Linwood Holton Governor's School Syllabus

Introduction to Robotics
Spring 2009

Instructor: Dr. Steve Rapp

Location: Southwest Virginia Higher Education Center, second floor

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My Web Site: http://steverapp.pageout.net/

Textbook: ***Robotics, Introduction, Programming, and Projects,*** **James L. Fuller, Prentice Hall, 1999;** ***Stiquito for Beginners, An Introduction to Robotics,*** **James M. Conrad and Jonathan W. Mills, IEEE Computer Society, 1999**

Computer Requirements:
IBM compatible, 300 MHz processor, 128 Meg of RAM, 1 Gigabyte Hard drive space, 56 K modem (cable modem or T1 line preferable)

Other Materials:
Scientific Calculator, Windows 98 or later, ILink 7.0, Microsoft Word 97 or later, Microsoft Excel 97 or later, sharp nose pliers, 9-volt battery, wire cutters, X-Acto knife, millimeter ruler, two AA batteries and holder, Stiquito robot, Vex Robotics Lab Kit, Mobile Robot Kit, and other materials TBA.

Course Delivery:
This course will be taught via the Internet using interactive audio. Tests will be administered on-line and homework will be collected via email.

Event Schedule:
For detailed information on weekly schedule and assignments contact: http://www.hgs.k12.va.us or Pageout Announcements at http://steverapp.pageout.net/ .

Policies:

Prerequisites: Algebra I, Introduction to Engineering, or permission of Instructor

Unexcused absences: Students who miss class without prior approval of their instructor will receive a grade of zero on the missed in class assignment.

In Class Assignments: All in class assignments must be completed by the end of the class period and emailed to the instructor. It is the discretion of the instructor to grant additional time if deemed necessary.

Assignments: All assignments must be completed on time and turned in by the due date. ASSIGNMENTS WILL BE ACCEPTED UP TO 3 DAYS LATE, BUT THERE WILL BE A PENALTY OF 10 POINTS FOR EVERY DAY LATE. THIS MEANS THE MAXIMUM SCORE THAT CAN BE RECEVIED IS 70%. AFTER 3 DAYS A GRADE OF ZERO WILL BE RECORDED. It is the discretion of the instructor to grant additional time if deemed necessary.

Academic Dishonesty: Collaboration on examinations, in class assignments, and homework assignments is forbidden except where specifically specified as "Team" activities. In general, one team may not collaborate with another team on "Team" activities. Students violating this policy will be subject to disciplinary action and a failing grade in the class.

Grading System: The regular university grading scale will be use:
90-100 = A; 80-89 = B; 70-79 = C; 60-69 = D; 59 or below = F.

Objectives of the Course

- **Excite the student about robotics.**
- **Provide a strong foundation in robotics fundamentals.**
- **Cultivate problem-solving skills.**
- **Challenge students.**
- **Provide reference material.**
- **Introduce the robotics design and development process.**
- **Emphasize the importance of communication skills.**

Curriculum Framework

- **What is a Robot?**
  - **Robotics – the study of robots**
  - **Industrial automation and robots**
- **The History of Robots**
  - **The value of studying the history of robots**

    - **Key events in the history of robots**
- **Components of an Industrial Robot – Part I**
    - **General characteristics of an industrial robot**
    - **General components of an industrial robot**
    - **Manipulator configurations and power supplys**
- **Components of an Industrial Robot: Part II**
    - **Control units**
    - **Operating methods of robot control units**
- **End-of-Arm Tooling**
    - **Grippers and human hands**
    - **Characteristics of end-of-arm tooling**
    - **Calculating gripper payload and gripper force**
- **Sensors**
    - **The role of sensors**
    - **Interfacing natural signals to digital controllers**
    - **Sensor areas for robots**
- **Applications for Industrial, Business, and Domestic Robots**
    - **Using robots**
    - **Industrial applications of robotics**
    - **Business use of robots**
    - **Domestic robots**
    - **Military robots**
    - **Other experimental areas of robotics**
- **Robot Maintenance**
    - **Preventive maintenance**
    - **Emergency maintenance**
    - **Maintenance and safety**
- **Robotics and Safety**
    - **When to consider robotic safety**
    - **Levels of danger**
    - **Robot power supplies**
    - **How robots injure people**
    - **A safety case study**
- **Artificial Intelligence**
    - **What is artificial intelligence?**
    - **Expert systems**
    - **Learning to understand human language**
    - **Interpreting sensory inputs**
    - **Intelligent tutoring systems**
- **Classification of Robots**
    - **Classification by arm configuration**
    - **Classification by controller**
    - **Classification by power supply**
    - **Classification by level of technology**
    - **Classification by tasks done**
    - **Classification by design**

    - **The LERT classification system**
- **Justifying the Use of Robots**
    - **Assessing the area's need for a robot**
    - **Justifying the cost of robots**
    - **Disadvantages of robot labor**
    - **How people react to robots**
- **The Future for Robots**
    - **Guessing at the future**
    - **Robotics at present**
    - **Short-term future for robots**
    - **Long-term future for robots**
- **Building Your Own Robot**

Tentative Test Schedule	
Chapter 1	January 23
Chapter 2	January 30
Chapter 3	February 6
Chapter 4	February 13
Chapter 5	February 19
Chapter 6	February 26
Chapter 7	March 5
Chapters 8 & 9	March 12
Chapter 10	March 26
Chapter 11	April 6
Chapter 12	April 15
Chapter 13	April 22

Major Projects: Tentative Work Time and Completion Dates	
NASA Aeronautics Project	TBA
Build Your Own Robot Mobile Robot	In Class Work Time: April 23-28 Report To Be Turned In: April 29
Build Your Own Robot Stiquito	In Class Work time: April 29-May 4 Report To Be Turned In: May 5
VEX Robots	In Class Work Time: May 6-14 Report To Be Turned In: TBA
Manna: Future Use of Robots	Repot Due May 15 ?