School of Applied Physiology
Georgia Institute of Technology
Fall 2013

Course No. & Title	APPH 6202; Clinical Gait Analysis
Credit Hours:	3 credit hours
Lecture time/day:	Lectures: Mondays & Wednesdays, 11:05-11:55am Laboratories: Wednesdays, 1:05-4:55pm
Locations of Class:	Main Location: Lectures: Applied Physiology, rm. 1253 Secondary Location: Laboratory: Applied Physiology, rm. 1550 (Unless otherwise indicated)
Course Coordinator:	Young-Hui Chang, Ph.D. Associate Professor of Applied Physiology
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Guest Faculty:	Robert Kistenberg, MPH, CP, LP, FAAOP Christopher, MS, CPO, LPO, FAAOP Geza Kogler, PhD, CO

Honor Code:
Honesty is expected of all students. The Georgia Tech Honor Code is intended to continuously remind students of the importance of honesty in their academic and professional lives. It also serves to create awareness on the part of both students and faculty of the rules regarding academic honesty and the processes to be followed when those rules are broken. In addition to the Honor Code and Honor Pledge students should be aware of the Rules for Student Conduct found in the Georgia Tech General Catalog. Of particular relevance are the rules that apply to academic misconduct. For additional information about the Honor Code and for a complete copy of the text go to the Georgia Tech On-Line Catalog at *http://www.honor.gatech.edu*

Honor Pledge:
All students are required, when requested, to attach the following statement to any material turned in for a grade in this course. ***"On my honor, I pledge that I have neither given nor received inappropriate aid in the preparation of this assignment."***

Course Description:
This course teaches the fundamental principles related to the biomechanics, energetics and motor control of legged locomotion. The first half of the course focuses on healthy locomotion and the second half of the course focuses on gait deficits due to a range of pathological conditions (e.g., limb amputation and stroke). Structured laboratory exercises in the first half of the course will introduce students to basic techniques for analyzing human gait. Laboratory work in the second half of the course will involve a self-paced Problem-Based Learning (PBL) module that will be coordinated with the Ankle-Foot Orthosis fabrication project in the Applied Physiology Lower Limb Orthotics course. Two additional structured laboratory exercises will be performed in the second half of the course to conduct sample gait analyses with volunteer subjects who are either a person with lower limb loss or regularly requires use of lower limb orthosis(es).

Relationship to the Curriculum Design:
In addition to recognizing the characteristic gait patterns of distinct pathologies, as either a clinical practitioner or researcher it is vital to also understand the general principles underlying these pathological behaviors. This entails a thorough understanding of healthy human locomotion as well as basic understanding of what physical and biological mechanisms determine legged locomotion in general. Through such a fundamental perspective of movement, one will be able to synthesize both basic and applied concepts learned across the curriculum related to the control of limb movement and physiological adaptations to external prostheses and orthoses.

Course GOALS/Objectives:
On completion of this course the student will be able to:
1. understand the biomechanics, metabolic costs and motor control of normal, healthy legged locomotion;
2. understand the underlying principles by which pathologies can affect human gait;
3. conduct an independent study of locomotion using current methods for studying human gait

Teaching/Learning Experiences:
In addition to rote lectures, students will actively engage in laboratory exercises where they will initially be introduced to rudimentary techniques in a structured environment and eventually be challenged through a group (PBL) project to develop and answer their own scientific question regarding gait. Students will also learn to critically evaluate the scientific literature and to present the results of their project as a project proposal in both oral and written formats.

Instructional Methods:
A variety of methods will be employed including: didactic lectures, group work in both lecture and laboratory settings; formal (PBL project) and informal (5 minutes) class presentations on course topics.

Evaluation Methods (include Weighting):

Exam 1:	30%
Exam 2:	30%
PBL Project:	20% (group presentation + paper), rubric will be provided
Lab Grade:	20% (lab assignments + participation)

GRADING RUBRIC:
Grades will be determined on a straight scale; however, a curved scale will be employed if overall class performance indicates evidence of negative skewing.

What makes an A	**A (≥90%)**
Versus a B	**B (80-89%)**
Versus a C	**C (70-79%)**
Versus a D	**D (60-69%)**
Versus a F	**F (<60%)**

EXAMS:
Give overview of exams/Quizzes/Homeworks if present. Use the table below to clarify weighting of assignments, exams, and projects in your course. Items are presented as an example only.

Name of Assignment	No. of Assignments	Points	Total	Percent Total Grade
Midterm Written Exam 1	1	30	30	30%
Final Written Exam 2	1	30	30	30%
Lab Assignments + participation	5 + 1	5 + 15	20	20%
PBL project (written/oral)	2	10 + 10	20	20%
		Total	**100**	**100%**

Course Grade	Percentage	Points
A	(90-100%)	≥90
B	(80-89%)	80-89
C*	(70-79%)	70-79
D	(60-69%)	60-69
F	(<60%)	<60

- *Final course grade less than Satisfactory is not considered passing and will have consequences on graduation requirements. See MSPO (or appropriate) Graduate Program Student Handbook (page 26-27) for details

Required Textbook:
"Gait Analysis: Normal and Pathological Function, 2nd ed" Perry & Burnfield, Delmar Learning, 2010

Additional Readings or Learning Resources:
Additional materials, assignments and helpful resources can be found on the course website: **https://t-square.gatech.edu**

CLASS SCHEDULE:

Week	Lecture (Monday)	Lecture (Wednesday)	Laboratory (Wednesday)
1 Aug 19, 21	Overview & Anatomy	Gait Terminology (Brian S)	Stride Parameters & Metrics
2 Aug 26, 28	Kinematics I	Kinematics II	Kinematics: *2-D Motion Analysis*
3 Sep 2, 4	**HOLIDAY (September 2)**	Kinetics I	Kinematics and Kinetics I: *3-D Motion Analysis*
4 Sep 9, 11	Kinetics II	Kinetics III	Kinematics and Kinetics II: *3-D Motion Analysis*
5 Sep 16, 18	Neural Control I	Neural Control II	Electromyography
6 Sep 23, 25	Metabolic Cost I	Exam 1 Review	Metabolism: The Cost of Transport ‡ *meeting place **TBD***
7 Sep 30, Oct 2	**EXAM 1**	Metabolic Cost II	***PBL** Intro: "Gait Analysis with AFO" *Hypothesis & Pilot testing*
8 Oct 7, 9	Metabolic Cost III	Gait Transitions I: Horses	***PBL** Lab: collect pilot data on own
9 Oct 14, 16	**HOLIDAY (October 14)**	Gait Transitions II: Humans	***PBL** Lab: Letter of Intent (LOI) due
10 Oct 21, 23	Pathological Gait I: Causes	Pathological Gait II: Stroke Gait 1	***PBL** Lab: revised LOI due *Solid AFO available in LLO course*
11 Oct 28, 30	Pathological Gait III: Transtibial Limb Loss I (RK)	Pathological Gait IV: Transtibial Limb Loss II (CH)	***Gait Analysis: Observational*** *Patient Assessment/Collection (10/30)*
12 Nov 4, 6	Pathological Gait V: Transfemoral Limb Loss I (RK)	Pathological Gait VI: Transfemoral Limb Loss II (CH)	**† *Gait Analysis: Instrumented*** *Patient Assessment/Collection (in LLO)*
13 Nov 11, 13	Pathological Gait VII: Stroke Gait 2	Pathological Gait VIII Prosthetic mass	***Gait Analysis: Work Period*** *Optional PBL extra time*
14 Nov 18, 20	Pathological Gait IX Prosthetic mass	Pathological Gait X: Gait Adaptation	* **PBL** Lab: collect data *Posterior leaf-spring AFO available*
15 Nov 25, 27	Pathological Gait XI: Energy costs	Exam 2 Review	* **PBL** Lab: collect data *Leaf-spring AFO available*
16 Dec 2, 4	**EXAM 2**	**PBL Work Period**	**No Lab**
17 Dec 9-14	**EXAM WEEK**	**PBL Presentations**	**PBL Project Papers DUE!**

** PBL projects can be coordinated with Lower Limb Orthotics I course AFO fabrication and can be done on a 'flex-schedule'*
† Data collection will be held in Gait Lab, but during Lower Limb Orthotics time period (TBD)

Tips for Success in this Course:

- You are in graduate school; be accountable for your own education.
- Come to class prepared to think and respond—it's a small class, I know when you are not engaged!
- Use the textbook and assigned readings as a resource to reinforce knowledge and principles covered in lectures and laboratories.
- Come to labs prepared (i.e., having read the handouts!) and ready to go.
- Come with an open-mind and armed with the knowledge that science is not neat, does not always fit into boxes, and experiments rarely work as expected—you often learn more from failures than successes if you take the time to understand why it failed.
- Be mindful of the **'π rule'**: however long you expect a task to take, multiply by π and that is how long it will *actually* take! (works surprisingly well...)
- Playing nice with others means team-*building*, not team-*destroying*.