**FLL Manual for RFL Coaches – Ashwin Shah**

FIRST stands for "For Inspiration & Recognition of Science & Technology". This program is mainly oriented towards the overall development of a child – right from his technical skills to research skills to presentation skills to pre-entrepreneurial skills. If coached properly – a child can witness an upright change in his life in a positive way – being more time managed – well behaved – more dedicated towards work & a lot more. Of the two major competitions we do, namely WRO & FIRST, both are the best at their respective levels & cannot be compared. Both comes with it`s own set of learning.

FLL (100)
- Robot Game (33.33)
- Project Work (33.33)
- Core Values (33.34)
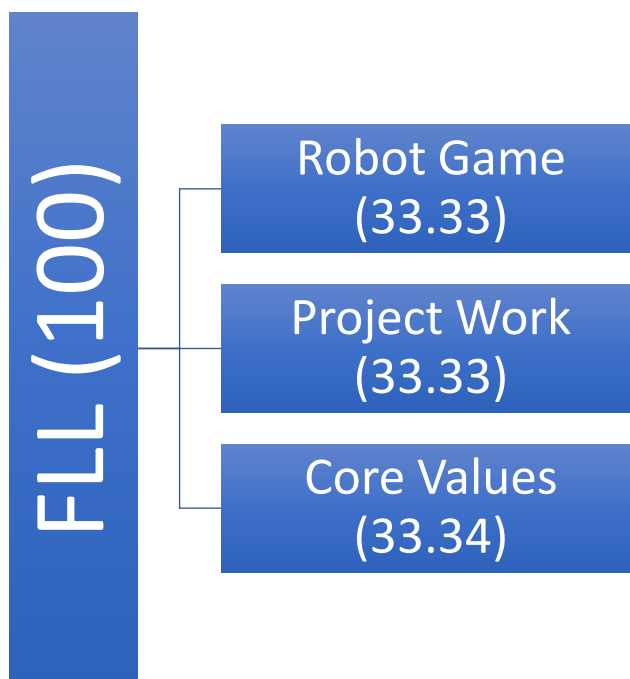
Pre – Season for the coaches

1. Register the team on your national FLL website.
2. Pay the fees & order the FLL Mat.
3. Read this coach manual & make it by heart.
4. Review the core values
5. Form a team (Guidance on team formation in the next chapter)
6. Identify the time slots for the team to work effectively & together.
7. Make a rough planner for 100 hours of working before regional event.
8. Team capacity building once the team is formed.
9. Keep the following resources ready
   a. Game table with appropriate borders
   b. Project definition with elaborated description of the problem statement
   c. Robot Run Rules
   d. Mission Model Building Instructions
   e. 08 – 10 team building activities

Team Formation

1. An FLL team can be of 2 – 10 students & 2 adult coaches. RFL recommended team size is 7-8 students & 02 coaches.
2. The team should be divided into the following nuclear teams / roles & responsibilities
   a. Technical team – 3-4 students
      i. Game strategy
      ii. Construction
      iii. Programing
      iv. Documentation
   b. Project team – 3 -4 students
      i. Project research & innovative solution
      ii. Documentation with pictures
      iii. Community outreach
   c. Core Value
      i. Team a & Team b collectively forms this team.
   d. Team Manager – The one who can bridge the gap between technical & project team for better coordination.
   e. Core Value Monitor – Who always ensures the team is in sync & always following the core values – you can plan to reward the best member each week.
3. Each team member can take more than one roles with the complete accountability.

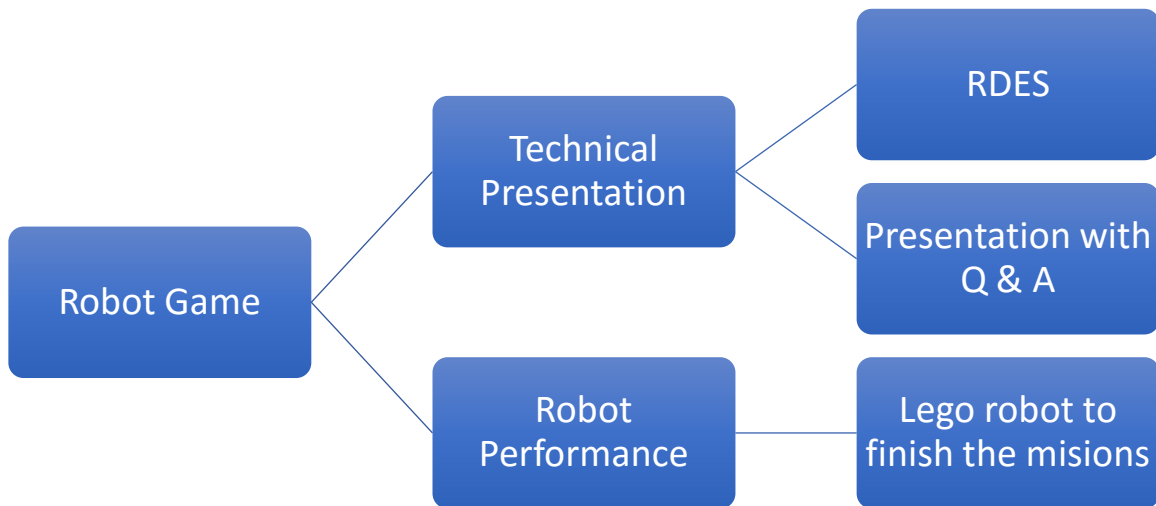### Important pointers for the coaches

1. A successful FLL coach controls the process, not the content!!!
2. Team members must make all the decisions & do all the work on robot game & project.
3. Instead of telling them how to solve the problems, try asking questions like
   a. What could you change to get the results you want?
   b. How will that affect…?
   c. What information do you need to answer that question?
4. Children becomes problem solvers by finding the solutions themselves – An adult must always remember; children first!
5. A minimum of 80-100 hours of working is required by the team. It is your duty to make an effective planner to implement this from day 1.
6. Maintaining an effective team composition will be the toughest job for you.
   a. Make sure to convey the importance of each role of the team members.
   b. Have teams go through team building activities once in each week.

   c. Proper implementation of core values will solve half of your problems.
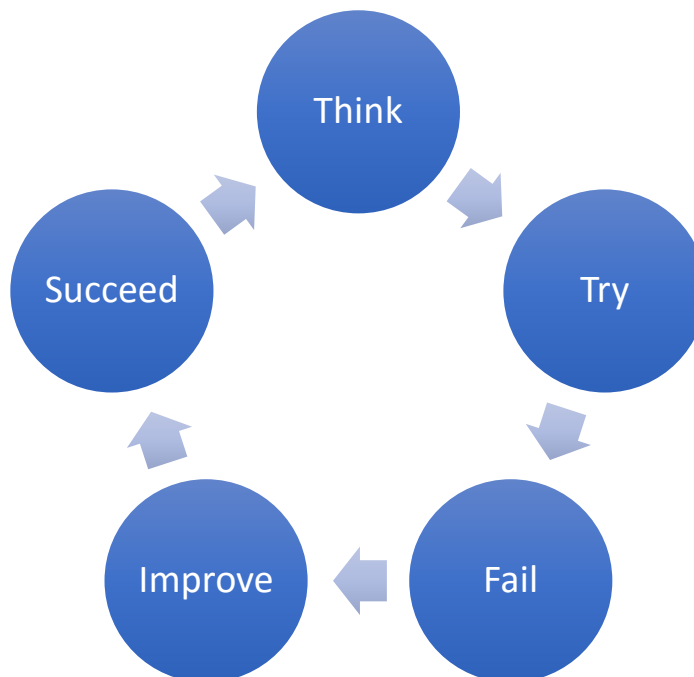
7. Ideal indexing for Project Booklet & Robot Game is given via an email once the team is formed. Try to guide the team accordingly. You can make the necessary changes in the index if required.
8. Documentation
    a. Habit to document each & everything from day 1 with photographs.
    b. Habit to use google drive effectively for each team with following folders & subfolders
        i. Project Work
            1. Data
            2. Photographs
            3. Presentation script

        ii. Robot Game
            1. Program
            2. Strategy document
            3. Game Manual
            4. Presentation script

        iii. Core Values
            1. Poster Data
            2. Presentation script
    c. Once in a week email communication with the whole team that includes
        i. Deadlines for upcoming week
        ii. Targets achieved this week & what is left & why.
9. Main pointers to keep in mind for innovative solution
    a. It is not necessary to have a tech savvy solution.
    b. Your solution must address the problem given & be effective.
    c. Follow the project guidelines for the further help.
10. Ideal Deadlines for each coach & team for this year

Week	Tasks		
	Robot Game	**Project Work**	**Core Values**
Week 1 - 13 - 19 November	Dividing missions into 4 P. Strategize & build a chassis robot	Identify 04 different problems & find their existing solutions	One team building activity
Week 2 - 20 - 26 November	Placing additional motors & making the basic programs ready - forward - backward- point turns - swing turns - forward & align - backward & align - PLF - PID. Attachment for first route	Meeting an expert & trying to narrow down to one major problem. Proper documentation as per the index given till finding a problem.	One team building activity
Week 3 - 27th November - 3rd December	Route 1 & Route 2 complete. Photographs of the attachments made & dismantled & made again or evolution.	Try to make own unique solution with the parameters defined in the manual.	One team building activity
Week 4 - 4th - 10th December	Route 3 complete. Proper documentation in place.	Building the solution & testing. Update the project book as per the index accordingly.	One team building activity
Week 5 - 11th - 17th December	Route 4 complete. Combine run of Route 1 to Route 4	Testing the solution & implementing it at the respective community	One team building activity
Week 6 - 18th - 24th December	Route 5 & complete robot run. Start working on RDES	Community outreach with the officials & documentation	Input data for core value poster.
Week 7 - 25th - 31st December	Script for technical presentation, RDES complete with photographs, robot run practices	Script for project presentation with an idea of how to present. Complete the project booklet with images as per the index.	Design core value poster & make a script for core value presentation
Week 8 - 1st - 7th January	Robot Runs & practice technical presentations	Project presentations & community outreach programs.	Presentations & problem solving activities
Week 9 - 8th - 14th January	Practice & fine tuning	Practice & fine tuning	Practice & fine tuning

➕ **FLL is broadly classified into 3 categories as shown above with an equal weightage. Let`s begin with the understanding of the robot game.**

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                                              │     RDES     │
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                          │   Technical  │    └──────────────┘
              ┌───────────┤ Presentation │    ┌──────────────┐
              │           │              │────│ Presentation with│
 ┌──────────┐ │           └──────────────┘    │    Q & A     │
 │  Robot   │─┤                                └──────────────┘
 │   Game   │ │           ┌──────────────┐    ┌──────────────┐
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➕ **Robot Performance**

Think → Try → Fail → Improve → Succeed → (cycle back to Think)

Technical Presentation

Judges will ask the team questions about their robot – right from their game strategy to robot design to programing features. It is recommended to have a 5 min technical presentation describing all the aspects of your robot. You must also make a Robot Design Executive Summary with the following indexing. Always ensure that students input the data & you as a coach take the lead to modify it & teach students how to write it technically. Each topic should not be of more than 150 words – majority of it being in pointers. It should be a combination of words & pictures. Judges here may ask you to run one of your favourite routes on the game field in the judging room. Make sure you try to run the most convenient route here – it counts! Following materials are recommended in the technical presentation

1. RDES
2. Programing Book
3. LDD Book
4. Robot Attachments
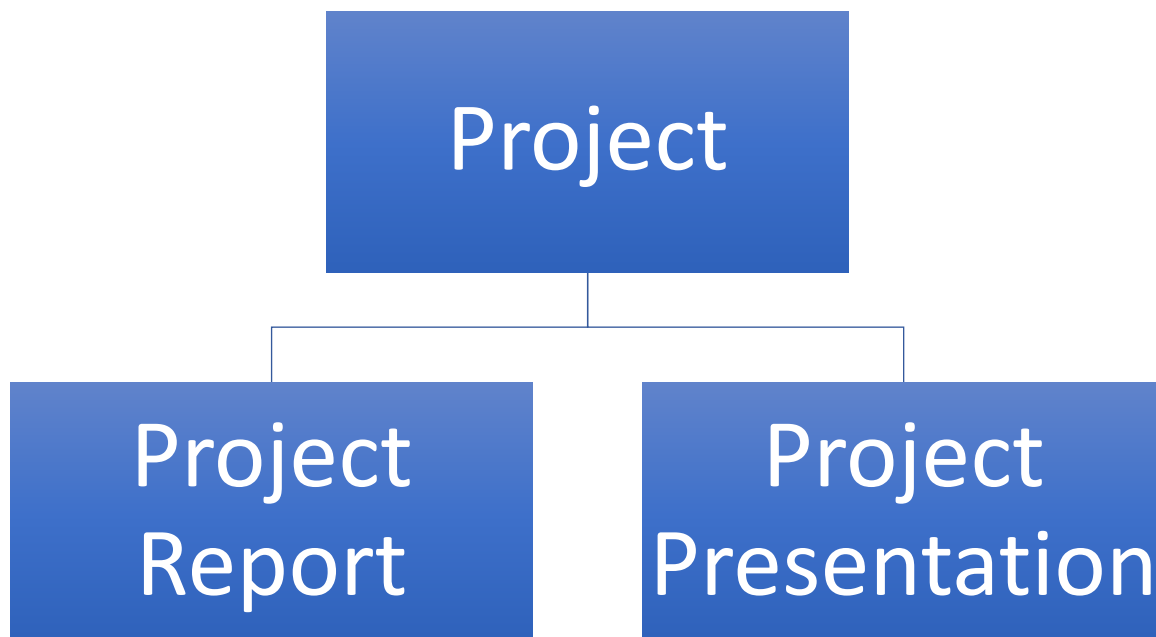
Tips & Tricks for Robot Game

1. Read the challenge document carefully & repeatedly. You & your team must be thorough with the challenges & it`s point system.
2. Have the rule book accessible on the go always. Read the rules thrice carefully before starting the work on robot game.
3. Strategize – seat with the team on the playfield & strategize effectively for your routes.
4. Don`t try to program more than one step at a time.
5. Robot should be sturdy.
6. Optical sensors must be covered properly – ensuring that external factors does not affect it`s performance.
7. Don`t try to work more than 90 minutes at a stretch. If you`re stuck up with the problem, frustrated for more than 30 min – call It a day.

Robot Performance Guide

1. The first step is to divide all the missions on the playfield in 4 P`s & put a sticky note on each mission. This work must be done by the Technical Team under the guidance of the coach. For this to happen effectively – the coach must do this practice on his own & verify everything before giving this activity to the team.
    a. Push
    b. Pull
    c. Pick
    d. Place
2. Dependency of the missions – in an FLL mat, there are always a few missions which are interdependent. List them out for better strategizing.
3. Decide the priority of the missions. Supposing that you will not approach the complete challenge – one must decide the priority of the missions before getting into the strategy. Priority can be decided on the basis of:
    a. Points for the mission
    b. Interdependency on the other missions
4. Finally sit with the team & freeze on the routes of your robot. It is not necessary that you will stick to those routes until end but it is extremely preferable to spend maximum amount of time to make smart routes with extreme scoring. Route can be decided on the following parameters

a. Points scored
b. Interdependency
c. Repeated usage of the attachments
d. More missions covered in a single route

5. Once done with these, your time to build the actual robot starts. It is again divided into following priority list
   a. Chassis Design – This includes
      i. Position & Orientation of Driving Motors
      ii. Position of EV3.
      iii. Type of Chassis – compact or broad.
   b. Position of
      i. Sensors – along with the decision on the kind of sensors to be used
      ii. Additional Motors
   c. Types of additional motors to be used & it`s orientation & position on the chassis robot.

Project Work

Project

Project Report

Project Presentation

Your project report is majorly divided into 3 parts:

Research

- Identifying the problems
- After sound research, narrowing down to a single problem with strong statistics to support.
- Meeting the experts & knowing their reviews on the chosen problem & it`s impact.
- Lookg for the existing solutions
- Find the flaws / showrtcomings of the existing solutiions.

Innovative Solution

- Your unique Solution / Modifying the existing solution to make it more usable.
- Your solution must be
  - Cost Effective --> Easliy available --> User friendly
- Easy to implement
- Must address & solve the problem in the best way

Share

- Share it with official authorities like the Mayor / Commissioner of the city & consider their reviews
- Share & implement it with the respective community - changing their lives in a better way.

Project Presentation

This 05 min of the presentation in front of the panel of judges must be:

a. Creative
b. Interactive
c. Engaging
d. To the point
e. Your presentation must pass this message very clearly & effectively
   i. Problem identified & it`s impact
   ii. Reviewing of the existing solutions to the problem with it`s flaws.
   iii. Your innovative solution
   iv. USP`s of your innovative solution
   v. Your community outreach & showing the fact of implementing it with the community & benefitting them.

Important tips & tricks for project work

1. Identify a real world problem.

Research
- Use a variety of sources here like
  - Books & Magazines
  - Websites
  - Reports
  - Other Resources

Meeting the Professional
- Meet atleast one professional & talk about your reaearch.
- The professional can be - Scientist / Engineer / Local Businessman in that filed / University / NGO who uses challenge topic in their work.

Discuss
- Discuss & analyse the problem that your team finds.

Review Existing Solutions
- This gives your team a chance to understand what is being done currently to solve this problem.
- This will help you improve upon a solution that already exist or create your own brand new innovative solution.

Decide
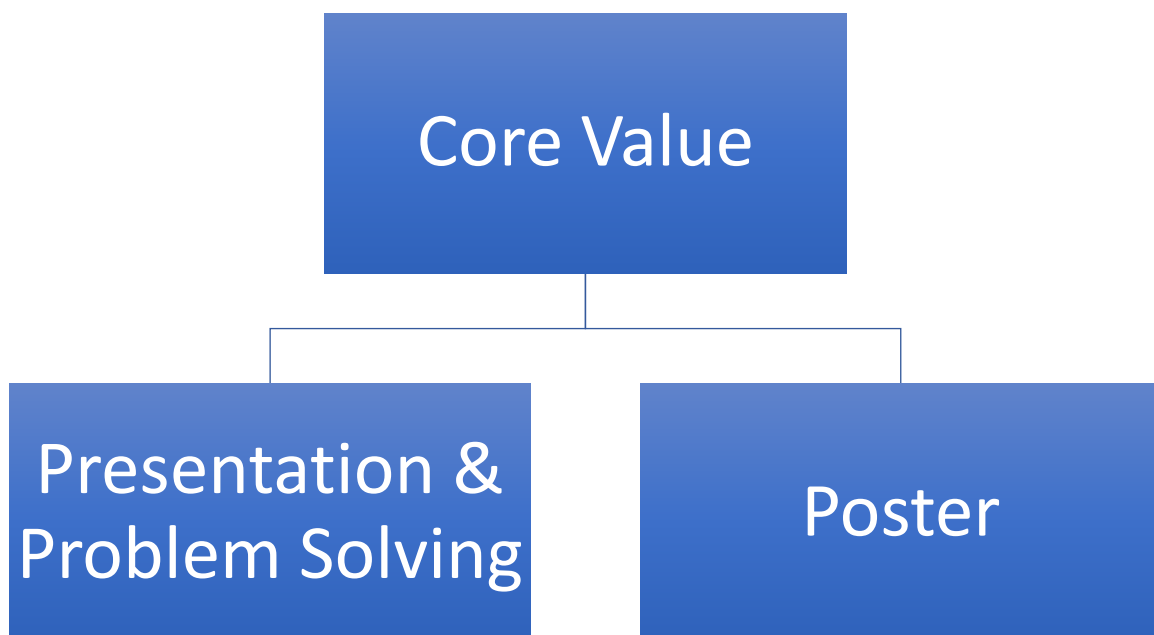- Decide on one problem that your team will try to solve.

Important parameters for making a presentation

1. Decide how to share it with judges – A presentation can be of many types
   a. Formal Presentation
   b. Interview type
   c. Skit
   d. Mime
   e. Dance
   f. Poem
   g. Stories
   h. Plays & many more.
2. Your presentation will not leave a mark until it has exact substance in it & a clear message is passed.
3. Your primary focus must be on – what format will allow the team to show it has met all the requirements.
4. Judges will only consider what you represent in the presentation. Make sure you are clear with the content to be passed to them.
5. Your presentation must not exceed 05 min. Other 05 min are utilized by the judges for QA round.
6. Following materials are recommended for the Project Presentation
   a. Project Booklet
   b. Solution Leaflet
   c. Working solution / prototype

Core Values

They are further divided into two parts. Core values is the heart of the FIRST Competitions.

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                    │   Core Value    │
                    └────────┬────────┘
              ┌──────────────┴──────────────┐
    ┌─────────────────────┐        ┌─────────────────┐
    │   Presentation &    │        │     Poster      │
    │  Problem Solving    │        │                 │
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1. Presentation

FIRST programs focus on 07 core values that must be instilled in a child`s brain so much so that it becomes a habit in their life. The core value presentation is a 02 min of presentation which depicts the sincere application of core values in team as well as Individual`s life with it`s positive outcomes. Again, the presentation can be in any form – song – skit – dance – mime – etc.

2. Problem Solving

After this 02 min of presentation, the judge`s will either go for QA with the team – questions directed towards the team work representation & how effectively have they been following those core values or can give the team a problem or puzzle to solve in 05 min. During these 05 minutes – judges can very well identify how well the team is bonded & how effectively are they using their core values in life.

3. Poster

This core value poster has 04 major segments:

a. Inclusion – What you learnt throughout your FLL journey must be included here.
b. Time Management – How you maintained the balance between your studies & other activities while keeping FLL going.
c. Coopertition (Cooperation + Competition)
d. Gracious Professionalism – Compete while respecting & appreciating each other.

This poster is 4ft * 3ft poster which can be made completely by students or the team can write the content & then can be rendered in the computer with some amazing designs. Be as much creative as you can be, here.

P.S – If you follow this manual completely without giving anything a miss or an excuse – you are certainly going to have amazing outcomes of the season. As a coach, always see how you can take your solution to the next level after the competition – may be by participating in other science events, applying for the patents of the same, etc. It is up-to you & your team how far you wish to go with the seeds sowed. In case of difficulties, always communicate with me directly instead of going through the channels or routes. I`m always accessible on what`s app & email if not anywhere else. Have a wonderful FLL season coaches.

Thanks & Regards

Ashwin Shah.