**Master of Science in Prosthetics and Orthotics Program**



**School of Applied Physiology**

**Georgia Institute of Technology**

**TRANSTIBIAL PROSTHETICS Syllabus**

**APPH 6984**

**SPRING 2013**



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| **Course Instructor** |
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**Office Hours:**

**By appointment**

**Class Day & Times:**

**Mondays and Sporadic Tuesdays (see schedule)**

**Locations**

**a.) Lecture:** Conference Room (TBD)

**b.) Laboratory:** MSPO Clinical and Fabrication Labs

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# Linked Clinical Practicum:

This course will develop the student’s theoretical knowledge and applied clinical and technical skill in order to participate in the course, APPH 6999B Clinical Practicum.

**Honor Code:** In addition to information about the Honor Code at Georgia Tech, [*http://www.honor.gatech.edu*](http://www.honor.gatech.edu)*,* now is a good time to familiarize yourselves with the American Board for Certification’s ***Code of Professional Responsibility****. http://www.abcop.org/assets/pdf/code\_rules\_complaint.pdf*

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

**Course Description:**  The physical, functional and some portions of the psychological deficits of lower limb physical impairment involving transtibial amputation will be investigated and will include topics in: the causes and levels of clinical pathology resulting in transtibial amputation, prosthetic biomechanics, endoskeletal and exoskeletal design/components, materials science, socket designs (patella tendon bearing [PTB], PTB-supracondylar [PTB-SC], PTB-supracondylar suprapatellar [PTB-SCSP], total surface bearing [TSB], Syme, Chopart, Lisfranc, Trans Metatarsal and Partial Foot), prescription criteria, patient history and physical examination principles. The process of creating and fitting transtibial prostheses including: history and physical examination, formulation of the prosthetic prescription, the measurement, impression taking (casting), positive model creation and rectifications, fabrication, static diagnostic socket fitting and alignment, dynamic alignment, normal and pathomechanical gait analysis, and adult (geriatric), pediatric, and sports considerations of transtibial amputees will be investigated and applied. Written reports and oral presentation assignments will include: patient history and physical examination, clinical case study, patient/prosthesis fitting, prosthetic prescription, third party billing considerations, and (where applicable) literature reviews.

Technical assignments will include patient history taking, physical examination, assessment and measurement of neuromusculoskeletal function. Students will utilize a variety of instruments to assess patient neuromusculoskeletal function and tools/machinery including prosthetic componentry for transtibial prostheses and subsequently apply the principles discussed/demonstrated in lecture and laboratory. Patient models will be evaluated, measured, cast, and fit with transtibial endoskeletal prostheses. This course will be linked with the APPH 6223 CAD/CAM in Prosthetics & Orthotics Course as well.

**Relationship to the Curriculum Design:** This course expands upon the foundation biomechanics, kinesiology, gait analysis, human pathology and general clinical patient assessment knowledge and skills developed in the first semester of the MSPO program. These knowledge and clinical/technical skill domains are expanded in this course in order to develop entry level competency in patient examination, measurement, impression taking, static/dynamic alignment and follow up patient management of individuals requiring prosthetic management at the transtibial amputation level.

**Teaching/Learning Experiences:** Materials science and prosthesis design theory and essential techniques will be outlined and discussed in the lecture portion of the course. Supervised applied experiences involving human models and prosthesis design and fabrication in the clinical and technical fabrication laboratory will prepare students for off-campus clinical practical experiences in the course, APPH 6999 Clinical Practicum.

**Evaluation Methods:** Written, oral and practical examinations based on didactic and clinical applied theory and procedures will be conducted at the end of the semester. During the semester, students will be evaluated on their patient model assessment, measurement, impression taking, technical design and fabrication, alignment, fitting and documentation of transtibial lower extremity prostheses. Additional weighted activities include literature reviews, Amputee support group attendance and participation, projects, and online quizzes.

**Instructional Methods:** Lecture and laboratory incorporating theoretical and applied demonstrations, patient models and technical fabrication assignments.

**Independent Assignments:** Students will present patient cases (such as the patient models they evaluate and fit with trans-tibial prostheses in this course) or in other clinical experiences they encounter outside of this course during the off-campus clinical practicum (APPH 6999 Clinical Practicum).

**Required Liability Insurance:** Proof of Professional Liability (Malpractice) Insurance is required.

**Required Health Insurance:** Proof of medical insurance is required. Students who do not possess an accident/sickness/health policy must sign a waiver recognizing the student’s understanding to waive the right to insurance agreeing to the payment for any medical services rendered.

# Course Objectives:

1. Develop Base Knowledge
   1. Anatomy and physiology of the lower limb including diseases and disorders causing lower limb functional impairments and amputation
   2. Prosthetic componentry
      1. Thorough and ongoing familiarity with the componentry of lower extremity prosthetics is paramount to optimal formulation and fabrication of prostheses.
   3. Clinically oriented kinesiology of the lower limbs
      1. Normal and pathomechanical joint function
   4. Engineering principles
      1. Applied Newtonian physics and ground reaction forces, other forces (pressure, multiple joint pressure systems, stress, strain, hysteresis loops, friction, shear, “I” beam and related engineering/architectural principles)
      2. Materials engineering related to prosthetics (i.e., metals, foams, natural and artificial fabrics, thermoplastics, thermosets and thermoforming methods.
      3. Clinically oriented biomechanics
      4. Normal and pathomechanical gait
2. Develop Clinical Knowledge
   1. Recognize signs and symptoms of a variety of clinical pathologies that cause limb physical impairments and amputation
   2. Systematic formulation of the prosthetic prescription
   3. Solve clinical problems and recommend appropriate treatments
3. Develop Clinical Skills
   1. Perform patient history & physical examination; apply biomechanical assessment techniques [i.e. range of motion (ROM), strength, etc.] therapeutics, observational gait assessment, patient socioeconomic factors, medical ethics, medical-legal factors and related methods when performing patient assessment
   2. Acquire knowledge and skills for assessment, measurement, diagnosis and third party billing/coding
4. Develop and demonstrate Professional Attitudes and Behaviors when evaluating, diagnosing and treating patients
   1. Appearance, bedside manner, compassion, empathy, sensitivity, concern, attitude, interaction with physicians and other allied health professionals.
5. Possess and/or develop Essential Skills and Functions: See the MSPO Student Handbook pages 5-6 for more information.

### Performance Measurement (i.e. Grading)

The following table is a summary of the proposed assignments for class. It is subject to change.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of Assignment** | **Number** | **Points Assigned** | **Total** |
| Patient Project Documentation | 2 | 50 | 100 |
| ·        Technical Proficiency |  | 10 |  |
| ·        Professionalism |  | 10 |  |
| ·        Patient Project Written Report |  | 30 |  |
| Literature Review | 1 | 30 | 30 |
| Literature Review presentation | 1 | 20 | 20 |
| Amputee Support Group Attendance | 1 | 0 | 0 |
| Quizzes | 2 | 50 | 100 |
| Final Exam (Written) | 1 | 75 | 75 |
| Final Exam (Practical) | 1 | 75 | 75 |
| Final Exam (Oral) | 1 | 100 | 100 |
|  |  |  |  |
| **Total** |  |  | **550** |

The course grade will be determined according to the following table based on the above point assignments.

|  |  |  |
| --- | --- | --- |
| **Course Grade** | **Percentage** |  |
| A | 90-100% |  |
| B | 80 – 90% |  |
| C | 70 – 80% |  |
| D | 60 – 70% |  |
| F | < 60% |  |

### Evaluation of Clinical Projects, Oral Presentations & Written Reports

Patient fitting projects incorporate a significant portion of the clinical knowledge, skill and behaviors we are going to develop over the course of the semester. As a result, they provide the primary activity by which the level of attainment of clinical knowledge, skill and behavior can be observed. The following assignments are designed to enhance the student’s problem solving and organizational skills and to enhance their abilities in communication. They are also designed to develop core knowledge and skills required in the management of patients with transtibial amputations.

**Patient Project Documentation**

The **technical proficiency** **(10 points/project)** considers such aspects as the overall safety, device safety, potential for irritation or pain, craftspersonship, durability, etc. You *must* have either the course instructor or the guest practitioner approve the prosthesis for fitting before putting it on anyone.

**Professionalism (10 points/project):** This component of the semester consists of the manner in which the student interacts with his peers and all of the patients involved with the fitting. Basically it is a chance to make points based on your behavior. It includes proper professional attire for patient days, punctuality for patient fittings (10 – 15 minutes prior to the scheduled start time), preparedness for patient fittings as well as the interactions that occur between student and patients. Students should have lab coats on at ALL interactions with patients. In addition, professional dress is expected when guest lecturers are presenting. The objective is to hone preparedness skills, professionalism and personal discipline.

Professionalism also means respecting your patient’s time. This is especially important as they are volunteering to come here. You must have your prosthesis ready to be fit at the time of the patient appointments.

The **written report of the patient projects** **(first report will be marked but not scored. 30 points for second project)** should follow the format outlined in class. Photos are appreciated when applicable but not essential.

Report all references according to the Format for Preparing and Writing Reports.

|  |  |
| --- | --- |
| **A (90-100%)**  Thorough coverage of the topic. Clear oral presentation. Very well written: clearly addressed topics, adhered to format, spelling, grammar, syntax and vocabulary are excellent, excellent references and format adherence. | **B (80-89%)**  Good coverage of the topic. Good oral presentation. Well written: clearly addressed topics, adhered to format, spelling, grammar, syntax and vocabulary are good (few errors). Good references and JPO format adherence |
| **C (70-79%)**  Oral presentation adequate. Writing is average: topics addressed, there may be format omissions, more than a few errors in spelling, grammar, syntax and vocabulary. Adequate references, inconsistent adherence to JPO format. | **D (60-69%)**  Writing is below average: may have failed to address or clearly address topics, oral presentation below average, there may be format omissions, many spelling, grammar, syntax and vocabulary errors. Inadequate references, inconsistent adherence to JPO format. |
| **F (<60%)**  Writing is poor, may have failed to address topics, there may be format omissions, number of spelling, grammar, syntax and vocabulary errors is unacceptable. Unacceptable references, inconsistent adherence to JPO format. | In addition to the above, for the presentations appearance, professional manner, speaking clarity, audience engagement and presentation pace will also be graded. |

### AMPUTEE SUPPORT GROUP ATTENDANCE/PRESENTATION

Attendance at a support group for people with amputations can be one of the most enriching and eye opening experiences a practitioner can have. We are fortunate to have an open invitation for our class to participate. In exchange for the invitation, the group has asked that each student group give a very brief introduction of their reasons for being there (and in the MSPO program) as well as some information on a new technique or component relative to prosthetics.

Up to three students can attend a support group meeting each time so please “sign up” with the instructor (rather than just showing up). The **Emory Amputee Support Group** meeting is located at the Emory Rehab Center located at the corner of Clifton Rd and Haygood Rd. 1441 Clifton Road, Atlanta, GA 30322. Starting time is 6:30 pm.

You can park at Children’s hospital next door. The meeting room is accessible from the Rehab Center lobby to the left. For directions call 404-712-5512.

The contact is Julie Suttles. 404-694-0974. Email is c\_legqt@yahoo.com

### MAIN TEXTBOOKS:

Smith, D., Bowker, G., Michael, J: Atlas of Amputations and Limb Deficiencies Surgical, Prosthetic and Rehabilitation Principles. Rosemont, Ill. 3rd ed. AAOS (2004)

Lusardi MM, Nielsen CC. *Orthotics and Prosthetics in Rehabilitation*. 2nd Edition. Boston: Butterworth Heinemann; 2007. ISBN 0-7506-7479-2

### ADDITIONAL TEXTBOOKS:

Hoppenfeld S. *Physical Examination of the Spine and Extremities*. Norwalk, CT: Appleton-Century-Crofts; 1976. ISBN 0838578535

New York University. *Lower Limb Prosthetics.* New York: Prosthetics and Orthotics New York University Post-Graduate Medical School; January 1986. Out of Print

Norkin CC, White DJ. *Measurement of Joint Motion A Guide to Goniometry*. 3rd ed. Philadelphia: F.A. Davis Company; 2003. ISBN 0803609728

Karacoloff, LA, Hammersley, CS, Schnieder, FJ *Lower Extremity Amputation A Guide to Functional Outcomes in Physical Therapy Management.* Gaithersburg, Maryland: Aspen Publishers, Inc; 1992. ISBN 0834202913

[Note: All textbooks are available on TWO HOUR RESERVE at the Georgia Tech Price Gilbert Memorial Library.]

**ADDITIONAL RESOURCES [NOT REQUIRED BUT PROVIDES GOOD REFERENCE INFORMATION]:**

Moore KL, Dalley AF. *Clinically Oriented Anatomy*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 1999. ISBN 0683061410

Field D. *Anatomy Palpation & Surface Markings*. 3rd ed. Oxford: Butterworth Heinemann; 2001. ISBN 0750646187

Salter RB. *Textbook of Disorders and Injuries to the Musculoskeletal System*, 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 1999. ISBN: 0683074997

Wiesel SW, Delahay JN. *Essentials of Orthopaedic Surgery*, 2nd ed. Philadelphia: W.B. Saunders; 1997. ISBN 072166671-x

Murdoch, G, Wilson, AB*. A Primer on Amputations and Artificial Limbs.* Springfield, Illinois: Charles C Thomas Publisher, Ltd; 1998. ISBN 0398068011

UTSWMC Below Knee Prosthetics Manual. 1980

**VIDEO:**

Bostock F. *Patient Driven Services: The Key to Exceptional Patient Management*. Alexandria: American Academy of Orthotists and Prosthetists. ISBN PSCO33

The Barr Foundation, “The Ertl Procedure: Beyond the Bridge, Four Surgeries: Osteomyoplastic Amputation and Reconstruction”, 76 minutes