CAREER TECHNICAL EDUCATION

COURSE TITLE/CODES:	Robotics 5.5	
RECOMMENDED PREREQUISITES:	None	
LENGTH OF COURSE/CREDITS:	Three terms (trimester)	2.5 credits per term
GRADE LEVELS:	9, 10, 11, 12	

I. COURSE DESCRIPTION

Robotics 5.5 provides students the opportunity to work in a FIRST Robotics teams to design and build a 120 lbs robot and compete in competitive robotics worldwide. The course will follow the engineering design process, robot fabrication focusing on the importance of integrating programming, sensors, controls, electronics, pneumatics, gears, sprockets and pulleys, horsepower, strategies, dynamics, and multi-robot systems. Students will fabricate and program the robot in the lab and out in the field of competition in the pit, and test the robot systems while following the iterations process to improve the robot to meet the game challenge. Students will mentor other teams in FIRST Lego, FIRST Tech Challenge, FIRST Robotics Competition, or FIRST Global Challenge, which they find and are committed too. Students will conduct outreach to provide awareness to youth and the community. Students will design, create and manage an outreach of their own. The course culminates in a final project where students as a team designs, builds and program a robot for a series of regional FIRST Competitions, the World Championship and outreaches. This course meets PUSD elective credit.

II. COURSE GOALS

A. Robot Fabrication skills, not limited to:
   a. Understand electronic symbols (resistors, Capacitors, Diodes, Switches, Transformers, and Batteries), the properties of parallel and series circuits.
   b. Solder wires to resistors, batteries, switches, etc.
   c. Demonstrate mastery of the circuitry
   d. Understand drafting (CAD) and the fundamentals of scaling.
   e. Master the use of power tools and machinery.
   f. Work together to fabricate a robot for competition.
   g. Understand how different components (Batteries, muti-controllers, motors, gears, and wheels) interact with each other in unison.
   h. Master construction of a functioning robot with hand tools (screw drivers, Allen wrenches, regular wrenches, and fasteners).
   i. Master installing motor mounts and bears for wheel adjustments.
   j. Understand how different gear ratios and wheels will the affect the movement of the robot and understand the laws of physics and friction that is applied to the robot.
   k. Master mounting a wireless receiver on the robots muti-controller, as well as, mounting a wireless transceiver on to a controller.
   l. Understand how wireless-controllers work and their applications in the world.
   m. Master the understanding of sensors, what they are, and the role it plays on our everyday life.
   n. Identify two types of sensor constructions.
   o. Master construction of switches and servo-motors that will give the robotic arm its mobility.
   p. Understand the mechanics, physics, torque that the arm applies to itself and to the object it is maneuvering.
   q. Demonstrate mastery of gear ratios that will help improve the torque of the arm.

A. Programming:
   a. Master programing language that will function with driving and sensors to complete the objective.
   b. Demonstrate mastery of computer programing

B. Mentoring:
   a. Students will mentor two teams in FIRST Lego, FIRST Tech Challenge, FIRST Robotics Competition, or FIRST Global Challenge, which they find and are committed too.

C. Outreach:
   a. Students will plan, organize and conduct an outreach to provide awareness to youth and the community. Students will organize their outreach with at least 3 other volunteers to develop outreach leadership skills.

D. Documentation:
    a. Write a reflective journal weekly on their accomplishments and their newly acquired knowledge/skills.
    b. Complete detailed lab reports.
    c. Students will write essays and answer questions to complete award submissions
E. Entrepreneurship:
    a. Students will participate in entrepreneurship activities by working with sponsors and business.
F. Communication:
    a. Students will communicate with other robotics teams, businesses and organizations to learn how to communicate professionally, and follow a professional model in all forms of communications.
G. Leadership:
    a. Students will learn to take initiative and develop leadership skills through taking on leadership roles on the team such as mentor a team and conduct outreach and specific roles such as executive roles or leads.
H. Competition:
    a. Student will compete in at least two competitions through the season to demonstrate and learn skills in a high stakes competition environment.
I. Participation/Attendance:
    a. Students will complete at least 20 hours in class (seat time) to fulfill the 5.5 attendance requirements. They will also attend specific events such as robotics events and outreaches we run as a team, including the Poway Parade and Saturdays during the build season. Students that miss too much time or a Saturday during the build season will have the opportunity to complete a makeup that is similar to what they missed.

III. COURSE OUTLINE

A. Robot Fabrication skills
    a. Drivebase
    b. Electricity
    c. Engineering Design Fundamentals
    d. Construction of Robots
    e. Wireless Interfacing
    f. Sensors
    g. Arms and End Effectors
    h. Competition Robot Capstone Project
B. Programming
C. Mentoring
D. Outreach
E. Documentation
F. Competition

IV. BASIC AND SUPPLEMENTARY TEXTS

A. On-line curriculum provided by FIRST with supplemental curriculum from teams

V. INSTRUCTIONAL METHODS

A. Teacher lecture
B. Presentations
C. Class discussion with a computer projector, using slide show software with visuals downloaded from the internet, a collection of slides, images, and a LCD projector.
D. Students discuss, compare/contrast and identify.
E. Project-based work with individual instruction (self-directed, cooperative, and collaborative learning opportunities to increase responsibility of students for their own learning)
F. Reading through Engineering Journals
G. Tests and quizzes (tests are short answer and essay, slide identification, sketching of architectural terms)
H. Class games for vocabulary instruction
I. Field trips to industry, schools, and sites of interest, competitions
J. Peer tutoring
K. Library and Internet research
L. Engineering Notebooks

M. Individualized instruction

VI. ASSESSMENT METHODS AND/OR TOOLS

A. Formative assessments
   1. Tests / Quizzes
B. Summative Assessments
   1. Presentation/Public Speaking assessments
   2. Free-response assessments
   3. Student / Teacher Conferences
C. Homework and Structured Class Work
D. State Standards
E. Projects