



# **ARMYANTS**

FRC ROBOTICS TEAM 3792

**Army Ants Robotics  
Team 3792 Handbook**

2018-2019 Season

# The Team

## Mission Statement

FIRST organization:

*“Our mission is to inspire young people to be science and technology leaders, by engaging them in exciting mentor-based programs that build science, engineering and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.”*

In addition, the mission of Team 3792 is *to be a leading and well-recognized focal point for promoting STEM careers that is a source of pride for the greater Columbia community.*

## History and Impact

FIRST (For Inspiration and Recognition of Science and Technology) Robotics / FRC<sup>1</sup>

- Founded in 1989
- Robots are built in 6 weeks, January through mid-February, and typically weigh ~100 lbs.
- ~3,660 active teams, 86 in Missouri (2018).
- 91,000 high-school students currently participate (2018).
- ~\$80M in scholarships are available from ~200 institutions (including MU, MUST) for students who have participated in FIRST robotics<sup>2</sup>.
- According to an ongoing large-scale longitudinal study by Brandeis comparing FIRST youth with a control group with similar STEM interests and background<sup>3</sup>:
  - At 48 months, FIRST participants are 3.0 more likely to show gains in STEM career interest and 2.4 times more likely to show gains in STEM knowledge than control group.
  - FIRST alumni are 2.6 times more likely than the control group to be enrolled in an engineering course their freshman year in college
  - The most dramatic impacts of FIRST on STEM measures are for girls:
    - All STEM-related outcome gains are larger for girls than for boys, particularly STEM careers and knowledge
  - Over 75% of FIRST alumni are in a STEM field as a student or professional

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<sup>1</sup> <https://www.firstinspires.org/about/at-a-glance>

<sup>2</sup> <https://www.firstinspires.org/scholarships>

<sup>3</sup> <https://www.firstinspires.org/about/impact>

## Team 3792 “Army Ants”

- Rookie Season 2010/2011 (coach: Jim Kyd), won “Rookie All Star” award at St. Louis Regional and competed at Championship in St. Louis.
- Made playoffs in 2012 (coach: Nat Graham), 2013 (coach: Karl Christopher), 2014, 2016, 2018 (coach: Kevin Gillis).
- Won *Innovation in Controls* award at St. Louis Regional in 2014, *Quality* award at St. Louis Regional in 2016, *Judge’s Choice* award at St. Louis Regional in 2017 and *Engineering Inspiration* award at St. Louis Regional in 2018.
- Won 1<sup>st</sup> place at Rocket City Regional in Huntsville, AL and competed at World Championship in Houston, TX in 2018.
- Student team members drawn from regional high schools including Rockbridge, Hickman, Battle, Tolton and home school.
- The team is extensively involved in K-12 STEM outreach. Examples include:
  - Team members have helped ~200 Boy Scouts earn the robotics merit badge at the MU Merit Badge University (2012 - present).
  - The team has made public appearances with robots at the Benton Elementary STEM Fair, regional 4-H clubs, Rotary club and other venues.
- In January 2016, the team transitioned from Columbia Public Schools to a 4-H Special Interest group administered by the Columbia Educational Robotics Foundation (CERF) and began operating out of the University of Missouri, Agricultural Engineering Building.

## Columbia Educational Robotics Foundation (CERF):

- Booster organization for Army Ants and other K-12 robotics organizations in the region.
- 501(c)(3) non-profit public charity, contributions tax-deductible.
- Funds raised by Army Ants flow through CERF.
- Army Ants Chief Mentor reports to CERF Board of Directors.
- CERF Board includes Dr. Gillis (Chair), Dr. Winslow (Secretary), two student representatives, community leaders.

**Student Leadership Council.** Students are selected by the Chief Mentor to provide recommendations on team membership, policy and to run the team with mentor oversight. These are usually upperclassmen who have one or more years of experience on the team. Many other students will have opportunities to learn leadership skills as they are assigned to lead projects during build season. *Regular attendance at meetings and outreach events (>50%) is required to be eligible for leadership positions, nomination for the Dean’s List award, to be on the drive team, or to be on the pit crew at the competition.*

**Team Organization:** During pre-season, students are assigned to one of three technical departments for specialized training:

- Robot Design (Computer-Aided Design, CAD, lead mentor: Dr. Josiah Bryan)
- Robot Fabrication (Machine shop, lead mentor: Steve Grieshaber)
- Robot Programming (lead mentor: Dr. Andy Winslow)

In addition, all team members are assigned responsibilities in:

- Business and Logistics (lead mentor: David Sabath)
- Outreach (lead mentor: Dr. Kevin Gillis)

**The Robot:** Every year we are given the task of building a ~100 lb robot to play a specific game. Every team gets the specifications at the same time via the Kickoff broadcast in early January. The team gets 6 weeks to build the robot and then it must be sealed and not touched until their first competition. This is called the “build season”, and typically encompasses January and February, with competitions in March, and if the team advances, Championships in April.

**Team Communications:** We have adopted a free, powerful application called Teamstuff to conduct team communications. The calendar with all events is maintained on Teamstuff, and students and mentors RSVP on which events they will attend. In addition, the team email list and cell phone numbers are maintained there, and only our team has access to them. Push notifications (an alternative to texting) is used for messages and for meeting reminders for those who download the free app to their smart phone.

The procedure to get on Teamstuff is that we first invite your student using their email, and then they invite parents in an email message to link to their account. (In order to do this, the student opens Teamstuff in a web browser and signs in. Then select Profile, click on icon with 2 heads, then select “+” icon on left and put in parents email address to add access.)

**Please respond to the email invitation from Teamstuff.** It is easy and very important to keep you informed. Please add your cell number also when you sign up. We also encourage you to download the app to your smart phone (iPhone or Android). Then all team information is at your fingertips.

**Team Apparel:** We have team T-shirts printed each year with the back dedicated to advertising our sponsors. One shirt is provided to each youth member each year and is covered by Annual Dues. Additional t-shirts for parents and siblings are available for purchase each year, but need to be ordered in advance in the Fall. The team needs to wear this apparel at events and competitions.

## **Team Schedule:** (See Teamstuff for complete schedule and details)

### **Pre-season (Fall 2018):**

Weekly meetings on Wednesday 6:30-8pm in 107 Agricultural Engineering Building, MU campus  
Outreach events include:

- Thurs., Aug 23<sup>rd</sup>, Home school ice cream social
- Fri., Sept. 28<sup>th</sup>, OLLIS STREAM event
- Sat., Sept. 29<sup>th</sup>, Boy Scout robotics merit badge at MU
- Wed., Oct. 10<sup>th</sup>, GradeAPlus robotics workshop #1
- Tues., Oct. 16<sup>th</sup>, Benton STEM Showcase
- Wed, Oct. 17<sup>th</sup>, GradeAPlus robotics workshop #2
- Fri/Sat., Oct. 26-27, Cow Town Throwdown, Lee's Summit, MO
- Fri/Sat., Nov. 2-3, FIRST Lego League Tournament, Jefferson MS, Columbia
- Mon., Nov. 5<sup>th</sup>, GradeAPlus mBot scholarship camp
- **Mon., Nov. 19<sup>th</sup>, Registration deadline for all district and regional events for 2019 season**
- Thurs/Fri., Dec. 27-28, Holiday robotics camp

### **Build Season (Jan 5 – Feb 19, 2019)**

- Sat., Jan. 5<sup>th</sup>, 2019 Competition Kickoff
- **Thurs., Jan. 24<sup>th</sup>, Payment deadline for all district and regional events**
- Thurs., Feb. 7<sup>th</sup>, Chairman's Award application deadline
- Thurs., Feb. 14<sup>th</sup>, Dean's List Award application deadline
- Tues., Feb. 19<sup>th</sup>, Stop Build Day

### **Competition Season (March-April, 2019)**

**1<sup>st</sup> Regional: St. Louis Regional, Chaifetz Arena: March 2019 (not yet scheduled)**

**2<sup>nd</sup> Regional: Rocket City Regional, Huntsville, AL: March 2019 (not yet scheduled)**

**Championship, Houston, TX: April 17-20, 2019 (if team qualifies)**

## **Pre-Season (Sept – Dec, 2018):**

Pre-season begins in August, coinciding with the start of the Columbia Public School academic year. We will meet every Wednesday from 6:30 – 8:00 PM to conduct various activities.

- Invite prospective students to visit the team and learn about the benefits of participation
- Mid-September: Admit new students, and finalize team membership
- Organize the returning team members into skill departments to prepare for build season
- Practice and learn skills for build season
- Plan and conduct various outreach activities
- Participate in Cow Town Throwdown, a pre-season competition

## **Build Season (Jan 5 – Feb 19, 2019):**

**Kickoff Party:** Build Season begins with the Kickoff Party on Saturday morning, January 5<sup>th</sup>. Please come join us for the breakfast fundraising party for the whole family, community members and sponsors. The game for the year is broadcast live during the party and then brainstorming begins.

**Meeting Schedule:** During build season, the team meets every school day from 4:30 – 7:30 PM. The team also meets on Saturdays (9:30 AM – 4:30 PM, divided into two shifts) and some Sunday and holiday sessions (e.g., MLK Day, President’s Day). This is a fun and exciting, but trying time for the students. Students are not expected to attend every day during build season, but are encouraged to attend as much as possible. Students learn a tremendous amount and noticeably mature during these intense six weeks if they fully participate.

**Parking during Build Season:** Whereas many aspects of working out of the Ag Engineering Building are great, parking during working hours on the MU campus is a headache. Parking officially opens to the public at 6 pm and enforcement after 5 or 5:30 pm is often lax. However, **expensive parking citations at 4:30 pm on weekdays or during other MU workdays (MLK, President’s Day, ...) are a real possibility.** We encourage dropping off kids, carpooling, and other means to reduce our parking footprint. There are a limited number of parking meters available; we will point these out to the kids. **Parking is not an issue after 6 pm or all day on weekends.**

**Build Season Meals:** During Build Season the parent group provides meals/snacks/drinks for the students, taking turns feeding the entire team and mentors. This is done for many reasons including, team spirit, comradery, time for brainstorming, and most importantly, for the safety of your student (traveling out to get food in the winter can be an issue). **You are asked to provide two meals.** Example meals include tacos, taco salad, spaghetti, lasagna, pasta dishes, chili, chili dogs, pizza, homemade soups, vegetables and fruits are also appreciated. Desserts can be as simple as store-bought cookies. They love iced tea, water, Gatorade, and soda. We will list any allergies or dietary restrictions (pork is a common restriction) on the sign up calendar. These will have to be taken into consideration when preparing meals, so please read contents carefully.

**When you bring a meal, please join the team for the meal** and bring the whole family if it is practical. This is a great chance to learn more about the team and for the mentors and students to get to know you better.

It is possible that we will meet on snow days. The Chief Mentor will contact students using Teamstuff if we will meet on a snow day. This will require lunch to be provided by a parent, so if you can, let the parent coordinator know if you are willing to be on call for snow days. Students should only travel on snow days with their parent’s permission.

## Competitions:

### St. Louis Regional (March 2019)

This is our local regional event with the new robot and new game. It runs 3 days (Thursday, Friday, and Saturday) in March. You will be informed in advance by the mentors the cost for each student to travel. We depart after school on Wednesday and miss two days of school on Thursday and Friday. **Missed school is an excused absence as a 4-H event.** Thursday afternoon the robot must pass inspection and the pit area is set up and practice rounds are scheduled. Friday and Saturday are matches and awards. The parent group supplies lunch for the team each day. We return on Saturday evening. **We need parents to join the team at this event in order to serve as chaperones, help transport the kids and execute meals.** Parents have the opportunity to book rooms with the team at the group rate.

### Second Regional Competition (March 2019)

We are planning to attend a second regional event, likely the Rocket City Regional in Huntsville, AL. Attending a second event greatly increases our odds to become a more competitive team and qualify for Championship. This will likely involve missing three days of school (again, an excused absence) with departure early Wednesday morning and return Sunday night. Again, we will need some parents to join the team for this event.

### International Championship (April 17-20, 2019, Houston, TX)

We need to win one of the major awards at a Regional competition to qualify to compete at Championship.

## Student Responsibilities:

**Sign Up:** a) Submit the online Army Ants team application, b) Sign up to Teamstuff, including your cell phone, add access to your parents, c) Register in the FIRST Youth Team Member Registration System: <https://www.firstinspires.org/resource-library/youth-team-member-consent-and-release-form>

**Show Up:** There is no specific minimum attendance requirement to be part of the team, however, a) students must indicate whether or not they will attend every team event on Teamstuff, honor this attendance commitment, and keep it up to date, b) regular attendance at meetings (>50%) is required to be eligible for leadership positions, nomination for the Dean's List award, to be on the drive team, or to be on the pit crew at the competition. c) **Participation in some of the outreach events is required to be part of the team.** This requirement can be filled a wide variety of ways, please discuss your situation with the Chief Mentor if you have any concerns about your participation.

**Work:** Be proactive to identify tasks that you would like to work on. If you are not sure what to do, ask for a job from a student leader or mentor. Only sign up for tasks that are consistent with your schedule. For example, don't sign up to fabricate a time-sensitive component during build season when you will be absent the next couple of days or have a large school assignment due.

Have fun and socialize, but try to do it while working and don't distract others from their work.

**Work Safely:** *Safety is the number one priority of the team.* Students must be trained on every piece of power equipment they use and pass a safety test. Safety glasses must be worn in the shop whenever equipment might be used and no horseplay is allowed. It is your obligation to speak up if either a student or mentor is violating safety rules. Violation of safety rules will result in dismissal from the team if the violation is serious enough or if there are repeated violations.

**Respect** your fellow students, mentors, the equipment you use, and the facilities that the University of Missouri is generously supplying.

## **Parent Responsibilities:**

**Permission forms:** a) The FIRST organization requires a Consent and Release Form be submitted. This is done online. b) The University of Missouri requires that a Liability Waiver be signed for each participant. We must have this before build season starts. c) A permission form for travel to the competition will be required. These must be in the hands of the coaches by the deadline date or your student will not be able to travel.

**Communication:** Sign up on Teamstuff so that we can easily communicate with you and you can stay informed on team activities.

**Financial:** Annual Dues are \$50 (due by October 1st) that will cover the cost of the team t-shirt, 4-H registration, and incidental expenses such as utensils and condiments for meals during Build Season. Parents also pay the cost of youth attending the competitions (hotel, transportation, meals). For the 2018 St. Louis Regional, the cost was \$200 per youth plus spending money. The Huntsville regional cost \$275 plus spending money. Parents are expected to contribute two meals during Build Season to feed ~25 people, and contribute food and snacks for competitions. Please help scout out potential sponsors among your business network.

**No youth are turned away due to an inability to pay.** Please see the Chief Mentor if these costs are a burden to your family.

**Team Budget:** The team budget last year was ~\$50,000 per year, a cost of >\$1,500 per year per youth. Currently, participation fees cover ~1/3 of the budget and the rest comes through fundraising. **We justify our budget through the impact the team has not only on the ~30 team members, but by the hundreds of youth we impact through outreach events.**

The entry fee for the regional competition is \$5,000, and this includes a basic Kit of Parts. We typically spend >\$7,500 above the Kit of Parts for construction of the robot. Registration for a second regional costs \$4,000. Other costs include the hotel, transportation and food costs for attending the regional competitions, off-season competitions, and kits and supplies for our robotics camps.

## How You Can Help:

### Coaches and Mentors:

Coaches will guide students, listen to ideas and help the team execute their plan. This is a student-led team, but without our mentors we would not have the years of knowledge and experience to guide our students on the path to building the robot, marketing the team, gathering support from sponsors, and creating websites, videos, business plans, award submissions, and most of all making sure our students are safe in their surroundings.

You do not have to be mechanically skilled or have software or programming skills to be part of this amazing team. There is room for everyone. **Please volunteer to be a mentor. Since we are a 4-H team, all mentors must submit a 4-H application that includes a screening process. There is no charge for registering as a 4-H volunteer.**

### Primary Mentors for 2018-2019 Season

**Coach / Chief Mentor (Dr. Anand Chandrasekhar and Dr. Andy Winslow).** The Chief Mentor (CM) is appointed by, and reports to, the board of directors of the Columbia Educational Robotics Foundation (CERF). The CM recruits, appoints and manages the department Mentors and the student team leaders. The CM establishes a team vision and makes strategic decisions with input from the Department Mentors and the Student Leadership Council. The CM is present most of the time when the team is working during build season in order to oversee operations and attends most team meetings. The CM manages the team budget. The CM serves as the responsible contact for team constituents including the FIRST organization, CERF, the MU College of Engineering, parents, mentors, students, sponsors, the press and other members of the community. The CM is ultimately responsible for making sure students have adult supervision at all times and maintains the security and integrity of the building(s) where team operations take place.

**Hardware Design Mentor (Dr. Josiah Bryan).** The HDM supervises students to design the robot using Computer Aided Design (CAD) tools. The HDM oversees training of students with CAD tools, helps students become familiar with robot design principles (drive trains, control implements, etc.) and identifies sources to obtain parts for the robot. The HDM helps students identify sources and obtain sponsorships for CNC fabrication of parts. The HDM ensures that robot design is carried out in a time-sensitive manner during build season, which involves a large time commitment at the beginning of the season.

**Hardware Fabrication Mentor (Steve Grieshaber).** The HFM supervises students to carry out the fabrication, testing and maintenance of all mechanical aspects of the robot as well as the playing field game elements. The HFM runs the robotics shop, trains and supervises students and maintains an organized and safe work environment. The HFM recruits and supervises other shop

mentors. The HFM works with the HDM to develop prototypes during build season. The HFM is present most of the time during team work hours during build season in order to ensure continuity of the fabrication process and attends most team meetings. During the pre-season, the HFM participates in student training, practice builds and supervises the maintenance of past robots so that they are ready for use in outreach activities.

**Programming / Control Systems Mentor (Dr. Andy Winslow).** The Controls System Mentor (CSM) supervises students to carry out development of the robotic control system. This includes supervising development of all software used on the robot as well as the selection, fabrication and installation of hardware sensors, cameras, and other electronic components. The CSM oversees software training of students during the pre-season.

**Business / Logistics Mentor (David Sabath and Sue Thomas).** The Business / Logistics Mentor (BLM) supervises students to carry out non-technical aspects of team operations. The BLM recruits and supervises mentors (including parents) to oversee non-technical tasks. Administrative tasks include administrative logistics, managing the budget, and fundraising.

*Fundraising and budget (David Sabath).* Supervision of development of materials for soliciting donations and recruits and supervises students to carry out fundraising. Sponsorships are solicited from corporate, government, and non-profit organizations. Special fundraising events and sales are managed by the BLM. The team budget ledger and all purchasing are overseen by this group.

*Administrative Logistics (Sue Thomas).* Team-related logistics including collection of forms, student registration, team registration and collecting payments from team families (Jane Shook Floyd). This team oversees the logistics of team travel to competitions including making hotel reservations, assigning rooms, and arranging meals. The lead mentor attends competitions and serve as the point of contact for logistical issues and coordinates chaperoning of students. This team organizes the parents and other volunteers to provide meals for the team (parent lead needed).

*Marketing (TBD).* Team branding and spirit activities, including planning social events and parties, are overseen by this team. Development of promotional materials such as buttons and stickers. Social media, including maintaining the team website, are overseen by this team.

**Outreach (“Inspiration”) Mentor (Dr. Kevin Gillis).** The OM supervises students to plan and conduct outreach and recruiting events and oversees diversity and inclusion efforts. The OM serves as the contact person for organizations requesting robotics presentations and also actively seeks such activities to promote STEM careers, recruit students to the team, increase community awareness of team activities and obtain sponsorships. The OM leads the development of the team application and promotes diversity and inclusion in outreach and team membership. The OM leads students to learn robotics principles while planning, advertising and carrying out STEM camps. The OM, together with the CM, oversees team efforts to obtain awards and other recognition for the team at FRC competitions, including Dean’s list applications. The OM compiles information about

scholarships available for team students and encourages / facilitates students to apply for scholarship opportunities. The OM oversees human resources to make sure students are engaged during build season.

## **Information:**

If you have questions or need information you can email the Team Mentor. The team also has a Facebook page, and team website. Information is also available at the FIRST Robotics website.

[anandc@missouri.edu](mailto:anandc@missouri.edu) Dr. Anand Chandrasekhar, Chief Mentor

[aerophd2001@yahoo.com](mailto:aerophd2001@yahoo.com) Dr. Andy Winslow, Chief Mentor

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<http://www.armyants.us>

<http://www.firstinspires.org/robotics/frc>

## **Acknowledgement:**

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