged my previous work experience to gain access to the world of ship design, but my interests remain broad. My electives are skewed to fluid mechanics, but I have also taken oceanography and look forward to an introduction to astrophysics this winter. I find engineering design and experimentation grounded in fundamental principles to be the most compelling, while I also enjoy the creative process of 2D and 3D modeling. My ideal career would combine these elements, incorporate data analysis, while also providing a public service. What I wish I had more exposure to is machine learning, as I expect this to become only more relevant to engineering in the near future.

My top 5 project choices are listed below, I will then discuss in more detail my motivation for the top 3 choices.

1. Project 32 - Distributed Pressure Sensors for Fluids Research
2. Project 14 - Controlled-atmosphere enclosure for a metal 3D printer
3. Project 13 - Nature Inspired Heat Exchanger
4. Project 01 - CVT cooling design and analysis for the Queen's Baja SAE team
5. Project 18 - Passive Back Flow Internal Design

Distributed Pressure Sensors for Fluids Research - Dr. Rival

I had the opportunity to work for Dr. Rival after first and second year. There I learned that the best flow reconstruction techniques require laboratory conditions and computationally expensive post-processing. I am excited to work on this project since it would allow for the design of flow-manipulation systems able to respond dynamically to non-linear conditions, and for higher resolution on experimentation 'in the field'.

Controlled-atmosphere enclosure for a metal 3D printer - Dr. Fallah

I had the pleasure of meeting Dr. Fallah in 2nd year when he taught manufacturing methods. This project is attractive for a number of reasons. For one, 3D printing is an immature

manufacturing technique, many of the problems will be novel and the skills developed will be in demand. Also, there is a 3D modeling aspect that would improve my skills with *SolidWorks*. Lastly, the enclosure design requires a synthesis of approaches from heat transfer, fluid mechanics and solid mechanics.

Nature Inspired Heat Exchanger - Dr. Pharoah

I appreciate the bio-inspired approach of this project and that it is grounded in principles from heat transfer, fluid mechanics and material science. My hope is that this project may offer an opportunity to combine skills developed in other courses I am taking concurrently, specifically *Computational Fluid Dynamics* and *Biological Fluid Dynamics*.

To all of these projects I bring strong research and report writing skills, as well as a comfort with software generally and with some specific design and analysis tools. My most relevant experience comes from my work with Dr. Rival in 2018, where I was responsible for the design, implementation, analysis and reporting of a project over a 4 month time frame. A specific skill I would hope to develop through any of these projects would be the application of statistics and probabilistic design approaches.

I look forward to the coming semester, thank you for your consideration,

-Patrick Shorey