Learning Roadmap

Gr. 4 to 6: Robotics Projects Track

Level B

Meet the basic requirement

Yes

Level I and II

Demonstrate Engagement, Maturity in following engineering process

Yes

Level I and II - Analytics

High proficiency in Pre-Algebra+

Gr. 7+ RobotC Group (start with Gr.7+ B level, but expect to move on more quickly than other new Grade 7+ Beginners)

Gr. 7+ RobotC Group

Not interested, or lack of practice or maturity.
Should not Renew for the time being.

No

# of Terms?

>2

# of Terms?

<4

<4

<4

<4

<=2

<=4

<=4
Learning Roadmap

Gr. 8+ : Computer Science Track

More details about the syllabus for Algorithms in C/C++:
http://cs.stormingrobots.com

- Algorithms in C/C++ - Level I
  - Satisfactory Completion
    - Yes → RCJ Rescue Line
    - No → # of Terms?
      - Yes → self-study Advanced Placement Comp. Sci.
      - No → Mostly due to lack of practice and/or Need more Independent help.

- Algorithms in C/C++ - Level II
  - Satisfactory Completion
    - Yes → USACO - Bronze to Silver
    - No → # of Terms?
      - Yes → MIT / NASA - ZeroRobotics (Require min. Pre-Cal)
      - No → Usually <=3
        - Yes → Algorithms in C/C++ - Level IV
          - USACO - Silver to Gold
          - RCJ Maze, Webots, or Soccer (Addl prerequisites)
        - No → Satisfactory Completion
          - Yes → Algorithms in C/C++ - V or Adv Independent Project
            - USACO - Gold / Platinum
          - No → Algorithms in C/C++ - Level III
            - Usually <=3
              - Yes → RCJ Rescue Line
              - No → RCJ Maze, Webots, or Soccer (Addl prerequisites)

Note: Despite of non-completion for this level, this will have covered most of AP Computer Science A.

- Software simulation /computer science
- Can be in either Mindstorms or MakeBlock RangerBot Platform
- Need Electronic with Robotics min Level I, prefer Level II & Computer Vision

P. 3 of 6
Prior to Fall 2019, Electronic and Robotics was used to be called Robotics with Arduino

***NOTE:
If you are interested in participating in RCJ competitions, click here to review the online criteria table.
**Description about Levels**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Exploratory. Beginner level. Shows some understanding in the topics &amp; learning process.</td>
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<tr>
<td>L - I</td>
<td>Demonstrates memorization of semantics &amp; apply a single level of abstraction and control structure.</td>
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<tr>
<td>L - II</td>
<td>Apply 2 levels of abstraction &amp; control structures. Start to involve more computational thinking with geometry and algebra.</td>
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<tr>
<td>L - III</td>
<td>Demonstrates ability to analyze and apply 2+ levels of abstraction, &amp; control structure. Can finish projects but require considerable guidance. Perform mathematical application, if needed.</td>
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<tr>
<td>L - IV</td>
<td>Can handle multiple levels of abstraction, new data &amp; structure design with minimal guidance. Ability to perform mathematical application along with physics concepts if needed.</td>
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<tr>
<td>ADV</td>
<td>Self-learner, self-driven, &amp; demonstrates self-guided level of resourcefulness. Design with minimal guidance. Ability to research on new topics &amp; extend projects with minimum guidance.</td>
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The following keys will assist parents to understand how we assign at evaluation time:

**Application thru understanding over memorization:**

- Mastery of a level means they "demonstrate" that they can apply without frequent assistance from the instructor, but not by memorization.
- Whether one enjoys in active learning and problem solving, not conventional passive learning, is important. This will also a good indicator for their level of interest in open-ended challenge, and engineering.

**About Projects assignment in classes:**

- Project content bespoke to each group. Challenge level bespoke to each individual. That's why even two groups in the same group may end up working on different level of challenge; i.e., various phases of a particular project.
- Placement is determined by instructor based on their interest and strength, and most importantly, it needs to keep students engaged and challenged.

**About Analytical level**

- Require high proficiency in Pre-Algebra (level I), and Introduction to Algebra or Algebra I (level II+)
- Require more in-depth analysis, patience in following thru engineering process and trouble shooting.

Competition is one of the multiple channels where they will apply all the knowledge that they have complied throughout their Robocub sessions, and summer workshops. Another channel is through Advanced Projects (required building online portfolio). Students further strengthen their knowledge base through hands-on, scaffold environment where new concepts constantly are introduced.

We choose only the competitions and projects which are artificial intelligence oriented. Our program aims to help in bridging students from high school not just to competitive colleges, but far importantly, to become a resourceful, self-driven life-long learner. History has shown SR alumni has gained competitive edge in obtaining internship in College.

Main goals of our participation into any of the competitions and independent advanced projects are to:

- Sustain motivation and inspiring more inquiries in in-depth knowledge about system engineering through robotics;
- Encourage students to delve in learning about full automation, and exploration in the realm of artificial intelligence.
- Strengthen competitiveness in science and technology, with integrity, sportsmanship, and professionalism.

See the criteria for participation into the following competitions:

MIT/NASA ZeroRobotics
- Heavily Mathematics and physics oriented
- High School only.
- Online competition working with virtual simulation.
- do not work with physical robot. The physical robot is the Satellite itself located in MIT and Space!
- Minimum Algebra II, prefer Trigonometry.
- Linear Algebra is a BIG Plus. Almost all of our students self-learned LA.

RCJ = RobocupJunior
- AI-oriented, Algorithms-based Tournament
- Age: 12-18.
- Students are expected to improve their platform year after year, that includes hardware and software
- Usually participate in the same game throughout several years.
- From USA to World Event

Advanced Independent Projects
- Not a competition
- High School Only.
- Duration depends on project scope.
- Require strong work discipline.
- Create Engineering / Computer Science Maker Portfolio.
- Opportunity to conduct Tech Talk in public forum.

USACO:
- Not a competition.
- Online Exam from December to April. One exam per month.
- USA Computing Olympiad.
- Age 13+ (usually high school only)
- HEAVILY Algorithmic based programming.
- Online Exams from Bronze to platinum levels.
- From USA to World Event