Robotics

Name _____

Robotics is technological field focused on the specification, design, implementation, and use of robots. Included in the field are the embedded processors used by the robots for sensing their surroundings, processing signals and data, and controlling the robot. Robots come in many shapes and forms and may have some human characteristics such as limited reasoning, behaviors, or appearance. They are used in a wide variety of applications such as manufacturing, interaction with humans, surgery, bomb disposal, and other applications in environments too harsh for humans.

Do all of the following requirements (1-2)

_____1. Explain the role of each robotic subsystem listed below and describe three different example subsystems for each subsystem:

_____a. Power

_____b. Actuation

_____c. Sensing

_____d. Manipulation (end effectors)

_____e. Locomotion

_____2. Explain the role of the processing subsystem and do the following:

_____a. Describe three different methods of human robot interaction.

_____b. List three sensors used for robot navigation.

_____c. Explain the levels of autonomy for robot control systems using one of the several current classification conventions.

Do six requirements (3-17) with at least one Project and two from Technology

Project (Do at least one)

_____3. Using a robotics kit or system, do the following:

_____a. Define requirements of what you want your robot to do.

_____b. Design the robot by making configuration sketch or list for the robot kit components and a list of steps for the program to do.

_____c. Build and program the robot.

_____d. Test the robot to verify that it meets the specified requirements.

_____e. Demonstrate the working robot for your Mentor.

_____4. Participate in an after school robotics program or competitive league for a season or school year and report to your Mentor what robotics activities you participated in.

_____5. Using an Arduino microcontroller, make robotics project of your choice that is approved by your mentor.

Technology (Do at least two)

_____6. Explain what is meant by robotics degrees of freedom. Research and prepare a presentation explaining two different robot arms. Give examples of where the types are used and include pictures.

_____7. Research and explain the seven degrees of freedom of the human arm. Teach a younger Unit or Patrol how to distinguish each of the yaw, pitch, and roll degrees of freedoms and which of those each joint in the arm has.

_____8. One type of end effector for the manipulation subsystem is a robotic gripper. Define the four types listed below and show an example for each kind including a picture and description of operation for each.

_____a. Impactive

_____b. Ingressive

_____c. Astrictive

_____d. Contigutive

_____9. Report on five different end effectors for the manipulation subsystem that are not robotic grippers. Show an example for each one including a picture and description of operation.

_____10. Define artificial intelligence in the context of robotics. Do some research and find out how far we have come in developing artificial intelligence. Explain this to your unit or family.

Professional Activities

_____11. Attend a robotics competition or trade show. Report on what you learned.

_____12. Visit a factory that uses robots. Report the following:

- _____a. If the tasks were previously performed by humans
- _____b. Specific type of each of the five subsystems in the robot (see requirement 1)
- _____c. Inputs the robot senses
- _____d. Decisions the robot makes
- _____e. Actions the robot does

_____13. Research two famous engineers in robotics and report what engineering degrees these engineers earned, their major accomplishments, and what organizations they led or for which they performed significant engineering.

_____14. With a parent, attend a meeting of a local professional engineering society in your locality related to robotics. List any scholarships or special opportunities for youth and young engineers that the Society may sponsor.

_____15. Modern engineering specialties related to robotics include aerospace, biomedical, computer, control systems, electrical, electronics, industrial, mechanical, mining, naval architecture and marine, software, systems, and transportation engineering. Choose two specialties you have not used for another Science and Technology Trail Badge and do the following:

- _____a. Describe what type of work is done in those two engineering specialties and how the work of those two specialties is related.
- _____b. Choose one specialty, and explain the education, training, and experience required to serve successfully in that profession.

_____16. Note: This requirement is listed in multiple Trail Badges, but may only be used for one Trail Badge. Explain what it means to be an Engineer Intern and a Licensed Professional Engineer. List the requirements to become a Licensed Professional Engineer in your state.

_____17. Note: This requirement is listed in multiple Trail Badges, but may only be used for one Trail Badge. Read the Code of Ethics or Professional Conduct for Professional Engineers for your state (or NSPE Code of Ethics for Engineers if your state does not have one). One role of the engineer is providing society with accurate facts in order to make the best possible decisions.

_____a. Explain how the code you read relates to the Trailman Oath and good stewardship.

_____b. List possible consequences to the public if an engineer does not follow this Code.

Trail Badge Mentor Signature _____ Date _____