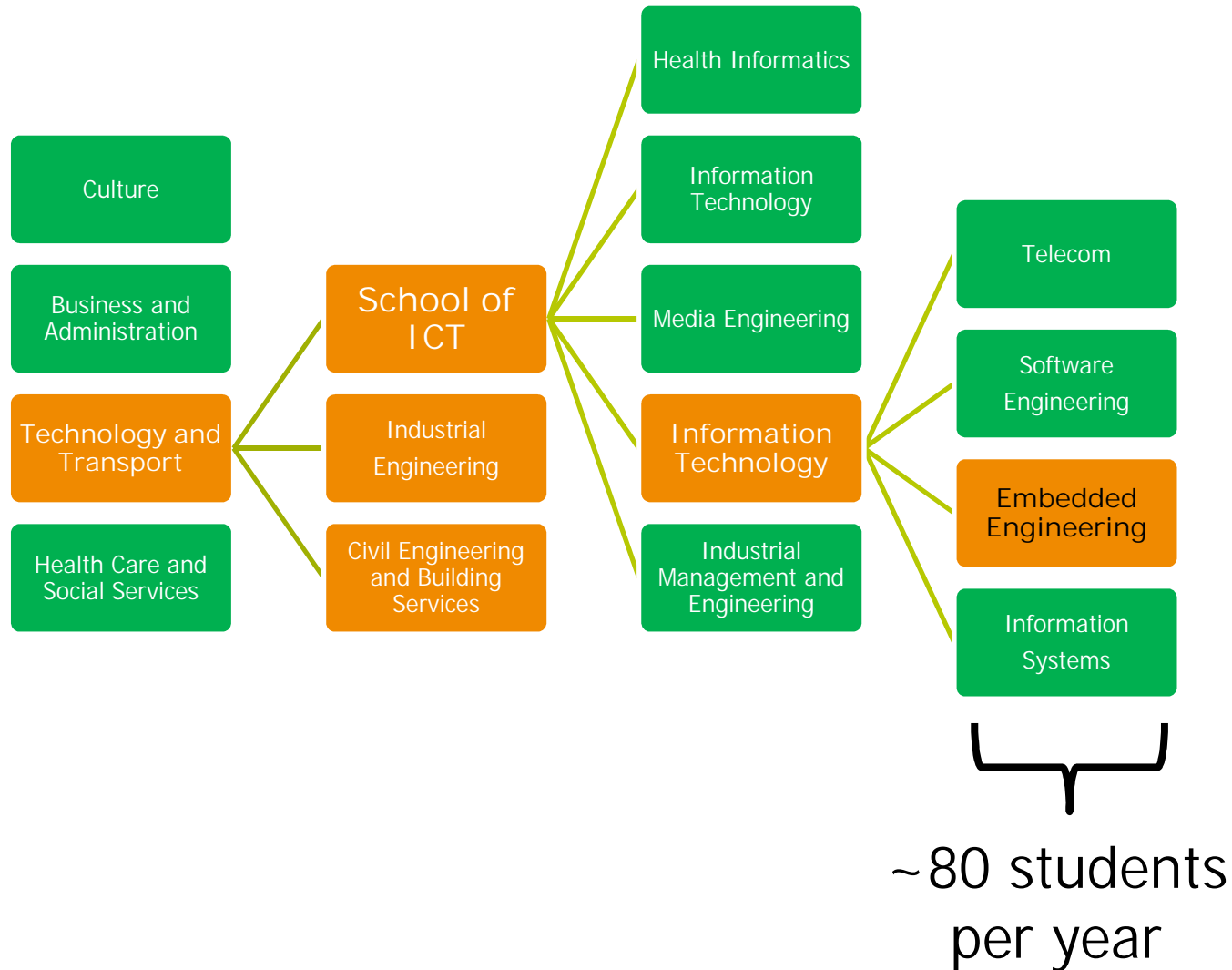




A Follow-up on the Challenge Based Learning project in Embedded Engineering Education

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Information Technology – Embedded Engineering



A fact:

- § Approximately 80 Information Technology students per year
- § 4 Specialisation Options to choose from:
 - § Telecommunications
 - § Software Engineering
 - § Information Systems
 - § Embedded Engineering
- § Fundamental question: How to get more students to choose Embedded Engineering?

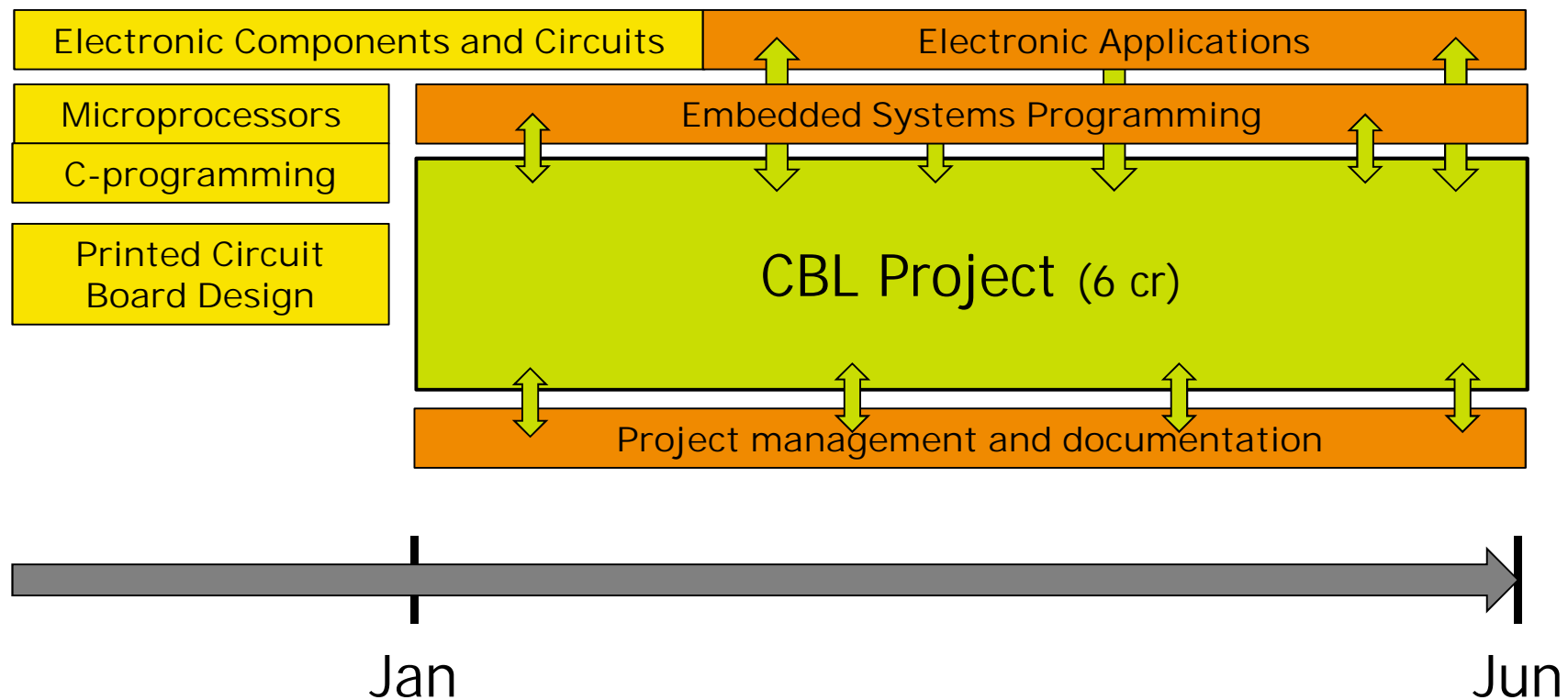


Result:

- § An Introduction to Engineering project during the 2nd year of studies
- § Opportunity to see what embedded engineering is
- § And hopefully grow interest in Embedded Engineering specialisation option
- § Method has proven to be rather successful



Challenge Based Learning Project for 2nd Year Engineering Students, spring semester



CBL - Challenge Based Learning

- § A *Challenge* instead of a problem
 - § Topic is not only to design, build and test an embedded system
 - § Instead the goal is
 - § to design something better, more reliable and more efficient than other project teams
 - § to gain success in the various competitions

➔ Extra motivation and dedication



Topic for academic year 2010 – 2011:

§ Design-Build-Test-Operate a remotely controlled robot

- § Basic building blocks are specified
 - § Motors and a gearbox
 - § CPU + RF communication
- § Sensors (IR, Sonic), basic electrical components and PCB material provided
- § Each team has a 20€ budget for additional components



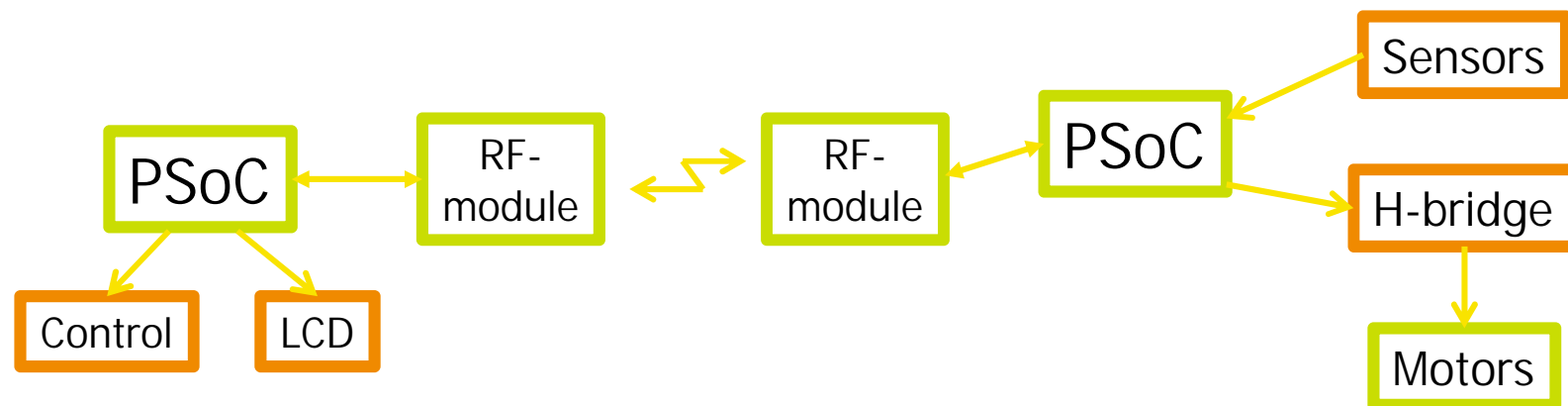
Topic for academic year 2010 – 2011:

§ Specifications:

§ Battery operated

§ Remote control

§ Telemetry, at least two physical quantities



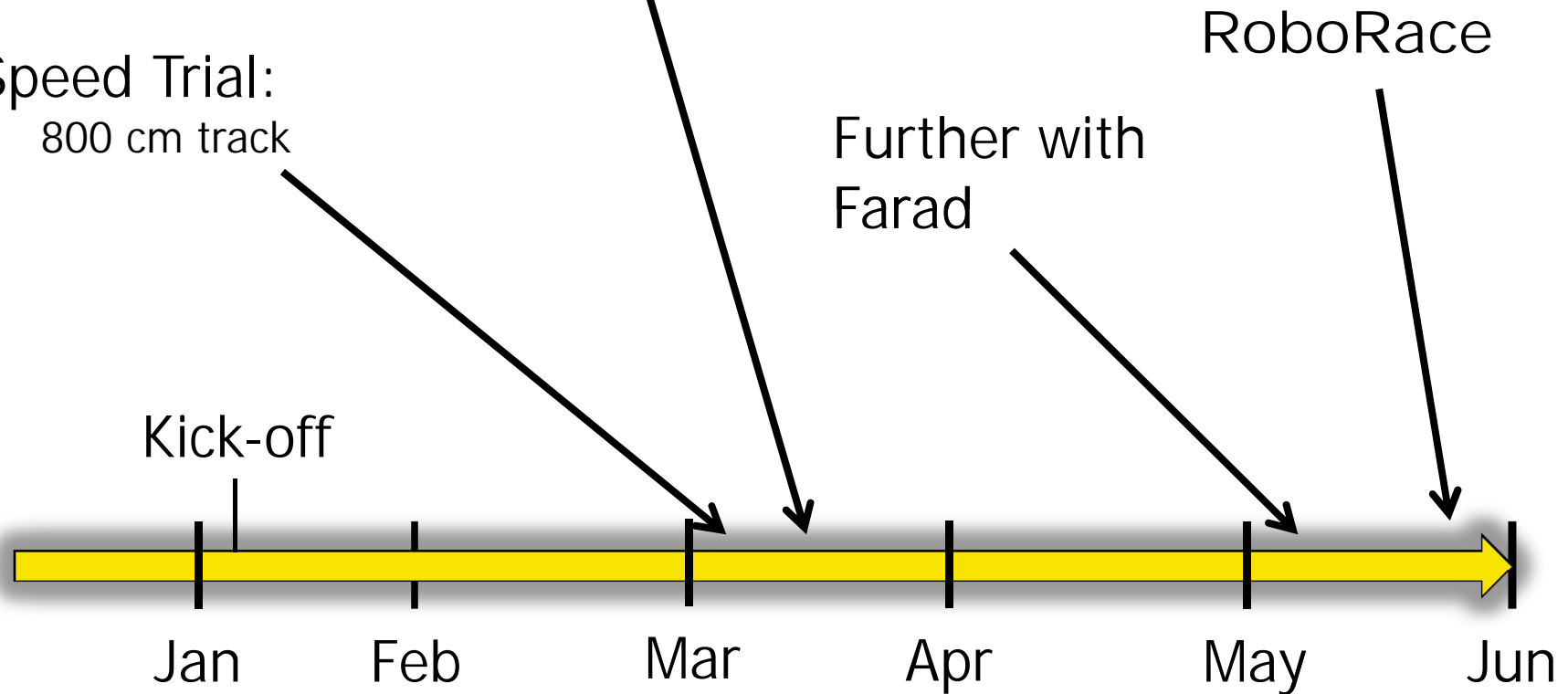
Competitions:

Customer presentation:

- Sell your concept to a R&D manager from Vaisala Oy

Speed Trial:

- 800 cm track



Competitions

§ Speed Race

- § At rather early stage of the project
- § To get project teams started with the development and testing
- § Get the "feeling" of competition

§ Further with Farad

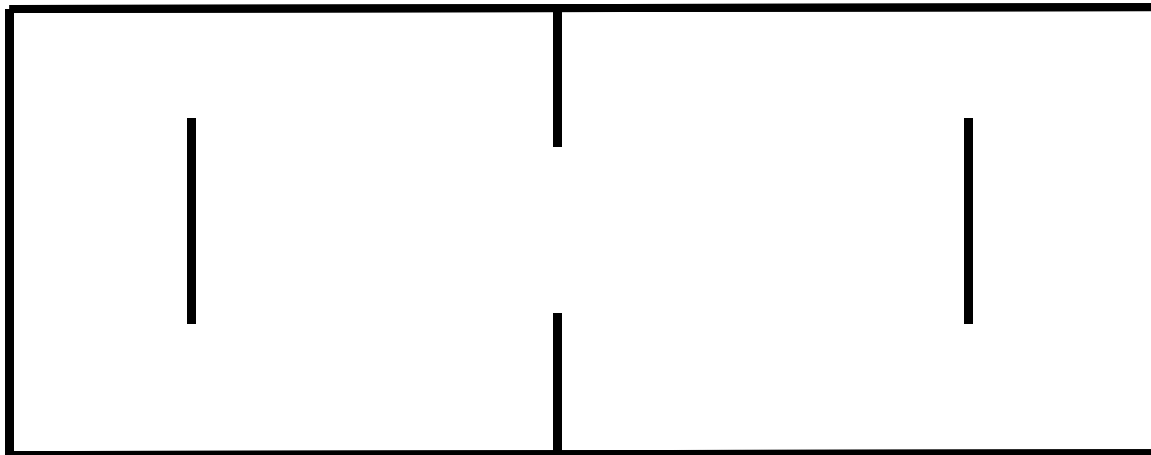
- § A 10F/10V capacitor provided as a power source
- § Competition: which robot runs further with given charge
- § Matter of optimizing the power consumption



Competitions

§ RoboRace

- § A speed race on a predefined track
- § 4 teams per start
- § Track:



Project assessment

- § Based on both success in the competition and the portfolio
- § Total points 5 (=grade)
 - § 0 – 3 points for overall success in the competition
 - § 0 – 2 points for design, documentation and portfolio



Project assessment

- § Effective method to get all team members involved in the project:
 - § Students can make a group decision on how to redistribute the “grade points”
 - § For example, group of three students and grade of 3 can be divided in $(4,3,2)$, or $(5,2,2)$, or even $(5,4,0)$

- § Two teams out of 10 used this privilege



Tips and tricks: Project teams

- § Students may not form the teams themselves
- § Instead: Prior the project each student does a self evaluation

"From 1 to 3 evaluate your interest in the following segments of the project":

- § Hardware design
- § Software design
- § Project documentation and management



Teams are formed to include an "expert" on each segment



Project Implementation: Pros

- § Excellent means to learn
 - § Team working skills
 - § Project management
 - § R&D project
 - § Project documentation and customer presentation



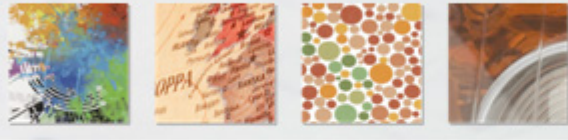
And Cons

- § First R&D project =>
 - § Over ambitious plans
 - § Lack of proper prototyping and testing
 - § Over resourcing => spending too much time with the project
 - § Lack of debugging skills

- § Group size 5 students => too large, problems with team dynamics

- § Project planning





Thank you.

