**Early College and Career Options
(ECCO) High School
Computer Science Department**

Exploring Computer Science
2014/2015 Course Syllabus, Policies, and Schedule

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Course Description
Exploring Computer Science is designed to introduce students to the breadth of the field of computer science through an exploration of engaging and accessible topics. Rather than focusing the entire course on learning particular software tools or programming languages, the course is designed to focus on the conceptual ideas of computing and help students understand why certain tools or languages might be utilized to solve particular problems. The goal of *Exploring Computer Science* is to develop in students the computational practices of algorithm development, problem solving and programming within the context of problems that are relevant to the lives of today's students. Students will also be introduced to topics such as interface design, limits of computers, and societal and ethical issues.

This course was originally developed for students in the Los Angeles Unified School District in an effort to broaden participation in computing district-wide, particularly for girls and students of color. After initial success in Los Angeles, several other districts and states have formally developed school-district-university partnerships to bring *Exploring Computer Science* course to their local high schools. Reaching historically underrepresented students continues to be a major emphasis of this course.

Curricular Approach
Exploring Computer Science teaches the creative, collaborative, interdisciplinary, and problem-solving nature of computing with instructional materials that feature an inquiry-based approach to learning and teaching. As part of this course, students will delve into real world computing problems that are culturally-relevant, and address social and ethical issues while delivering foundational computer science knowledge to students. Students will engage in several in-depth projects to demonstrate the real-world applications of computing.

This curriculum builds off of learning theories that view learning as a social and cultural process that does not only occur in a vacuum at school; that is, students bring to school bodies of knowledge from their lives, culture, and communities. Building from students' prior knowledge, the collection of problem solving skills, and the social and ethical knowledge of computer-related problems will result in a more active curriculum. Each unit connects students' informal knowledge, technology skills, and beliefs about computing to the theoretical and foundational tenets of computer science. Students will become members of a "computing community of practice" in the classroom where they will be introduced to the behavior, language, and skills of computer scientists. Furthermore, the interdisciplinary nature of computing allows for the incorporation of subject-matter topics across disciplines into the computing curriculum.

Unifying Themes and Practices
The individual lessons in this course were developed to reinforce the unifying themes and support the use of the computational practices that we expect students to employ.
The three themes are:

- The creative nature of computing
- Technology as a tool for solving problems
- The relevance of computer science and its impact on society

There are many technological tools that enable people to explore concepts and create exciting and personally relevant artifacts that impact society. In this course, programming is used as one of the tools, but not the only tool. Students are asked to be creative in designing and implementing solutions as they translate ideas into tangible forms. As students actively create, they will also discuss the broader implications of computing technologies.

Assessment and Grading
With the exception of the final projects, there are no specific assessments listed in the lesson plans. We are fortunate to have dozens of volunteers, mentors, educators, industry experts and many other individuals volunteering their time to help our school assess proficiency and readiness for both college and career settings. There is so much more to proficiency than numbers and grades.

There are also very few specific "homework" assignments. Differences in grading policies, types of assessments required, and student schedules make it difficult to gauge the best combination of assessment tools to use in a particular environment. Teachers are encouraged to determine which class activities might lend themselves to some research outside of class and which might make useful assessments. Currently SRI International is developing unit assessment tools as well as summative assessments.

Weights
> Exceptional = 100-90%
> Proficient = 89-70%
> Emerging = 69-0%

Required Texts
To be revealed throughout the course of the class, but we have some phenomenal texts and mind-bending films to explore.

Film Screenings & Documentary Project
We will be viewing many films to help deepen and expand our understanding of texts and concepts explored in class. Film is a powerful vehicle for understanding history, human nature, the importance of tradition and the central place of story-telling in our society.

That said, we wish to share our experiences with the world and are fortunate to be working with talented filmmakers to help us capture and tell our story.

Required Materials

Students must come to class every single day with paper, pens with blue and/or black ink, #2 pencils, notes, appropriate reading materials, student body card, and assignments due on that day. It is important to develop strong habits early in the year and all students will be expected to come prepared to class with all necessary materials.

We are working hard to ensure that every student has access to a computer or other useful digital learning tool. It is important that students bring all school devices to meeting sessions in addition to the old-school materials mentioned before. Though we are a cutting-edge tech program we still learn the value of the pencil and paper when delivering electricity to our beloved devices is not an option.

Classroom Rules
1. Come prepared to learn.
2. Come willing to learn.
3. Help others learn.

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Projected Schedule of Study – 40 Weeks + Summer Trip

Prologue – *September 15th – 26th*

1. The Bubble World / State of the Human World (September 15-19) ONE WEEK
   a. Critical period. There will be no outside contact with students. This is a very important formative period when we will be seeking our best candidates for this team.
   b. Human starvation statistics
   c. Survey of 20th century history
   d. Education statistics and discussion
2. History of Human Technology (September 22-26) ONE WEEK

ONE - Human Computer Interaction – *September 29th – November 7th*

3. Introduction to Exploring Computer Science (September 29 – October 3) ONE WEEK
4. Project Intent Phase – Define purpose, vision, goal: (October 6 – 17) TWO WEEKS
   a. Development and production of electric vehicle (Arcimoto SRK-DN for use in developing nations. Arcimoto team will mentor students through process of reconfiguring existing generation 6 prototype drive train and battery system for easy incorporation into developing nations and regions with a very high priority on low cost, ease of repair/service, and resilience.
   b. Integration of state-of-the-art water filtration and purification system from AquaDrop into the Arcimoto SRK-DN concept vehicle.
   c. In-depth exploration of 21st century technology infrastructure including organic food production and preservation practices, stream restoration,

geothermal power, light technology, home rehabilitation and restoration skills and community building in both urban and rural contexts.

5. Define Constraints – (October 20 – 24) <mark>ONE WEEK</mark>
   a. Technical
   b. Sociological
   c. Economic
6. Assumption Validity Phase (October 27-31) <mark>ONE WEEK</mark>
   a. Verify the list of constraints.
   b. Determine whether real and valid
7. Customer Development Phase (November 3-7) <mark>ONE WEEK</mark>
   a. Market Research – who is the first customer?
   b. Market Research – what is their ability to pay?
   c. Market Research – what are the customer's expectations/aspirations?
   d. What problem are we solving for the customer that they will invest?

TWO – Problem Solving – November 10th – December 19th

8. Concept Generation Phase – (November 10-26) <mark>THREE WEEKS</mark>
   a. Vehicle Design
   b. Hone Message & Mission Statement
   c. Concept Sketches
   d. Mock-ups
   e. Elementary and Middle School Drawing Contests (based on SRK chassis)
   f. Keep it loose, fun, informal.
   g. Keep it exciting, positive, open and do not offer direct negative criticism!
9. Creative Insight, Genius, Synergy Phase (December 1 – 5) <mark>ONE WEEK</mark>
   a. Link the vision of the customer (education system) to the solution (meaningful tasks giving students genuine experiences and education)
   b. Make this a week to share our successes and film. The idea is that we will release an update to the public during winter break for all to see and be thankful.
   c. Make this concept a bright spot for humanity. The Three Essentials
   d. Inspire what is possible
   e. Make connections that others have failed to see
   f. Embrace your inner potential
10. Proof of Concept Phase (December 8-19) <mark>TWO WEEKS</mark>
    a. List possible solutions and evaluate
    b. First public presentation. Expose your solution to everyone. (First public unveiling of student SRK-DN designs and discussions of technology)
    c. Focus group study (Coexist & LA8) + Steering Committee
    d. Open to additional insight and input
    e. Let the public, customer, and stakeholders poke holes in our ideas.
        i. The stakeholders are the people that primarily funded the project, and have a financial and metaphysical stake in the success of the venture.
    f. Ask questions:

      i.   Has this been done before?
     ii.   If so, why did it fail?
    iii.   What makes our concept valid today?
    iv.   Let this phase rock our worlds, let the depression unfold, but realize that everything worth doing is hard and we are pioneers of 21st century humanitarian technology. It is wroth it!

==WINTER BREAK – December 20th – January 5th==

THREE – DESIGN – January 5th – February 6th

11. Fine Tuning Phase (January 5-23) ==**THREE WEEKS**==
    a. Redesign.
    b. See above steps 1-7 (back to the drawing board to necessary extent)
    c. Don't give up! Don't go forward until we nail intent – conceptually
    d. Give team a tight deadline! Human creativity requires pressure
    e. The real genius will show up in this phase and we will feel it wholly.
12. Time to Shine Phase (January 26 – February 6) ==**TWO WEEKS**==
    a. Final concept presentation
    b. Be bold and unapologetic in our solution (make "them" believers)
    c. Solidify concept with renderings and demonstration models and remember to make it dramatic!
    d. Create the "myth" that is going to feed the imagination of our customer and propel the project through the really tough stuff to follow.

FOUR – Engineering & Advanced Design – February 9th – April 3rd

13. Initial Engineering Phase (February 9-27) ==**THREE WEEKS**==
    a. Scale drawings (CAD Models)
    b. Initial list of supply chain partners
    c. Bill of materials (BOM) generated
    d. Cost Projections
       i. Accurately detail to financial team the projected cost of the product development costs as well as the projected whole business development cost (i.e. CapX. costs to start the business or business unit within the existing business). Business development team should have all they need at this point to write the Business Plan.
    e. Performance projections
    f. "Embrace your inner geek"
14. Making it Real / Making Tough Choices Phase (March 2-13) ==**TWO WEEKS**==
    a. Trade-offs and Compromising
    b. Assess initial cost data
    c. Assess initial performance data
    d. Assess engineering model relative to initial intent (95% rule)
       i. Assess whether the engineering phase of the project is resulting in a design plan that is at least 95% of the goal. Do not proceed until

we seriously question whether the essence of the intent is still present. If not, re-challenge the engineers to inject more creativity. If that still does not lead to a 95% result, re-assess initial list of constraints, and revisit steps 4-8. Note the other 5% can be recaptured in the second iteration of the project, once projection is underway. The most important part of this step is to find a way to get to market with a near perfect result. Note this is not mediocrity, it is business pragmatism. Perfection (100% of the intent): a) is not possible nor desired (we need a carrot/incentive to keep inventing), and b) can only be nearly achieved once the product is in the customer's hands.

15. Final Engineering Phase (March 16 – April 3) ==THREE WEEKS==
    a. Operational engineering
    b. Full engineering documentation of the build (drawings to build from)
    c. Full specification documentation of the purchased parts
    d. Structured BOM created for cost and project tracking
    e. Fabrication and supply chain partners solidified

==*Spring Break – March 23 - 27*==

FIVE – Introduction to Creating – April 6th – May 15th

16. Prototype Building Phase (April 6 – May 1) ==FOUR WEEKS==
    a. Functional prototype build
        i. MUST HAVE AQUADROP TECHNOLOGY WELL UNDERSTOOD BY WATER TEAM.
        ii. HAVE LIGHTING TEAMS AND AESTHETICS TEAM SELECTED BY THIS TIME
    b. Convert engineering documentation to parts
    c. Procure all purchased parts (issue POs)
    d. Fabricate production tooling and molds needed
    e. Fabricate prototype
17. Prototype Testing Phase (May 4 – May 15) ==TWO WEEKS==
    a. Run the prototype through its paces
    b. Establish testing ground both in urban limits and in rural setting.
    c. Try to emulate terrain similar to that which we will encounter on our mission. Do the research.
    d. Evaluate performance and if needed revisit steps 15 and 16
    e. Evaluate manufacturability and production steps
    f. Detail voids in production planning, i.e. missing tooling, missing supply chain partner, missing assembly, human resources
        i. Reassess the accuracy of the Business Plan CapX. Projections.
    g. Schedule official launch date (tell the stakeholders/customers when it will be ready for purchase, or in this case, confirm that we can as a matter of fact take this vehicle across the world on schedule for Summer 2015.

SIX – Share Accomplishments with the World – Mary 18th – June 19th

18. Completion of Product Development Phase (May 18 – June 19) <mark>**FIVE WEEKS**</mark>
    a. Product launch
    b. Have a party
    c. Launch volume production (our solution, our intent to the masses)
    d. School ends June 19th.
        i. *Subject to change depending on snow days*
19. Beavers Without Borders Trip?
    a. <mark>**SUMMER**</mark> *(true work never ends…)*
    b. Take vehicle to a community in need and truly test the technology for its given purpose and utility. Documentary culminates with a TED talk given by a student or students looking back on the year at ECCO.
    c. Students come in struggling and leave prepared and happy.