

Honors Thesis/Creative Project Prospectus

For Fall 2018 project completion: Priority Due Date: November 3, 2017, Final Due Date: February 16, 2018

For Spring 2019 project completion: Priority Due Date: April 6, 2018, Final Due Date: September 14, 2018

If you are unable to meet the deadline, contact your Barrett Honors Advisor in advance. Submit your prospectus to the Barrett Advising Office located on your campus.

Design Tools for Low-cost Robots

Thesis Title (May be a working title)

Jacob Knaup

1208852537

Spring 2019

Student Name

ASU ID #

Semester/Year of ASU Graduation

480-323-5061

jknaup@asu.edu

Polytechnic

Current Phone #

Email

Campus

N/A

List Group Members (If applicable) Each group member is required to submit a separate prospectus.

Director

[ASU DIRECTORY](#)

Dan Aukes

Polytechnic School

Asst Professor

Director Name (print/type)

Department

Title

480-727-1894

danaukes@asu.edu

Phone #

Email

Do you, as the Thesis Director, require that the Second Committee Member be an ASU Faculty member including the titles of: Professor, Associate Professor, Assistant Professor, Lecturer, Clinical Professor, Emeritus Professor, Professor of Practice, Research Professor, or Research Scientist?

☒ Yes

☐ No

If No, list acceptable qualified professional credentials. Qualified Professional: _____ Title/Unit

Third Committee Member Required? (check one)

☐ Yes

☒ No

I have received and read the *Thesis/Creative Project Committee Guidelines* and accept responsibility for providing project expectations, guidance throughout the entire thesis/creative project process, and evaluation of the final work. I have reviewed the student's thesis/creative project summary and find it acceptable.

9-13-18

Director Signature

Date

Second Committee Member

[ASU DIRECTORY](#)

Thomas Sugar

Polytechnic School

Professor

Second Committee Member Name (print/type)

Department

Title

480-727-1127

thomas.sugar@asu.edu

Phone #

Email

I have received and read the *Thesis/Creative Project Committee Guidelines* document and agree to the requirements set forth by Barrett, The Honors College for the position of Second Committee Member. I have reviewed the student's thesis/creative project summary and find it acceptable.

9/14/2018

Digitally signed by Thomas Sugar
DN: cn=Thomas Sugar, o=Arizona State University, ou,
email=thomas.sugar@asu.edu, c=US
Date: 2018.09.14 08:14:16 -07'00'

Second Committee Member Signature

Date

Third Committee Member (optional-varies by academic unit)

Academic units may choose to require a Third Committee Member. If needed, a Third Committee Member will offer insights beyond those offered by the Director and Second Committee Member. You and the Director should choose the Third Committee Member no later than six weeks prior to the defense; the Third Committee Member should receive a draft of your thesis/creative project at least 2-3 weeks before the defense. With agreement from your Director, you may also apply for the Barrett Honors External Examiner Program, which provides funding for an outside expert to act as a third committee member. An External Examiner is only eligible for the role of Third Committee Member. The Third Committee Member signature on the prospectus is not required.

Student Agreement

In order to have a successful thesis/creative project experience and graduate from Barrett, The Honors College I have read the guidelines set forth in the *Barrett Thesis/Creative Project Guidebook* and understand:
(Please check boxes prior to signing)

- ☐ I am responsible for contacting my committee members and initiating regular meetings as well as meeting Barrett thesis/creative project due dates and submission deadlines.
- ☐ My Director and his/her academic unit may set its own standards for methodology (i.e., empirical, comparative, or descriptive), thesis/creative project length, and content, and I am required to adhere to such standards.
- ☐ All changes to the scope of the thesis/creative project, committee members, and/or date of graduation must be discussed with the thesis/creative project committee and be reported to the Barrett Advising Office in the form of a revised thesis/creative project prospectus.
- ☐ My thesis must be successfully completed and submitted to the Barrett Advising Office and online by the Barrett thesis due date or approved discipline specific timeline in order to participate in Barrett convocation. Submitted document should be unbound (no staples, hole punches, bindings, or covers) and clean (no stains, creases, or wrinkles).



Student Signature

5/4/2018

Date

Please attach a 2-3 page summary of your thesis/creative project

This is an action plan for the thesis/creative project and provides a definitive list of goals and procedures with which you and your committee will work. It should include expectations for the project, overall timeline of progress and internal deadlines for your work. We expect the summary to be professional, clear, and grammatically correct. The prospectus will be kept on file in the Barrett Honors Advising office and serves as confirmation of your thesis/creative project and it may be accessed by faculty or the Dean's Office during this time.

Use the Prospectus Planning Document to help you prepare.

Topic and Goals

The topic will be the design of low-cost robots. This will include design methodologies, modular devices, reusable models, and design tools. The focus will primarily be on robots utilizing 3D printing and laminate manufacturing, which are generally constructed from non-rigid materials and require unique considerations.

The goal of this work will be to show how those properties can be used advantageously, and to document these uses in a conference paper. For example, one expected outcome of this work is a process for a modular force-sensing device that can be easily incorporated into robot designs. This device will take advantage of the inherent flexibility of laminate materials and use it to register forces. Another expected outcome is a model for designing jumping and hopping robots. This model will incorporate the flexibility of the members in a leg and will be useful for optimizing the leg characteristics and for selecting an appropriate motor. Both will need to make reasonable estimates (of force and performance respectively), and this work will ultimately be presented in a conference paper.

Method

I have already conducted work in these areas, so this thesis will be the culmination of previous work. To prepare the force sensing work for a conference paper, more detailed data will need to be collected to support the accuracy and usefulness of the force sensing device. A more robust mathematical model of the device will also be created to explain the function and force calculations that it uses. The jumping/hopping robot model will need some refinements to the model and the experiment itself. This will hopefully bring the theoretical and experimental results into closer agreement. Additionally, the limitations of the model that result in the discrepancies with the experimental results will be explained.

Director Meetings

I will meet with my director on Thursdays for an hour. These meetings will be in small groups with other students who are working on related work. In these meetings, my director

will provide guidance regarding the direction of my research and suggest next steps for how my work should continue. He can correct potential problems with what I am doing and point out difficulties that may arise or obstacles that must be considered. I will also meet with my director on Fridays for an hour and a half as part of our weekly lab meetings. These meetings will mainly serve as an opportunity to present work with my lab mates and receive feedback and ideas on the accomplishments I have made and difficulties I am currently having.

Second Committee Member Meetings

I will meet with my second committee member intermittently throughout the semester as his availability permits. We will hopefully meet as often as every other week to once a month. In these meetings I will update my second committee member on my progress, and he will offer his input in much the same way as my thesis director. This will likely take the form of pointing out problems I had not considered or suggesting better technics for conducting experiments or creating models.

First Semester Timeline

Month	Month-End Accomplishments
September	Completed jumping/hopping model Final simulation results Considered experiment and refined setup as needed
October	Final jumping/hopping experimental results Experimental/simulation results are presentable Explanation for experimental/simulation results
November	Jumping/Hopping paper completed All figures drawn/generated Written explanation and discussion of results Literature review of related work Results presented according to clear story
December	Reviewed previous force-sensing work

Second Semester Timeline

Month	Month-End Accomplishments
January	Improved, higher-performance jumping platform designed/constructed for demonstration/future use New version of force sensing device manufactured
February	Updated experimental results of force sensing device Complete model for force sensing device
March	Figures for force sensing paper generated
April	Force sensing/materials paper completed Literature review Potential applications discussion
May	Create pretty demo of thesis work to be kept in lab for future use