TEACHING STATEMENT – GREGORY S. SAWICKI

BACKGROUND AND EXPERIENCE:

I have more than 15 years of teaching and mentoring experience in both formal and informal academic settings that goes all the way back to graduate school. While a Master's student in mechanical engineering at UC Davis (1999-2001) I supported myself by teaching a number of courses in areas such as: numerical methods, system dynamics, heat transfer, machining and mechanical design. At the University of Michigan - Ann Arbor, while pursuing my doctoral degree in Mechanical Engineering and Kinesiology (2002-2007), I taught the lab portion of the entry-level biomechanics course and mentored ~8 undergraduates on independent projects in the laboratory. At Brown University, while an NIH-Post Doctoral Fellow (2007-2009), I continued gaining mentoring experience, working closely with 3 talented undergraduates on guided research projects, one that led to a publication in the Journal of Experimental Biology.

Since joining the faculty in Biomedical Engineering at NC State University in August 2009, I have been the primary instructor for two courses -- **BME 201: Computer Methods in Biomedical Engineering** and **BME 590: Introduction to Rehabilitation Engineering**. I am/have successfully mentored 3 post-doctoral fellows, 5 doctoral students, 6 master's students and 25 undergraduates. My graduates have so far all moved on to competitive positions in academic (University of Queensland, University of Nebraska), clinical (Walter Reed, VA, Center for the Intrepid) and industrial (e.g., FitBit, TransEnterix) settings.

BME 201 is the core undergraduate course in numerical methods and programming in MATLAB and is geared toward freshman and sophomores. I use a case-based approach (see Philosophy and Approach below) and have taught it 6 times (>250 students) with high marks from both students and peer evaluations*.

BME 590 is the seminal course in our developing curriculum in Rehabilitation Engineering. It is an upper level undergraduate/graduate level course aimed to broadly cover practical, basic scientific and applied engineering aspects of developing field of rehabilitation engineering. Major focus is on rehabilitation robotics. A component of this course is also case-based, as students must develop a hypothetical solution for an imagined patient/client over the course of the semester. I have taught 590 3 times (>35 students) with the 4th offering coming in Fall 2016. 590 has also received high marks from both students and peer evaluations.*

*See recent syllabi for both BME201 and BME590 courses at end of this document. In addition, a compendium of course reviews and a summary of previous teaching performance can be obtained upon request.

More informally, I have always taken a proactive role within the my own laboratory and across the department to promote interaction between faculty, graduate students and post-doctoral scholars in order to foster a culture and environment that values interdisciplinary scientific inquiry and critical thinking from multiple perspectives. For instance, I have developed journal clubs, joint laboratory meetings and many outreach events over my career (see CV) and will continue to do so.

PHILOSOPHY AND APPROACH:

My collective experiences as both student and teacher have shaped my views on effective teaching strategies. I believe an engineering curriculum should develop more than quantitative analytical tools to solve existing canonical problems. Many students leave college having learned a lot of facts without developing any useful general framework for independent inquiry. This severely limits the long-term value and scope of their education. In my experience, this is especially true in the engineering disciplines, where students often leave courses with formulas, not fundamentals.

My overall goal as an instructor and mentor is to teach *skills* and not just *content*. Courses should promote critical thinking skills based on applying the scientific method to generate testable hypotheses and systematically rule out potential underlying causes of an observation. Students should become comfortable extending analytical skill sets to solve problems of their own design. Self-guided, hypothesis-driven learning

often leads to innovative, creative insights and sparks enthusiasm for the subject matter. When students extend concepts beyond cook-book problems, they are often quickly exposed to the limitations and assumptions that are inherent in engineering theory, making learning more fundamental and thus more widely applicable.

My courses typically take a 'case-based' approach and have components that go beyond developing students' ability to solve problems in engineering using standard techniques. My students learn to (1) interpret and critique basic and applied scientific work, (2) formulate and express ideas both verbally and in writing, (3) think conceptually and abstractly to develop useful analogies and (4) interact across disciplines and perspectives.

I am qualified to teach entry level courses in engineering mechanics, dynamics, numerical methods, control theory, musculoskeletal biomechanics, and motor control. I am also confident that I could develop upper-level undergraduate or graduate courses in biorobotics, principles of legged locomotion, rehabilitation engineering and advanced methods in whole-body biomechanics. Finally, I would be excited to participate as a faculty mentor/facilitator in an upper-level Capstone Design setting.

In addition to courses I have already taught (see Background and Experience), some candidate courses and brief descriptions of their content are listed below.

1. A core undergraduate course in mechancal engineering on principles and methods of musculoskeletal biomechanics. This would be a lecture-based course that would draw heavily from basic mechanics (both statics and dynamics) principles (e.g. Newton's Laws; Linear and Angular Momentum; Energy Methods) to address classic and current problems in human movement science. Examples would survey the areas of sports biomechanics, orthopedic biomechanics, and clinical gait analysis giving students a broad survey of the applicability of the concepts in the course. In a final project, students would team up to develop a mathematical model to conduct carefully designed, hypothesis-driven computational experiments using a simple software package (e.g. MATLAB/Simulink).

2. A cross-listed upper-level undergraduate/graduate level elective course that follows one or two hotly debated topics in biomechanics, muscle physiology, or the neural control of movement through careful and critical evaluation of the scientific literature. To represent a number of perspectives, ideally about half of the students would come from life science programs (i.e. kinesiology, physiology, neuroscience) and half from engineering programs (i.e. mechanical engineering, and electrical engineering, biomedical engineering). The topics would be chosen by the members of the course early in the term. Initial discussions would focus on general aspects of the process of scientific inquiry like hypothesizing different mechanisms, testing predictions, and increasingly gaining support for an idea while never *proving* it. Student participation would involve weekly group presentations on the chosen topic(s) following a rotating schedule. The course would culminate in a final project (written and oral presentation) where student groups are asked to propose a study design that can challenge current thinking about the surveyed topic.

3. A graduate level course in biorobotics. Bipedal walking robots and lower-limb robotic exoskeletons would be used as platform to study the mechanics, energetics and control of human locomotion. The course would cover analogous artificial and biological sytems in parallel, discussing ways to use engineering technologies and design principles to develop biomimetic devices. The utility of biorobotics as a tool to gain insight into fundamental priciples of locomotion physiology would also be discussed. Topics would include power sources (e.g. muscles vs. electrical or pneumatic actuators), sensors and transducers, energy accounting, control schemes (i.e. feedback versus feedforward) and utilizing compliance to maximize locomotor economy.

Finally, I believe that scientists at top research universities have an obligation to provide opportunities for undergraduates interested in pursuing learning opportunities outside the classroom. I will make a strong effort to

continually seek ambitious undergraduates to work on projects in my laboratory that are mentored directly by myself, my graduate students and my post-doctoral scholars. An undergraduate research experience can be a crucial stepping stone to continuing education and help develop the scientists of the future.

BME 201- Computer Methods for Biomedical Engineers - Fall 2015

Instructor: Dr. Greg Sawicki, greg_sawicki@ncsu.edu
Office: 4212C EB3
Office Hours: MW 4:00-5:00 pm or by appointment
Lecture: MW 9:35-10:25 am – Hunt Library Auditorium

Instructor: Dr. Naji Husseini, nshussei@ncsu.edu
Office: 4310 EB3
Office Hours: MW 1:00-2:00 pm or by appointment
Lecture: MW 9:35-10:25 am – 4142 EB3

TA: Claire Hall, crhall5@ncsu.edu
Office Hours: W 11:45-12:45 pm –4101 EB3
Lab Section 1: Th 8:30-10:20 am –4101 EB3
Lab Section 2: Th 10:40-12:30 pm –4101 EB3

TA: Julio Morales, jamoral2@ncsu.edu
Office Hours: T 11:30-12:30 pm –4101 EB3
Lab Section 3: Th 12:50-2:40 pm –4101 EB3

TA: Patrick Erb, pderb@ncsu.edu
Office Hours: M 2:00-3:00 pm – 4101 EB3
Lab Section 4: Th 2:55-4:45 pm – 4101 EB3

TA: Ian Kaszubski, ijkaszub@ncsu.edu
Office Hours: F 10:30-11:30 am – 4101 EB3
Lab Section 5: F 8:30-10:20 am – 4101 EB3

Required Resources (for Assigned Readings and Problems):

Textbook

- Introduction to MATLAB 7 for Engineers by William J. Palm III, McGraw Hill, 2010 (~$70-90)

Electronic Book

- zyBook : Programming in MATLAB ($48)
  1. Sign up at zyBooks.com (https://zybooks.zyante.com/#/home); -->Create Account link.
  2. Enter zyBook code NCSUBME201SawickiFall2015 or NCSUBME201HusseiniFall2015
  3. Click Subscribe

Other Useful Reference Texts (Not Required):

- Essential MATLAB for Engineers and Scientists by Hahn and Valentine, Academic Press, 2013 (~$20-40)
- Mastering MATLAB by Hanselman and Littlefield, Pearson Prentice Hall, 2011 (~$100)
- Introduction to MATLAB by Etter, Pearson Prentice Hall, 2014 (~$60)

*Note: All four of these books will be on reserve under the course name BME201 at the Hunt Library on Centennial Campus and the D.H. Hill Library on North Campus.

Software:

- If you have a personal computer you are encouraged to download the latest version of

MATLAB (R2014a) using your Unity ID and password. You are encouraged to bring your laptop to lecture and program along with the instructor.

- For information on MATLAB at NCSU go to the following URL: http://www.eos.ncsu.edu/software/downloads/instructions/matlab-how-to-get.php .
- To download your personal copy, go to the following URL: http://software.ncsu.edu/vendor/mathworks-matlab/package/matlab-student-version. These versions no longer require a network connection and Unity login for each use.
- If you have problems downloading, stop by the ITECS Helpdesk at 204 Daniels Hall or 1002 EB I for guidance. The Helpdesk is open Monday - Friday, 8:00am-5:00pm. To resolve any questions or problems with download you can also contact eoshelp@ncsu.edu.
- MATLAB R2014a is also available in all university Eos computing facilities http://www.eos.ncsu.edu/.

Expectations of Students:

- **Show up.** Students are expected to attend all classes. Read the NCSU attendance policy http://policies.ncsu.edu/regulation/reg-02-20-03 for definitions of excused absences. If you anticipate an excused absence on a due date, please see one of the instructors to make other arrangements. Laboratory attendance is also mandatory and is included in the lab grade.
- **Work hard, help each other.** The course is designed to be challenging, but fair. You will need to spend a considerable amount of time outside of class to do well. I expect that you will help each other outside class and come to office hours to clear things up that are confusing.
- **Focus, be courteous.** I expect that during class students will be respectful of the instructor and fellow classmates by refraining from chatting, facebooking, texting, tweeting, etc. I need your focus for fifty minutes twice a week in lecture and 110 minutes once a week in lab. If you are caught being disruptive, I will ask you to present a worked problem in front of the class in the following lecture.
- **Participate.** SPEAK UP, ASK QUESTIONS, and point out MISTAKES during lecture/lab! This will help everyone learn quicker.
- **Evaluate.** We get to evaluate you, so you should get to evaluate us- it's a 2-way street! There will be periodic anonymous evaluations handed out in lecture/lab over the course of the term. Please take these seriously, as your comments will help shape the on-going organization of the course. In addition any comments for instructors outside of these evaluations are welcome.

Assignments:

- A course Moodle Site https://wolfware.ncsu.edu/: *BME 201 (001 or 002) Fall, 2015 Computer Methods In Biomedical Engineering* is set up on-line for announcements and the exchange of assignment files and documents. Each lecture has a different website. There is also a course calendar posted. There will often be documents posted on Moodle that you will need to print out *before* lecture or lab. Please check Moodle before each lecture.
- **zyBook Pre-Lecture Activities (10%).** Online activities from the zyBook include readings and short questions that should be completed BEFORE the lecture. TA's will award credit based on a time-stamped completion report of pre-lecture activities in zyBook for each student. Note that sometimes you have to be careful with semicolons and spaces, because the answer may not register as correct if your syntax differs from the zyBook-accepted answers. Students are encouraged to work on zyBooks in groups.
- **Homework (20%) Case-based.** Longer 'real-world' problems/analyses that will involve a program and formal engineering report. There will be 4 of these over the term. Grade out of 100%.
- **Lab (25%).** Lab assignments will include: (~10%) short coding problems (SCPs) typically due 1 week after they are assigned in lab and (~15%) 2 longer case-based lab assignments (i.e.

experiments) will be more research-based than the homeworks, stressing *hands on applications of programming skills* and *experimental design*.

- **Exams (45%).** 3 total. 2 preliminary exams and 1 final comprehensive exam (15% each). All exams will be hand written- closed book, closed notes, closed computer/electronic devices.

Homework-Lab- Exam Details:

- **Hand-in policy-** Case-based homework and lab write-ups are due in hardcopy form at the beginning of lecture or lab on the due date. In addition, homework and lab programs must be uploaded to Moodle site prior to class time on the due date. *For *documents*- .pdf file format is preferred. For *programs*- executables in .m file format are required.
- **Late policy-** Late homeworks or labs *will not* be graded without permission from the instructor(s) prior to the due date.
- **Grading errors-** If you find an error in your grade on an assignment or exam, please hand it in person with a written description of the issue at office hours. If the error is legitimate, a correction will be made.
- **Missed exams-** If you miss an exam with either a certified medical excuse or prior instructor approval, you may take a makeup test at a designated time during the last week of the semester. Only one makeup test will be given. It will be fair but comprehensive and challenging.

Grades: Final course grades will be based on the following scale:

100–97	A+	89–87	B+	79–77	C+	69–67	D+	<60	F
96–93	A	86–83	B	76–73	C	66–63	D		
92–90	A-	82–80	B-	72–70	C-	62–60	D-		

Academic integrity. Students are expected to adhere to the guidelines for academic integrity outlined in the NCSU Code of Student Conduct:

http://policies.ncsu.edu/policy/pol-11-35-01

Cases of misconduct will be addressed according to the procedures outlined in the Code. Your signature on any submitted work implies that you have neither given nor received unauthorized aid.

http://policies.ncsu.edu/regulation/reg-11-35-02

Student disabilities. Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653 and notify the instructors.

http://dso.dasa.ncsu.edu/

For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation.
http://policies.ncsu.edu/regulation/reg-02-20-01

Course Objectives: By the end of the course students should be able to confidently perform the following tasks:

- Apply the multi-step process for solving engineering problems with a computer;
- Demonstrate good problem solving skills by identifying the inputs and outputs from an engineering problem and constructing a detailed algorithm (i.e. pseudo-code) to solve it,

- Test a detailed algorithm using a hand calculated example to track variable values;
- Identify and implement different program flow constructs including for-loops, while-loops, switch statements and if-then-else logic;
- Write and test a MATLAB program to solve an engineering problem;
- Exhibit good programming practices including comments, program organization, understandable input requests, and output tables and graphs including descriptive labeled axes with consistent engineering units;
- Explain and demonstrate debugging procedures,
- Produce a professional engineering case-report that includes a clear problem statement, addresses method(s) for solving the problem, displays results from relevant analyses and clearly states conclusions/recommendations for next steps

Schedule of Topics and Assignments (Tentative)

Week of…	Day	Topics	zyBook pre-lecture reading	Palm optional reading	Assignments due
8/17	W	Review syllabus,	Sign-up for zyBook		
	Lab	**NO LAB**			
8/24	M	MATLAB environment, help files, variable assignments, scalar arithmetic, order of operations	1.1-1.5 2.1-2.5	Ch. 1	Questionnaire
	W	Variable assignments, scalar arithmetic, order of operations	2.6-2.10 3.1-3.8	Ch. 1	
	Lab	Policies, starting MATLAB, simple calculations			
8/31	M	Scripts, built-in functions, plotting, problem-solving examples	4.1-4.5	Ch. 1, 3.1	
	W	Data types, defining and manipulating arrays/matrices, sample case problems	4.6-4.13	Ch. 2	
	Lab	Parameter study			SCP 1
9/7	M	**NO CLASS (Labor Day)**			
	W	Statement level controls (if, and, or, not, else)	11.1-11.4	Ch. 4	Case 1
	Lab	Statement level controls			SCP 2
9/14	M	*For* and *while* loops, switch statements, tracking output values by hand	11.5 12.1-12.4	Ch. 4	
	W	Loops, tracking variables, pseudo-code, flowcharts, algorithm development	12.5, 12.6 6.1	Ch. 4	Eval 1
	Lab	*For* and *while* loops		Ch. 4	SCP 3
9/21	M	Euler's method loops, variables tracking		Ch. 9.3	
	W	Euler's method loops, variables tracking		Ch. 9.3	
	Lab	Functions, data input/output			SCP 4
9/28	M	Example case-like problem(s)			Case 2
	W	Question day			
	Lab	Exam review			SCP 5
10/5	M	**EXAM 1**			
	W	Custom function, input/out syntax, simple program development	13.1	Ch. 3.1, 3.2	
	Lab	**NO LAB (Fall Break)**			
10/12	M	Data input/out from/to files, custom functions	5.7	Ch. 3.4	
	W	Advanced program development, data structures, debugging strategies			Eval 2
	Lab	*RasbPi:* Introduction to Raspberry Pi			
10/19	M	Advanced program development and data structures, debugging strategies			
	W	Numerical differentiation, data acquisition, signal processing	6.2-6.5	Ch. 9.2	
	Lab	*RasbPi:* Static/dynamics image acquisition			SCP 6
10/26	M	Anonymous functions, Function functions	13.2-13.5	Ch. 3.3	Case 3
	W	Anonymous functions, Function functions		Ch. 3.3	
	Lab	*RasbPi:* Video processing: BounceBallEnergy			SCP 7
11/2	M	Root finding, simple optimization		Ch. 6	
	W	Root finding, simple optimization		Ch. 6	
	Lab	Exam review			Lab 1
11/9	M	Question day			Case 4
	W	**EXAM 2**			
	Lab	*RasbPi:* Audio capture/processing			

11/16	M	Numerical integration, solving systems of equations, matrix mathematics	6.6 8.1-8.6 9.10	Ch. 8 Ch. 9.1	
	W	Matrix mathematics, curve fitting	6.14, 6.15 8.7-8.10	Ch. 2	Eval 3
	Lab	*RasbPi:* Audio processing: TunerApp			SCP 8
11/23	M	Curve fitting, interpolation, statistics		Ch. 6 Ch. 7.4 Appendix B	
	W	**NO CLASS (Thanksgiving)**			
	Lab	**NO CLASS (Thanksgiving)**			
11/30	M	Curve fitting, interpolation, statistics			
	W	Wrap up, open question day			
	Lab	Exam Review			Lab 2
12/16	W	**FINAL EXAM, 8-11 am, Hunt Library Auditorium**			

BME 590/ISE 589: Introduction to Rehabilitation Engineering
Spring 2015 (3 credits)

Time and Location:

Tues.-Thurs. 3-4:15 PM
4142 and/or 4153 EB3, NCSU Centennial Campus or Daniels Hall 407, Main Campus

Instructors:

Greg Sawicki, PhD (Lead Instr.)
4212C EB #3
NCSU
Phone: 919-513-0787
email: greg_swicki@ncsu.edu
O. Hrs.- 4:15-5PM T and Th.

Binil Starly, PhD
414A Daniels Hall
NCSU
Phone: 919-515-1549
e-mail: bstarly@ncsu.edu
O. Hrs.- By appt.

Rick Segal, PT, PhD
Dept. of Health Professions
Med. Univ. S. Carolina
Phone: 843-792-4593
e-mail: segal@musc.edu
O. Hrs.- By appt.

Prerequisites:

A previous course in basic physiology and/or biomechanics is highly encouraged. Some experience with CAD software (e.g. Solidworks) is also highly encouraged. The course is open to both undergraduates and graduate students; however, the course will move at a brisk pace and has a large 'self-guided' component that requires independent research.

Required Readings:

**-An Introduction to Rehabilitation Engineering*
by Rory Cooper, Hisaichi Ohnabe and Douglas Hobson
CRC Press, Taylor and Francis Group, 2007. 470 pgs. 89.95$

*Cooper text available at NCSU Bookstore or from publisher @ http://www.crcpress.com/product/isbn/9780849372223

-Falvo, DR (2009) *Psychosocial and Functional Aspects of Chronic Illness and Disability*. In: Medical and Psychosocial Aspects of Chronic Illness and Disability. By Donna Falvo, 4th Edition. Jones and Bartlett Publishers, LLC, Sudbury, MA. *WILL BE POSTED ON *Moodle* - NOT REQUIRED TO BUY!!!

Other Useful References/Resources:

Course Moodle Site-
@ https://moodle1415-courses.wolfware.ncsu.edu/course/view.php?id=4256

Software (Not Required to Buy)-
* SolidWorks *www.**solidworks**.com*
* Geomagic *www.**geomagic**.com*
* Point Cloud http://www.autodesk.com/products/recap/features/recap-pro/all/gallery-view

Books (Not Required to Buy)-
* *Physical Rehabilitation* - by Susan B. O'Sullivan and Thomas J. Schmitz, 4th Ed., F. A. Davis Co., 2007.
* *Neurologic Interventions for Physical Therapy* - by Martin Kessler, 2nd Ed., Saunders/Elsevier, 2007.
* *Rehabilitation Engineering*- by Raymond V. Smith and John H. Leslie, CRC Press, 1990.
* *Introduction to Biomechatronics* - by Graham M. Brooker, SciTech Publishing, 2012.
* *Wearable Robots – Biomechatronic Exoskeletons* - by Jose L. Pons, John Wiley & Sons Publishing, 2008.

*Denotes book is on Course Reserve in the new Hunt Library or ask Prof. Sawicki to borrow a copy.

And also others! Just ask the Instructors if you are looking for a reference on a particular topic ;)

Web-

-PubMed - the leading on-line searchable database for medical research
-IEEE *XPlore* – a good on-line searchable database for technical papers on rehabilitation devices
-Rehabilitation Engineering Rehabilitation Centers (RERC) http://www.resnaprojects.org/nattap/at/rercs.html

Course Description/Learning Objectives:

This graduate-level course will explore the basics of Rehabilitation Engineering from a broad, non-technical perspective focusing on engineering applications and needs.

The first ~12 weeks will be *lecture-based* and cover three core areas: (1) ***the client*** (patient), societal and healthcare perspective (rights, problems and needs) (Dr. Segal) (2) ***the processes*** for engineering design of rehabilitation devices (prototyping/manufacturing/production of synthetic and biological products) (Dr. Starly) and (3) ***the tools*** for rehabilitation (e.g. mobility aids, rehabilitation robotics, prosthetics and orthotics, engineering treatment systems, etc.) (Dr. Sawicki). When appropriate, book readings and/or journal articles will be assigned prior to classroom sessions. In addition, students will be asked to find ~three journal articles/book chapters on their own that are relevant to the lecture topics and write semi-formal critiques that will be available to the class via *Moodle* posts. A group-based 'make' project will also be assigned during the processes portion of the course.

The last ~5 weeks will be *case-based* and focus on applying knowledge from the lectures as well as 'self-guided' learning (e.g. from the scientific literature and other sources) in order to address 'real-world' scenarios that will require a Rehabilitation Engineering solution. Teams of 2-3 students will be randomly assigned a cutting edge 'case' from a number of possibilities developed by both the students' and instructors' interests. Students with ideas for a 'case' are encouraged to post a brief description on *Moodle* anytime during the term.

During these final weeks, significant class time will be spent working on/discussing issues related to the 'cases' with brainstorming sessions led by both students and instructors on topics relevant to the case scenarios. These student-guided lessons with make up the major component of the participation part of the final grade. Each 'case' will culminate in a team report and presentation worth ~50% of the final grade in the course.

Expectations of Students:

Attendance. Students are expected to attend all classes. Read the NCSU attendance policy http://policies.ncsu.edu/regulation/reg-02-20-03 for definitions of excused absences. Students who anticipate an excused absence on a due date, should see one of the instructors to make other arrangements.

Work hard, help each other. The course is designed to be challenging, but fair. Students will need to spend a considerable amount of time outside of class to do well. Students are expected to help each other outside class and come to office hours to clear things up that are confusing.

Focus, be courteous. During class students are expected to be respectful of the instructor and fellow classmates by refraining from chatting, facebooking, texting, tweeting etc. We need your focus for 75 minutes-twice a week in lecture. If you are caught being disruptive, we will ask you to present a brief lesson on lecture material in the next class session..

Participate. SPEAK UP, ASK QUESTIONS, and point out MISTAKES during lecture! This will help everyone learn quicker.

Evaluate. We get to evaluate you, so you should get to evaluate us- it's a 2-way street! There will be two anonymous evaluations handed out in lecture over the course of the term. Please take these seriously, as your comments will help shape the on-going organization of the course. In addition any comments for instructors outside of these evaluations are welcome.

Other Course Policies:

-Academic integrity. Students are expected to adhere to the guidelines for academic integrity outlined in the NCSU Code of Student Conduct:

http://policies.ncsu.edu/policy/pol-11-35-01

Cases of misconduct will be addressed according to the procedures outlined in the Code. Your signature on any submitted work implies that you have neither given nor received unauthorized aid.

http://policies.ncsu.edu/regulation/reg-11-35-02

-Assignment Hand-in policy- Homework and project write-ups are due in hardcopy form at the beginning of lecture on the due date unless otherwise stated by the instructors. In addition, we may ask you to upload assignments to the *Moodle* site prior to class time on the due date. *For *documents*- .pdf file format is preferred.

-Late policy- Late homeworks/projects *will not* be graded without permission from the instructor(s) prior to the due date.

-Grading errors- If you find an error in your grade on an assignment please hand it in person with a written description of the issue at office hours. If the error is legitimate, a correction will be made.

-Student disabilities. Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653 and notify the instructors.

http://dso.dasa.ncsu.edu/

For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation. http://policies.ncsu.edu/regulation/reg-02-20-01

Student Evaluation:

Short Writing Assignments/Journal Article Critiques (x 6)	30%
Class Participation	20%
Final 'Case' Study Paper/Presentation	50%

	100%

Grades:

Final course grades will be based on the following scale:

100–97	**A+**	89–87	**B+**	79-77	**C+**	69–67	**D+**	<60	F
96–93	**A**	86–83	**B**	76-73	**C**	66–63	**D**		
92–90	**A-**	82–80	**B-**	72-70	**C-**	62–60	**D-**		

Course Schedule:

Period	Date	Day	Topic	Readings/Preparation
1	1/8	Th	Sawicki, Segal, Starly: A. Introduction to Course and Rehabilitation Engineering in the Healthcare System B. Brief Participant Intros C. Overview of Current State of the Field via RERCs (Sawicki),	**JNER Review Article(s):** Posted on *Moodle* **RERC Website:** Link on top of *Moodle*
2	1/13	T	PoWeR Lab Visit – Powered AFO (Sawicki)	**EB3 - Rm. 1404**
3	1/15	Th	Starly Lab Visit - Tissue Engineering/ Manufacturing.	**Location TBD.**
			SEGAL (Client)	
4	1/20	T	Models of Disability and Ability with emphasis on International Classification of Functioning, Disability and Health (ICF) model Psychosocial Aspects of Chronic Disability and Disease	**A. Cooper:** Forward, Preface and Introduction (Ch1.) **B. Cooper:** Ch 2. Clinical Practice of Rehabilitation Engineering and ICF supplemental readings **Falvo:** Posted on *Moodle*
5	1/22	Th	Psychosocial Aspects of Chronic Disability and Disease/ Pathophysiology of Common Chronic Disabilities	**Falvo:** Posted on *Moodle* Lecture Slides Posted on *Moodle*
6	1/27	T	Pathophysiology of Common Chronic Disabilities	Lecture Slides Posted on *Moodle*
*7	1/29	Th	Pathophysiology of Common Chronic Disabilities / Legislation and Assistive Technology in Society and the Healthcare System	Lecture Slides Posted on *Moodle*
8	2/3	T	Assistive technology from a clinicians perspective: “typical” low to high tech assistive technology that is commonly prescribed	**Sara Kraft, PT, DPT, NCS, ATP** **Division of Physical Therapy** **Medical University of South Carolina** **Cooper:** Ch 3. Universal Design **Cooper:** Chs. 14-17
			STARLY (Processes)	
*#9	2/5	Th	Current Topics in Tissue/Organ Engineering	**Cooper:** Ch. 6, 7 TBD Journal Articles
10	2/10	T	Materials in Rehabilitation Engineering	Lecture Slides Posted on *Moodle* TBD Journal Articles
11	2/12	Th	Manufacturing Processes for Rehab Products - Traditional Manufacturing Processes - Machining, Investment Casting and Composites Manufacturing	Lecture Slides Posted on *Moodle* TBD Journal Articles
12	2/17	T	Manufacturing Processes for Rehab Products – Additive Manufacturing	Lecture Slides Posted on *Moodle* TBD Journal Articles

*13	2/19	Th	CAD/CAM in Prosthetics & Orthotics	**Cooper:** Ch 5. Standards for Assistive Technology TBD Journal Articles
14	2/24	T	Reverse Engineering from Scan to 3D Virtual Model- **Lab 1** *Train students on using PointCloud Scan Data of patients using Geomagic	*Students to scan a physical part and build the virtual model
15	2/26	Th	Reverse Engineering from Scan to 3D Virtual Model- **Lab 2** *Train students on improving digital data to build a complete 3D design model via Geomagic and SolidWorks	*Students to build 3D printed models in AM Labs
16	3/3	T	Digital Comparison of Physical model with Virtual Model - **Lab 3** *Train students to assess the quality of a 3D printed part using Geomagic.	*Students to assess the manufacturing cost of the 3D printed part
17	3/5	Th	Manufacturing Economics Estimating Manufacturing Costs of Products Tech Transfer/ Small Business Funding	**Cooper:** Ch 4. Technology Transfer NCSU Office of Tech Transfer Slides Posted on *Moodle* Lecture Slides Posted on *Moodle*
18	3/10	T	**No Class - Spring Break!**	
19	3/12	Th	**No Class - Spring Break!**	
			SAWICKI (Tech/Tools)	
20	3/17	T	Neuromechanics of Movement: Actuation/Sensing/Planning	Lecture Slides Posted on *Moodle* TBD Journal Articles
21	3/19	Th	Neuromechanics of Movement: Actuation/Sensing/Planning	**Cooper:** Ch. 11 Lecture Slides Posted on *Moodle* TBD Journal Articles
*22	3/24	T	Neuromechanics of Movement: Actuation/Sensing/Planning	Lecture Slides Posted on *Moodle* TBD Journal Articles Pick Cases!
*#23	3/26	Th	Motor Control Principles for Rehabilitation Robotics - Upper and Lower Limbs	**Cooper:** Chs. 12, 13, 8, 18 Lecture Slides Posted on *Moodle* TBD Journal Articles
*24	3/31	T	Lower-Limb Neuromechanics and Energetics of Locomotion- Normal and Abnormal	**Cooper:** Chs. 12, 13, 8, 18 Lecture Slides Posted on *Moodle* TBD Journal Articles
25	4/2	Th	**No Class- Spring Recess!**	
26	4/7	T	Prosthetics and Orthotics/ FES/Brain Machine Interface	**Cooper:** Ch. 9 Lecture Slides Posted on *Moodle*
SAWICKI (Student-driven 'Case'- based Learning				
*27	4/9	Th	Case 1-2 Introductions	2-3 x 15 min Lightning Talks
*28	4/14	T	Case 3-5 Introductions	2-3 x 15 min Lightning Talks
29	4/16	Th	Cases 1/2	Classroom Discussion/Brainstorm (Teams 2/3 Facilitate)
30	4/21	T	Case 3/4	Classroom Discussion/Brainstorm (Teams 4/5 Facilitate)
31	4/23	Th	Case 5	Classroom Discussion/Brainstorm (Team 1 Facilitates)
*#32	5/7	Th	**FINAL CASE PRESENTATIONS**	**1-4 PM**

Assignment Schedule:

Assignment	Due Date	Day	Topic
*Client #1	**1/29**	Th	Describe a Clinical Condition and Current Treatment(s): <=3 pages Create a 'Case Scenario' with Ideas for Solution: <=3 pages.
*Client #2	**2/5**	Th	RERC-style Center Proposal: <=5 pages.
# Prelim Eval 1	**2/5**	Th	Course Evaluation
*Processes #1	**2/19**	Th	123D Catch and SOLS Review <=5 pages.
*Processes #2	**3/26**	T	'Make' Project Report Length TBD
# Prelim Eval 2	**3/26**	T	Course Evaluation
*Tools #1	**4/7**	T	Journal Article Critique - Rehab Robotics/ PandO <=5 pages
*Tools #2	**4/14**	T	Novel Device Concept: <=5 pages
CASE COLLABORATIVE DISCUSSIONS	**4/9-4/23**	Th -T	Participation - Discussion Preps - Moodle 'Blog' Posts
CASE PRESENTATIONS	**5/7**	Th	*Final Case Reports: <20 pages. Due on: **Thursday, May 7th**
#Final Eval 3	**5/7**	Th	Course Evaluation