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SOCIAL MEDIA
#RMC2018

CODE OF CONDUCT
The Robotic Mining Competition is a NASA event and held in a professional and positive environment. Competitors shall be courteous and conduct themselves with the integrity required by this event. Behavior inconsistent with this philosophy (e.g. profanity, safety violations, deception to circumvent rules/regulations) is unacceptable and shall be grounds for assessment of penalty points and/or disqualification from the Competition.

SCHEDULE
RMC Competition Week of May 14 - 18, 2018

<table>
<thead>
<tr>
<th>Monday</th>
<th>Thursday</th>
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<tbody>
<tr>
<td>7 a.m. - Team Check-In Opens</td>
<td>7 a.m. - RobotPits Open</td>
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<tr>
<td>7 a.m. - RobotPits Open</td>
<td>7 a.m. - Robot Check-In Opens</td>
</tr>
<tr>
<td>8 a.m. - Judge’s Meeting</td>
<td>7:30 a.m. - Judge’s Meeting</td>
</tr>
<tr>
<td>9 a.m. - Inspections Open</td>
<td>8 a.m. - Robot Check-In Closes</td>
</tr>
<tr>
<td>Noon - Team Check-In Closes</td>
<td>8 a.m. - Competition Runs Begin</td>
</tr>
<tr>
<td>Noon - Lunch</td>
<td>11 a.m. - College Recruitment Fair</td>
</tr>
<tr>
<td>1 p.m. - Practice Runs Resume</td>
<td>11:30 a.m. - Women in Stem Lunch</td>
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<tr>
<td>7 p.m. - RoboPits Close</td>
<td>Noon - Lunch</td>
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<table>
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<tr>
<th>Tuesday</th>
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<tr>
<td>7 a.m. - RobotPits Open</td>
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<td>7 a.m. - Robot Check-In Opens</td>
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<td>7:30 a.m. - Judge’s Meeting</td>
<td>7:30 a.m. - Judge’s Meeting</td>
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<td>8 a.m. - Robot Check-In Closes</td>
<td>8 a.m. - Robot Check-In Closes</td>
</tr>
<tr>
<td>8 a.m. - Practice Runs Begin</td>
<td>8 a.m. - Competition Runs Begin</td>
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<tr>
<td>11 a.m. - Opening Ceremony</td>
<td>Noon - Lunch</td>
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<tr>
<td>Noon - Lunch</td>
<td>1 p.m. - Competition Runs Resume</td>
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<tr>
<td>1 p.m. - Practice Runs Resume</td>
<td>7 p.m. - Competition Runs Resume</td>
</tr>
<tr>
<td>7 p.m. - RoboPits Close</td>
<td>4 p.m. - RoboPits Close</td>
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<table>
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<th>Wednesday</th>
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<tr>
<td>7 a.m. - RobotPits Open</td>
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<td>7:30 a.m. - Judge’s Meeting</td>
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<td>8 a.m. - Robot Check-In Closes</td>
<td>8 a.m. - Robot Check-In Closes</td>
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<tr>
<td>8 a.m. - Competition Runs Begin</td>
<td>8 a.m. - Competition Runs Begin</td>
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<tr>
<td>Noon - Lunch</td>
<td>Noon - Lunch</td>
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<tr>
<td>1 p.m. - Competition Runs Resume</td>
<td>1 p.m. - Competition Runs Resume</td>
</tr>
<tr>
<td>7 p.m. - RoboPits Close</td>
<td>4 p.m. - RoboPits Close</td>
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<th>Friday</th>
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<tr>
<td>7 a.m. - RobotPits Open</td>
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<td>7:30 a.m. - Judge’s Meeting</td>
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</tr>
<tr>
<td>8 a.m. - Robot Check-In Closes</td>
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</tr>
<tr>
<td>8 a.m. - Competition Runs Begin</td>
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</tr>
<tr>
<td>Noon - Lunch</td>
<td>Noon - Lunch</td>
</tr>
<tr>
<td>1 p.m. - Competition Runs Resume</td>
<td>1 p.m. - Competition Runs Resume</td>
</tr>
<tr>
<td>4 p.m. - RoboPits Close</td>
<td>5:45 p.m. - Bus loading for Award Ceremony</td>
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</table>
INTRODUCTION
Recent discoveries by NASA missions to Mars such as the Mars Science Laboratory (MSL) rover named “Curiosity” and instruments on orbiting satellites have found large amounts of water in the form of water ice at the higher latitudes and also hydrated minerals globally on Mars. They are the result of ancient clays and clay-like minerals called phyllosilicates, or other polyhydrated sulfates that formed millions of years ago in wet environments on the surface or underground. Capturing this water is the key to allow humans to “live off the land” or in scientific terms “In-Situ Resource Utilization (ISRU)”. The water can be used for human consumption, hygiene, grow plants, provide radiation shielding and to make rocket propellant for the journey home. The minerals and soil are typically in the form of crushed and weathered rock called “regolith”, which must be removed to get to the water ice below.

This competition is for university-level students to design and build a mining robot that can traverse the challenging simulated chaotic off-world terrain. The mining robot must then excavate the ice simulant (gravel) and return the excavated mass for deposit into the collector bin to simulate an off-world, in situ resource mining mission. The complexities of the challenge include the abrasive characteristics of the regolith simulant, the weight and size limitations of the mining robot and the ability to tele-operate it from a remote Mission Control Center. The on-site mining category will require teams to consider a number of design and operation factors such as dust tolerance and dust projection, communications, vehicle mass, energy/power requirements and autonomy. In addition to the on-site mining category, teams must also submit a systems engineering paper that explains their design approach. The teams also get extra points for giving a presentation about their design philosophy and the robot to judges while at the Kennedy Space Center. Points from both the mandatory and optional categories are used to determine the winner of the grand prize, the Joe Kosmo Award for Excellence.

NASA directly benefits from the competition by encouraging the development of innovative robotic excavation concepts. These concepts may result in unique solutions which may be applied to an actual excavation device and/or payload on an ISRU mission. The unique physical properties of basaltic regolith, reduced 3/8th of Earth gravity and other factors make off-world excavation a difficult technical challenge. Advances in off-world mining have the potential to significantly contribute to our nation’s space vision and NASA space exploration operations.

MESSAGE FROM THE PROJECT MANAGER
Long-duration habitation, surface systems and human life support systems will evolve through NASA's capability-driven approach to exploration, but even the most sophisticated designs must include ISRU components when possible. These research and technology development areas will focus on technologies necessary to extract consumables (O₂, H₂O, N₂, He, etc.) for human life-support system replenishment. The technologies can be used to mine source materials for in-situ fabrication, repair technologies, and
source materials (composites, etc.) such as radiation shielding for shelters. Mission capabilities and return on investment multiply when human consumables and spacecraft propellant can be harvested from extraterrestrial environments.

As we embark on deep-space missions with months or longer travel times, ISRU becomes increasingly important because resupply missions are expensive and exclusively relying on them may put crews at risk.

Each year university-level teams design and build robots to dig in the simulated basaltic regolith at the Kennedy Space Center to find alternative practices of harnessing resources from off-world exploration sites. Since its inception RMC has hosted over 340 different robots and 3,500 students from across the country including Alaska, Hawaii and the Commonwealth of Puerto Rico.

The Robotic Mining Competition Three Lines of Business Focus

- **Technology - Technology Drives Exploration.** We develop, test and fly transformative capabilities and cutting edge exploration technologies. Our technology development provides the onramp for new ideas, maturing them from early stage through flight and giving wings to the innovation economy. #NASA Tech

- **Mars - We are on a journey to Mars.** Today our robotic scientific explorers are blazing the trail. Together, humans and robotics will pioneer the next giant leap in exploration. #JourneyToMars

- **Solar System and Beyond NASA - We’re Out There.** NASA’s exploration spans the universe. Observing the sun and its effects on Earth. Delving deep into our solar system. Looking beyond to worlds around other stars. Probing the mysterious structures and origins of our universe. Everywhere imaginable, NASA is out there. #NASA Beyond

The Robotic Mining Competition Accreditation Board for Engineering and Technology (ABET) Focus

The Accreditation Board for Engineering and Technology is the global standard for programs in applied science, computing, engineering, and engineering technology (http://www.abet.org). The Competition rules and rubrics meets the requirements for engineering, and engineering technology accreditation.

NASA’s resources and personnel provide a unique experience available nowhere else giving students the opportunity to create off-world technologies from this on-world competition.

**IMPACT**

Caterpillar reported over 80 online internship applications in the first week after the end of RMC 2017. Over 5,000 KSCVC guests and K-12 students from the central Florida area stopped to view the Competition and tour the RoboPits. NASA’s Distance Learning Network (DLN) at [http://www.ustream.tv/channel/nasa](http://www.ustream.tv/channel/nasa)
dlinfo logged in over 15,000 connections during Competition week with viewers from 49 states (where are you Wyoming?), Washington DC, the Commonwealth of Puerto Rico, the US Virgin Islands, US Armed Forces Europe, and 55 countries around the world.

NEW FOR RMC 2018
- Mining BP-1 (regolith) is worth zero (0) points; the Competition challenge is to mine the precious gravel (icy regolith). During each competition attempt, the team will earn 15 Mining points for each kilogram in excess of 1.0 kg of gravel (icy regolith) deposited in the Collector Bin.
- To emphasize the importance of Systems Engineering, a new award, the Systems Engineering Leaps & Bounds Award is established. Awarded to the team that made a significant improvement over the previous years (or consistently sustained improvement) in their application of systems engineering to the development of their robot as demonstrated by their systems engineering paper (teams placing in the top 3 are not eligible for this award, not necessarily awarded every year).

COMPETITION EVENTS
Systems Engineering Paper – (MANDATORY) papers should discuss the Systems Engineering methods used to design and build the mining robot. The purpose of the systems engineering paper is to encourage the teams to use the systems engineering process while designing, building and testing their robots.

Outreach Project Report – (MANDATORY) requires team to report the type of STEM outreach in their communities, activities provided, numbers reached and are encouraged to reach out to the underserved / underrepresented K-12 students.

Slide Presentation & Demonstration – (OPTIONAL) provides the teams with the opportunity to present the spirit, intent and the technical outcome of their design project. This is another opportunity for the students to develop their presenting and public speaking skills. These skills will serve them in thesis defense and / or doctoral dissertations, grant requests, job interviews, etc.

On-Site Mining – (MANDATORY) requires the teams to design and build a mining robot that can traverse the simulated Martian chaotic terrain. The robot must then excavate the icy regolith simulant (gravel) and return the excavated mass for deposit into the Collector Bin to simulate an off-world mining mission. The teams will have two, 10-minute competition runs to mine the icy regolith. The abrasive characteristics of the basaltic regolith simulant, the weight and size limitations of the mining robot and the ability to tele-operate it from a remote Mission Control Center are some of the additional factors in the competition.

AWARDS
The Judge’s Innovation Award
Awarded to the team that demonstrates the most innovative design.

NASA’s Solar System Exploration Research Virtual Institute (SSERVI) Regolith Mechanics Award
Awarded to the team with the best example of a real granular innovation that identified a specific regolith mechanics problem (like the way the regolith flows around the grousers, or angle of repose too high in their dump bucket, etc.) and intentionally improved their design to deal with it. Courtesy SSERVI’s Center for Lunar and Asteroid Surface Science (CLASS).

The Caterpillar Autonomy Award
Awarded to the teams with the first, second and third most autonomous points averaged from both mining attempts. In the event of a tie, the team that deposits the most, icy regolith will win. If no icy regolith is deposited, the Mining Judges will choose the winner.

The Efficient Use of Communications Power Award
Awarded to the team for using the lowest average data utilization bandwidth per icy regolith points earned the official runs. Teams MUST collect the minimum amount of icy regolith to qualify for this award.
**Systems Engineering Leaps & Bounds Award**
Awarded to the team that made a significant improvement over the previous years (or consistently sustained improvement) in their application of systems engineering to the development of their robot as demonstrated by their systems engineering paper (teams placing in the top 3 are not eligible for this award, not necessarily awarded every year).

**Systems Engineering Paper Award**
Awarded to the team that best discusses the systems engineering methods used to design and build their mining robot. The papers are evaluated by engineers from across the NASA community.

**Outreach Project Report**
Awarded to the teams with the best educational outreach project in their local community to engage students in STEM (Science, Technology, Engineering and Math). Outreach activities should capitalize on the excitement of NASA’s discoveries to spark student (K-12) interest and involvement in STEM.

**Slide Presentation and Demonstration**
Awarded to the team that best presents their design at the competition in front of an audience including NASA and private industry judges.

**Robotic On-Site Mining**
Awarded to the team that receives the highest average score, passes robot and communication inspections, mines more than 1 kg of icy regolith simulant (gravel), and receives the most points for efficient use in bandwidth and camera usage, minimized robot mass, minimized energy consumed, dust tolerant design, better dust free operations, performs tele-robotic and/or autonomously and mines the most resources.

**THE JOE KOSMO AWARD FOR EXCELLENCE**
Awarded to the team that scores the most points in all competition events.

Joseph Kosmo graduated from Pennsylvania State University in 1961 with a bachelor of science in aeronautical engineering and began his career with the NASA Space Task Group in the Crew Systems Division, working on the Mercury Program spacesuit. During the past 45 years, he has participated in the design, development, and testing of Mercury, Gemini, Apollo, Skylab, and Space Shuttle spacesuits, as well as numerous advanced technology configuration spacesuits and EVA gloves for future mission applications. Kosmo received the American Astronautical Society’s Victor A. Prather Award, the NASA Exceptional Service Medal, and the Astronaut Silver Snoopy Award. He has pursued the development of advanced spacesuits, gloves, and ancillary EVA-supporting hardware concepts for future planetary surface exploration. In 2011, he retired from NASA after a 50-year career in the space industry. This award honors his service and contributions to America’s space program.

<table>
<thead>
<tr>
<th>Category</th>
<th>Award</th>
<th>Points</th>
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<tbody>
<tr>
<td>The Judges’ Innovation Award</td>
<td>Trophy</td>
<td>NA</td>
</tr>
<tr>
<td>The SSERVI Regolith Mechanics Award</td>
<td>Trophy</td>
<td>NA</td>
</tr>
<tr>
<td>Caterpillar Autonomy Award</td>
<td>1st Place - $1,500</td>
<td>NA</td>
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<tr>
<td></td>
<td>2nd Place - $750</td>
<td>NA</td>
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<td></td>
<td>3rd Place - $250</td>
<td>NA</td>
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<tr>
<td>Efficient Use of Communications Power Award</td>
<td>Trophy</td>
<td>NA</td>
</tr>
<tr>
<td>Systems Engineering Leaps &amp; Bounds Award</td>
<td>$250</td>
<td>NA</td>
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<tr>
<td>Systems Engineering Paper (mandatory)</td>
<td>1st Place - $1,000</td>
<td>Up to 25</td>
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<td></td>
<td>2nd Place - $750</td>
<td>NA</td>
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<td></td>
<td>3rd Place - $500</td>
<td>NA</td>
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</tbody>
</table>
### Outreach Project Report (mandatory) | $500 | Up to 20
---|---|---
### Slide Presentation and Demonstration (optional) | $500 | Up to 20
### Robotic On-Site Mining (mandatory) | 1st Place $3,000 | 25
| 2nd Place $2,000 | 20
| 3rd Place $1,000 | 15
| Teams not placing receive one point per kilogram of icy regolith simulant (gravel) mined and deposited up to 10 points | Up to 10
### Professional Conduct / Sportsmanship | Determined by the Mining Arena Chief/RoboPit Chief | Up to 10
### Joe Kosmo Award for Excellence (Grand Prize) | Trophy and $5,000 team scholarship | 

**ELIGIBILITY - WHO CAN COMPETE AT RMC**

Teams that are from post high school vocational/technical schools, colleges and or universities located in the United States, its Commonweath and territories and / or possessions are eligible to register for the competition (no more than one team per university campus is allowed). A team shall stand alone, and consist of:

- Current faculty/staff members registered with the college or university.
- A minimum of two undergraduate students; and graduate students. Students must be enrolled during the current or previous school semester and are in good standing with their school, with submitted transcripts.
- Due to the changing nature of security concerns, all faculty/staff and students shall be cleared by security prior to the competition. If you are not cleared by security you cannot be a part of the Competition here at the Center.
- The number of team members is at the discretion of the school but should have a sufficient number of members to successfully design, build and operate their mining robot.
- Participants can be members of only one team.
- Each team must have its own working robot.
- Each team will have 10 seats for the Award Ceremony, only registered students and registered faculty are eligible to attend.

**TEAM REGISTRATION**

Registration is limited to the first 50 teams and opens at 12 Noon, Eastern Time on Wednesday August 9, 2017 at: [https://www.spacegrant.org/forms/?form=nasarmc](https://www.spacegrant.org/forms/?form=nasarmc)

All other teams will be placed on a wait list.

**GENERAL INFORMATION**

**Emergency/Security Procedures** – Use the Buddy System.

- **If you see something suspicious, say something immediately** to the RoboPit Chief, Arena Chief, Staff or Staff Coordinator.
If you see someone in distress or injured, have someone stay with the distressed party and then report it immediately to the RoboPit Chief, Arena Chief, Staff or Staff Coordinator.

GO WITH YOUR GUT FEELING
Call NASA KSC Emergency 321.867.7911

Have volunteers meet and guide the First Responders to where the distressed/injured party is located.

Comply with directions given to you by First Responders, KSC Visitor Complex Staff and RMC Staff.

Emergency Eyewash Stations - are located in the RoboPits, Bot Shop and both the PPE side and HEPA-Vac side of the Competition Arenas.

Hand Wash Stations & Water Dispensers - Hand wash stations and water dispensers are located in the RoboPits, Bot Shop and the HEPA-Vac side of the Competition Arenas.

Personal Protection in the RoboPits
Remember to use good engineering practices and principles, use eye protection and hearing protection as needed, wear gloves and de-energize robots and equipment as needed. Use the right tool for the right job, bring jack-stands to support your robot (folding chairs are unacceptable), etc. Know where the fire exits, fire extinguishers and eyewash stations are located. Each team is responsible for bringing a First-Aid kit. Report any safety concerns to the RoboPit Crew Chief.

Personal Protection in the Florida Weather
Florida is the Lightning Capital of the U.S. the lightning phase conditions are as follows:

- Phase I Condition - prepare to close down all tents/sunshades and seek shelter.
- Phase II Condition - close down and seek shelter in any building. Arena tents are not to be used as lightning shelters.
You and your off-world mining robots will be exposed to the Florida weather so be prepared for heat, humidity, wind and rain. You are responsible for protecting your robot from the elements so remember to bring a rain cover/tarp and tie downs/bungees for your robot to keep it covered and dry while it is outside. Plan for weather when transitioning between the RoboPits (inside temperature approximately 24°C) and the Caterpillar Competition Arenas (outside temperature averaging 32°C & 95% humidity).

Remember to have hats, sunglasses, insect repellent, sunscreen (SPF 50 or better) and a raincoat / poncho on hand for the Competition. REMEMBER TO STAY HYDRATED - DRINK PLENTY OF WATER.

**Personal Protection in the Competition Arenas**

- **Respiratory** – The Black Point-1 (BP-1) Lunar / Martian Basaltic Regolith Simulant used in the competition contains a small percentage of crystalline silica, which is a respiratory hazard. All participants must use respiratory protection when required to prevent dust inhalation. Respiratory protection must be used in accordance with the manufacturer’s operating instructions. Without exception, use of N-95 masks and/or tight fitting negative pressure respirators will require a clean, shaven face, no facial hair shall be in contact with any part of the mask/respirator in order to maintain the seal.

- **Skin & Eye** - The Black Point-1 (BP-1) Lunar / Martian Basaltic Regolith Simulant used in the competition is crushed lava basalt aggregate with a natural particle size distribution similar to that of lunar soil. BP-1 is alkaline and may cause skin and eye irritation. All personnel should avoid contact with BP-1 and use appropriate skin and eye protection when performing tasks (such as handling dusty robots) where they may be exposed to BP-1.

**Unmanned Aerial Vehicles (UAV), Unmanned Aerial Systems (UAS)** – The use of Unmanned Aircraft Systems (Drones) are prohibited at the Kennedy Space Center Visitor Complex under all circumstances. If any member of the team is caught on KSCVC property with these types of items, the item will be confiscated and the team member shall be removed from the KSCVC. The UAV / UAS will not be returned.

**Disputes** – Disputes shall be forwarded to the Robotic Mining Competition Project Manager for resolution. The decision of the Project Manager is final.

**Frequently Asked Questions (FAQ)** - The frequently asked questions (FAQ) document is updated regularly and is considered part of this document. It is the responsibility of the teams to read, understand, and abide by all of the Rules and Rubrics and FAQs, communicate with NASA’s representatives and complete all surveys, remember, tomorrow is too late to ask questions, submit inquiries to: KSC-Robotic-Mining-Competition@mail.nasa.gov

**Updates**

These rules and rubrics are subject to updates please check NASA’s Robotic Mining Competition website at [http://www.nasa.gov/offices/education/centers/kennedy/technology/nasarmc.html](http://www.nasa.gov/offices/education/centers/kennedy/technology/nasarmc.html)

**DATES & DEADLINES**

All items are due by 12:00 noon Eastern Time on the dates listed below. Do not wait until the last day to submit your items. Failure to submit required items by the due date will lead to disqualification.

<table>
<thead>
<tr>
<th>REQUIRED</th>
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<tbody>
<tr>
<td>Registration Opens (limited to one team per university campus)</td>
<td>August 9, 2017</td>
</tr>
<tr>
<td>Systems Engineering Paper</td>
<td>April 10, 2018</td>
</tr>
<tr>
<td>Outreach Project Report</td>
<td>April 10, 2018</td>
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</table>
OPTIONAL
Slide Presentation and Demonstration April 27, 2018

REQUIRED DOCUMENTATION
Letter of from University’s Faculty Advisor With Application
Letter of from University’s Dean of Engineering November 14, 2017
Faculty Participation Form November 14, 2017
Signed Media Release Form November 14, 2017
Student Participant Form November 14, 2017
Team Roster November 14, 2017
Transcripts (unofficial copy is acceptable) November 14, 2017
- must be from the university with name of school
- show name of student, coursework taken, grades
- current student status within the 2017-2018 academic year
Student Resume (Optional) November 14, 2017
Team Biography (200 words maximum) January 17, 2018
Team Photo with Faculty January 17, 2018
 Corrections to NASA Generated Team Roster February 15, 2018
Head Count Form February 15, 2018
Final Team Roster (no changes after this date) March 1, 2018
Shipping Bill of Lading/Commercial Invoice May 1, 2018
Robot Details/Proof of Life May 1, 2018

THE COMPETITION
Team Check-In, 7 a.m. – 12 Noon Eastern Time May 14, 2018
Slide Presentation and Demonstration Days May 15-17, 2018
Practice Days May 14-15, 2018
Opening Ceremony May 15, 2018
Competition Days May 16-18, 2018
Awards Ceremony Friday Evening May 18, 2018

SHIPPING YOUR ROBOTS
Use a reputable shipping company, your shipping company is responsible for providing a forklift, pallet jack, lift gate and the personnel required to load and unload your crate on and off of their shipping vehicle. You are responsible for the cost of shipping, tracking, crating and uncrating your robot for the competition and the voyage home. Submit via email both of your Shipping Bills of Lading (to the competition and return to home school) by May 1, 2018.

To the Competition:

SHIP TO:

NASA John F. Kennedy Space Center
ISC Central Receiving - Bldg. M6-0744
Kennedy Space Center, FL 32899
Mark For: Robotic Mining Competition at the Kennedy Space Center Visitor Complex

- Do not have the shipping company deliver the mining robot directly to the Kennedy Space Center Visitor Complex. The shipping company will go to the NASA KSC Pass &
ID Office on the south side of State Road 405 (call 321.749.0320 three (3) hours prior to your arrival and call again on arrival) and ISC Central Receiving will send an escort to the shipper

- Monday May 7, 2018 through Thursday May 10, 2018 (8 a.m. - 2 p.m.). Shipping containers will be accepted for delivery, coordinate with your shipping company to ensure deliveries are made within this time period.
- Friday May 11, 2018, ISC will transport the robot crates to the tent located at KSCVC Lot 4 across from Guardhouse Post 6.
- Monday May 14, 2018 (7 a.m.), Delaware North will transport the crates from the tent located at KSCVC Lot 4 across from Guardhouse Post 6 and place them on the sidewalk in front of the AMF’s Center for Space Education, Building M6-306.

**The Voyage Home:**

Friday May 18, 2018. Place your sealed robot crate on the sidewalk on the south side of the Center for Space Education (CSE) building (see the RoboPit Chief). Your crate may be exposed to Florida Spring weather (rain) while it is outside of the CSE and before it is picked up for shipment.

**PICK UP FROM:**

Kennedy Space Center Visitor Complex  
Delaware North Companies (DNC)  
Robotic Mining Shipping Area - Mail Code: DNPS  
State Road 405  
Kennedy Space Center, FL 32899

Give this information to your shipping company –

- Drivers will go directly to the Kennedy Space Center Visitor Complex retail warehouse (behind the DNC Administration Building) through Guard Post 4; from there, the DNC warehouse team will take the driver to the appropriate site where the robot crates are being stored for pick up. The on-site P.O.C. is Charlie Lamattina 321.449.4252, clamatti@dncinc.com
- You are responsible for attaching the Shipping Bill of Lading/Commercial Invoice on the shipping crate. Please have the “Ship To” information clearly labeled on the crate and have the shipping company name clearly labeled on the crate.
- **Saturday May 19, 2018 (7 a.m.):** Delaware North will transport the crates from the sidewalk in front of the AMF’s Center for Space Education, Building M6-306 and transport them to Kennedy Space Center Visitor Complex retail warehouse (behind the DNC Administration Building) through Guard Post 4 driver to the appropriate site where the robot crates are being stored for pick up.
- **Tuesday May 22, 2018 (5 p.m.):** All crates picked up and shipped.
- **Wednesday May 23, 2018:** Remaining crates will be discarded.

**Robot Details / Proof of Life**

Teams must submit the following by May 1, 2018:

- photo of your robot (photos shall be a minimum 1024 x 768 pixels in a JPEG format)
- a description of your robot, robot’s operation and potential safety hazards
- diagram of the robot and a basic parts list
- a link to your YouTube video documenting proof of life (this “proof of life” documentation is solely for technical evaluation of the mining robot) between 30 seconds and 5 minutes
of their mining robot in operation for at least one full cycle of operations (one full cycle includes excavation and depositing the material). Please begin the title of your presentation with #RMC2018POL ---- and add your unique name to it:

ex: #RMC2018POLMarsScoop

COMPETITION WEEK

Check-In Monday

Check-in begins Monday morning at 7:00 a.m. and will close at 12 noon Eastern Time. Show your parking pass to the attendant and proceed to the RMC Check-In Tent located in Parking Lot 4 of the Kennedy Space Center Visitor Complex (KSCVC) and park your vehicle.

All vehicles, robots and support equipment shall be cleared by security before being allowed into the Complex.

The RoboPits are located in the Astronauts Memorial Foundation’s (AMF) Center for Space Exploration Building (CSE) (M6-306). You will be provided a temporary pass that will allow one vehicle to proceed through the gate. You will then proceed to the CSE where you will drop off your robot and equipment to awaiting team members who have already entered through the Complex’s main entrance.
Teams will then return to Parking Lot 4, return the temporary placard to the RMC check-in tent and then enter through KSCVC main entrance. Proceed to the RoboPits and check-In with the RoboPit Chief.

The RoboPits
The RoboPits are located in the CSE adjacent to the west end of the KSCVC. The RoboPits are air-conditioned and equipped with restrooms, emergency eyewash stations, and hand wash station and disposal containers for used aerosol cans, batteries, degreasers and wipes used as cleaners. This is where you will be working on your ‘bots, meeting other competitors and after spending months “Designing It” and “Building It”, this is where you will get your ‘Bot inspected before it set off to “Dig It”.

Check-In, Robots and Equipment
Teams can take their robots from the RoboPits and out of the Complex, once your robots are checked-out, there is no re-entry for the day. To bring your robot back to the Competition, follow the Check-In, Robots and Equipment Tuesday - Friday, below.

Check-In, Robots and Equipment Tuesday - Friday
Check-in begins each morning at 7am and will close at 9am, without exception. Follow the directions to park your vehicle, all vehicles containing robots and support equipment must be cleared by security. After you are cleared by security, you will be provided a temporary placard that will allow one vehicle to proceed through the gate to drop off your robot and support equipment in front of the Center for Education. You will then take your vehicle out to Parking Lot 4, return the temporary placard to the RMC check-in tent and enter through the Kennedy Space Center Visitor Complex (KSCVC) main entrance.

Practice Runs for Monday and Tuesday
Each team will get at least one practice run and the opportunity to work out issues prior to the start of competition. You must complete your robot inspection, communications check and be cleared by the RoboPit Chief before you can sign up for your practice run. Practice runs are on a first come – first serve basis. Teams are encouraged to have their Mining Robots arrive in as complete of condition to possible to take advantage of the practice runs.

Opening Ceremony Tuesday
Tuesday morning from 11 am to noon under the sunshade in front of the Caterpillar Competition Arenas.
College Recruitment Fair Thursday
Thursday from 11 am to 3 pm Contact SECOR LLC (Paul@secorstrategies.com) if your school wants to participate in this event designed for high school seniors.

Award Ceremony
The Award Ceremony will be held at the Apollo-Saturn V Complex. Buses start loading Friday evening at 5:45 pm in front of the Center for Space Education Building. Each team is allocated 10 slots for the Ceremony. Only registered students and registered faculty are eligible to attend.

RoboPit Check-in Protocol
Check in with RoboPit Chief. A volunteer will escort the team with the robot to the team pit. The team leader and another representative will remain behind to ensure that the following information has been communicated to and understood by the team:

- The RoboPits Chief will require two contact phone numbers, in case the team needs to be reached at any point during the competition and cannot be found. These numbers will not be shared with anyone and will be disposed of at the end of the competition.
- The new layout for the Pits and the overall competition will be described
- Comm and mechanical inspection locations
- Travel path from RoboPits to Arena
- RoboPits Chief will give team leader the Communications (Comm)/Inspection card. The C/P card is used to ensure that all teams have had their ‘bot checked out prior to entering the Arena.
- Either inspection can be performed first, and will not be scheduled, it’s first-come, first-served.
- Return the card when you have passed both inspection and Comm check, and when you are ready for a practice run.
- The RoboPits Chief will schedule you for the next available practice slot
- Check with the RoboPits Chief before heading to the arena for your practice run, in case of a schedule change
- Let the RoboPits Chief know if you are headed to the sandbox and will go from there to the arena

RoboPits
- If you plan to take your ‘bot out with you any evening, check out with the RoboPits Chief.
- You will need a placard to get through the gate.
- Check-in the following morning will be 7am – 9pm, no exceptions.
- Vacuums are provided for the BP-1, they are for use by all teams as needed
- When you are done using it, please return it to the designated area near the RoboPits Chief
- If you discover a full vacuum, please alert the RoboPits Chief
- NASA provided carts are for the use of all teams.
- Priority goes to those teams headed to the Arena for competition, and for teams going to presentations
- Carts are NOT for use in your pit. Carts are not to be used as platforms for working on the ‘bots.
- All pits have power strips provided. DO NOT DAISY-CHAIN POWER STRIPS.

Competition Runs for Wednesday - Friday
- The competition schedule will be sent out Tuesday afternoon to the team contact information provided. On competition days teams will be brought to Inspection 45 minutes before the scheduled competition start time.
- A volunteer will come to your pit to retrieve you, do not leave without the volunteer.
- If you are not in your pit at that time you run the risk of forfeiting your competition run.
- Following the inspection, the volunteer will escort the team to the Arena, where Arena volunteers will take over.
- Presentations and Demonstrations:
  - A volunteer will come to your pit to retrieve you approximately 10 minutes prior to your scheduled presentation time, do not leave without the volunteer.
Clean-up and Check-out:
- Each night your pit is expected to be neat, with nothing outside of the pit boundaries.
- Try to keep your pit and the surrounding area neat and generally clean, use the provided vacuums as necessary.
- Each team is expected to leave their pit as they found it. When you are ready to leave, go to the RoboPit Chief to ask for a volunteer to come inspect your pit.
- Check with the RoboPit Chief no earlier than Wednesday afternoon regarding shipping if you are shipping your ‘bot home.
- There will be a designated area for those ‘bots, do not assume it can be left in your pit.
- Teams are required to clean their pit and the area around it and meet with the RoboPit Chief to checked-out at the end of the competition. This process must be completed in order to attend the Award Ceremony Friday evening.

Waste Accumulation Containers
Teams will comply with Federal and Kennedy Space Center hazardous and controlled waste program requirements. Regulations requires that you coordinate with the RoboPit Chief before disposing of the items listed below (specially marked containers will be provided):

- Batteries – Alkaline, Lithium, Ni-Cd. Oily wipes; IPA/solvent wipes; Solder waste; Acetone wipes. PVC cement - brushes, wipes, cans; PVC primer - brushes, wipes, cans; PVC cement - brushes, wipes, cans. Super glue; Epoxy tubes. Aerosol cans, Spray paint, Spray foam, Spray adhesives. WD40; PB Blaster; Silicone Spray. Oil cans; 3 in 1 oil.

We need your help in following regulations and keeping the Merritt Island National Wildlife Refuge the pristine gateway site to the Florida Birding Trail for The Next Generation.

Test Bed (Sand Box)
The Sand Box is located in the south of the IMAX Theater under NASA Central. Teams can test their robots in a silica sand environment and interact with the Visitor Complex guests. While you are at this competition you not only represent yourself and your school, you also represent NASA. Remember when things on your robot go south (and they will), there are little ears and plenty of cell phones around you and your team.
Reminder
You are responsible for checking in with the RoboPit Chief for the process and to find out when your team is scheduled to have your robot inspected for volumetric and communications compliance and when you are scheduled to present and demonstrate your team concept and robot. The RoboPit Chief is your only point of contact to coordinate practice and competition runs, when things get hectic, be professional.

The Bot Shop
The Bot Shop is supported by David, Jim, James and Otis – from KSC’s Prototype Development Laboratory (PDL). The PDL is a team of NASA engineers and engineering technicians whose primary purpose is the design, fabrication and testing of prototypes, test articles and test support equipment. The PDL supports research and technology development laboratories at KSC as well as all of the major engineering programs and projects in development at KSC. You have the privilege of using this resource to make repairs and or modifications to your robots.

Viewing the Competition
The Kennedy Space Center Visitor Complex opens at 9 am. If you have family or friends that want to see your robot run and your run time starts before the park opens at 9 am, you need to notify the Competition Staff to make arrangements the day before the run. Your family or friends must have a valid KSCVC Admission Ticket for that day. No one will be admitted without a valid KSCVC Admission Ticket.

Competition Schedule
You must complete your robot inspection, communications check and be cleared by the RoboPit Chief before you can sign up for your competition run. The schedule below is for planning purposes and will be change to meet competition requirements. The Competition Schedule will be emailed to the teams the day before each run is scheduled.
## Competition Schedule (subject to change)

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### 12 noon - 1 p.m. Lunch

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Contingency

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**END OF PART I**