INTRODUCTION TO ISYE 4800 SENIOR DESIGN PRE-PLANNING

March 5 2019
Topics

• What are 4106 and 4800?
• What you need to finish in 4800?
• When you need to do what?
## Faculty Team in 4800 – Fall 2019

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Role</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. Dima Nazzal</td>
<td><a href="mailto:dima.nazzal@gatech.edu">dima.nazzal@gatech.edu</a></td>
<td>Coordinator</td>
<td>Info session, coordinate activities</td>
</tr>
<tr>
<td>Prof. Dima Nazzal</td>
<td><a href="mailto:dima.nazzal@gatech.edu">dima.nazzal@gatech.edu</a></td>
<td>Co- Examiner</td>
<td>Project screening</td>
</tr>
<tr>
<td>Prof. Natasha Boland</td>
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<td>Co- Examiner</td>
<td>Project screening</td>
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What is Senior Design in ISyE

• Student teams seek a client’s IE-related opportunities
  – Provide significant value to client using IE methodology
• What do project clients get out of it?
  – Implementable ideas, supporting analysis, prototype software, ...
  – 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 is more than other courses

- Be inspired to do something impactful
- Be professional under pressure
- Be prepared to broaden and deepen knowledge
- Ask the right questions before finding the right answers
- Improve your communication skills
- Improve your computing skills
- A lot of help, if you are looking for it
- …
Be professional

• Be punctual
• Have a good attitude
• Take initiative
• Be responsible and reliable
• Develop work ethic
• Be prepared
• Cooperate
• Be honest and ethical
• ...

To paraphrase Dr. Adam Grant: “Argue like you're right, but listen like you're wrong. Instead of arguing to win, you can argue to learn. Acknowledge when a good point has been made. Acknowledge your weaknesses."
Professionalism starts now!

- Failure to meet deadlines or follow instructions can lead to grade deductions carried to 4106.
Prerequisites for 4106 Senior Design

1. ISYE 3025, ISYE 3133, ISYE 3232, ISYE 3044 (and the prerequisites to these courses)

2. 4 of 6 ISyE concentration elective courses

3. Successful completion of ISYE 4800
   - Approved preproposal
     1. Team Composition
     2. Client Notification
     3. Project Pre-proposal
   - Sufficient contribution to an approved preproposal
Tasks in (or before) ISyE 4800

1. Register for ISyE 4800A/4800Q/4800R
   - Q is for students taking SOUP classes (summer only)
   - R is for study abroad students
   - A is for everyone else
   - If you already took 4800 before, you must re-take

2. Form team of size from 6 to 8

3. Find potential clients
   - Postings on ISyE website
   - Past senior design teams
   - Internships and co-ops
   - Cold-calling
   - Site visit (virtual) is required

4. Develop the pre-proposal and get approved
# 4800 Deliverables and Schedule

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Details</th>
<th>4800 Summer semester</th>
<th>4800 Fall semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team composition report</td>
<td>Students submit team members, liaison, and resumes</td>
<td>Monday in the week final exams starts in spring semester</td>
<td>Monday of 5th week in fall</td>
</tr>
<tr>
<td>Client notification report</td>
<td>Students submit a report listing the client name and nature of the project</td>
<td>3rd Monday in the summer</td>
<td>7th Monday in fall</td>
</tr>
<tr>
<td>NDA Routing Form</td>
<td>If your client requires an NDA</td>
<td>As soon as you have talked to your client. Process for approval is lengthy</td>
<td>As soon as you have talked to your client. Process for approval is lengthy</td>
</tr>
<tr>
<td>Initial pre-proposal</td>
<td>Students submit initial pre-proposal</td>
<td>7th Monday in the summer</td>
<td>10th Monday in fall</td>
</tr>
<tr>
<td>Meetings with project</td>
<td>A faculty member will be assigned to work with you to shape up the pre-proposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>screener/examiner</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Revised pre-proposal</td>
<td>If the initial proposal is not approved, a student can submit a second one. It can be an enhanced version of the first or another project with a different client</td>
<td>10th Monday</td>
<td>13th week</td>
</tr>
<tr>
<td>Peer evaluation</td>
<td>Students assess every other team member (including themselves) for contribution</td>
<td>12th Tuesday</td>
<td>16th Tuesday</td>
</tr>
<tr>
<td>Permit to ISYE 4106 to your section</td>
<td>Registration permit to your section will be issued if you satisfy the requirements</td>
<td>Phase II registration during the 4106 semester</td>
<td>Phase II registration during the 4106 semester</td>
</tr>
</tbody>
</table>
Step 1: Build yourself a team

- **KEY: Be able to trust their work & work ethic**
- Similar academic goals: A for winners vs. D for done
- Diverse skill set: Cover all skills with one or two members
- Compatible 4106 class schedules: no classes conflict with one of two team class schedule: MW or TR sections

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>R</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00 – 2:45</td>
<td></td>
<td>TR</td>
<td></td>
<td>TR</td>
<td></td>
</tr>
<tr>
<td>12:10 – 2:55</td>
<td>MWF</td>
<td></td>
<td>MWF</td>
<td></td>
<td>MWF</td>
</tr>
<tr>
<td>6:00 – 8:45</td>
<td></td>
<td></td>
<td>MWF</td>
<td>TR</td>
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</tbody>
</table>
Step 1: Build yourself a team (cont.)

- Students you have worked with, been in class with, post on 4800 Piazza board

- Once you have a team, get together outside of senior design
  - You’ll get along better during the semester
Team Composition Report template

• Each team submits one report to course website by the team liaison person
• File name: team liaison’s last name + Team
• Date:
• Team members in a table (including Liaison) and information in alphabetical order

<table>
<thead>
<tr>
<th>Family Name *</th>
<th>Given Name</th>
<th>Working GT email</th>
<th>Preferred 4106 section</th>
</tr>
</thead>
</table>

  – *Please use * to indicate the liaison person.
  – ** All team members must have classes that can fit in the same 4106 section type
    • Section type MW: MWF 12:00 – 3:00, W 6:00 – 9:00
    • Section type TR: TR 12:00 – 3:00, WR 6:00 – 9:00

• Resume for all members in alphabetical order
• Compile everything together in a single file to submit to T-Square
• Submit to online form
• *Under extenuating circumstances, the coordinator has the coordinator to add, remove, and change the team
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
- Flow of material, people, documents
Project Clients, 2005-2018, (Feel free to add to the list!)

- Acuity Brands
- ADEX Machining
- Aerotronics
- AGI 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
- BlueLink
- Buckhead Baseball
- Burger King
- Burt's Bees
- CAD
- Canvas Systems
- Cardiovascular Associates
- CARE
- Carrier Europe
- Carter's
- Caterpillar
- Cheyenne
- Centers for Disease Control and Prevention
- Centro da Agcias
- 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
- CSA
- CYI Gifts
- DeKalb County Police Department
- DeKalb Medical Center
- Delta
- DHL
- Dick's Sporting Goods
- EarthLink
- EGO North America
- Elysian
- Emory Crawford Long Hospital
- Emory University Healthcare
- Energy Dispatch
- Enraf
- Equifax
- Exel
- Express
- F&P Georgia Manufacturing
- Flu-Free Schools
- Flying Lisard Motorsports
- Fulton County
- GE Energy
- General Mills
- Georgia Aquarium
- 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
- Goodby Products
- Grenzebach
- Gwinnett County Public Schools
- Gyproc Management & Supply
- H.C. Brill
- Heidelberg
- High Museum of Art
- HNI
- Home Depot
- HON Furniture
- Honda
- Honeywell
- House Of Cheatham
- ICF International
- IKEA
- Idaho Potato Company
- ITO
- Interface
- Intercontinental Hotels Group
- JM Smuckers
- JCPenney
- JC ATM Services
- Kimberly Clark
- Kobuta
- Landsis Gyr
- Legacy Property Group
- Lockheed Martin
- Macy's
- Manheim Auto Auctions
- Marcus Autism Center
- Mami Natural Stone
- Mars
- Metzendorf Distributing
- McKensies
- McKesson
- Medshare International
- Metro Atlanta Regional Transportation Authority
- Michelle
- Midtown Consulting Group
- Monday Night Brewing
- MSCI
- NCR
- Newell Rubbermaid
- Next Wave
- Nisus
- Norfolk Southern
- Northside Hospital
- Office Depot
- OHL
- PACAR Parts
- Panasonic
- PepsiCo
- Philips
- Piedmont
- Piedmont Heart Institute
- Platt Electric Supply
- Porsche
- Pratt & Whitney
- Predictive Analytics
- Project Open Hand
- Publix
- RaceTrac
- Relay Bikes
- Radiant
- Rainmaker
- Rain X
- Ramada
- Rankin
- Regal
- Reynolds
- Reliance Electric
- RiverStone Medical Supply
- RMG
- RockTenn
- Rosen
- Roswell Recycling
- Ryder
- Salsa
- Salvation Army
- Sandoz
- Sandvik Mining & Construction
- ScheduleWise
- Scientific Atlanta/Cisco
- Shaw Industries
- Shenwin Williams
- Siemens
- Southeastern Pneumatic
- Southern Company
- Spectral Response
- Starline Associates
- Summit Industries
- SunTrust
- Synt Solutions
- The Children's School
- Textron
- Titus
- 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
- UFI
- Vertical Brands
- VF
- Virgin America
- Virginia Dominion Power
- Volunteer Express
- Waffle House
- Wal-Mart
- Ware Furniture
- WellStar Kennestone Hospital
- Whirlpool
- WJIA
- Windstream
- World Health Organization
- ZF Industries
Step 2: Finding Project: Requirements

- Requirements
  - Design
    - Make recommendations to change an existing system or design a new system, not just a tool or an analysis or a model
  - ISyE knowledge/methods
  - Magnitude
    - 12 hrs/person/week = 1080-1440 hrs total (full-time job ≈ 2000 hrs)
  - Value to client
    - Part of Senior Design is learning to identify which problems are worth your time to fix and which are not

- 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, 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 notification

- Organization Name
- Client Contact Name, Email, Phone
- Describe the Organization you will work with
- Describe the system you propose to study, design, re-design
- Describe the opportunities for improvement
- Describe the opportunity’s worth/value to client
- Describe what you will deliver to the client
- Describe the relationship of your potential project to the ISyE curriculum
Client may share proprietary or confidential information

<table>
<thead>
<tr>
<th>Proprietary</th>
<th>Confidential</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Formula</td>
<td>• ID</td>
</tr>
<tr>
<td>• Financial info (salary)</td>
<td>• SSN</td>
</tr>
<tr>
<td>• Methods or strategies</td>
<td>• Account info</td>
</tr>
<tr>
<td>• Marketing plans</td>
<td>• Intellectual property</td>
</tr>
<tr>
<td>• Customer list</td>
<td>• Patient information</td>
</tr>
<tr>
<td>• IT system details</td>
<td>• Passwords</td>
</tr>
<tr>
<td>• ...</td>
<td>• ...</td>
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</tbody>
</table>

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 NDA. It is just a one-semester undergrad project

2. Undesirable: Individually sign the client’s NDA
   1. GT employees are not allowed to sign client’s NDA
   2. It must allow GT employee acceptable access, or no grade!
   3. Quick and dirty in the short run, risk in the long run

3. Individually sign client’s NDA to allow access to data and at the same time start the GT-Client NDA process

4. GT-Client NDA: If you must have an NDA, below is the way to go.
Student NDA process

1. Check if Client requires NDA
   - Yes: Coordinator will review, ask you for more information then send to GT legal
   - No: Find another Client

2. Fill out and send NDA routing form to coordinator

3. Negotiations Successful?
   - Yes: GT legal negotiates with Client
   - No: Sign individual NDAs with client (Must meet 3 conditions)

4. Coordinator sends PIA forms for individual signatures and signature sheet
   - Students sign PIAs and send as one individual file back to coordinator
   - Students acquire signatures of all GT employees who will access protected information
   - Students return signature sheet to coordinator

5. You have a Client

   - Try to avoid NDAs
   - This step can be done throughout the ISYE 4106 semester
   - As soon as all signatures are acquired and before final report submission

   - Three conditions are:
     1. Client NDA cannot name GT as a party to the NDA (faculty cannot sign client's NDA)
     2. NDA must permit GT students to discuss client's info with teammates
     3. NDA must permit GT students to discuss with GT faculty & staff if faculty and staff need access to client's info to advise or evaluate project

6. Done. Remember your NDA commitments
NDA Routing form

• Liaison fills out
  – Company’s contact info
  – Class/Project details
• Send it to me for my signature and date
• I will send it to GT Legal. Please do not contact GT Legal.
Student PIA

GT Legal fill out these

1. Liaison gets each member to fill out these 4 fields, and sign
2. Liaison combines into single file
3. Liaison sends the file to coordinator
The signature sheet SS (2nd page)

Bring with you to presentations
Get signatures
Submit with final report
We cannot read without having signed
Project Pre-Proposal

• Convince project screeners/examiners that your project is appropriate
  – Design content, ISyE methodology, difficulty, value

• Convince with evidence: data/analysis, not just (buzz) words!
  • Opportunity statement
  • 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!

• Get help from writing specialist

You will receive permit for 4106 only if your pre-proposal is APPROVED by the senior design examiners and your contribution is satisfactory

We will guide you through the process but it’s on you to get your project into an approvable form. You don’t have a good project you will NOT get permit.
• Show evidence that the project will be valuable...
  – This is a CRITICAL skill.
    • 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.
  – You must learn this... in Senior Design.
Preproposal Template

• Who is the Client?
• Client contact information
• What is the system?
• Is an NDA required?
• What is the Opportunity?
• What type of information you need to take on the challenge?
• What is the value of the opportunity you identified?
• What will you deliver to the client?
• What is the relationship to the ISyE curriculum?

First Draft Acceptance Rate:
• < 10% are accepted
• > 50% require major changes
• ~ 15% need to change client
What is an Opportunity Statement?

• It requires:
  – A **motivation** (e.g., sales are down by 13% last year or customer ratings went down, etc.)
  – A **goal** (e.g., reduce cost, increase revenue, improve customer service, etc.) and this should be consistent with the motivation
  – **Success Metrics**: How we measure your success in the project? (e.g., percent decrease in labor cost)
    • Remember that it’s impossible to measure in the timeframe of senior design
  – **The opportunity**: What do you bring to the table to achieve the goal? (e.g., an inventory control system, truck routing, consolidating shipments, predictive maintenance process, etc.)
  – We will evaluate your work product based on the strength of the evidence that your proposed solution:
    – is the right **approach** to achieve the goal, and
    – the magnitude at which it achieves the goal
Tips and Pitfalls

• **Goal vs. Tasks:** You are not supposed to be given tasks. It’s your job to identify the tasks to achieve the goal
  – Start with the Goal
  – Logically dissect all the steps in the process that can help achieve the goal,
  – Identify the alternatives for exploiting them,
  – Prioritize based on impact and effort.

• **Disparaging the Client will not be tolerated**
  – Do NOT motivate your project by pointing the shortcomings of the current process
  – Focus on what you bring to achieve the goal not what the client is not doing
DON’T FORGET!!

- REGISTER FOR ISYE 4800/4800R/4800Q
- 4106 PREREQUISITES
- START NDA ASAP, FOLLOW INSTRUCTIONS
- PRE-PROPOSAL MUST INCLUDE DATA AND VALUE
Communications

• Meaningful email subject line
• Meaningful document name (pay attention to template)
  – Team: Liaison’s name
  – Client notification: TeamNumber + ClientName (to be given)
    • E.g. 11 Staples
  – Preproposal: TeamNumber + ClientName + Type of project
    • E.g. 11 Staples OrderPicking (to be given)
• Piazza
Warnings

• You must contribute to your team’s preproposal; being out of town is NOT an excuse.

• You cannot drop a team without Associate Chair approval
  – Once your preproposal has been submitted, individuals will not be allowed to switch teams.
    • 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
Do I have to meet with an examiner after initial preproposal 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 preproposal 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.
  - 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 on the course website (Canvas) but not until the summer semester when you are registered in an actual class.

What happens if we miss the deadline for pre-proposal submission?
- 1/3 letter grade deduction from your ISYE 4106 grade.
What to look for in 4106

• Advisor assignment, toward the end of the 4800 semester
• Mandatory Peer Evaluation toward the end of the semester
• Mandatory 4106 Introduction session: Wed in first week of class, 6 – 8 PM
• Exciting work of senior design
  – Freedom
  – Challenges
  – Achievements
  – ...

CREATING THE NEXT®
Questions?

- dima.Nazzal@gatech.edu
- Later, your assigned examiner or advisor
- Please don’t ask other faculty
Questions you should know the answer to...

- What are the prerequisites for 4106?
- What do you do if your client wants an NDA?
- What is the process to get GT-client NDA?
- What do you have to do this semester?
- 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?
- What happens if I fail one of the 4 concentration electives?