

600.445  
Computer-Integrated Surgery

Prof. Russell H. Taylor  
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# Organizational Information

- Class Place & Times
  - Thursdays and Fridays 1-2:15 in Shaffer 300
- Instructor
  - Russell H. Taylor (rht@cs.jhu.edu)
  - Guest Lectures
- TA
  - Ameet Jain (jain@cs.jhu.edu)
- Textbook
  - *Computer-Integrated Surgery*; (Editors: Taylor, Lavalley, Burdea, Mosges), MIT Press, 1996
  - Handout Material
- Office hours
  - By appointment, but I will usually be available before or after class
- Web site: <http://www.cs.jhu.edu/~cis/cista/>

# Overview of the CIS Course Sequence

- 600.145 (Intersession and Summer)
  - One credit introductory course for students who just want an exposure to basic concepts without in-depth analytical treatment
  - Targeted at freshmen & sophomores
  - Minimum prerequisites

# Overview of the CIS Course Sequence

- 600.445 (Fall)
  - Goal is to provide overview of basic techniques & applications and to provide background for subsequent research
  - Lectures + homeworks
  - Optional “project” is usually a report and plan for subsequent implementation project
- 600.446/646; 600.452 (Spring)
  - Combination advanced seminar + lectures + student team projects
  - Emphasis on student projects + project management + presentation skills
  - 600.452 is same course without the project

# Other courses

- Surgery for Engineers
  - Lectures on basic physiology and surgical techniques
  - Animal use and lab etiquette
  - Hands-on labs using animal models
  
  - Strictly limited numbers (about 12)
  - Preference given to CIS ERC students
  
  - First offered as very intensive intersession course
  - Considering moving to once per week during spring semester

# Course content

- Basic concepts of computer-integrated surgery
  - Image segmentation, registration, modeling
  - Robotics
  - Safety
  - Human-machine interfaces
- Application case studies
  - Lectures by clinicians & systems implementors
- Outcomes and economic analysis
- Other topics of interest
  - E.g., regulatory affairs

# Guest lectures

- Surgeons (tentative list)
  - Spine surgery
  - Laparoscopic
  - Interventional radiology
  - Microsurgery
- Regulatory
- Health economics
- Specific technical topics

# Prerequisites

- No hard and fast rules, but ...
- Mathematical background
  - You will need to work with coordinate transformations and linear approximations
  - Calculus will be assumed
  - Linear algebra is highly recommended
- Programming
  - No specific languages required. Homework can be handed in in any “usual” language (C, C++, Java, Fortran, ...) but needs to be well discussed and documented
  - Example handouts will be in C++ and/or C
  - But the language is less an issue than basic concepts
  - Familiarity with basic data structures is important
  - Your lab partner choice is important. Pick complementary skills

# Grades and homework

- Course grade is based on take home assignments
  - Take home exams (called “homework”) done alone
  - Programming assignments done in teams of two
  - Grading formula discussed on next page
- Because of JHU’s interpretation of FERPA, all assignments must be accompanied by a self-addressed, sealable 8 ½ x 11 inch envelope
  - If it is not included, your homework will not be returned and will possibly be shredded at the end of the semester
- All assignments must be turned in BEFORE class on the day that they are due.
  - This is because I plan to discuss answers in class
  - Contact the TA immediately if you have a problem or special need
- **NOTE: Modification from last year’s format. More homework assignments, but I will try to make them smaller and you can throw out more.**

# Grading formulas

- Throw out grade for one programming assignment and one homework
- Must hand in PA#5. Do not “dog” this one. If grade is less than 60, I may throw out the lowest of the other assignments instead.
- Numerical grade formula  $\text{Max}(0.4P+0.6H, 0.6H+0.4P)$   
H is homework average and P is the programming average
- Letter grade thresholds vary but usually fairly close to 90-80-70
- Optional project with negotiated modification to formula  
See me by add/drop date if you want to do this

# Graded Homework

- Thought exercises with essay-type answers & analytical problems
- Answers should be neat and legible. I prefer typed answers to the essay questions.
- Homework is open-book (and open library) but you must work alone. You may not consult with other students about the answers, and you may not consult the answers to previous years' homework and exams.
- Typically due 1-2 weeks after handed out, but I may modify dates
- Hand in to lock box outside NEB 224
- Homework assignments must be handed in on day due. I will accept late homework only in extraordinary circumstances. I may make arrangements for makeup assignments.

# Programming Problems

- Programming projects build on each other
- Typically involve using CIS algorithms discussed in class to determine an “unknown” quantity
- I will provide several debugging data sets with answers and an “unknown” data set
- You should hand in a report containing:
  - Description of the problem and method used to solve it
  - Description of the program structure & who did what
  - The “answer” & short discussion of the answer (why you think it is correct). I recommend that you include also a discussion of the debugging data. Also, the answers should not be embedded somewhere in a program printout. Put them clearly in the report.
  - The documented program listing
- You can use Java, C, C++, Matlab, Fortran or something else with concurrence of TA
- Intention is to provide C++ modules that “solve” incremental problems. These will be handed out after the homework is due.

# Programming Problems (con'd)

- For programming, can work in teams of 2 or alone.
- Teams should not share code with other teams but may discuss problems
- If work in a team, grade is identical for the assignment, but I want you both to participate about equally and also tell me who did what.
- Assignments must be handed in on day due. I will accept late homework only in extraordinary circumstances. I may make arrangements for makeup assignments.