Workforce Structures

Robotics (VEX)

<table>
<tr><td colspan="8">Lead Engineer</td></tr>
<tr><td colspan="2">Lead Competition Engineer</td><td colspan="2">Lead Software Engineer</td><td colspan="2">Lead Design Engineer</td><td colspan="2">Lead Build Engineer</td></tr>
<tr><td>Team A - Competition Engineer</td><td>Team X - Competition Engineer</td><td>Team A - Software Engineer</td><td>Team X - Software Engineer</td><td>Team A - Design Engineer</td><td>Team X - Design Engineer</td><td>Team A - Build Engineer</td><td>Team X - Build Engineer</td></tr>
<tr><td colspan="2">Competition Team</td><td colspan="2">Software Team</td><td colspan="2">CAD Team Lead</td><td colspan="2">Build Team</td></tr>
<tr><td colspan="2">Research Engineer
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Research Engineer</td><td colspan="2">Software Engineer
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Software Engineer</td><td colspan="2" rowspan="3">CAD Engineer
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CAD Engineer</td><td colspan="2" rowspan="3">Build Engineer
Build Engineer
Build Engineer
Build Engineer</td></tr>
<tr><td colspan="4">Drive Team</td></tr>
<tr><td colspan="4">Driver Team 1 (Based on Practice Scores)
Driver Team 2
Driver Team 3
Driver Team 4
Driver Team 5
Driver Team 6</td></tr>
</table>

Bold = Positions Applied for and assigned by Mentor and Lead Engineer
Italics = Available Positions for higher following training
Underlined = Any Robotics Club or Class Member can elect to tryout

Zero Robotics

First Robotics Program Team 8012:

Lead Engineer			
Lead Competition Engineer	**Lead Build Engineer**		**Lead Software Engineer**
CAD Manager	Design Team	Supply Chain	Software Team
Outreach	Build Team Field	Build Team Robot	
Travel Specialist	Scout Team	Data Collection and Analysis	

SkillsUSA Competition:

Robotics Club

Structure Diagram:

Club President (Elected)		
Club Vice President (Elected) Project Leads (Assigned)		
Club Treasure (Elected)	**Club Secretary (Elected)**	**Club Outreach (Elected)**
All Build Leads from each robotics program and Lead Engineers (assigned)	Documentation, Video and Digital Records (Cabinet Member)	Fundraising (Cabinet Member)

Constitution 2019-2020

This document states the duties and guidelines of the Red Mountain APEX Robotics Club. Articles I – IX will be held true every year the club is active and will be debated and changed as deemed necessary.

ARTICLE I – Name

The club will be referred to as Red Mountain High School APEX Robotics Club.

ARTICLE II – Membership

All students students and faculty of Red Mountain High School \ are encouraged to participate in the actions of the Red Mountain APEX Robotics Club and membership is free to any persons who are interested.

ARTICLE III – Statement of Purpose

The purpose of the Red Mountain APEX Robotics Club is to exploit the capabilities of the Engineering Facility of the Engineering Department at Red Mountain High School. The club and its participating members will construct automated machines that can further demonstrate the

effectiveness of Red Mountain Engineering Engineering Department. The club will enter these "robots" in **VEX Robotics Education and Competition (REC/EDR), First Robotics Competitions (FRC) and Zero Robotics** or will hold competitions at Red Mountain High School for other surrounding schools to compete in. This will benefit Red Mountain Engineering Department in showing the capabilities of its Robotics and Engineering Facility.

ARTICLE IV – Officers and Duties

1. **Club President - Elected by constitutional rules:**
    a. It is the President's duty to:
        i. Attend and begin all meetings.
        ii. Provide the members with consistent hours or alternative methods to work on all existing Robotic Projects.
        iii. Approve or disapprove of any supply requests that the Treasurer presents to the President.
        iv. To organize events in the convenience of all club members.
        v. To speak and make decisions in the best interest of Red Mountain Engineering and Robotics and the members of its Robotics Club.
        vi. Relate all projects within the Robotics Club/Robotics class with the Engineering Department of Red Mountain High School.
        vii. Member of the fundraising committee as final approving member.
        viii. Final sign off on all cabinet members position and the hiring of all Lead Engineers for Robotic Projects
        ix. Be responsible for any duties other officers do not uphold.
        x. Help in construction of year Robotics Calendar / Gantt Chart

2. **Vice President - Elected by constitutional rules:**
    a. It is the Vice President's duty to:
        i. Be an active part of the duties the President holds.
        ii. Be a representative of the members and while influencing the President in his/her decisions.
        iii. Assume command in the absence of the President.
        iv. Represent the Robotics Club for any affairs involved with Student Government.
        v. Attend student government meetings when deemed necessary.

3. **Treasurer:**
    a. It is the Treasurer's duties to:
        i. Keep all accounts of any funds the Robotics Club receives including funds received from outside sources or from Student Government.
        ii. Be present when a request is made to receive funds from Student Government.

iii. Record the financial budget of the Robotics Club and all Robotics Projects and will give a financial report when deemed necessary.
iv. Voice his/her opinion when purchases for the Robotics Club are considered.
v. Consider requests taken from the Project Leader and relay the request back to the President.
vi. After the President approves a request for supplies on an existing project, take the request to the Robotics Club's advisor to be completed.
vii. Complete and correctly record all documentation associated with the purchasing process in accordance with Red Mountain High School Student Council Fund requests.
viii. Keep all financial records and copies of documentation organized in paper and digital form.

4. **Secretary:**
    a. It is the Secretary's duties to:
        i. Be present at every meeting.
        ii. Keep records of all minutes of the Red Mountain APEX Robotics Club, including topics discussed at meetings and things accomplished during work hours.
        iii. Maintain Club Calendar (working with outreach)
        iv. Be present when meetings are held with Student Government and will record what is accomplished at the meetings.
        v. Work with Red Mountain STEM Programs for any cross pathway events and or act as representing member at STEM level meetings.
        vi. Ensure the constitution of the Robotics Club is followed by all members and the ideas held in this document are held true.
        vii. For spell checking any documents produced for the Robotics Club, including any changes made to this constitution.
        viii. Log all outreach hours for community service records

5. **Outreach**:
    a. a. It is the Outreach duties to:
        i. Coordinate all outreach events and fundraising activities. This includes equipment, swag items and staffing of events.
        ii. Act as lead on all advertising, marketing and registration of all outreach events.
        iii. Work with Secretary on Club Calendar
        iv. Work with Red Mountain Student Council and Yearbook Students
        v. Maintain outreach databases (summer programing and teacher/school outreach) contacts
        vi. Lead the Summer marketing and registration campaign.

6. ***Project Leaders (not elected)***:
    a. It is the Project Leader's duties to:
        i. Become a team leader.
        ii. Submit work hours for team members
        iii. Request any order of parts necessary for an existing project to the Treasurer.

Prior to graduation where any officer leaves their position vacant, anyone interested in becoming an officer the following year shall inquire to the current officers about assuming office for the upcoming year and shall henceforth become an apprentice. This will ensure the club will maintain a direction that will not lose focus.

ARTICLE V – Elections

Elections will be held at the second meeting at the beginning of the Fall Semester unless otherwise specified by intrigued members. The day of the Elections, self-nominations are encouraged. The person who receives the most votes for the position is elected.

ARTICLE VI – Member Status

There are two types of members in the Robotics club:

1. Inactive Members:
    a. Membership status all incoming members receive when they first become a part of the Robotics Club.
2. Active Members:
    a. Active members are any members defined as having ten or more hours dedicated to working on existing Robotics projects.
    b. Only members that are active and have passed the Robotic Training Workshops can become elected members of be assigned official position with in projects.

All members will be required to keep track of their hours via a sign in sheet when they work on a project.

1. Active members have the right to:
    a. Request an order for any parts required to finish a Robotics project.
    b. Requests will be considered as they come, however, the person with the request that has dedicated the most hours will be considered first and so on.
    c. Vote in the removal of office process.

ARTICLE VII – Removal of Office

The steps to removing officers of the Robotics Club are as follows:

1. Officers must be in office for at least three months before removal is considered.
2. After the initial three months, a meeting can be called at any time by the members, in which all the officers must attend. Members who attend must be considered “Active Members” to vote in the removal process when removing officers from the Robotics Club.
3. At least ten active members must be present as well as the current Robotics Club Advisor.
4. The advisor must be provided with probable cause of removal and must approve of said cause.
5. After the advisor’s approval is made, a 2/3 majority vote is required to remove an officer.
6. Once the officer is removed, the highest current authority will decide who may assume the position.

ARTICLE VIII – Advisor and Duties

Rules concerning the Club Advisor:

1. A faculty member of Red Mountain High School must be chosen to lead the Robotics Club as club advisor. The club must have an active advisor to maintain club status.
2. The duties of the Advisor are:
    a. To inform any officer of their responsibilities.
    b. To keep all records of the Robotics Club documents.
    c. Informs the officers of any general correspondence concerning to Robotics Club.
    d. Reviews any and all activity of the Robotics Club.
    e. To approve or deny supply requests concerning existing Robotics Projects.
    f. Accept or deny probable cause for removing an officer.
    g. Work with the President concerning club events.
    h. Be available for all members.

ARTICLE IX – Additional Amendments and Revisions

Alterations to this constitution are encouraged; the changes must be in the best interest of Red Mountain High School and the members of its APEX Robotics Club. However, only

officers are allowed to make changes. The editing officers must sign the document below in the signatures section and all revisions must be approved and signed by two other current officers.

Roles and Responsibilities APEX Program:

First Year Robotics Engineers:

Description: Any student who has not been a member of either the Robotics or Engineering program for more than one year. Students of Engineering who have successfully completed Principles of Engineering (POE) with a grade of B or better shall be exempt from training. All other students in Engineering current IED or POE students will be expected to undertake training. Exemptions can be provided by mentorship only.

Outline of Training Program:

Within the quarter before any new/unassigned robotics engineer can be placed on a team/department the robotics engineer must complete and document the following:

1. Code for test board 1A (POE)
    a. Number of test boards?
    b. Full code used with labels and footnotes
    c. Also will need to explain lines of code
2. Design each drive train:
    a. Drivetrain is defined as the following:
        i. A rectangular Chassis
        ii. Two Motors
        iii. Four Wheels
        iv. Gears transmitting power from the motor to all wheels
    b. The designs must take into account turning scrub, tire selection and gear ratios.
    c. Three designs are required:
        i. One that clearly defines a greater torque
        ii. One that clearly is purposed for speed
        iii. One that will show a compound gear that includes a compound gear reduction
3. Sketch each drive train with footnotes
    a. Annotated sketch will identify parts of each drivetrain and chassis. This is not a dimensioned drawing it is a basic sketch and should include the following annotations:
        i. All gear sizes and purpose in the drivetrain (Driving Gear, Idler Gear and Driven Gear…)
        ii. Gear ratio
        iii. Frame components including wheels and axles
4. Fully Cad Claw Bot - print screen shots and assemblies
    a. Need all the parts pre-made and some tutorial information on the process

5. Build claw bot produced in CAD, Code and Test it

Robotics Engineering Notebooking:

Description: Each Robotics Engineer will construct a small prototype engineering notebook patterned after the Red Mountain High Engineering Notebooking Protocol. This notebook will act as evidence for the completion of Robotics Training and will remain on file for the duration of the student's years in Robotics.

Example Page:

Below example is a rewrite from 2018-2019 APEX VEX Robotics Engineering Notebook (AV-REN). Additional information can be found on Project Lead the Way (PLTW) Engineering Notebook Online Resources.

SCORING ON THE FLAGS "SHOOTER"

DATE: 09/12/24

DEFINED PROBLEM: METHOD TO SHOOT GAME BALL AT FLAGS OF DIFFERENT DEFINDED HEIGHT WITH ACCURACY AND PRECISION. WITH OUT REGAURD FOR LOADING METHOD

THROUGH THE PROCESS OF BRAINSTORMING TWO VALID AND JUSTIFIABLE SOULTIONS HAVE BEEN DETERMINED. BALSITA AND CATAPULT.

THE TWO SYSTEMS OF "SHOOTING" THE GAME BALL WILL BE CONSTRUCTED ON IDENTICAL DRIVE PLATFORMS WITH IDENTICAL DRIVE TRAINS AND CODE FOR DRIVING. TWO TEST WILL BE PREFORMED: ONE WILL BE TO LOOK AT SPEED, DISTANCE AND THE OTHER WILL LOOK AT CONSISTENCY.

TESTING:

SPEED: TIME IT TOOK TO HIT TARGET FROM THE TIME MOTOR WAS STARTED.

CONSISTENCY: OUT OF 10 TESTS, HOW MANY LAUNCHES WERE SUCCESSFUL WHEN THE ROBOT WAS PLACED IN ITS "IDEAL" SPOT ON THE FIELD.

DISTANCE: THE MAX DISTANCE THE BOT ROBOT COULD SHOOT.

RESULTS:

SPEED:

BALLISTA:

TRIAL	TIME
1	5.27 SEC
2	5.72 SEC
3	5.56 SEC
4	5.38 SEC
5	5.52 SEC
AVG.	5.49 SEC

CATAPULT:

TRIAL	TIME
1	5.17 SEC
2	5.06 SEC
3	5.38 SEC
4	6.02 SEC
5	6.56 SEC
AVG.	5.83 SEC

"IDEAL" LOCATION WILL BE DETERMINED BASED ON THE LOCATION WHERE EACH PROTYPE WAS PRE-DICTED TO HIT BASED ON MATHMATICAL MODEL (SEE PAGE X FOR PROTOTYPE INFO.).

CONSISTENCY:

- BALISTA HIT THE TARGET 100% THROUGH 10 TRIALS.
- CATAPULT HIT THE TARGET 70% THROUGH 10 TRIALS.

DISTANCE:

- BALLISTA WAS ABLE TO LAUNCH AND HIT FLAG FROM 111 INCHES AWAY, WHILE CATAPULT LAUNCHED AND HIT FROM 99 INCHES.

** TEAM WILL ANALYSE THE DATA AND USE IN DECISION MATRIX TO FINALIZE CHOICE OF BILLISTA OR CATAPULT DURING THE NEXT MEETING.

PROJECT: SCORING ON THE FLAGS "SHOOTER"	DESIGNED BY: MRS. SMITH	WITNESSED BY: MJ
		DATE: 09/12/2024

General Sections of an Engineering Notebook:

1. Title Page
2. Table of Contents
3. Chronological entry pages
4. References (list of sources cited)
5. Contacts (name, position, contact information)

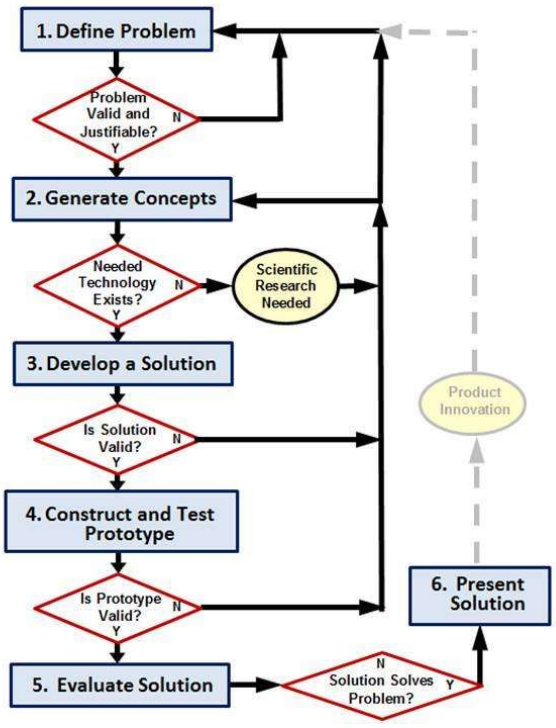
Engineering Best Practice:

- Use a provided Notebook
- Use INK Pen (preferably black) - NO PENCILS
- Document all steps of the design process
- Include summaries of research and conversations
- Add periodic progress reports
    - Reflect on task accomplished
    - Reflect on future needs
- Follow specific entry page guidance in figures

Design Process:

The design process that the APEX Robotics Program adheres to is the same as Red Mountain Engineering Program's design process.

Shown to the right, the RM Engineering Design Process is used for looking at the entire project as well as the daily challenges associated with solving a larger problem.



APEX Robotics VEX Lead Engineers / Departments:

APEX VEX Lead Engineering:

Job Description: Oversee the design, coding and build of two competitive robots 9573A and 9573X for the 2019-2020 seasons. Individual is ultimately responsible for the financial, build, documentation and competition registration for the 2019-2020 year. The Engineering lead will hire the competitive team with assistance from the class mentor and oversee all aspects of the competitive team as well as the many departments associated with the APEX Robotics Program in affiliation with the Red Mountain Engineering Department. The Lead Engineer will ensure that the APEX VEX Robotics program is the most competitive team it can and follows the Engineering Design Process in all aspects of the design, code, build and testing of both 9573A and 9573X robots.

Listing of Job Related Tasks:

- Work closely with Engineering Club and Officers
- Work closely with elected Robotics Club Members Treasury and President to ensure the purchasing supplies, and registration of robotic teams.
- Hire and manage the APEX VEX Robotic Competitive team and departments.
- Establish working Gantt Chart and the maintaining of schedules for all parts of the VEX season from Online Challenges to Qualifying Competitions.
- Develop and run the budget for the APEX VEX Program in association with lead Build Engineer
- Work with the Lead Design Engineer for the design and cad of robots
- Work with the Lead Code Engineer for Online Code Challenge, Coding of Robot
- Work with Competitive Lead on scouting, development of competitive calendar, metadata collection and documentation of the Engineering Design Process.
- Work with Build lead to ensure inventory is accurate and maintain as well as the creation and funding of a supply list.
- Hire and promote new robotics students through the leadership and guidance
- Develop a team culture in all levels of robotics
- Oversee the creation and operations of the 2020 summer programing associated with APEX Robotics
- Schedule, develop and execute all outreach events.
- Ensure the documentation of all outreach events.
- Final approval on all APEX VEX related paraphernalia and gear
- Prep teams for qualification and judging
- Ensure the code of conduct is adhered to both on the Engineering floor and at competitive events.
- Evaluate all leads quarterly

- Evaluate progress and potential of all Robotic Engineers in APEX VEX Program which will include final sign off for all engineers finishing training.
- Required to produce an end of year progress report that assesses the team performance and the merit of individuals within the program

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX VEX Lead Competition Engineer:

Job Description: Oversee all aspects of APEX VEX Competition from the acquisition of metadata on design trends, creation/maintaining of documentation associated with VEX Program, production of scout reports for competition to working with Lead Engineer on the competitive schedule for both 9573A and 9573X Teams. The Competition Lead is responsible for the dissemination of information on VEX competition with regards to rules, regulations and scoring. In addition, they are to work with design team to work with a competitive strategy and focus based on work with the Data team

<u>Listing of Job Related Tasks:</u>

- Manage and act as main editor of overseeing both Engineering Notebooks for team A and X
- Develop and report on team scout reports throughout season, state and worlds
- Hiring and promotion of research team with assistance of the Lead Engineer
- Oversee and instruct research team along with quarterly evaluation of team members
- Develop with Design and Lead Engineer a comprehensive team strategy based on quantitative data supported by Software team.
- Prep pit teams on roles and responsibilities at competition including practice for judging.
- Work with drive teams on field strategy
- Assign drive teams to competition
- Develop and maintain drive team records and training information
- Build competition timelines for both qualifying, state and world competitions.
- Support outreach through reveal videos and swag items in accordance with overall team gantt chart
- Sign off on notebook for recruiters in the training program
- Timeline of all Online Worlds Competition and Challenges

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX VEX Team A/X Competition Engineer:

Job Description: Each of the Team Competition Engineers will work closely with the Lead Competition Engineer to ensure that the engineering notebooks are properly edited and are fully complete. This may include the create of documents to support the books, images and pictures. In addition, depending on level may be the main writer of one of the two engineering notebooks. In addition, this engineer will be expected to be available for all competitions if needed.

Listing of Job Related Tasks:

- Each Competitive engineer will be assign a specific team to help and work with.
- Help with the development and implementation of a comprehensive, competitive game strategy.
- Help in the acquisition and dissemination of scout reports.
- Run analytics on data from scout reports, driver data and robotic data to support competitive game strategy.
- Help in the final editing and creation of engineering notebooks.
- Help develop training for driver teams, and pit crews.
- Collect data on driver teams and pit crew results.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application.

Research Engineer:

Job Description: A Research Engineer will work with the team Competitive engineers to build data for scout, meta data for trends in the vex world as well as compile data for the use of data based decisions associated with the development and implementation of a comprehensive competitive game strategy.

Listing of Job Related Tasks:

- Work with excel documents and the internet to build archive of data for use in game strategy, training or build processes.
- Record Data
- Analyse data sets
- Build reports based on needed data sets.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application.

APEX VEX Lead Software Engineer:

Job Description: The Lead Software Engineer will be responsible for the development and recording of code related to all aspects of the VEX teams (both 9573A and 9573X). This will include making a competitive program for Skills, Driver Competition and Autonomous Competition. In addition, they will work closely with design and build team to ensure the process of the physical robots match the abilities of code on the VEX platform. Lead Software will also help in the production of a strategic game plan for field in conjunction with the competition team. Plus, software engineer will also help in the creation of scout reports with competition team for both competition and internal development of drive teams.

Listing of Job Related Tasks:

- Code robots for driver portion of competition which will require working with drive teams, design and build.
- Develop a competitive program for autonomous portion of both Skills and Competition play.
- Record the development of all code in compliance with the requirements and criteria of competition lead.
- Oversee and help in the development of software engineer team members.
- Sign off on the coding portion of training.
- Hire with assistance of lead engineer all software engineers
- Compile quantitative data for the competitive robots, driver teams, and all components of the robots themselves for analysis and the help of data based decisions.
- Save all code in a manner that is accessible to others and understood by others.
- Create a code and data timeline for season and submit to competition and lead engineer for implementation into team season gantt chart.
- Participate in World Online Competitions

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience with considerable background in code.

APEX VEX Team A/X Software Engineer:

Job Description: The Team Software Engineer will work closely with a team robot to build and maintain code needed for all aspects of the competitive VEX season. These engineers will be expected to code and understand the code at a level that they can be a member of the pit crew

at competitions. They are to work closely with the lead software engineer and may undergo additional training to act as representative of Software team in the pit at competitions when needed.

Listing of Job Related Tasks:

- Code robots for driver portion of competition which will require working with drive teams, design and build.
- Be available for any and all competitions
- Work with Lead Software Engineer to create code to complete tasks associated with competition, and skills.
- Work with software engineers to continue the improvement and documentation of all aspects of code.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and have experience with considerable background in code.

Software Engineer:

Job Description: A Software Engineer will work on the software team to build, write and annotate code. This can include the acquiring, analysing and dissecting code. Software engineers will also help in the collection of data, the analysis of that data as well as the possible presenting of data. Software engineers will work closely with research engineers to find and interpret scout data and meta-data on trends in the VEX world.

Listing of Job Related Tasks:

- Code robots for driver portion of competition which will require working with drive teams, design and build.
- Work in Excel and Google Sheets
- Work in Robot-C or other code platforms as needed
- Analysis and collect data

APEX VEX Lead Design Engineer:

Job Description: The Lead Design Engineer is responsible for the total design of both 9573A and 9573X which includes the design of all parts (drivetrain to lift). This position will work closely with the Lead engineer of all departments to ensure that the overall design of the robots match the build constraints, game criteria and the coding constraints associated with all aspects of VEX Competition. In addition, the design engineer must work very closely with the competition team on the proper recording of the design process from the start of season to the

end. Furthermore the design engineer must lead the modification and iterations of robot following competitions to ensure the most competitive robots

Listing of Job Related Tasks:

- Develop and record a comprehensive design that fits the criteria of game play for current season while taking into account the constraints associated with the build and coding of robot.
- Follow the RM Engineering Design Process to its fullest fidelity.
- Use data from robot performance to modify and iterate current design.
- Use data from driver team performance to modify and iterate current robot design.
- Organize and communicate design timeline with all engineering leads in the development of the team gantt chart.
- Hire and support the Design team including the CAD team.
- Construct a fully modeled CAD version of the competitive robot.
- Work with Build team to maintain the current and any future needs associated with VEX inventory.
- Evaluate and sign off on Design aspect in engineering training curriculum.
- Develop summer programing games and challenges.
- Start the development of a VEX outreach robot.

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience. Would like some CAD experience but not required.

APEX VEX Team A/X Design Engineer:

Job Description: Each of the Team Design Engineers will work with their respected robot and the Lead Design Engineer to establish the most competitive robots for the current year. They will work closely with other departments to understand the constraints and criteria associated with the game and competition needed. The Team Design Engineers will be expected to be available for all competitions through qualifications, state and worlds if needed. Team Design Engineers will be trained in pit expectations and may represent team in competitions.

Listing of Job Related Tasks:

- Develop and record a comprehensive design that fits the criteria of game play for current season while taking into account the constraints associated with the build and coding of robot.
- Follow the RM Engineering Design Process to its fullest fidelity.
- Use data from robot performance to modify and iterate current design.
- Use data from driver team performance to modify and iterate current robot design.

- Organize and communicate design timeline with all engineering leads in the development of the team gantt chart.
- Help in the development of summer programing.
- Oversee the production of their respected robot by the CAD team.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and CAD experience is suggested with possible National Certification.

APEX VEX CAD Team Lead:

Job Description: The CAD Team Lead will work with the CAD team to fully digital model both competitive robots. In addition, the CAD team lead will work closely with Software and Competition Leads to ensure that any aspect of the Engineering Notebook or Online World Challenges are addressed.

Listing of Job Related Tasks:

- CAD using either Inventor or Solidworks.
- Help develop CAD team and training
- Help in the construction of CAD timeline
- Ensure CAD team meets all deadlines
- Sign off on CAD portion of training.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and have extensive CAD experience is suggested to have a current National Certification.

CAD Engineer:

Job Description: A CAD Engineer will work with CAD Lead to build a digital model of competitive robots. They will be assigned aspects of the modeling and work with the team to complete task on time. CAD engineers will work closely with the build team to ensure that all digital models match those of the physical model.

Listing of Job Related Tasks:

- CAD using either Inventor or Solidworks.
- Attend Trainings on Inventor or Solidworks when needed.
- Seek out instructional Videos to help in the CAD Process

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and CAD experience is suggested with possible National Certification.

APEX VEX Lead Build Engineer:

Job Description: The Lead Build Engineer will be responsible for the overall build of both 9573A and 9573X robots based on the requirements of the design team. Will maintain both robots both in and outside of competition. Maintain the inventory of all VEX parts throughout the entirety of season including all additional competition such as SkillsUSA that uses VEX Parts. This will include parts list of both robots. Inventory will extend to the tools needed to manipulate parts. The Lead Build Engineer will also develop a supply list for purchasing of all VEX parts for the Classroom Budget as well as other budgets assign by the Lead Engineer.

Listing of Job Related Tasks:

- Build and Maintain all competitive robots.
- Build and Maintain all outreach robots.
- Maintain VEX inventory which includes all parts and tools associated with VEX
- Modify inventory for purchased and the decomishing of parts.
- Maintain status and quality of parts in VEX inventory.
- Hire and promote Build Engineering team that includes training on all tools associated with build of VEX robots.
- Sign off on the Build aspect of Engineering Training.
- Maintain the cleanliness of build cage, and classroom.
- Develop safety training for all team members and facilitate training classes.
- Maintain the competitive field and field elements associated with that year and past years.
- Communicate the build process to design and competition leads.
- Develop a working supply list for purchasing and work with Lead Engineer on cost constraints
- Work with both design and code team to establish the most competitive robots through the communication of build constraints in association with VEX parts.
- Keep and accurate and reliable supply list on all VEX robots.
- Submit projects to Online World Competitions

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX VEX Team A/X Build Engineer:

Job Description: The Team Build Engineer will be directly responsible for the physical build of either Team 9573A or 9573X. They will work closely with the Lead Build Engineer to ensure that robots are built and maintained to the highest quality. They will also take a direct role in ensuring the current inventory in up to date and accurate. This includes both the checking in and out of parts as well as the the maintains and care of tools. The Team Build Engineers will also be responsible for the VEX Cage, Manipulation of all VEX parts, training of Build Engineers as well as adhering to all safety requirements. Team Build Engineers will be expected to be available for all competitions through qualifications, state and worlds if needed. Team Build Engineers will be trained in pit expectations and may represent team in competitions.

Listing of Job Related Tasks:

- Build and Maintain all competitive robots.
- Build and Maintain all outreach robots.
- Maintain VEX inventory which includes all parts and tools associated with VEX
- Modify inventory for purchased and the decomishing of parts.
- Maintain status and quality of parts in VEX inventory.
- Maintain the cleanliness of build cage, and classroom.
- Develop safety training for all team members and facilitate training classes.
- Maintain the competitive field and field elements associated with that year and past years.
- Communicate the build process to design and competition leads.
- Develop a working supply list for purchasing and work with Lead Engineer on cost constraints
- Work with both design and code team to establish the most competitive robots through the communication of build constraints in association with VEX parts.
- Keep and accurate and reliable supply list on all VEX robots.
- Submit projects to Online World Competitions

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application.

Build Engineer:

Job Description: The Build Engineer will work with the Team Engineer on the physical build of competitive robots. A build engineer is expected to learn and provide ideas to the build process. A build engineer must be up to date on all safety trainings and be able to manipulate VEX parts when needed.

Listing of Job Related Tasks:

- Build and Maintain all competitive robots.
- Work with CAD Team to ensure the digital rendering of physical robot is accurate and precise.
- Attend and adhere to all safety protocol.
- Report to Team and Lead Engineers

First Robotics Program Team 8012:

Lead Engineer			
Lead Competition Engineer	**Lead Build Engineer**		**Lead Software Engineer**
CAD Manager	Design Team	Supply Chain	Software Team
Outreach	Build Team Field	Build Team Robot	
Travel Specialist	Scout Team	Data Collection and Analysis	

APEX FRC Lead Engineer:

Job Description: Oversee the design, coding and build of FRC competitive robots 8012 2019-2020 seasons. Individual is ultimately responsible for the financial, build, documentation and competition registration for the 2019-2020 year. The Engineering lead will hire the competitive team with assistance from the class mentor and oversee all aspects of the competitive team as well as the many departments associated with the APEX Robotics Program in affiliation with the Red Mountain Engineering Department. The Lead Engineer will ensure that the APEX VEX Robotics program is the most competitive team it can and follows the Engineering Design Process in all aspects of the design, code, build and testing of FRC Robot 8012.

Listing of Job Related Tasks:

- Work closely with Engineering Club and Officers
- Work closely with elected Robotics Club Members Treasury and President to ensure the purchasing supplies, and registration of robotic teams.
- Hire and manage the APEX Robotic Competitive team and departments.
- Establish working Gantt Chart and the maintaining of schedules for all parts of the season from Online Challenges to Qualifying Competitions.
- Develop and run the budget for the APEX Program in association with lead Build Engineer
- Work with the Lead Build Engineer for the design and cad of robots

- Work with the Lead Code Engineer for Online Code Challenge, Coding of Robot
- Work with Competitive Lead on scouting, development of competitive calendar, metadata collection and documentation of the Engineering Design Process.
- Work with Build lead to ensure inventory is accurate and maintain as well as the creation and funding of a supply list.
- Hire and promote new robotics students through the leadership and guidance
- Develop a team culture in all levels of robotics
- Oversee the creation and operations of the 2020 summer programing associated with APEX Robotics
- Schedule, develop and execute all outreach events.
- Ensure the documentation of all outreach events.
- Final approval on all APEX FRC related paraphernalia and gear
- Prep teams for qualification and judging
- Ensure the code of conduct is adhered to both on the Engineering floor and at competitive events.
- Evaluate all leads quarterly
- Evaluate progress and potential of all Robotic Engineers in APEX Program which will include final sign off for all engineers finishing training.
- Required to produce an end of year progress report that assesses the team performance and the merit of individuals within the program

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX FRC Lead Build Engineer:

Job Description: The Lead Build Engineer will be responsible for the overall build of 8012 robot based on the requirements of the design team. Will maintain both robots both in and outside of competition. Maintain the inventory of all FRC parts throughout the entirety of season including all additional competition such as AIA State that uses FRC Parts. This will include parts list of robot. Inventory will extend to the tools needed to manipulate parts. The Lead Build Engineer will also develop a supply list for purchasing of all FRC parts for the Classroom Budget as well as other budgets assigned by the Lead Engineer. In addition, the Lead Build Engineer will oversee the Design Team along with the Competitive Lead and Lead Engineer. The lead build

<u>Listing of Job Related Tasks:</u>

- Build and Maintain all competitive robots.
- Build and Maintain all outreach robots.
- Oversee the construction of field elements for practice field.
- Oversee the construction and layout of FRC Pit
- Work closely with Safety Commission on Pit protocol and team safety at competitions.
- Develope a build gantt chart that is shared with the Lead Engineer.

- Maintain FRC inventory which includes all parts and tools associated with FRC
- Modify inventory for purchased and the decomishing of parts.
- Maintain status and quality of parts in FRC inventory.
- Hire and promote Build Engineering team that includes training on all tools associated with build of FRC robots.
- Sign off on the Build aspect of Engineering Training.
- Maintain the cleanliness of build cage, and classroom.
- Develop safety training for all team members and facilitate training classes.
- Maintain the competitive field and field elements associated with that year and past years.
- Communicate the build process to design and competition leads.
- Develop a working supply list for purchasing and work with Lead Engineer on cost constraints
- Work with both design and code team to establish the most competitive robots through the communication of build constraints in association with FRC parts.
- Keep and accurate and reliable supply list on all FRC robots.
- Submit projects to Online World Competitions

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX FRC Build Team Engineer Robot and or Field/Pit:

Job Description: The Team Build Engineer for Robot will be directly responsible for the physical build of FRC robot 8012. They will work closely with the Lead Build Engineer to ensure that robots are built and maintained to the highest quality. They will also take a direct role in ensuring the current inventory in up to date and accurate. This includes both the checking in and out of parts as well as the the maintains and care of tools. The Team Build Engineers will also be responsible for the FRC Cage, Manipulation of all FRC parts, training of Build Engineers as well as adhering to all safety requirements. Team Build Engineers will be expected to be available for all competitions through qualifications, state and worlds if needed. Team Build Engineers will be trained in pit expectations and may represent team in competitions. The addition of a building robots, a build team member can be associated with the Field/Pit build associated with the FRC practice field and competitive pit.

<u>Listing of Job Related Tasks:</u>

- Build and Maintain all competitive robots.
- Build and Maintain all outreach robots.
- Maintain VEX inventory which includes all parts and tools associated with VEX
- Modify inventory for purchased and the decomishing of parts.
- Maintain status and quality of parts in VEX inventory.
- Maintain the cleanliness of build cage, and classroom.

- Develop safety training for all team members and facilitate training classes.
- Maintain the competitive field and field elements associated with that year and past years.
- Communicate the build process to design and competition leads.
- Develop a working supply list for purchasing and work with Lead Engineer on cost constraints
- Work with both design and code team to establish the most competitive robots through the communication of build constraints in association with VEX parts.
- Keep and accurate and reliable supply list on all VEX robots.
- Submit projects to Online World Competitions

Member of the Field/Pit Build Team:

- Construct Practice Field to the exact specifications of the FRC Competition Manual
- Maintain Practice Field
- Construct the PIT for competition
- Set up the competition PIT

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application.

APEX FRC Lead Competition Engineer:

Job Description: Oversee all aspects of APEX VEX Competition from the acquisition of metadata on design trends, creation/maintaining of documentation associated with VEX Program, production of scout reports for competition to working with Lead Engineer on the competitive schedule for both 9573A and 9573X Teams. The Competition Lead is responsible for the dissemination of information on VEX competition with regards to rules, regulations and scoring. In addition, they are to work with design team to work with a competitive strategy and focus based on work with the Data team

<u>Listing of Job Related Tasks:</u>

- Manage and act as main editor of overseeing both Engineering Notebooks for 8012
- Develop and report on team scout reports throughout season, state and worlds
- Hiring and promotion of research team with assistance of the Lead Engineer
- Oversee and instruct research team along with quarterly evaluation of team members
- Develop with Design and Lead Engineer a comprehensive team strategy based on quantitative data supported by Software team.
- Prep pit teams on roles and responsibilities at competition including practice for judging.
- Work with drive teams on field strategy
- Assign drive teams to competition
- Develop and maintain drive team records and training information
- Build competition timelines for both qualifying, state and world competitions.

- Support outreach through reveal videos and swag items in accordance with overall team gantt chart
- Sign off on notebook for recruiters in the training program
- Timeline of all Online Worlds Competition and Challenges

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience.

APEX FRC Lead Software Engineer:

Job Description: The Lead Software Engineer will be responsible for the development and recording of code related to all aspects of the FRC 8012. This will include making a competitive program for Skills, Driver Competition and Autonomous Competition. In addition, they will work closely with design and build team to ensure the process of the physical robots match the abilities of code on the FRC platform. Lead Software will also help in the production of a strategic game plan for field in conjunction with the competition team. Plus, software engineer will also help in the creation of scout reports with competition team for both competition and internal development of drive teams.

Listing of Job Related Tasks:

- Code robots for driver portion of competition which will require working with drive teams, design and build.
- Develop a competitive program for autonomous portion of both Skills and Competition play.
- Record the development of all code in compliance with the requirements and criteria of competition lead.
- Oversee and help in the development of software engineer team members.
- Sign off on the coding portion of training.
- Hire with assistance of lead engineer all software engineers
- Compile quantitative data for the competitive robots, driver teams, and all components of the robots themselves for analysis and the help of data based decisions.
- Save all code in a manner that is accessible to others and understood by others.
- Create a code and data timeline for season and submit to competition and lead engineer for implementation into team season gantt chart.
- Participate in World Online Competitions

Requirements: Student must be a veteran of Robotics/Engineering with a resume showing examples of pass leadership roles in the Robotics or Engineering Departments with preferably 2-3 years of Robotics/Engineering experience with considerable background in code.

APEX FRC Team Design Engineer:

Job Description: Each of the Team Design Engineers will work with their respected robot and the Build/Lead Engineer to establish the most competitive robots for the current year. They will work closely with other departments to understand the constraints and criteria associated with the game and competition needed. The Team Design Engineers will be expected to be available for all competitions through qualifications, state and worlds if needed. Team Design Engineers will be trained in pit expectations and may represent team in competitions.

Listing of Job Related Tasks:

- Develop and record a comprehensive design that fits the criteria of game play for current season while taking into account the constraints associated with the build and coding of robot.
- Follow the RM Engineering Design Process to its fullest fidelity.
- Use data from robot performance to modify and iterate current design.
- Use data from driver team performance to modify and iterate current robot design.
- Organize and communicate design timeline with all engineering leads in the development of the team gantt chart.
- Help in the development of summer programing.
- Oversee the production of their respected robot by the CAD team.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and CAD experience is suggested with possible National Certification.

APEX FRC CAD Team Manager:

Job Description: The CAD Team Lead will work with the CAD team to fully digital model both competitive robots. In addition, the CAD team lead will work closely with Software and Competition Leads to ensure that any aspect of the Engineering Notebook or Online World Challenges are addressed.

Listing of Job Related Tasks:

- CAD using either Inventor or Solidworks.
- Help develop CAD team and training
- Help in the construction of CAD timeline
- Ensure CAD team meets all deadlines
- Sign off on CAD portion of training.

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and have extensive CAD experience is suggested to have a current National Certification.

CAD Engineer:

Job Description: A CAD Engineer will work with CAD Lead to build a digital model of competitive robots. They will be assigned aspects of the modeling and work with the team to complete task on time. CAD engineers will work closely with the build team to ensure that all digital models match those of the physical model.

Listing of Job Related Tasks:

- CAD using either Inventor or Solidworks.
- Attend Trainings on Inventor or Solidworks when needed.
- Seek out instructional Videos to help in the CAD Process

Requirements: Student must be a member of the Robotics/Engineering class or club and have completed the robotics training class successfully with two or more recommendations from lead engineers. Must also submit an online application and CAD experience is suggested with possible National Certification.

FRC Safety Manager/Commissioner:

This is a dedicated FIRST Title and thus has very specific role in the FIRST Programing (https://www.firstinspires.org/resource-library/frc/safety-manager) go to website for more information.

Job Description: The Safety Manager for FIRST Robotics Competition is a Key Volunteer position. These individuals will work with the UL Safety Advisors (if present) and the Safety Attendants to increase the awareness of safety. Volunteers in this role will work with teams to ensure they understand, comply with, and practice the fundamentals of safety to ensure the safety of all FIRST event participants. The FIRST Safety program nurtures a positive reinforcement model that emphasizes safe behavior and coaching to correct unsafe behavior. The goal is to have a safe event and to promote safety as a holistic life skill. Safety Advisors will receive training prior to the event and maintain a high level of safety as stated in the FIRST Safety Manual and the FIRST Game & Event Rules Manual.

Responsibilities

- Knowledge of safety issues
- Manage the daily Safety Recognition awards (when UL is not at the event)
- May be required to attend daily morning meetings conducted by Event Manager or Coordinator
- Monitor overall event safety, observe unsafe actions, and coach teams in appropriate safe behavior
- Oversee safety from beginning to the end of the event including Load in and Load out

- Monitor Safety glasses tables to ensure safety glass stations are properly stocked and running efficiently
- Conduct Safety Captain meetings at event

Experience and Skills Needed

- Must be post-high school or equivalent (minimum age of 19 at time of service)
- Exceptions may be granted by event Volunteer Coordinators after review and approval by FIRST Headquarters
- FIRST experience not required; general knowledge of FIRST preferred
- Thorough knowledge of the safety principles required, work related safety background preferred
- Ability to "take charge"; be assertive
- Ability to link FIRST principles to a safety approach and move teams to compliance
- Ability to move about the facility
- Ability to work and interact with volunteers, team members, contracted staff and FIRST staff
- Approachable and friendly personality
- Strong interpersonal/communication skills focused on a coaching approach