

# FALL 2023

## Student Academic Grant (SAG) Packet

Within this packet you will find the following information:

- Types of SAG Awards / Grants
- Selection Criteria
- Application

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### **Types of SAG Awards / Grants**

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There are four types of academic grants that can be awarded. All four types of grant applications require that you identify and obtain the signature of the faculty mentor/advisor who will sponsor the activity. In your application, you are asked to classify your needs according to the following definitions:

#### **1. Conference**

This type of grant is intended for students who will be presenting their work at a conference, with preference in funding to students in this order: (a) giving a talk, (b) presenting a poster, (c) participating in the conference in another capacity, and (d) simply attending a conference. Conferences are by far the most common type of SAG and the category most often funded.

#### **2. Independent Study / Research**

These grants are generally awarded for semester-long research projects. The project may be part of a faculty member's research program or a completely independent project (student-designed with faculty input) that the faculty member has agreed to mentor. Applicants must demonstrate their need for funding beyond what their faculty mentor has available. This necessitates a letter/email from the faculty mentor explaining the need for additional funds.

#### **3. Competition**

This type of grant is for students who are participating in a competition. However, this grant is not for the Olin Competition Teams.

#### **4. Eureka**

Seed funding is available to students (as well as to faculty and staff members) to stimulate and facilitate innovative research and educational initiatives. Novel approaches that promote collaboration and diversity of perspectives with "reasonable risk" and promise of new capabilities are encouraged. Eligible activities include research projects related to academic activities, implementation of ideas to improve institutional processes, course development initiatives, and intellectual vitality efforts expanding the overall knowledge base of the community. As these unforeseen opportunities may arise outside of the regular application review period, a portion of the yearly budget will be set aside to fund meritorious Eureka applications. *These grants are not for students who simply missed the application deadline.*

## Document Requirements

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### 1. Application

All academic grant applicants must complete the attached one-page application in addition to the information listed under “Required Documentation Checklist” in full by the announced deadline. Please carefully review the “Selection Criteria” and “Important Information” listed below when preparing your application.

### 2. Final Report, Reflection and Reimbursement Requests

If you receive a grant of any form, you will be required to complete a **full final report** that conveys the details of your project to Student Affairs and the Selection Committee that includes any relevant information or documentation, such as Design Review slides or project photographs. In addition, a **one-page reflection piece** is required. See “Required Follow-up Checklist” on the application page for details. If any of these items are not submitted, future requests will not be considered, as Screening Criteria will not have been met. Both the final report and reflection will be made available to the Olin community via the Olin Repository. All awardees are asked to upload their files using this process:

- 1) Go to <https://phoenixfiles.olin.edu/>
- 2) Scroll to the bottom and log in with these credentials:  
Username: olin-student  
PW: Phoenix1735!
- 3) Select "Add New Phoenix Files Item" from Tools (on the top/blue menu).

## Deadline

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The posted application deadlines will be announced at the start of each semester. **The application submission deadline for the Fall 2023 semester is Monday, September 18<sup>th</sup>, 2023.**

Except in unusually pressing circumstances, all applications are reviewed as a batch soon after the application deadline. Any applications received after the deadline are unlikely to receive funding because the Committee has a limited amount of money allocated for distribution of grant funding each semester.

The Committee will meet shortly after the application deadline to review all proposals and determine funding levels. If a student or group has not met all Screening Criteria (below), the proposal will not be forwarded to the Committee for consideration at that time. The Selection Criteria assist the Committee in determining if the proposal is fundable.

### Screening Criteria

#### 1. *Olin Student Participation*

Applicants must be currently enrolled Olin students.

#### 2. *Academic Standing*

Participating Olin students must be in good academic standing. Students in good standing may continue to apply even though others on the grant may not be eligible to continue.

#### 3. *Past Performance*

Participating Olin students must have completed all reporting requirements for prior awards.

**4. *Completeness***

Proposals must be completed to the satisfaction of the Committee.

## Selection Criteria

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### **1. Proposal Quality**

Consideration is given to the clarity, thoroughness, and feasibility of the proposed activities.

### **2. Academic Merit**

Consideration is given to the intellectual merit of the activity and the benefit to the applicants.

### **3. College Welfare**

Consideration is given to the benefit to, consistency with the mission of, and reflection upon the College.

### **4. Use of Resources**

Consideration is given to the resources required to complete the proposed activities relative to the resources available and to the proportionality of the costs to the benefits. Evidence of good stewardship of SAG resources – for example, the inclusion of a detailed budget that demonstrates efforts to minimize costs and optimize resources – will positively reflect on the application.

### **5. College Policies**

Proposed activities are checked to be consistent with the operational policies of the college, including safety, purchasing, and facilities policies.

## Important Information

### **1. Space**

If you are participating in an activity on campus, you will need to identify space in which this activity will occur. If it will be in an Academic space that is not a faculty member's research space, you may need to seek permission from Facilities. If you plan to conduct the activity in the Residence Hall, you will need to seek permission from the Office of Student Life.

### **2. Budget**

As you prepare your budget, please keep in mind that the funding for this program has limits. The committee typically has approximately \$20,000 to distribute for the entire year and always has requests for much more than that amount. Your budget proposal should **justify and clarify your budget needs**. Explain reasons for travel and how you arrived at flight and lodging expense estimates (include screenshots of flight searches and hotel websites for costs). **Requests for lodging reimbursement are limited to two nights**, even if the event is for a longer period, and room-sharing is expected. Allowable travel expenses are generally limited to conference and transportation fees. **Meals, transportation to/from airports, and hotel internet charges are excluded**. To enable funding of the greatest number of applications, your request may be considered at a reduced funding level. Therefore, we ask that you include a statement indicating whether you will still be able to conduct your activity if partial funding is awarded. Include estimates, when applicable, of all items to be purchased and relevance to the project. If materials or equipment are purchased, Olin will generally own them following completion of the project. Please indicate where they will be located after the project is finished. Also, please list any sources of additional funding for your proposal.

#### **4. Examples of Past Proposals**

Examples of past proposals and final reports are available in the Student Academic Grants folder on the Public Drive.

#### **5. Travel**

If you are traveling to a conference or event, you **MUST** submit the Travel Authorization and Indemnity Form.

**\*\*THIS APPLICATION MUST BE TYPED\*\***

**Office of Academic Affairs Funding Request Application Fall 2023**

Name(s) and Class: Jeremy Wenger '24 Date Submitted: 09/18/23  
(If >2 applicants, submit 1 application and identify coordinator/leader and all participants in the general description.)

Activity/Project Title: Robotics Lab: Creation of Autonomous Tractor

Type of funding:  Conference  Independent Study/Research  Competition  Eureka

	Yes	No	N/A
Will you be presenting a talk?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will you be participating in a poster session?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Will you have to miss classes?	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Have you made arrangements to make up class time?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Have you received support before? <i>If so, provide details in an attached note.</i>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you submitted this proposal to other departments at Olin? <i>If so, provide details within your proposal.</i>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Name of faculty advisor/sponsor: Kenechukwu Mbanisi

Faculty advisor signature (REQUIRED): 

Amount requested: \$4,282 Amount Approved: \_\_\_\_\_ (To be completed after review)

**REQUIRED DOCUMENTATION CHECKLIST:** Submit the below documents **TOGETHER** with this application page:

- General Description** of activity and anticipated goals, outcomes and benefits.
- Budget and resource requirement and justification.** Include information about alternative/supplemental funding sources. State clearly if the activity will occur if partial funding is awarded (versus full amount requested).
- Space Requirements** Identify space needed/requested for this project. NOTE: Spaces will require prior approval for use as noted for Fall 2023.
- Project timeline** including start and end date.
- Travel Authorization and Indemnity form** (if applicable).  
The Student Reimbursement Form and Travel Authorization / Indemnity Release Forms are on the Public Drive (in the Student Project Folder).
- Letter/Email of Support from Faculty Advisor:** Provide an email (or letter) from your faculty advisor and ensure that it is submitted along with all other application documentation.

**Email COMPLETED application and proposal (combined into a single pdf)**  
**Barb Luciano ([bluciano@olin.edu](mailto:bluciano@olin.edu)).**

**DUE DATE is on or before Monday, September 18<sup>th</sup>, 2023**

**REQUIRED FOLLOW- UP CHECKLIST:**

- FINAL REPORT:** The final report is due to Academic Affairs ([bluciano@olin.edu](mailto:bluciano@olin.edu)) **within one week of the end date of the project or activity.** Include a conference program if you are presenting or participating in a poster session. Attach copies of any posters, presentations, etc.
- REFLECTION PIECE:** Please also attach a one-page reflection describing how this supported activity has enhanced your academic development.
- Kindly **upload your Final Report and Reflection Piece** using this process:
  - Go to <https://phoenixfiles.olin.edu/>
  - Scroll to the bottom and log in with these credentials:  
Username: olin-student  
PW: Phoenix1735!

3) Select "Add New Phoenix Files Item" from Tools (on the top/blue menu).

REIMBURSEMENT REQUESTS: Original itemized receipts of purchase are required for reimbursement. All reimbursement requests must be submitted to Barb Luciano in Academic Affairs (bluciano@olin.edu) within two weeks of the purchase/expenses.

SAG Additional Documentation  
**Creation of Autonomous Tractor**

### **General Description**

This project plans to create an autonomous tractor that operates based on waypoint navigation. The autonomous tractor will be created from a Kubota tractor that is outfitted with systems such as control over the velocity and the wheel angle that will allow for the operation of the tractor without an operator. The autonomous tractor will additionally be augmented with a myriad of sensors including LiDAR, GPS, IMU, Sonar, and Cameras. We plan to build a smaller testbed on an RC car to validate and test software changes before pushing them to the tractor.

These members of the Robolab have been running various versions of autonomous ground vehicles since early 2020. The Kubota project stems from the GATOR project that was discontinued in the spring of '23 due to changes in Olin's ability to acquire funding from external companies. Last semester we took the tractor from not starting to full remote functionality and got a [demonstration video](#) of the remote control functionality. We plan on building on this functionality and presenting it in the future.

Kene Mbanisi will be our faculty advisor and will be checking in and assisting us throughout the semester. His goal is to have the robotics lab attend the 2024 FIRA USA event ([Home \(farmbot.ai\)](#)) in the spring.

After our first interest meeting this semester, we had 32 students wishing to participate in the lab. 23 of which were first-year / first-time members. A good portion of the SAG funding we receive will go to building a robot that these new students will be able to use for advancement in their research.

### **Main Missions:**

1. Fix and upgrade tractor physical systems "Tractor Hardware"
  - a. Build a tilting system for lidar
  - b. Install RTK GPS
  - c. Install Cellular Router
  - d. Improve gas actuator
  - e. Build hydraulic lever actuators
    - i. For box blades or other agriculture implements
2. Build a small Ackerman steering robot "SmallBot"
  - a. Same software stack as trackbot/tractor
    - i. Arduino listening to RC receiver and Linux pi
    - ii. Hokuyo lidar
    - iii. Short term, use a phone for odometry
  - b. Small-scale testing promotes safe, rapid testing and engineering
3. Build waypoint navigation software "Software"
  - a. Integrate ros with tractor tech stack



- b. Do calibration/figure out how to characterize gas and steering in ROS (speed isn't going to be consistent given variable RPM, steering may not be consistent on different ground)
  - c. Obstacle avoidance
  - d. Actual "go from point A to point B"
  - e. Build Ackerman steering simulator
4. (optional) Build a user interface to facilitate user-friendly multiple-waypoint navigation

Next semester we plan to compete in the Farm Robotics Challenge ([Home \(farmbot.ai\)](http://Home(farmbot.ai))) and we will utilize software, hardware, and firmware we will develop this semester to aid our approach to Farm Robotics Challenge. We may also create posters demonstrating the skills and techniques used in this project that can be used in presentations at conferences for farming robotics.

Our deliverables are:

- A vehicle capable of "waypoint navigation"
- A vehicle with more reliable and capable physical systems
- Thorough documentation on our modifications, work, and performance metrics such as repeatability, obstacle avoidance, and accuracy
- Autonomous movement through Parcel B
- A final report summarizing milestones achieved and what was learned over the course of this project.
- Possible presentation during Expo

Notes:

Alternative funding sources are unlikely. The activity will go on if partial funding is awarded, but likely at reduced pace and with less ambitious deliverables.

**Budget/Resource Requirement and Justification:**

Item:	Retailer:	Price:
<a href="#">LiDAR</a>	Hokuyo	\$1,675
<a href="#">Depth Camera D457</a>	Intel	\$499
<a href="#">NUC</a>	Intel	\$460
<a href="#">RC Car Testbed</a>	Axial	\$350
<a href="#">RTK GPS</a>	Sparkfun	\$290
<a href="#">Yellow Jacket Motors (2)</a>	Bilda	\$258
<a href="#">Linear Servos</a>	Bilda	\$199.98

<a href="#">3D Printing Filament</a>	MatterHacks	\$104
<a href="#">Aluminum</a>	McMaster	\$100
<a href="#">GPS Antenna</a>	Sparkfun	\$83.50
<a href="#">Raspberry Pie 4b</a>	Raspberry Pi	\$68
<a href="#">Lithium Ion Batteries</a>	Amazon	\$50
<a href="#">Fasteners</a>	McMaster	\$50
<a href="#">Serial RS-232 (2)</a>	Best Buy	\$40
<a href="#">IMU</a>	Adafruit	\$24.95
<a href="#">Jumper Wires</a>	Amazon	\$10
<a href="#">Potentiometers</a>	Amazon	\$9.99
<a href="#">USB to USB-C</a>	Amazon	\$9.37
	Total:	\$4,282

### Justification:

The components we are requesting funding for will allow the lab to build a new robot test bed for all of the newer members of the lab, it will also supplement the main tractor project by allowing us to acquire some of the hardware needed to implement new actuator designs. Without this funding, we will likely not have enough mechanical engineering projects to support our first-year students as the mechanical tasks on the tractor are not suited for them. This new testbed also allows the first-year software members the ability to learn basic ROS 2 skills without the concern of operating a very large, and rather dangerous robot.

### Space Requirements

Our space requirements are already met. We have a dedicated space for Robo Tractor in both the robotics lab and the LPB granted by Dave Barrett.

### Project Timeline

- AGILE Scrum Process
  - Sprint period (3 weeks)
    - Sprint 1: 9/15 - 10/6
      - Tractor Hardware: Improve gas actuator, install gps (and cellular)
      - SmallBot: Build smallbot
      - Software: Integrate ROS, build sim
    - Sprint 2: 10/6 - 10/27
      - Tractor Hardware: Tilt for lidar
      - SmallBot: Done
      - Software: Calibration, basic a to b
    - Sprint 3: 10/27 - 11/17

- Tractor Hardware: Hydraulic levers actuators
- Software: Obstacle avoidance & multi point waypoint navigation
- Scrums
  - Tues (written update), Fri (in-person)
  - Fridays 4:30 - 5:30 Check-in + working time

## Contact

Jeremy Wenger: [jwenger@olin.edu](mailto:jwenger@olin.edu)

Kene Mbanisi: [kmbanisi@olin.edu](mailto:kmbanisi@olin.edu)

## List of those involved:

Han Vakil '24

Charlie Babe '24

Live Dawes '24

Jack Levitsky '24

Rohith Tatineni '24

Ertug Umsur

Jeffrey Woodyard

Vivian Mak

Fiona McSherry

Brook Moss

Anthony Cheung

Agatha Ford

Luca Odio

Kenji Sakaie

Arianne Fong

Elisa Camacho

Elias Lopez Dalla Nora

Nicholas Cunha

Zachariah Adeboye

Darian Jimenez

Tobin Mallon

Pauline Petersen

Rebecca Cramer

Rishit Bansal

Wilder Brown

Samuel Wisnoski

Alexander Qazilbash

Eddy Pan

Mark Belanger

Wynona Brinkmann

Lily Dao