Enhancing Introductory Courses with Hands-on Projects

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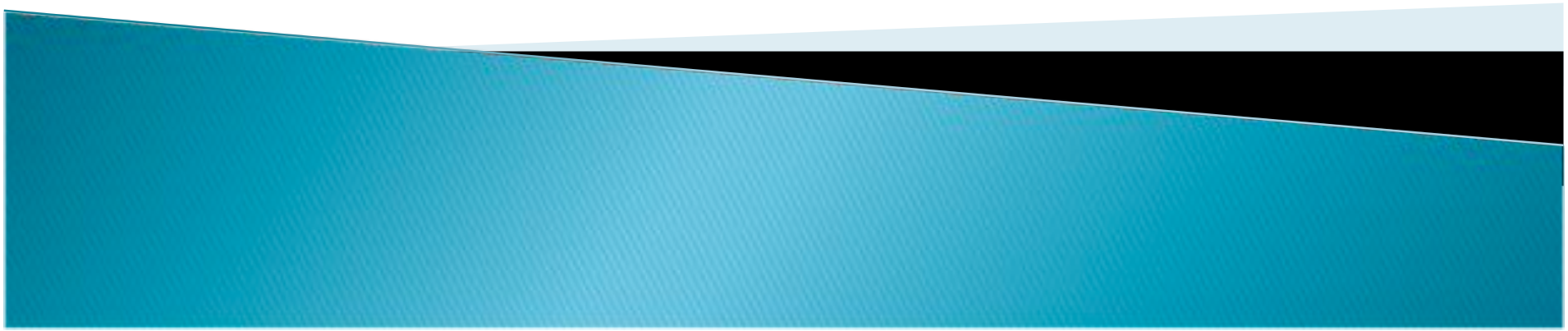
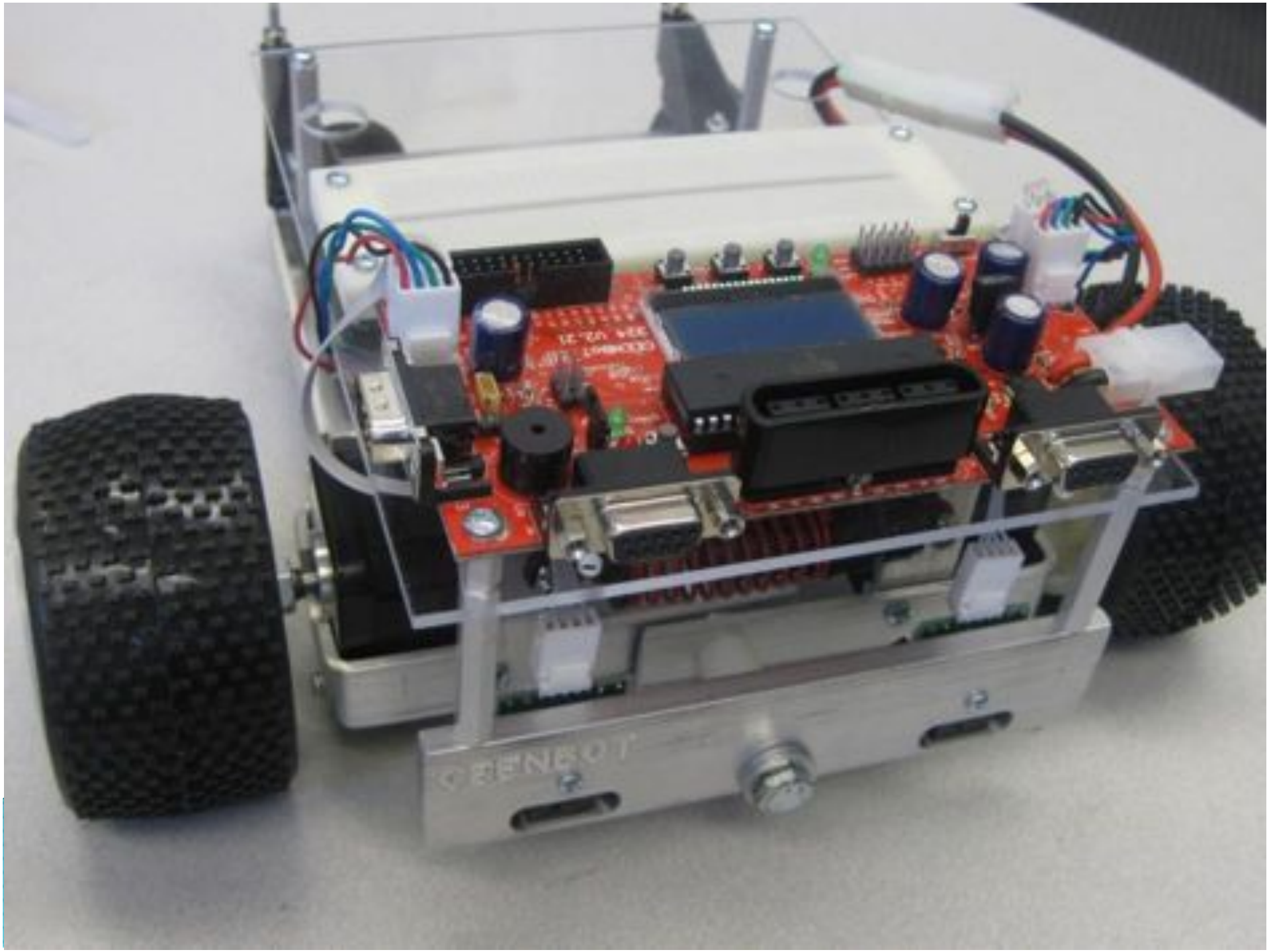


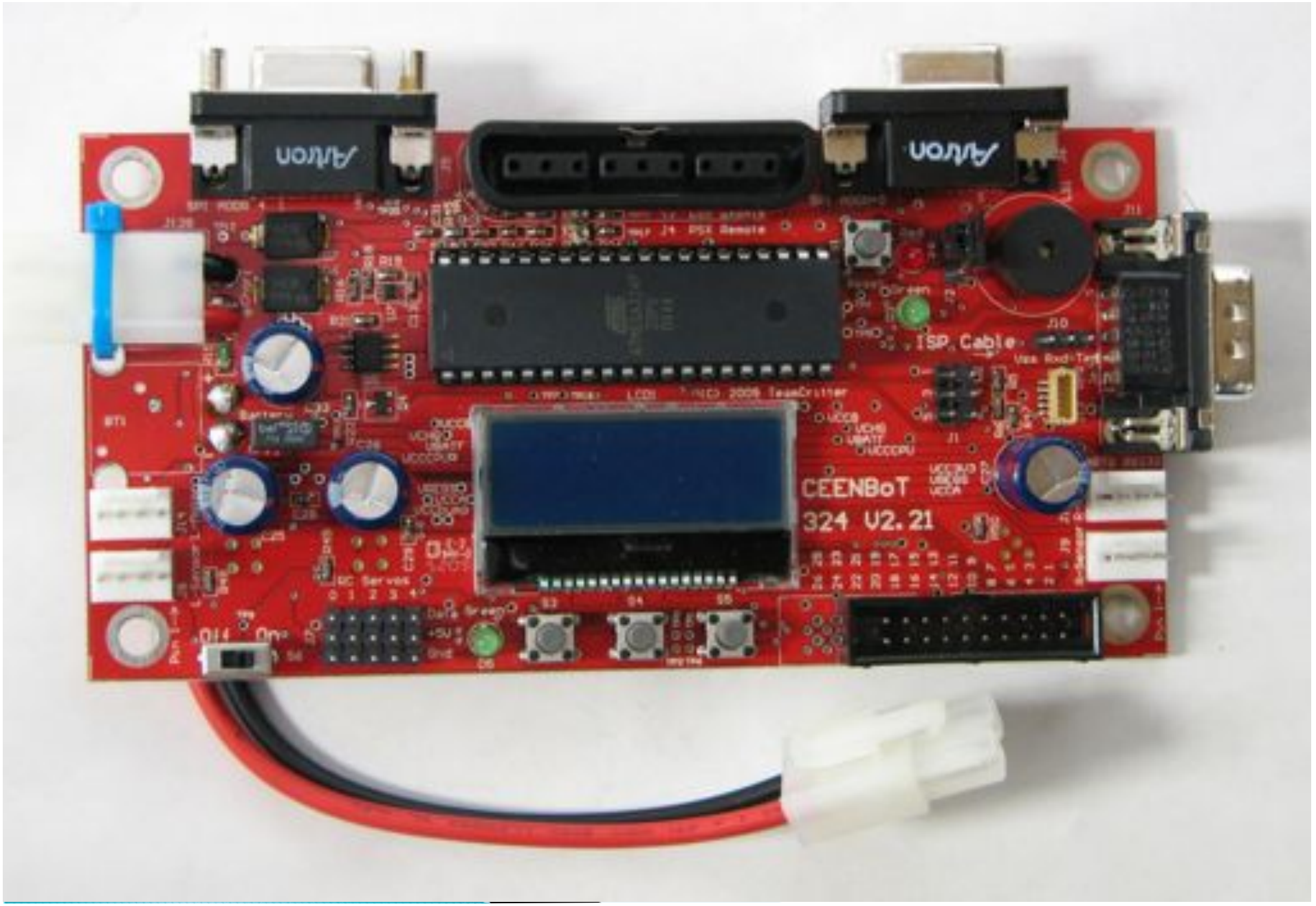
Objectives

- Cooperate with UNL-CEEN
- Provide building/assembly experience
- Develop teamwork and supporting skills
- Expose students to programming
- Develop written/oral communication
- Actively engage students

Cooperation and Consistency

- UNL CEEN – Peter Kiewit Institute, Omaha
  - National Science Foundation (NSF) grant
  - CEENbot kits
  - Students use in all 4 years and in class
- WNCC
  - Intro to Engineering – build CEENbot
  - NSF Scholarship class – program CEENbot
  - Extensive support from UNL-CEEN



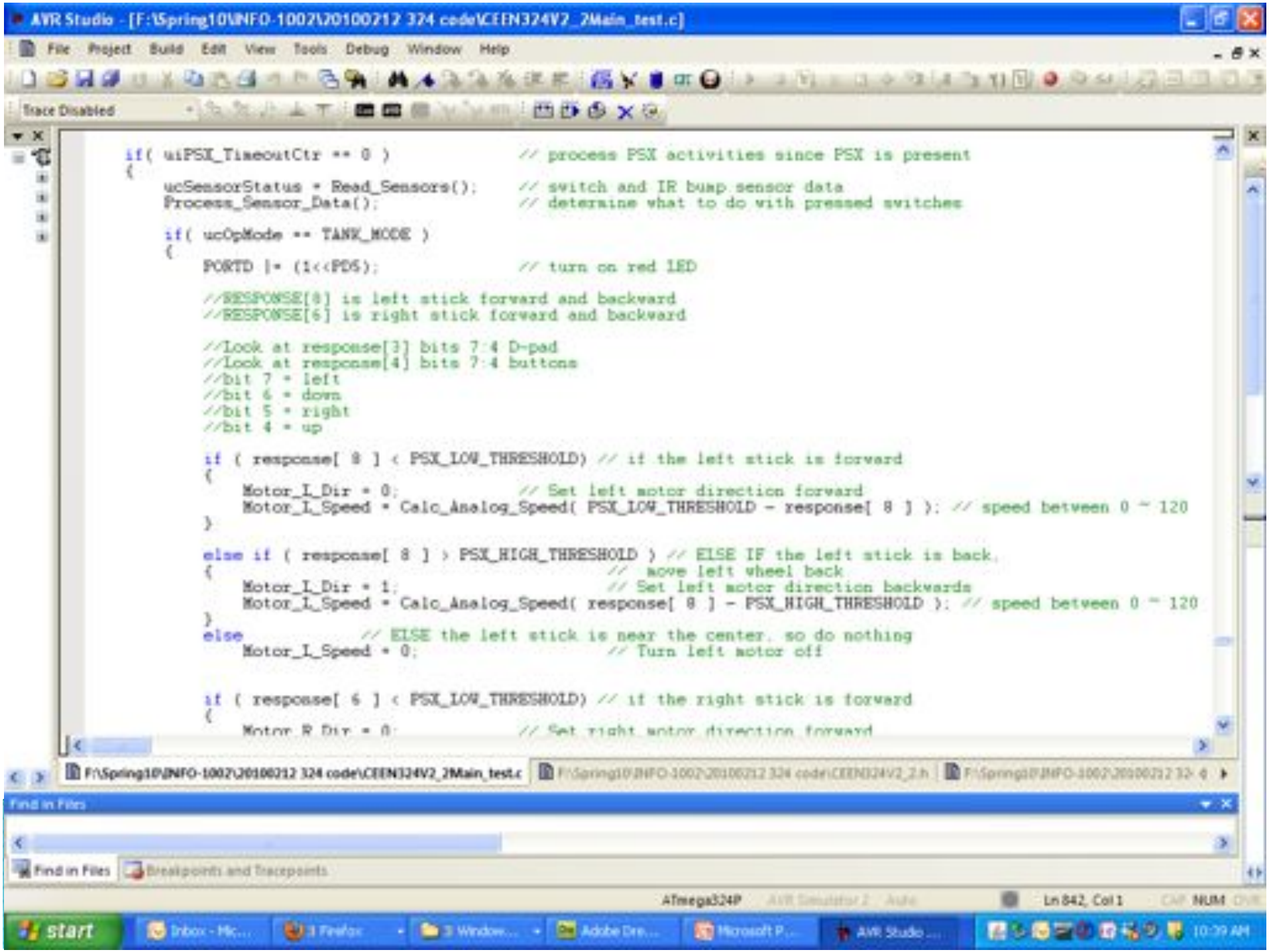

CEENBoT
324 V2.21
ISP Cable

Teamwork and Supporting Skills

- Cooperation and cohort/team building
- Organization
  - Communication and instructions
  - Documentation and inventory control
- Problem solving/troubleshooting
  - Correct assembly/soldering
  - Correct robot operation

Exposure to Programming

- C programming language (free compiler)
- Microprocessor level
- Basic sequence, selection and loops
- Simple paths
  - Square
  - Figure eight (definition and mathematics)
- Sounds (frequency and duration)


AVR Studio - [F:\Spring10\INFO-1002\20100212 324 code\CEEN324V2_2Main_test.c]
File Project Build Edit View Tools Debug Window Help
Trace Disabled
if(uiPSX_TimeoutCtr == 0) // process PSX activities since PSX is present
{
ucSensorStatus = Read_Sensors(); // switch and IR bump sensor data
Process_Sensor_Data(); // determine what to do with pressed switches
if(ucOpMode == TANK_MODE)
{
PORTD |= (1<<PD5); // turn on red LED
//RESPONSE[0] is left stick forward and backward
//RESPONSE[6] is right stick forward and backward
//Look at response[3] bits 7:4 D-pad
//Look at response[4] bits 7:4 buttons
//bit 7 = left
//bit 6 = down
//bit 5 = right
//bit 4 = up
if (response[0] < PSX_LOW_THRESHOLD) // if the left stick is forward
{
Motor_L_Dir = 0; // Set left motor direction forward
Motor_L_Speed = Calc_Analog_Speed(PSX_LOW_THRESHOLD - response[0]); // speed between 0 ~ 120
}
else if (response[0] > PSX_HIGH_THRESHOLD) // ELSE IF the left stick is back,
// move left wheel back
{
Motor_L_Dir = 1; // Set left motor direction backwards
Motor_L_Speed = Calc_Analog_Speed(response[0] - PSX_HIGH_THRESHOLD); // speed between 0 ~ 120
}
else // ELSE the left stick is near the center, so do nothing
Motor_L_Speed = 0; // Turn left motor off
if (response[6] < PSX_LOW_THRESHOLD) // if the right stick is forward
{
Motor_R_Dir = 0; // Set right motor direction forward
F:\Spring10\INFO-1002\20100212 324 code\CEEN324V2_2Main_test.c
Find in Files
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Breakpoints and Tracepoints
ATmega324P
Ln 842, Col 1
NUM
start
10:39 AM

Communication Skills

- Projects include written reports
  - Proper report format
  - Technical writing
  - Proper documentation (figures and tables)
- Oral reports
  - PowerPoint presentations
  - Should mirror written report but summarized
  - Oral presentation skills/practice

Conclusion

- Cooperation with UNL CEEN and support
- Building/assembly and soldering
- Build cohort groups and supporting skills
- Exposure to programming concepts
- Written and oral communication
- Energized and actively engaged students