Introduction to ISyE 4800
Senior Design Pre-planning

Chen Zhou
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3/11/2016
Today’s topics

- What are Senior Design and pre-planning?
- What you need to do before and in 4800?
- When you need to do it?
Student teams work intensively to solve a client company’s IE-related problem
✓ Provide significant value to client using IE methodology

What do project clients get out of it?
✓ Implementable ideas, supporting analysis, prototype software (when applicable), etc.
✓ Significant value to client (a course requirement/focus)

What do GT students get out of it?
✓ Transition from academic to professional life
  • Professionalism, communication, project management, teamwork, etc.
✓ Real engineering project experience
Senior Design Objectives

- Learn workplace professionalism

- Experience IE professional practice
  - Define & scope problem (ask the right question)
  - Collect, analyze and validate data
  - Develop and implement strategy
  - Make solution usable by client (ex: coding, etc.)
  - Demonstrate value to client
Senior Design Objectives

- Learn to work in a (real) team environment
  - Project management (use of time, distribution of work, planning for deadlines, reliance on teammates, etc.)

- Enhance communication skills
  - Planning, presenting, and writing to explain your solutions
Challenges

- **Project definition, scoping, and solution design**
  - Problem not clearly defined (ask the right questions)
  - Data unavailable or hard to obtain
  - Strategy not immediately apparent (even to your advisor)

- **Making the best use of your human resources**
  - Time requirements & pressure
    - Deadlines are *real*, "mandatory" means mandatory
    - It’s easy to waste time if you’re not careful
  - Group dynamics/conflict
    - Be professional under pressure
    - Remember that you represent all of Georgia Tech!

- **Adjusting to real-world: uneven, non-nurturing, etc.**
  - Anything hard is *your* responsibility
  - Communications must be correct & respectful
  - Some feedback may be blunt and negative
Note on professionalism

- Some things are obvious
  - Fail client drug tests, lateness, not dependable, disrespectful

- Some are less obvious
  - “…very excited and eager to be a part of [the project]…, confident we will be a valuable asset…, eagerly await your decision on choosing a group.”
    - Be polite but straightforward.
    - Definitely want the project?
    - Definitely don’t want the project?
    - Not sure, will decide later?
  - Suggestion: ask your friends outside the team, ask me

- Professionalism starts now! Misbehavior can lead to grade deductions carried to 4106.
Prerequisites for 4106 Senior Design

1. ISYE 3025, ISYE 3133, ISYE 3232, ISYE 3044

2. 4 of 6 ISyE concentration elective courses

3. Successful completion of ISYE 4800
   ✓ Approved preproposal
     1. Team
     2. Client
     3. Project
Tasks in ISyE 4800

1. Register for ISyE 4800/4800R for summer 2016
   ✓ If you already took 4800 in fall 15, you must re-take

2. Form team of 7 or 8

3. Find potential clients
   ✓ Company postings on ISyE website
   ✓ Past senior design teams
   ✓ Internships and co-ops
   ✓ Cold-calling
   ✓ Site visit is required

4. Submit pre-proposal and get approved
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Step 1: Build yourself a team

- **KEY: Be able to trust their work & work ethic**

- Similar academic goals
  - Award winner vs. good grade vs. D-is-for-done

- Diverse skill set
  - Cover all important skills with one or two people
  - No all-stars needed

- The class schedule for everyone in your team must fit in one of the two 4106 section schedule: MWx or TRy, where x, y can be from A – O.
Step 1: Build yourself a team

- TeamBuilder site: pennant.isye.gatech.edu/sdmatch
  - The more questions you answer, the better your team will fit

- Once you have a team, get together outside of senior design
  - You’ll get along better during the semester
Step 2: Finding a project
Sample of past project topics

- Activity valuation
- Capacity management
- Customer service enhancement
- Demand/price forecasting
- Distribution network design
- Energy usage reduction
- Equipment replacement planning
- Facility layout/redesign
- Flow management
- Inventory planning
- Manufacturing line/cell design
- Materials handling
- Money/capital management
- Pricing strategy
- Preventative maintenance scheduling
- Process design/redesign
- Production scheduling
- Supply chain design
- Technology integration
- Vendor selection
- Waste reduction
- Workforce scheduling
Project Clients, 2005-2015
(Feel free to add to the list!)

- Acuity Brands
- ADEX Machining
- Aerotron
- AGL Resources
- AirTran
- Alternate Apparel
- Amazon
- American Birkebeiner
- American CyberSystems
- Anheuser-Busch
- AT&T
- Atlanta Brewing Company
- Atlanta Community Food Bank
- Atlanta Gas Light
- Atlanta Gastroenterology Associates
- Atlanta Journal-Constitution
- Atlanta Regional Commission
- Avery Dennison
- Avnet
- Bella Cucina
- BellSouth
- BlueLinx
- Buckhead Baseball
- Burger King
- Burt’s Bees
- Cab
- Canvas Systems
- Cardiovascular Associates
- CARE
- Carrier Europe
- Carter’s
- Caterpillar
- Cbyond
- Centers for Disease Control and Prevention
- Centro de Agencias
- Chick-fil-A
- Chico’s
- Children’s Healthcare of Atlanta
- Cisco Systems
- City of Atlanta
- Coca-Cola
- Coca-Cola Enterprises
- Coca-Cola North America
- Coca-Cola Refreshments
- Comcast
- Cooper Industries
- Cox Communications
- CR Bard
- Craft-Art
- Crosslink
- CYI Gifts
- DeKalb County
- DeKalb County Police Department
- DeKalb Medical Center
- Delta
- DHL
- Dick’s Sporting Goods
- e2M
- EarthLink
- EGO North America
- Elysian
- Emory Crawford Long Hospital
- Emory University Healthcare
- Emory University Hospital
- Energy Dispatch
- Enraf
- Equifax
- Exel
- Express
- F&P Georgia Manufacturing
- Flu-Free Schools
- Flying Lizard Motorsports
- Fulton County
- GE Energy
- General Mills
- Georgia Aquarium
- Georgia Poison Control
- Georgia Power
- Georgia Tech Athletic Association
- Georgia Tech Campus Recreation Center
- Georgia Tech Capacity Planning and Space Management
- Georgia Tech Library
- Georgia Tech Office of Undergraduate Admissions
- Goody Products
- Grenzubach
- Gwinnett County Public Schools
- Gypsum Management & Supply
- H.C. Britt
- Heidelberg
- High Museum of Art
- HNI
- Home Depot
- HON Furniture
- Honda
- Honeywell
- House of Cheatham
- ICF International
- IKEA
- iRobot
- Innovate
- Intel
- InterContinental Hotels Group
- Interface
- iParametrics
- JC ATM Services
- Kimberly Clark
- Kubota
- Lands’ End
- Legacy Property Group
- Lockheed Martin
- Macy’s
- Manheim Auto Auctions
- Marcus Autism Center
- Marmi Natural Stone
- Mars
- Matador Distributing
- McKesson
- McLane
- MedShare International
- Metro Atlanta Regional Transportation Authority
- Michelin
- Midtown Consulting Group
- Monday Night Brewing
- MSC
- NCR
- Newell Rubbermaid
- Next Wave
- Nissan
- Norfolk Southern
- Northside Hospital
- Office Depot
- OHL
- PACCAR Parts
- Panasonic
- PepsiCo
- Phillips 66
- Piedmont Fayette Hospital
- Piedmont Heart Institute
- Piedmont Hospital
- Piedmont Newman Hospital
- Platt Electric Supply
- Porsche
- Pratt & Whitney
- Predictix
- Project Open Hand
- Publix
- RaceTrac
- Radiant
- Rainmaker
- Reliance Electric
- Remington Medical Supply
- RMI
- RockTenn
- Rockwell Collins
- Roswell Recycling
- Ryder
- Saia
- Salvation Army
- Sandoz
- Sandvik Mining & Construction
- ScheduleWise
- Scientific Atlanta/Cisco
- Shaw Industries
- Sherwin Williams
- Siemens
- Southeastern Pneumatic
- Southern Company
- Spectral Response
- Starline Associates
- Summit Industries
- SunTrust
- SynQ Solutions
- The Children’s School
- Titan
- Toyota
- TriVantage
- Tyco Healthcare
- Tyco Safety Products
- UNC Healthcare
- UNICEF
- United Distributors
- United Nations High Commissioner for Refugees
- United Nations World Food Programme
- UPS
- UPS Capital
- UPS Global Health
- USG
- UTI
- Vertical Brands
- VF
- Virgin America
- Virginia Dominion Power
- Volunteer Express
- Waffle House
- Wal-Mart
- Weir Furniture
- WellStar Kennestone Hospital
- Whirlpool
- Wika
- Windstream
- World Health Organization
- ZF Industries
ISyE Senior Design projects (USA)
Step 2: Finding a project

Requirements

- Requirements
  - Scope/difficulty
    - 12 hrs/person/week = 1080-1440 hrs total (full-time job ≈ 2000 hrs)
  - ISyE knowledge/methods
  - Value to client
  - Design
    - Make recommendations, not just a tool

- Also...
  - Should be very interesting to you
    - If you don’t like it now, you’ll hate it after 1000+ hours!
Step 2: Finding a project
Approaching potential clients

- How to approach companies for a project

  ✓ Engineers, managers, etc. – they have the work to be done!
    • Not human resources or university relations

  ✓ Ask in a way they understand
    • IEs vs. non-IEs

  ✓ Make a personal approach
    • Personal visit, direct phone call

  ✓ Be prepared
    • “Elevator speech” & details
    • Information about Senior Design & you
Expectations of Project Clients

- Commitment to providing access to data & site
- Selection of a primary contact/champion for team
  - Client-side organization (meetings, site visits, data, questions, etc.)
- True interest in project
  - Real value, not busywork!
Risk and reward factors in project/client selection

- Consulting firms
- Startups
- Small operations
- Access
  - Information
  - Response time
  - Location
- Participation
Client may share proprietary or confidential information

Proprietary
- Formula
- Financial info (salary)
- Methods or strategies
- Marketing plans
- Customer list
- IT system details
- ...

Confidential
- ID
- SSN
- Account info
- Intellectual property
- Medical record
- Passwords
- ...

Client may ask you to sign their legal agreement
What should you do?

1. Ask the client to filter or mask the data to avoid the non-disclosure agreement. Emphasize this is just a class project for 1-semester.

2. Sign the client’s agreement as individual. You are responsible. Be sure to read carefully.

3. Provide GT standard senior design NDA to client to see if they agree. Emphasize this is just a class project for 1-semester.

4. Start the GT Non-disclosure agreement (NDA) or Proprietary Information agreement (PIA) process.
3. Show client GT Standard NDA (PIA), urge them to agree

PROPRIETARY INFORMATION AGREEMENT

&

The Board of Regents of the University System of Georgia
by and on behalf of Georgia Institute of Technology

THIS AGREEMENT is effective the ___ day of __________________ 2016, by and between __________________________ located at __________________________ (hereinafter referred to as “COMPANY”), and The Board of Regents of the University System of Georgia by and on behalf of Georgia Institute of Technology, a nonprofit educational institution organized and existing under the laws of the State of Georgia and having its principal offices at 225 North Avenue, Atlanta, Georgia 30332 (“GIT”).

WHEREAS, COMPANY may disclose to GIT certain technical data or information that is commercially valuable and not generally known in its industry of principal use (hereinafter collectively referred to as “Proprietary Information”) pursuant to GIT’s performance of certain research pertaining to ____________________________ for use in a Georgia Tech Senior Design Project for Industrial & Systems Engineering Senior Design Course, ISyE 4106 (the “Purpose”); and
GT NDA process, start ASAP

- Student fill out following forms available on T-square
  - Client contact info on NDA routing form (not the topic)
  - Student Proprietary Information Agreement form (do not put date on)
  - Put everything into a single PDF file
  - Send it to senior design coordinator

- The coordinator will sign and forward to GT Legal
- GT legal will work with the client and coordinator to reach a fully executed NDA
Office of Legal Affairs
Non-Disclosure Agreement (NDA) Routing Form

GT’s Principal Investigator (PI) Information:
Name (as it should appear in NDA): Chen Zhou
Title: Associate Professor
Email: cz3@gatech.edu
Phone: 4048942326
Alternate Phone: 4048942300
Fax: 4048942301
Admin Asst: Dimetra Diggs-Butler
Phone: 4048944307
Email: dimetra.diggs-butler@isye.gatech.edu
Department: ISYE
Mail Code: 0205

Company’s Contact Information:
Company Name: ____________________________
Address: ____________________________________
Technical Contact Name & Title: ________________________________
Phone: ______________________ Fax: ______________ Email: __________________________
Contract/Business Contact Name & Title: __________________________
Phone: __________________________ Fax: __________________ Email: _______________________
Will you be disclosing any proprietary/confidential information? Yes _______ No ___
If yes, identify the topic of information to be disclosed: ________________ I fill this part
“Student PIA”

Complete before submission!

Complete after NDA fully executed
The signature sheet (2nd page) on fully executed PIA

For every GT employee you discuss proprietary information to sign. Make extra copies of the second sheet if needed.
Tips for good practice

- Designate someone responsible for the “signature sheet”
- Get signatures to any GT employee: advisor, coordinator, other professors, TA’s, ...
- Include a pdf of the signature sheet with your final report submission (two separate documents). Without this, I will not read your final report (and you will fail 4106).
NDA/Confidentiality requirements (non-legal wording)

- **Deliverables**
  
  ✓ Presentations
    - **To faculty:** Do not include confidential material (not all faculty will have signed your NDA)
    - **To client:** Include all necessary material
  
  ✓ Reports (to me)
    - Include all necessary material, clearly label what is confidential
  
  ✓ ISyE Presentation Coaching
    - Clearly indicate what is confidential (they will have signed NDA)
  
  ✓ GT Communication Lab
    - Make sure they have signed NDA; then clearly indicate what is confidential

- **Project work**
  
  ✓ Shared computers & work areas
    - Remove all confidential data from hard drives when you leave (each session)
  
  ✓ Discussions with advisor
    - Clearly indicate what is confidential
  
  ✓ Discussions with other faculty
    - Make sure they have signed NDA; then clearly indicate what is confidential
  
  ✓ Others (friends, family, etc.)
    - Do not disclose any confidential material
NDA/Confidentiality requirements (legal wording)

- **Project Reports**
  - Presentations
    - To GT faculty: Do not include confidential material (not all GT faculty will have signed the internal NDA signature sheet)
    - To companies: Include all necessary material
  - GT Advisor, Faculty and Communication Labs
    - Ask company if NDA is required
    - Ensure you can disclose confidential information to necessary GT personnel
    - Ensure all confidential information is clearly labeled
    - If disclosure permitted by NDA, only disclose to GT personnel who have signed the internal NDA signature sheet

- **Project work**
  - Shared computers & work areas
    - Remove all confidential data from hard drives when you leave (each session)
    - Remove all papers, erase whiteboards, etc.
  - Discussions with GT advisor and Faculty
    - Ask company if NDA is required
    - Ensure you can disclose confidential information to necessary GT personnel
    - Ensure all confidential information is clearly labeled
    - If disclosure permitted by NDA, only disclose to GT personnel who have signed the internal NDA signature sheet
  - Others (friends, family, etc.)
    - Do not disclose any confidential material
DON’T FORGET!!

- KNOW THE NDA PROCESS
- PRE-PROPOSAL MUST INCLUDE DATA AND ANALYSIS AND VALUE
- REGISTER FOR ISYE 4800/4800R
Step 3: Project Pre-Proposal

- Convince me this project is appropriate
  - Design content, ISyE methodology, difficulty, value

- Convince with evidence: data/analysis, not words!
  - Background
  - Data/analysis to support the size/scope/value of opportunities
  - Proposed type of deliverables
  - Connection to ISyE discipline

- Writing quality (spelling, grammar, typos) counts too!

You will receive permit for 4106 only if your pre-proposal is APPROVED by the senior design coordinator and your contribution is satisfactory. 53/54 teams in last 3 semesters got approval.
Step 3: Project Pre-Proposal

- Show evidence that the project will be valuable...

  ✓ This is a CRITICAL skill.

    • If you can’t show that your work is worth paying for, you’ll have a hard time finding jobs.

    • If you’re good at making the case that you’re worth paying, you’re likely to have a very successful career in any field.

  ✓ ISyE wants you to learn this... in Senior Design.

  ✓ It’s not easy, so you’ll need to work hard to learn it.
Step 3: Pre-Proposal Submission

- HOW/WHERE TO SUBMIT PRE-PROPOSALS

- ✓ Hard copy to ISyE Academic Office

- ✓ Electronic copy on t-square site
  - Label file “Name_of_Company Submission_Type.doc”
  - Example: “Home_Depot Pre-proposal.doc”
DON’T FORGET!!

- KNOW THE NDA PROCESS
- PRE-PROPOSAL MUST INCLUDE DATA AND ANALYSIS AND VALUE
- REGISTER FOR ISYE 4800/4800R
Warnings

- You must contribute to your team’s preproposal; being out of town is NOT an excuse.
  - (last year: 3)

- You cannot drop a team without Associate Chair approval
  - Once you begin the pre-proposal process, your teammates are counting on you.
  - Individuals will not be allowed to drop from their team.
    - Obvious exception: serious health issues, etc.
    - No exceptions for unhappiness with team, project, expected grade, etc.

- Failure to complete any ISyE required course or 4 of 6 concentration classes will result in you being dropped from your team
4800 FAQs

- Do I have to meet with an examiner after initial pre-proposal submission?
  - Yes, unless you live/work outside of driving distance.

- What if I live/work far away this semester?
  - You’re still expected to contribute to the project-finding and pre-proposal effort. Shirkers will be penalized; most semesters, one or more students have not been given a permit with the rest of their team.

- Will you have office hours?
  - Don’t wait for office hours. Time is of the essence, so ask your questions right away.
    - If I’m not in my office, send me your questions by email – wherever I am, I’ll be able to give you a pretty quick answer.
  - Piazza is an excellent way of communication once T-square site is up.
Recent national/international awards for Senior Design projects

- IIE best student paper award
  - 1st place internationally, 2015; 2nd place internationally, 2009

- INFORMS best student paper award
  - Runner-up national & international, 2010 & 2011 & 2012

- INFORMS “Doing Good with Good OR” competition
  - Finalist, 2010 & 2011 & 2014(2)...competing against PhD students!

- ...and others would’ve won too, but were constrained by NDAs
US News & World Report
Top 15 Colleges for Senior Projects

- Alverno College
- Brown University
- Carleton College
- College of Wooster
- Elon University
- GEORGIA TECH
- Kalamazoo College
- Miami University (OH)
- Portland State University
- Princeton University
- Reed College
- Southern Illinois University – Edwardsville
- Stanford University
- Swarthmore College
- Worcester Polytechnic University

Senior Design is a great experience…
…but you have to put in a lot to get a lot out of it.
## Schedule, again

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Questions?

- Ask me (for now, 2 more will join later)
  
  Dr. Chen Zhou
  Groseclose 202
  404-894-6484
  czhou@isye.gatech.edu

- Please don’t ask other faculty
  ✔ They’re paid for other things.
DON’T FORGET!!

- KNOW THE NDA PROCESS
- PRE-PROPOSAL MUST INCLUDE DATA AND ANALYSIS AND VALUE
- REGISTER FOR ISYE 4800/4800R
My questions to you

- What do you do if your client wants an NDA?
- What is the process to get NDA?
- Do you have to do anything this semester?
- What do you have to do in the summer?
- How to get permit to register for 4106?
- I will study abroad, can I be in 4800?
- I will co-op in Seattle, can I be in 4800?
- What happens if I withdraw from 4th concentration elective?