Course Syllabus for CS 444
Robotics
Spring 2015

Basic Course Information:

Instructor:	Sharon Tuttle		
Lecture times and location:	Tuesday, Thursday	3:00 - 4:20 pm	BSS 313
Lab time and location:	Friday	9:00 -10:50 am	BSS 313
Instructor's office:	BSS 322		
Instructor's e-mail:	st10@humboldt.edu or sharon.tuttle@humboldt.edu or smtuttle@humboldt.edu		
Instructor's office phone:	(707) 826-3381		
Instructor's office hours:	Monday, Wednesday	3:00 - 4:30 pm	
	Thursday	11:00 am - 12:00 pm	
	Friday	3:00 - 4:00 pm	
	or by appointment		
Course public web page:	follow link from: http://users.humboldt.edu/smtuttle/ or follow link from course Moodle site		

Course Description:

From the HSU catalog: A project-based introduction to robotic systems and software that controls them, including gearing, mechanics, AI control systems, and problem solving with robots.

This is an introduction to robotics. It is an exploration course for both you and the instructor, and the robots for this course may only be used within our class' room and during class. Participation and attendance in class sessions is thus more heavily weighted than is typical -- and exams are weighted less than in typical, although there will still be quiz-style exams.

Course Objectives:

After successfully completing this course, students should be able to:

- Explain how mechanical hardware differs from the discrete paradigm dominant in computer science.
- Program a robot to perform basic tasks, such as line following.
- Explain theories of rudimentary intelligence, as embodied in Braitenberg vehicles and in reactive and contemplative artificial intelligence approaches.
- Design a gearing system according to concepts of gearing.
- Employ advanced concepts to build robots which balance or navigate.

CS Program Learning Outcomes that this course addresses:

This course addresses departmental learning outcomes of:

- Computational Thinking
- Communicating and Collaborating

This course addresses computational thinking using a different paradigm, one incorporating the use of mechanical hardware. It addresses communicating and collaborating at a moderate to advanced level via working on several team robotics projects.

HSU Learning Outcomes that this course addresses:

This course explicitly contributes to students' acquisition of skills and knowledge relevant to HSU Learning Outcomes:

HSU graduates will have demonstrated:

- Effective communication through written and oral modes.
- Critical and creative thinking skills in acquiring a broad base of knowledge and applying it to complex issues.
- Competence in a major area of study.

HSU graduates will be prepared to:

- Succeed in their chosen careers.

Course Prerequisites:

CS 211 and STAT 108

or

[instructor's consent]

You should be comfortable with object-oriented programming. While we will be using a version of Java in this course, prior knowledge of Java is not assumed.

Required Course Materials:

- Turning Point RF Response Clicker, available at the campus bookstore
  - BEWARE!! My understanding is that HSU does NOT support Responseware, EVEN THOUGH the TurningTechnologies module in Moodle may MENTION it!

    SO -- I would recommend that you DO NOT PURCHASE Responseware for this course, since students have told me they do NOT give refunds if you are unable to use it!
- "Maximum Lego NXT: Building Robots with Java Brains", Third Edition, Bagnall, Variant Press, 2013, ISBN# 978-0-9868322-2-2 (NOTE - there are significant differences between editions!)
- A flash memory device for moving code from device to device
- Any additional required readings will be made available either on-line, or via resources available through the HSU Library such as the ACM Digital Library and Safari TechBooks Online.

Robot Security:

The robots are not to be taken home or otherwise removed from the labs where they reside. Occasionally, outside students wander into the lab. During class sessions, you will often be working with the robots -- for security reasons, then, this lab is closed to outside students. Please help me patrol the class by notifying me if someone not in the course enters the room.

Course Software:

We will be using leJOS NXJ, a Java programming environment for Lego Mindstorms NXT. It can be downloaded via the Downloads link at:

http://www.lejos.org/nxj.php

(I also hope to have the necessary software loaded onto the workstations in BSS 313.)

Throughout the semester, you also will be making some use of the UNIX operating system. Note that you may access `nrs-labs.humboldt.edu` by using the programs `ssh` (secure shell) and `sftp` (secure ftp). One of several versions of `ssh` and `sftp` may be downloaded for free from:

http://www.humboldt.edu/its/software

Campus labs run by Academic Computing that contain computers running Windows (such as BSS 317) have PuTTY installed to provide a GUI implementation of `ssh` and WinSCP installed to provide a GUI implementation of `sftp`. PuTTY and WinSCP are available from download from the software-download link above. There are also GUI implementations of `ssh` and `sftp` for Mac OS X available from that link, but command-line versions (usable from the Mac OS X Terminal command-line) are installed already as part of Mac OS X.

CS 444's lecture and lab sessions will be held in a lab, BSS 313, that has different versions of these than campus academic computing labs. An introductory tutorial, including some screenshots, for the graphical Windows version of `ssh` and `sftp` installed in BSS 313 can be found at:

http://sils.unc.edu/it-services/servers/using-ssh

Clickers:

We will be using Turning Technologies student response clickers in class. There is significant literature indicating that using clickers may increase student engagement and success in learning.

Students purchase this clicker (they are available from the campus bookstore); purchased clickers can be returned at the end of the semester for a partial refund of the purchase price or they can be kept for use in future HSU courses. You register your clicker at the beginning of each semester by logging into Moodle and going to the course Moodle site; in the lower left or right columns, you should find a block labeled "Turning Technologies" -- if you click on the link in that block, you should be able to enter your clicker code (consisting of 6 characters/digits) from the back of your clicker. You then bring your clicker to every class session.

These clickers will be used both for attendance and for in-class questions, which will be interspersed within class sessions. In-class questions will usually be given in a **think-pair-share** fashion, where you answer a question first individually, and then, if the answers vary sufficiently, you discuss your answer with another student who gave a different answer, trying to persuade them that yours is the correct answer, and then you can change your answer if you wish. The response system will record the overall class response percentages as well as keep track of individual answers.

Typically, you will receive:

- **2 points** for a correct answer,
- **1 points** for an incorrect answer, and
- **0 points** for no answer,
- but with a **maximum** semester clicker-questions grade of **120**.

- (There may be some no-point questions from time-to-time as well -- such questions will be noted if/when they come up.)

Thus you will be rewarded for regular attendance and participation. (Note, however, that participation will also factor into robotics project grades as well as a separate participation grade component.) If you miss a class session, you miss that day's clicker questions and cannot make them up. However, there will be a sufficient number of questions asked to allow for the possibility of extra credit (up to a **maximum** clicker grade of **120**) or to make up for a day that you are out due to illness (although note that you are still responsible for finding out what you missed on such days).

If you forget your clicker for a class meeting, then **up to 5 times** you may still receive some clicker credit, **minus a 2-point penalty**, by e-mailing me your clicker answers for that day, **by midnight on that day**, using a Subject: line of: `Subject: CS 444 Clicker Answers for <date>`. Later e-mails, or e-mails without the proper `Subject:` line, might not be accepted for credit.

The idea is that the clicker questions will help you to see if you are starting to understand concepts being discussed; sometimes they will also provide review of concepts discussed previously. Clicker questions may be quite different from exam questions. They still enable you to get some immediate feedback regarding whether you are grasping course concepts, whether you need to pay more attention to course discussions and/or readings, etc. They may even help me to know what concepts might need more explanation in-class.

I hope to run tests of the system during the first week's class meetings, and hope to begin asking questions that "count" during the second week's class meetings. Therefore, you must purchase your clicker and register it as soon as possible. If there is an issue with this (for example, if the bookstore runs out of clickers), contact me immediately.

Finally, please note that use of another CS 444 student's clicker, or having someone else use your clicker in a CS 444 class session -- that is, pretending that someone is in class who actually is not -- is considered to be cheating, with the same policies applying as would be the case if you turned in someone else's work as your own or permitted someone else to copy your work. Please ASK ME if you are not sure what I mean by this.

Grading Breakdown:

If you are a Computer Science (CS) major, note that you must earn at least a **C-** in CS 444 for this course to count towards your major.

Your semester grade will be determined by the percentage of points that you earn, **subject to some minimum requirements**. Here are the grade percentages, followed by those minimum requirements:

Participation and Attendance:	20.0%	
Individual assignments:	10.0%	
Clicker questions:	10.0%	
Quizzes:	15.0%	
Final "Exam"/Quiz:	15.0%	Tuesday, May 12, 3:00 - 4:50 pm, BSS 313
Projects:	30.0%	

Participation and Attendance:

Both because of the team-project nature of this course and because the robots must be used in-class, there is a "Participation and Attendance" component to the course grade (*in addition* to the clicker questions component and the participation component *within* projects' grades). If you are late to class or leave early, this can harm your team, and so these will also affect your grade.

Attendance will be taken, via clicker, typically during the first 5 minutes of class. If you arrive to class after the attendance clicker question, you are expected to let me know so that I can note when you arrived -- the penalty for arriving late is less than the penalty for not being in class at all.

Illness and life happen -- if you find you are going to have to miss class, please send me an e-mail as soon as you are able, including "CS 444 absence" in the subject line, containing the day you will miss/missed and a general explanation as to why. (I don't need deep detail, but please include the general nature of the reason for your absence.)

In general, for compelling reasons, each student may have up to two "excused" absences without penalty to their "Participation and Attendance" grade, but otherwise, typically, each unexcused absence from a class session will result in a loss of 10% of the "Participation and Attendance" grade (and a lower grade on the current project, if applicable). Each unexcused late arrival will result in a loss of 5% of the "Participation and Attendance" grade -- if I notice an unexcused early departure, that will also result in a loss of 5% of the "Participation and Attendance" grade. I reserve the option to further lower the "Participation and Attendance" grade of any student whose participation in class is not active and positive -- I likewise reserve the option to raise the "Participation and Attendance" grade of a student whose participation in class is above-and-beyond.

Grade Requirements:

- To earn a grade of **C- or better** in this course, the following three requirements must **all** be met:
    1. your overall semester average must **equal or exceed 70%** - this is to show a reasonable level of overall mastery of the course material.
    2. the **average** of your quizzes' and Final "Exam"/Quiz grades must **equal or exceed 60%** - this is to show that you understand at least a minimal reasonable level of the most important course concepts.
    3. the **average** of your Projects must **equal or exceed 60%** - because successfully participating in the robotics projects is the very heart of this course, and that expertise cannot be tested on the course quizzes. If you have not met this requirement, you have not truly shown minimal competence in this course's material.
- If **all three** requirements above are **not** met, then your semester grade will be **either D+** or the letter grade computed according to the mapping given below, **whichever is lower**.
    - (That is, if a student had an overall semester average of 74% but a Projects average of 55%, that student would receive a **D+** for his/her semester grade; if a student had a Projects average of 61% and a Quizzes average of 71%, but an overall semester average of 65%. then that student would receive a **D** for his/her semester grade. You are expected to ASK ME if this aspect of the grading policy is not clear to you.)
- Including the three requirements noted above, your semester grade will be computed according to the mapping given below:

Overall Percentage (based on the given weights)	Quizzes Average	Projects Average	Letter Grade
>= 93	>= 60	>= 60	A
>= 90 and < 93	>= 60	>= 60	A-
>= 87 and < 90	>= 60	>= 60	B+
>= 83 and < 87	>= 60	>= 60	B
>= 80 and < 83	>= 60	>= 60	B-
>= 77 and < 80	>= 60	>= 60	C+
>= 73 and < 77	>= 60	>= 60	C
>= 70 and < 73	>= 60	>= 60	C-
>= 70	< 60	any	D+
>= 70	any	< 60	D+
>= 67 and < 70	any	any	D+
>= 60 and < 67	any	any	D
< 60	any	any	F

Final "Exam"/Quiz:

Again, the Final "Exam"/Quiz for this course is scheduled for **Tuesday, May 12, 3:00 - 4:50 pm**, in **BSS 313** (unless I announce otherwise). Note this time and date **BEFORE** making your end-of-semester travel plans.

Students with Disabilities:

Persons who wish to request disability-related accommodations should contact the **Student Disability Resource Center** in the Learning Commons of the Lower Library, **826-4678 (voice)** or **826-5392 (TDD)**. You can reach the Student Disability Resource Center's web site at:

http://www.humboldt.edu/disability/

Please note that some accommodations may take up to several weeks to arrange. If you are eligible for such accommodations, please contact me as soon as possible to discuss them.

Add/Drop Policy:

Students are responsible for knowing the University policy, procedures, and schedule for dropping or adding classes. You can find these on the web at:

http://www.humboldt.edu/registrar/students/regulations/schedadjust.html

You can find the University policies for repeating classes at:

http://www.humboldt.edu/registrar/students/regulations/repeat.html

Note the following highlights from the above CSU (and thus HSU) policies on withdrawing from and repeating courses:

- Students may withdraw from no more than 18 semester-units after the first four weeks of instruction; that is, students may withdraw from no more than 18 semester-units between census and the final 20% of instruction, and only then with a serious and compelling reason. (Note that: "Withdrawal from courses for reasons that are catastrophic, such as accident or serious illness do not count toward the 18-unit limit." [from the Registrar's web site])

- Students may repeat courses for grade forgiveness only if they earned grades lower than a C.

- Students may repeat up to 16 semester-units with grade forgiveness.

- Students may only repeat a course for grade forgiveness two times and each of these attempts counts toward the 16-unit maximum for repeats.

- Students may repeat up to an additional 12 semester-units with grades averaged.

Please note - it is the Registrar's Office that determines what constitutes a "serious and compelling reason".

The census date for Spring 2015 (before which you can drop **without** a W, and **without** it counting toward your 18 semester-units drop limit) is: **Monday, February 16th**.

The last date for Spring 2015 to drop with a W on your transcript, with a serious and compelling reason, and subject to the 18 semester-unit drop limit, is: **Monday, April 6th**.

If you do drop the course, note that it is **your responsibility** to complete and submit the appropriate forms.

Incompletes:

Incompletes are rarely given and only in the case of a true emergency. They certainly are not appropriate for students who find they have fallen behind on assignments, missed a test, or taken on too much academic, work, or family responsibilities. For these situations, dropping the course would be appropriate (**if** that is still possible according to the University policies for dropping courses).

How to Succeed in this Course:

- Attend class sessions, and bring your clicker to class! You only have access to the robots during class sessions, and

you will be working in teams on each project. When you miss class sessions, you are hurting your team as well as losing time when you have access to the robots. Therefore, I expect you to arrive on time and stay the full period. **I will take attendance in the course at the start of each class session (lecture and lab), and it will count toward your semester grade.** You should not take this course if you have a time conflict with another course.

- If there is a programming prep for a class session, **have it completed before the beginning of the class session** so that you can immediately begin testing your code on your robot.

- Some class sessions will have reading assignments -- for these, **I may tell you to expect a short quiz on the reading** at the start of that class session.

- Participate in class -- discuss clicker answers with other students, ask questions, pay attention, take notes (as applicable), be an engaged and attentive member of your project team.

- Treat your fellow class members with care and respect. Also, if you finish with your robot, help another team figure out what isn't working with theirs. **Participation is part of the semester grade for this course.**

- Please come to class sessions prepared to work with and around others -- if you are coming from a gym class, for example, try to remember that you will be in close quarters with others.

- Individual assignment deadlines will **not** be extended because you waited too late to start or because you did not allocate enough time before the deadline to work on it; likewise, they will **not** be extended because of hardware or network failure. (Admittedly, campus failures might affect deadlines. But don't assume so until you have heard from me definitively.) You need to keep backups of your files at all times, and need to plan your schedule to be able to work on on-campus computers as necessary.

- If you have not completed an individual assignment by the deadline, **your best choice is to submit whatever you have managed to do by then**, as partial credit is your friend, (if applicable) to carefully study the posted example solution as soon as it is available, to ask me about anything there that is still unclear, and to get a good early start on the next individual assignment.

Academic Honesty:

Students are responsible for knowing HSU and course policies regarding academic honesty. For more information on HSU policy in this area, visit:

http://www2.humboldt.edu/studentrights/academic-honesty

Observe that among the actions that are unacceptable are submitting another's program, code, or file as your own and failing to quote material taken from another person's written work.

There are a number of individual assignments in this course in addition to the team robot projects. For such individual assignments, students may discuss general approaches **as long as no one involved in the discussion is writing anything down or typing anything during such discussions**. Students may also help one another in determining causes of program bugs, or in determining the meaning of compiler error messages. However, in general, students may not work together to complete homework assignments, one student should not instruct another in how to write the code for a homework assignment, and **any type of copying or modifying of another person's computer files, OR of providing computer files to another, related to homework assignments is definitely over the line, and never justified**. This applies to copying of documentation and comments as well as to copying of program code.

Note that it is **your** responsibility to ensure that individual course assignment files are read-protected. If you are careless about this, and someone else copies your work, you will share the penalty. (In particular, be very careful about leaving work on shared network drives in campus labs, or in UNIX/Linux directories that are not read-protected.)

Learning takes hard work; when students turn in others' work as their own, it is a slap in the face to those seriously interested in learning. Not turning in an assignment results in no credit for that assignment, of course, but that is an honest grade. Work that violates the course honesty policy deserves a lower grade than that, and therefore the course policy is that work violating this policy will receive **negative** credit. A person providing a file for copying receives the same **negative** credit as the copier. Repeat offenses will be handled according to University policies.

Asking Questions/Getting Help:

- Include `CS 444` along with the subject of your e-mail in the `Subject:` line of any class-related e-mail that you send me. This will help your e-mail be more recognizable as a class-related message, and will make it less likely that I will accidentally overlook it.

  – That said, if I have not replied to your e-mail within 24 hours, please re-send it, just in case I did overlook it somehow.

  – Also, DON'T INCLUDE the word "`password`" in your e-mails to me -- `pwd` is a handy abbreviation to use instead -- because, due to phishing scams, HSU's spam filtering does not seem to like e-mails with that word in it! (Odd, but this was definitely the case in Spring 2010...)

- I try to check my e-mail (`st10@humboldt.edu` or `sharon.tuttle@humboldt.edu` or `smtuttle@humboldt.edu`) about once a day on weekdays, and about once over each weekend. This is another reason to start assignments early, so that you have time to receive a reply to any questions that might arise.

- You are encouraged to ask me questions in class, in office hours, and by e-mail. The most successful students are those who are not afraid to ask questions early and often (I will gently let you know if you are overdoing it), who do the assigned reading, who attend class sessions regularly, who start individual assignments promptly after they are made available from the course web page, and who practice course concepts as much as possible.

  – It is better to ask a question sooner than later -- for example, it is better to send an e-mail with a specific question as soon as you think of it than it is to wait a day or two until the next class session or office hour. If you wait to ask such questions, you may not have time to complete an individual assignment.

  – It is perfectly reasonable if you send me a question and then end up finding out the answer yourself before you receive my answer; likewise, it is not a problem if you end up sending me several questions in separate e-mails (as you work on different parts of an assignment while awaiting earlier answers).

- That said, I am expecting that you will ask **specific** questions – overly vague or broad questions are problematic.

  – (For example, an example of a specific question is, "When I try to run the Java class: (attach the `.java` file), I receive the following error message: (paste in the error message) Can you point me in the right direction about what is wrong?" An example of an overly vague or broad question is: "Here's my Java class. Is it right?")

Additional Coursework-Related Policies:

- Each individual assignment must be submitted as is specified on its handout to be accepted for credit. This may vary for different assignments. Often, parts of assignments will be submitted using a special tool on nrs-labs.

- Each individual assignment will be clearly marked with one or more due dates (a single assignment could have multiple parts with multiple due dates).

  – **No individual assignments will be accepted late. If you wish to receive any credit for an individual assignment, then you must turn in whatever you have done, even if it is incomplete, by the deadline. Partial credit is usually preferable to no credit.** Note that "the computer/network/etc. going down" is no excuse --- if you leave an assignment for the last minute and there are technical problems, you still must turn in whatever you have by the deadline. As with any work done on computer, make frequent back-ups of your files!

  – You may submit **multiple versions** of individual assignment files before the deadline; I will grade the latest pre-deadline submission unless you inform me otherwise. This is to encourage you to turn individual assignment parts in early (since you will know that you can always turn in an improved version if further inspiration strikes). You also don't have to worry about forgetting to submit something that has already been submitted.

  – If for any reason you cannot submit course work using the submission tool on nrs-labs, e-mail me your files as attachments by the deadline, and then submit the files using the submission tool as soon as you are able. The e-mailed files will establish that these files were completed by the deadline.

- The tool that you will be using to submit individual assignments results in a file that serves as your "receipt" for having submitted items. You are expected to retain these "receipt" files at least until a grade has been posted to the

course Moodle site for that assignment. If there is a system glitch or other hardware/software/network problem, you may be asked to make me a copy of one or more receipt files; if you do not have them, then you will not receive credit for the files involved. These receipt files are for your protection!

- It is nearly impossible to write unambiguous specifications. If you have questions about "what she means", get them resolved very early in the development cycle by **asking**.

- There is more to a program than whether it runs or not...

  - Part of your grade may be determined by how well your work meets the written requirements. Work that you turn in is expected to meet handout specifications precisely; when one eventually works within a team on large projects, following the specifications precisely is vital, and can mean the difference between a working product and one that just sits there.

  - Note that work may be graded on **style** as well as on whether it runs properly and whether it precisely meets the homework specifications and requirements. Discussions on style will be ongoing throughout the semester.

- Some course work may be graded simply based on whether it has been attempted (the instructor's decision is final as to whether this is the case) -- other course work may be graded for correctness, style, and whether it meets specifications. You will not know in advance which will be the case.

Additional Course Policies:

- You are expected to read this syllabus and be prepared to verify in a required Moodle activity that you have received it, have read it, and understand its contents.

- Quiz dates will be announced in class. Make-up quizzes are only possible by special prior arrangement or because of a valid medical excuse.

- You should monitor your e-mail for course-related messages. The University provides a means for you to specify your preferred e-mail address, so if you wish to receive e-mail into an account other than the one HSU provides, change your preferred e-mail address in both Account Center and Moodle accordingly. Course-related messages from me will include `CS 444` in the `Subject:` line.

- You are expected to check the public course web page and the course Moodle site regularly --- course handouts, individual assignments, examples from class sessions, and possibly more will be posted to the public course web page, and grades will be posted to the course Moodle site. You are expected to monitor your posted grades and let me know about any discrepancies.

- When reading assignments are given, you are expected to prepare (read and study) assigned readings before class sessions and to participate in class discussions. Projected examples will be utilized frequently during discussion. You should understand that there may be material in the reading that will not be discussed in class sessions, and material in class sessions that may not be found in the reading. You are responsible for both.

- **Attendance and disruptive behavior:** Students are responsible for knowing policy regarding attendance and disruptive behavior:

  http://www2.humboldt.edu/studentrights/attendance-behavior

- Regular attendance at class sessions is expected. If you should happen to miss a class session, then you are responsible for finding out what you missed. "I wasn't there that time" is never an acceptable excuse. Class session notes are not posted, although many of the projected examples will be made available on the public course web site. Clicker questions **cannot** be made up later.

- **Late arrival to class:** Please attempt to come to class on time, with your headphones put away and your cell phones turned off. If you must arrive late or leave early, please do so with the least possible distraction to other students. If your late/early habits become disruptive, you may be asked to leave the class permanently.

- **Class disruption:** University policy requires that instructors eliminate disruptions to the educational process. Distractions such as excess talking, ringing cell phones, working on assignments for other classes, inappropriate or distracting laptop/tablet/smartphone/gadget use, demonstrations of affection, packing of books early, loud music leaking from headphones, chronic late arrivals or early departures, excessive comings and goings or other behaviors

that disrupt the class are not acceptable. Students indulging in such behaviors will first be warned before being required to leave the class permanently.

• **Emergency Evacuation:** Please review the evacuation plan for the classroom (posted on the orange signs), and review the campus Emergency Preparedness web site at:

  http://www.humboldt.edu/emergencymgmtprogram/campus_emergency_preparedness.php

  ...for information on campus Emergency Procedures. During an emergency, information regarding campus conditions can be found at **826-INFO** or:

  http://www.humboldt.edu/emergency

Tentative Course Schedule: (subject to change, AND depending on projects completed)

• **Weeks 1-2:** Java for robots

• **Weeks 3-4:** Building more sophisticated logic: line-following robot

• **Weeks 5-7:** Sound and more; Braitenberg robot

• **Weeks 8-9:** Gearing; walking robot

• **Weeks 10-12:** Balancing robot

• **Weeks 13-15:** Sumo Bot

• **Final "Exam"/Quiz: TUESDAY, May 12, 3:00 - 4:50 pm**, in **BSS 313** (unless I announce otherwise)