ISyE 4106 Senior Design Manual
Processes and Guidelines

Stewart School of Industrial and Systems Engineering, Georgia Tech
Brandy Blake, Steve Hackman, Leon McGinnis, Joel Sokol and Chen Zhou

This manual contains a complete description of the key requirements and processes for ISyE 4106, Senior Design, as well as guidelines for the format of key deliverables. Every student enrolled in ISyE 4106 is expected to read this manual, and when questions arise, to consult the manual before posing questions to the faculty advisor, examiner, or coordinator about procedures or deliverables.

Revised 8.17.2018 by Dima Nazzal
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1. OVERVIEW

All BSIE graduates in the Stewart School of Industrial & Systems Engineering must successfully complete ISYE 4106 Senior Design, sometimes referred to as Capstone Design. The Senior Design experience is an intensive team-based engineering design project based on a real-world design problem faced by a local, national, or international client. Senior Design is a mentored experience in which you begin the transition from school to engineering practice. You will find that your curriculum preparation prior to ISyE 4106 is necessary but not sufficient for success in Senior Design. Courses are highly structured presentations of theories, methods and tools, often with highly simplified examples of their applications, where data are given and the assumptions are always satisfied. In Senior Design, you must learn to apply these theories, methods and tools in situations which are not simple, where the data are not given, and where the assumptions required by formal analyses may be violated. You also will learn that technical knowledge alone is not sufficient for success—you must also be able to apply what you know to new situations, be competent in teamwork, communication, and “selling” your ideas, and exercise good engineering judgement.

Senior design is more than a course. It is an opportunity for you to work with client, team members and faculty to do something impactful. There are high expectations for the Senior Design projects. You will find that ISyE, Georgia Tech, and your client can provide a lot of help, if you ask. We all want you to succeed.

1.1 Prerequisites for ISyE 4106 Senior Design

A registration permit for ISyE 4106 is only given to students who have successfully completed ISYE 3025, ISYE 3133 or ISYE 3833, ISYE 3232, ISYE 3044, 4 out of 6 BSIE concentration electives and sufficiently contributed to an approved Senior Design Preproposal.

1.2 What You Learn in Senior Design

Your BSIE curriculum has given you important preparation in theory, some application methods, the logical thinking (or grounding) necessary to learn broader and deeper aspects of each topic. What Senior Design provides is the opportunity to synthesize these different knowledge and skills, which many alumni call “learning-how-to-learn.” “Learning-how-to-learn” is an important aspect of continuous personal and professional development. For example, you spent a whole semester learning the building blocks of simulation: pseudo random numbers, servers, queues, input data modeling, output data analysis, etc. A real simulation model typically requires much more: entity-dependent routing, merging, diverging, etc. You are expected to learn more on your own. Similarly, in order to develop proper models for problem solving, you must synthesize what you learned from previous courses. You need to learn:

1. Develop solutions using what you learned in multiple courses simultaneously, such as stochastic process models, optimization, data base tools, and flow line dynamics analysis.
2. Find solutions when the assumptions or restrictions associated with the model or analysis you have learned are violated.
3. Be professional under the pressure of deadlines, disagreements among team members, poorly performing team members, unsatisfying results, or conflicts with exams in other courses.
4. Identify what you need to know and ask the right questions of the right people.
5. Learn new skills, information, or processes necessary to achieve the project objectives.
6. Sharpen your efficiency in various productivity suites.

You should learn what our alumni told us are useful skills they have learned in ISyE:

1. Critical and logical thinking,
2. Learning-how-to-learn,
3. Problem solving,
4. Work ethics/time management, and
5. High standards.

1.3 Senior Design Course Outcomes

By the end of the semester, students will have had an opportunity to

- Demonstrate professionalism: punctuality, responsiveness, reliability, tolerance, work ethic, preparation, independence, honesty, and integrity (including intellectual integrity) as well as meeting deadlines, conforming to requirements, having a positive attitude, and showing initiative;
- Through observation and asking the right questions, identify and define an opportunity, identify an appropriate scope for a solution that captures this opportunity, and identify an appropriate and effective approach for realizing the solution;
- Identify, gather, and analyze relevant data to support the identified solution approach;
- Apply appropriate industrial engineering methodologies and computational tools in executing the proposed approach;
- Generate and evaluate alternative solutions;
- Identify the preferred solution and justify it to a client; and
- Demonstrate competent skills in:
  - Technical writing,
  - Public speaking,
  - Working within a team, and
  - Project and time management.

1.4 Resources in Senior Design

ISyE has allocated many resources to enable your success. These are summarized in Table 1.1. Three key individuals are the Coordinator, who manages the total Senior Design process, the Examiner, who applies the grading rubric and assigns grades, and the Advisor, who works with your team on a day-to-day basis.

Table 1.1. Resources Available to Senior Design Teams

<table>
<thead>
<tr>
<th>Resource</th>
<th>Area(s) of Assistance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Design Coordinator</td>
<td>Develop syllabus, give information sessions, coordinate grades; mediate serious issues with faculty advisor, client, resources, or teammates; investigate honor code and legal issues; etc.</td>
<td>The Senior Design coordinator has final authority over all matters pertaining to the course.</td>
</tr>
<tr>
<td>Resource</td>
<td>Area(s) of Assistance</td>
<td>Notes</td>
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<tr>
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<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Faculty Examiner</td>
<td>Screen projects in ISyE 4800; provide feedback to the project teams on pre-proposals, interim and final reports, presentations, communications, and professionalism; and assign ISyE 4106 grades in coordination with other examiners and coordinator.</td>
<td>See details after this table.</td>
</tr>
<tr>
<td>Faculty Advisor</td>
<td>Interacts with team weekly to provide coaching on how to define project and develop solutions; help with professionalism, communications, and link team with other resources.</td>
<td>Faculty advisors do not assign grades. Please see more details after this table.</td>
</tr>
<tr>
<td>Other ISyE Faculty members</td>
<td>Help you with special technical expertise relevant to your project</td>
<td>You can consult with other ISyE faculty only with faculty advisor’s permission. More details after this table.</td>
</tr>
<tr>
<td>Teamwork/Leadership Coach</td>
<td>Special help with teamwork issues, small-group leadership, and professionalism. Please use it if you foresee potential problems. Your advisor or examiner may recommend you use this resource.</td>
<td>Meetings are confidential and content will not be shared with your advisor or the Senior Design coordinator.</td>
</tr>
<tr>
<td>Written Communication Specialist</td>
<td>Help with professional written communication (reports, posters). Offer writing workshops. Provide feedback on pre-proposals and interim reports.</td>
<td>Reservations are required in advance for team consultation. Content of these meetings will not be shared with the Senior Design advisor or examiner.</td>
</tr>
<tr>
<td>Presentation Coach</td>
<td>Help with oral presentations, including preparation, delivery, and Q&amp;A through coaching, practice, feedback, video review, etc.</td>
<td>Reservations will be required in advance. Content of these meetings will not be shared with the Senior Design advisors or examiners.</td>
</tr>
</tbody>
</table>

Maj. Gen. Ron Johnson, USA (ret.)
Groseclose 203-D, 4-2331
ron.johnson@gatech.edu

Dr. Chelsea Murdock
chelsea.murdock@lmc.gatech.edu

Dr. Judith Norback
Groseclose 203, 5-1079
jnorback@isye.gatech.edu
<table>
<thead>
<tr>
<th><strong>Resource</strong></th>
<th><strong>Area(s) of Assistance</strong></th>
<th><strong>Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Senior Design Administrator</strong></td>
<td>Schedule and reserve rooms for presentations, arrange Capstone Expo and finalist presentations, order plaques, maintain course site, collect assignments and NDA forms.</td>
<td></td>
</tr>
<tr>
<td><strong>Cecil Johnson Studio TAs</strong></td>
<td>Assist Dr. Norback in presentation coaching, recording, and review of recordings; print posters; maintain studio schedules.</td>
<td>Reservations may be required in advance. Content of these meetings will not be shared with the Senior Design coordinator.</td>
</tr>
<tr>
<td>ISyE 103 Suite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservations may be required</td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="mailto:isyestudio@isye.gatech.edu">isyestudio@isye.gatech.edu</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Georgia Tech Communication Center</strong></td>
<td>Help you with written reports &amp; oral presentations</td>
<td>Reservations may be required in advance. Content of these meetings will not be shared with the Senior Design coordinator.</td>
</tr>
<tr>
<td>CULC 447</td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="http://communicationcenter.gatech.edu/">http://communicationcenter.gatech.edu/</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By appointment OR just walk in</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Librarian Assigned to ISyE</strong></td>
<td>Help you find relevant books, papers, or other references.</td>
<td>Email in advance for an appointment. Content of these meetings will not be shared with the Senior Design coordinator.</td>
</tr>
<tr>
<td>Ms. Liz Holdsworth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-5392</td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="mailto:elizabeth.holdsworth@library.gatech.edu">elizabeth.holdsworth@library.gatech.edu</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Advanced Microsoft Excel</strong></td>
<td>Provide advanced topics in Microsoft Excel. Some past students have found this course helpful and valuable.</td>
<td>0-credit course not related to Senior Design. Do not bother the MNGT 1034P instructor with questions unless you are in his/her course. The course is listed here only for your information.</td>
</tr>
<tr>
<td>MNGT 1034P</td>
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<tr>
<td><a href="http://www.pe.gatech.edu/courses/advanced-microsoft-excel">http://www.pe.gatech.edu/courses/advanced-microsoft-excel</a></td>
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</tr>
<tr>
<td><strong>Lynda.com</strong></td>
<td>Provide online courses on multiple topics, including more than 10 courses on Tableau, Excel: pivot table, micros, VBA, MS certificate.</td>
<td>As a GT student, you have unlimited free access to Lynda.com, a $20/mth value.</td>
</tr>
</tbody>
</table>
1.4.1 Advisor Role

The person you interact with most is your team’s advisor, who is assigned by the Coordinator and examiner. Since your advisor does not assign your grade, he/she is like a coach, providing guidance and mentoring your team. The advisor’s objective is to help you to succeed in your Senior Design project and thus prepare you for success in future projects. Each advisor has his/her own style but, generally speaking, is only supposed to provide direction and information so that your team can determine the specifics on your own. There is a balance each advisor must strike: too little help may leave the team struggling; too much would deprive them of the opportunity to learn and would be unfair to other teams. Your advisor is not a member of your team, is not expected to solve the problem for you is not responsible for your senior design grade.

Your advisor will typically meet you once a week for about one hour. He/she will provide advice and observe your interactions. Your advisor’s opinion regarding your communications, attitude towards team members and others, preparedness in meetings, punctuality, and general engagement and knowledge about the project can be communicated to the Examiner, who is responsible for applying the grading rubric.

Each team’s meeting schedule with the advisor will be determined by the team and advisor. Advisors’ styles and requirements differ; e.g., some advisors require teams to prepare a written agenda for each meeting, including a progress report, unresolved issues, and proposed next steps; others are less formal in their interactions with their assigned teams. It is your responsibility to learn and comply with your advisor’s preferences.

Any issues that arise between a team and the assigned advisor should be brought to the attention of the Coordinator for resolution.

1.4.2 Examiner Role

You will also interact with your assigned Examiner. An assigned Examiner approves your project during 4800. He/she may offer advice before your initial pre-proposal and will provide feedback on your pre-proposal. You may find that Examiners can be rather stern in their messages. They do so with good intentions so that you understand you are not doing another term paper. Senior Design is more serious and is held to a higher standard.

During 4106, your Examiner will observe your three presentations (proposal, interim, and final) and read your two reports (interim and final). He/she will provide formal feedback for interim assignments and both feedback and grades for the final assignments. You can schedule to meet with your Examiner after you receive feedback to clarify issues. Other than that, your Examiner will not routinely interact with you. The grades will be based on his/her readings and observations as well as the information collected from advisor and peer evaluations, and are developed using a standard grading rubric. Please refer to section four for more details.

1.4.3 Other ISyE Faculty

ISyE has many faculty members who are not directly involved in senior design in any one semester. Most have experience supervising senior design teams. At times, your team may feel a need for special expertise from certain faculty members. Because these faculty have other assigned duties, you must first consult with your advisor and get permission before you can contact the other faculty members for help.
1.5 Format of Senior Design

In the semester prior to senior design, students register for ISyE 4800. In ISyE 4800, the students form their teams of six to eight members, find a client and project, and develop a pre-proposal for faculty approval. ISyE 4800 is a non-billable course. You do not have to be on campus to register for 4800. More in Section 2.

The format for senior design is 0-12-4, meaning no lecture hours, 12 lab hours and 4 credits. The 12 credit hours have specific times reserved for students to visit clients, give presentations, meet with advisors, work on projects, practice presentations, write reports, etc. Students must insure availability in the assigned lab hours designated for the section in which they are registered. Outside work is not an acceptable excuse for failure to be available.
2. ISYE 4800 SENIOR DESIGN PREPARATION

In the semester immediately prior to Senior Design, students register for ISyE 4800 Senior Design Preparation. The tasks in 4800 are to:

- form a team,
- find a client,
- complete the NDA requirements (if necessary),
- develop a pre-proposal, and
- get the pre-proposal approved.

ISyE 4800 is a zero-credit, non-billable course. There is no tuition fee. Students planning to register for 4106 Senior Design in spring semester should register for 4800 in the prior fall. Students planning to register for senior design in the fall should take 4800 in the prior summer. A student not given a permit for senior design in the semester planned (e.g. student did not complete the prerequisite courses, did not get the pre-proposal approved, or did not contribute to the development of the pre-proposal), must register for 4800 again prior to the senior design semester.

2.1 Approximate Schedule in ISyE 4800

The approximate schedule in ISyE 4800 in the summer and fall semesters are shown in Table 2.1. The exact dates in each semester may vary due to holidays and other events.

<table>
<thead>
<tr>
<th>TASK</th>
<th>Details</th>
<th>4800 Summer</th>
<th>4800 Fall</th>
<th>Submission Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attend Information session</td>
<td>A 60-minute session is given to outline the details of ISYE4800</td>
<td>1st Tuesday in spring semester, 6:00pm - 8:00pm</td>
<td>1st Tuesday in fall semester, 6:00pm - 8:00pm</td>
<td>N/A</td>
</tr>
<tr>
<td>Submit Team Composition Form</td>
<td>Each team must select a liaison. The team liaison will submit the Team Composition form consisting of:</td>
<td>Monday in the week final exams starts in spring semester</td>
<td>5th Monday in fall</td>
<td>Form</td>
</tr>
<tr>
<td></td>
<td>• the GT usernames of the team members</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• a PDF which includes the resumes of all team members sorted in alphabetical order</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submit Client Notification Form</td>
<td>All team liaisons must fill out this form listing the client name and nature of the project</td>
<td>3rd Monday in summer</td>
<td>7th Monday in fall</td>
<td>Form</td>
</tr>
<tr>
<td>Submit NDA Process Form</td>
<td>All team liaisons must fill out this form. If your client requires an NDA, submit the routing form or explain where you are in the process.</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>
<td>Form</td>
</tr>
<tr>
<td>TASK</td>
<td>Details</td>
<td>4800 Summer</td>
<td>4800 Fall</td>
<td>Submission Format</td>
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</tr>
<tr>
<td>Submit initial Pre-proposal</td>
<td>Teams submit initial pre-proposal</td>
<td>7th Monday in the summer</td>
<td>10th Monday in the fall</td>
<td>Canvas</td>
</tr>
<tr>
<td>Meet with project screener/examiner</td>
<td>A faculty member will be assigned to work with you to shape up the pre-proposal. They will provide feedback and meet with teams as needed.</td>
<td>10th Monday in the summer</td>
<td>13th Monday in the fall</td>
<td>N/A</td>
</tr>
<tr>
<td>Revise pre-proposal</td>
<td>If the initial proposal is not approved, a team 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 in the summer</td>
<td>13th Monday in the fall</td>
<td>Canvas</td>
</tr>
<tr>
<td>Submit FERPA Consent Form</td>
<td>All team members need to fill out this form. After project is approved</td>
<td>After project is approved</td>
<td>After project is approved</td>
<td>Form</td>
</tr>
<tr>
<td>Submit peer evaluation</td>
<td>Students assess every other team member (including themselves) for contribution</td>
<td>12th Tuesday in the summer</td>
<td>16th Tuesday in the fall</td>
<td></td>
</tr>
</tbody>
</table>

In ISyE 4800, some team members may be away from campus for study abroad, Intern/co-op, etc. However, every student must contribute to the development of the pre-proposal; participation can be enabled through on-line meetings (Webex, Google Hangout, Skype, etc.), but it is essential that every team member contribute to the pre-proposal. A peer evaluation will be conducted toward the end of the semester. The Examiner can determine if a student has contributed sufficiently based on peer evaluations and observations. Students who study abroad or work abroad should sign up for a 4800 R section. A video student (such as those in SOUP classes) should register for a 4800 Q section.

### 2.2 Team Formation

The first task in ISyE 4800 is to form a team. Considerations in finding team members can include:

1. **Professionalism.** Your team should be composed of people you can work with and trust, who would not seek short cuts under pressure.
2. **Work ethic.** Senior design is demanding. Most people have done projects in various classes or in other settings, but the senior design standard is higher because it culminates the knowledge of a team of seniors from their entire college education into one semester and services a real client. An “A” grade in a course project may not even merit a “B” or even a “C” in 4106. It will demand more from everyone and require a strong work ethic to keep from dropping the ball.
3. **Similar academic goals.** Everyone would like to get a good grade in senior design. However, when the pressure mounts or conflicts emerge, people prioritize differently. Students have to prioritize between studying for a test or improving the result of this group project; between going to a friend’s wedding and debugging simulation code; between attending fraternity activities and revising the reports. To some, the team result in senior design is above personal goals. To others, it is different.
4. Diverse skill set. Rarely is any single student good at everything: statistics, forecasting, human resource management, optimization, simulation, programming, supply chain, manufacturing, layout, health systems, writing, editing, and presenting. Seek out teammates with skills that differ from your own.

5. Similar class schedule. The team formation starts after the beginning of Phase I registration. Teams have two schedule options, and all team members must register for the same section. This non-traditional schedule is designed to balance between two sections.
   - MWF 12:00 – 3:00, W 6:00 – 9:00
   - TR 12:00 – 3:00, WR 6:00 – 9:00

Many forward-looking ISyE students already have formed the core of a team before 4800. Learn from these people – always plan ahead. ISyE tries to help by creating a piazza page for seniors so that they can announce their availability to form a team. ISyE does not assign students to teams. Under extenuating circumstances, the senior design coordinator might change the make-up of a team by adding or removing members.

Experience shows that it is a good practice to know each other well by getting together in a more casual setting. When the pressure mounts, the differences in opinion also mount: what is the right problem to solve? What are the right tools to solve it? What is more important considering the advisor, coordinator, and client?

2.3 Project Requirements

When you develop your pre-proposal, you must consider the following four requirements for an acceptable Senior Design project:

1. **Engineering Design.** The project must involve a recommendation for change(s) to an existing system or the development of a new system and an economic analysis of the associated costs and benefits. A project may include the analysis and presentation of data, cycle time analysis, simulation, optimization, determining standards, documenting process flow, etc., but these elements themselves do not constitute an engineering design project.

2. **Methodology.** The project must require the use of substantial industrial and systems engineering tools and methods learned in the curriculum. A project might be quite valuable for a company, but if it does not involve significant ideas and/or methods from ISyE courses, it will not be acceptable for ISyE 4106. You must work on a project that naturally requires IE methodology for analysis and design recommendations. The methodologies can include probability, statistical analysis, regression, queuing models, optimization, engineering economy, quality, regression, flow line dynamics, transportation, warehousing, inventory control, supply chain, capital investment, analytics, etc. In other words, the project must require the use of methods and tools taught in the ISyE curriculum.

3. **Magnitude.** Each team member is expected to spend a minimum of 12 productive hours per week on the project for a total of 180 hours for the semester, which equates to a minimum of 1080 hours for a six-member team. The project’s scope must be consistent with this expectation.

4. **Value.** The value of the project to the client must be commensurate with the amount of time spent. If the main result of the project is cost savings, the amount of the saving should be commensurate to 12 hours/person/week or over 1080 hours for 15 weeks and a 6-member team. A consulting company would charge several hundred dollars per hour. Even as a senior,
your value is worth more than 100/hour. Therefore, the cost savings should be more than $100,000. Another way to consider this is by asking whether your client would pay a consulting firm for this project. This second measure also applies if the performance measure is waiting times, people served, etc. Part of Senior Design is learning to identify which problems are worth your time to fix and which are not. Many IE projects’ value can be in savings, revenue increases, lives saved, people served, waiting time reduced, energy or water saved, etc.

In addition to completing a project that meets these requirements, you are required to present your results in oral and written form and to act in a professional manner toward the faculty, the client company, and your fellow students at all times throughout the process.

2.4 Risk and Reward Factors in Client and Project Selection

You should carefully assess your prospective client during the early stages of your interaction, particularly in regards to information availability and response times. If the client is slow to respond and does not show signs of change, it can be a warning signal. If the contact person does not have access, or cannot get access, to the information you need to succeed, it can also be a warning. It is best that your main client contact is motivated to solve the problem you identify so that he/she has incentive to help you to succeed.

The location of the client can also be important. If the nature of the operations of interest are well reflected in the available data, on-site visits may not be critical. As long as the client can provide the necessary information and participate in the presentations, the location may not be critical. However, some projects need a significant number of on-site visits, for system understanding and data collection. In such cases, the distance becomes a major setup cost. The rule of thumb is that the client should be within a one hour drive from Georgia Tech.

Additional Tips:

- Consulting firms may not be the best Senior Design clients if your project is for a client of the consulting firm because you may not have direct access to your ultimate client. On the other hand, if you design a system or process for the consulting firm itself, it may be perfectly fine.
- Working with startups can be risky but rewarding. Startups are inherently risky, and the principals in the startups are always extremely busy. Senior design as a course has its rhythm and will need client participation at certain times. The critical tasks in a startup may change on short notice. This makes them more challenging to work with in senior design.
- Small operations can be good because you get exposure to many aspects of the operation. However, the total value of the project can be limited. In addition, many small operations depend on something unique, such as special product design, patented processes, etc., for their success, rather than on operational efficiency, so your IE skills may not be the most appropriate for helping them succeed.

2.5 Non-Disclosure Agreement (NDA)

Some clients may request that your team or Georgia Tech sign a non-disclosure agreement (NDA), a proprietary information agreement (PIA), or a similar agreement in order to protect proprietary information, such as salary, marketing plans, and customer lists, or privacy information, such as ID, SSN, account information, and medical records. The agreement process will involve the legal team in both the
client organization and Georgia Tech and can be rather involved due to the legal requirements of the two parties. GT legal advises that if you receive such a request, please follow these steps.

First, if the client’s concern is the ownership of the intellectual property resulting from the project, such as a software application, a patentable algorithm or method, etc., then, you (as the creator of such) or the client can own the intellectual property. Your claim is valid because the property is your brainchild; however, the client has a claim because they provided support for you to create the property. In such a situation, it is up to you (not Georgia Tech) to sign an agreement with the client. This is different from agreements addressing the disclosure of proprietary information.

If the client needs to provide you with proprietary or confidential information, a non-disclosure agreement (NDA) or proprietary information agreement (PIA) may apply. Figure 2.1 illustrates the NDA process flow from the students’ point of view.

![Figure 2.1 Georgia Tech NDA process.](image)

The client often provides their existing NDA designed to work with universities on research projects. Such an agreement may be too restrictive. Georgia Tech faculty and staff cannot sign the client’s NDA. If the NDA prohibits faculty’s access to presentations and reports, the advisor and examiner cannot advise or grade your project, and you cannot get a grade. If you have to sign such an agreement, make sure that your client’s NDA includes the 3 conditions in the comments part of Figure 2.1.
It is best that you emphasize to your client that senior design is only a semester-long student project. The proprietary information can be filtered to avoid the tedious NDA process. If this is not possible, start the Georgia Tech NDA process below.

1. The team's liaison should download a NDA routing PDF form and fill out company’s contact information and Class/Project details, including the brief description of the proprietary/confidential information. Save the PDF and submit it using the NDA Process Form. GT Legal will prepare a student PIA form, send it to coordinator to be sent to the team's liaison. The liaison will get each team member’s signature and send the form back to coordinator, who forwards it to GT Legal.

2. GT Legal will send the Georgia Tech Standard Senior Design PIA to the client and modify it with the client to reach a final version acceptable to both.

3. Once an NDA is agreed upon by both the client and GT Legal, GT Legal will send the signed fully executed Student PIA, NDA, and signature sheet to the coordinator. The coordinator will send them to students for their records. The coordinator should also keep a copy for ISyE’s records.

4. The students are responsible to get signature from each Georgia Tech personnel who they discussed their project with.

5. The student will return the SS with all signatures to the senior design Administrator before the end of the senior design semester.

2.6 Required Statements in Report, Presentation, and Poster

2.6.1 For Every Project

Every project or presentation should include the following statement on the cover page:

“This project has been created as a part of a student design project at Georgia Institute of Technology.”

2.6.2 For projects with an NDA between the Client and Georgia Tech

Add the statement below on the cover page of the presentation or report:

“This project is subject to a Non-Disclosure Agreement between [client] and Georgia Tech [document number].

The document number is in the file name of your Fully Executed (FE) PIA form or Signature Sheet (SS), which is assigned by the GT Office of Legal Affairs.

For capstone poster, you must seek approval from your client (by email) on the content and release of the poster. You should include the statement below on the poster:

“This poster has been reviewed and approved for public release by [client]”

2.6.3 If Your Team Members Signed the Client’s NDA Individually

If your team members signed an NDA with your client individually, do what your NDA tells you.

2.6.4 If your project is with Emory Health Care (or Other Medical Organizations)

Please use “This project is under Emory Affiliation Agreement”

2.6.5 Pre-proposal for Project that Requires NDA
At the pre-proposal stage, you may not have or do not need proprietary information. Even if you have submitted a Georgia Tech Routing form and Student PIA forms, the NDA process can be long and possibly will not be completed by the time the pre-proposal is due. Therefore, you should try to prepare your pre-proposal without proprietary information. If not possible, you can sign the Client NDA to get the data but do not share the proprietary information with the examiner. If in doubt, please check with your client.

2.7 Grading in 4800

A student in a team with an approved pre-proposal who contributed at acceptable levels will be given a grade of “v”. Otherwise, the student must retake 4800 for a future 4106. However, any lack of professionalism can carry grade deductions toward the individual’s subsequent Senior Design final grade.

2.8 Report Templates in 4800

There will be at least three deliverables in ISyE 4800: Team Composition, Client Notification, and Pre-proposal. Some teams may need to modify their pre-proposal, thereby turning in more than 3 deliverables. You can find templates for these documents in the Appendix of this manual.

2.9 Peer Evaluations

For each milestone (i.e. the pre-proposal and the senior design proposal, interim, and final, a mandatory peer evaluation will be administered. Missing the peer evaluations leads to automatic grade deductions. Team members should remind each other of this responsibility.

There is a numeric value and a qualitative description in the peer evaluation. For the numerical portion, suppose that your client has just given your team $1,000 per person for work performed on this project, i.e., a 7-person team receives $7,000, an 8-person team receives $8,000, etc. You are to distribute this sum to the members of your team (including yourself) based on your overall assessment of how each member has contributed from the beginning of the project. You should prepare the list of the team members, arranged alphabetically based on their last names, and give each member a candid assessment on attendance, quantity and quality of work, intellectual contribution, attitude, reliability, and honesty. Some have tendency to assign equal values without too much thought. Typically, the contributions vary due to many reasons. You should assign the value accordingly. If, in rare cases, the contribution is equal, you must justify in the qualitative part of the peer evaluation in the qualitative discussions. In the qualitative part, please provide a candid explanation of your overall assessment for the team and each member in the team in terms of attendance, quantity and quality of work, intellectual contribution, attitude, reliability, and honesty. If you have assigned $1,000 for each member, you have to justify here, otherwise, this can be considered not serious or unprofessional.

This peer evaluation will be repeated after proposal, interim report and final report during the senior design semester. Failure to submit peer evaluation on-time will result in automatic grade deduction.

3. ISYE 4106 SENIOR DESIGN

Each team member should register for the specific section of 4106 associated with the assigned Advisor and Examiner before the end of the first week. The process for requesting and getting access to permits will be announced to you by the senior design coordinator or administrator.
3.1 Approximate Schedule

Senior design sections use two types of scheduling blocks: MWF 12-3pm and W 6-9pm, and TR 12-3pm and WR 6-9pm. These times are set aside for your team to work together, visit your client site, present, and/or meet with your faculty advisor. You are expected to participate in all senior design activities within these scheduled times. Only Georgia Tech official excuses are acceptable for absences.

There are three milestones in senior design: proposal, interim report and final report. Each milestone has its specific elements and due dates. Since there are no regular classes, please read and review the schedule carefully. It is your responsibility to comply with all due dates. No reminders will be given. The missed deadlines carry automatic grade deductions.

Toward the end of semester, you will also prepare a poster to be presented at the Georgia Tech Capstone Expo. After the semester ends, senior design teams will submit all the relevant data and other files on a flash drive to the ISyE academic office.
<table>
<thead>
<tr>
<th>Wk</th>
<th>Day</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>W</td>
<td>6pm</td>
<td>Introduction Session, full class of all sections (Mandatory)</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>10am</td>
<td>Deadline: submit proposal presentation (faculty version)(^5)((^6))</td>
</tr>
<tr>
<td></td>
<td>M-F</td>
<td>Class Time</td>
<td>Team: present proposal to faculty (^2)((^3))</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>10am</td>
<td>1(^{st}) Peer Evaluations due. Link will be sent to all students</td>
</tr>
<tr>
<td></td>
<td>M-F</td>
<td>TBD</td>
<td>Proposal wrap-up meeting, optional</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>10am</td>
<td>Deadline: submit interim report (^6)((^7))</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>10am</td>
<td>Deadline: submit interim presentation (faculty version)(^5)((^6))</td>
</tr>
<tr>
<td></td>
<td>M-F</td>
<td>Class Time</td>
<td>Team: present interim progress to faculty (^2)((^3))</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>10am</td>
<td>2(^{nd}) Peer Evaluations due. Link will be sent to all students</td>
</tr>
<tr>
<td></td>
<td>M-F</td>
<td>TBD</td>
<td>Team: present progress and deliver interim report to client (^4))</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>10am</td>
<td>Deadline: submit final presentation (faculty version)(^5)((^6))</td>
</tr>
<tr>
<td></td>
<td>M-F</td>
<td>Class Time</td>
<td>Full class: present final project to faculty and class (^2)((^3))</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
<td>10am</td>
<td>Deadline: submit final report (^6)((^7))</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>10am</td>
<td>Deadline: Submit and print final poster(^8)</td>
</tr>
<tr>
<td>16 &amp; 17</td>
<td>M-F</td>
<td>4pm-9pm</td>
<td>Team: Present and deliver final report to client (^4))</td>
</tr>
<tr>
<td>T</td>
<td>4pm-9pm</td>
<td>Georgia Tech Capstone Design Expo</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>TBD</td>
<td>Senior Design finalist presentations</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>11pm</td>
<td>Senior Design mandatory survey</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>10am</td>
<td>3(^{rd}) Peer evaluation due. Link will be sent to all students</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>10am</td>
<td>Deadline: submit USB of all work product for the semester</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>10am</td>
<td>Deadline: fill out form for project summary</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Dates include both MWF and TR sections.

\(^2\) You do not need to bring color handouts to the faculty presentations as they will be printed from the material you submit.

\(^3\) Both afternoon and evening class times may be used. For proposal and interim presentations, each team will be assigned a specific time to be present. Attendance is mandatory, even if you are not presenting. For final presentations, each team must attend 2 – 3 hour sessions with 3 – 5 other teams.

\(^4\) All team members and the faculty advisor must be present at client presentations; the scheduling is up to you, your advisor, and the client.

\(^5\) If your project has an NDA between your client and Georgia Tech, the final presentation should not include proprietary information. If your NDA allows, you can include proprietary information in the proposal and interim presentation and get everyone in the presentation room to sign the NDA signature sheet. If each team member signed the individual NDA by the client, do whatever your NDA tells you to do.

\(^6\) Name your files “TeamNumber Client SubmissionType.ppt”; for example, “12 Emory Orthopedics Interim Presentation.ppt”.

\(^7\) If your project has an NDA, please submit 2 complete hard copies of your report to Academic Office and submit only your title page and Executive Summary (no proprietary information) through Canvas.

\(^8\) If your project has an NDA, you must seek approval from client to release the poster prior to printing. The approval should be in writing (email is fine) and should be forwarded to the senior design coordinator for documentation. Your grade will not be impacted if the client does not approve release of poster, but you should inform the coordinator in order to seek remedy

**NOTES:**

- Your faculty advisor may also require you to meet other deadlines (e.g., providing him/her with a copy of your reports a week before the submission deadline).
- Adjustments to the schedule may have to be made and will be published through Canvas and Piazza.
- Attendance to presentations and weekly meetings with advisor are mandatory (unless otherwise instructed); be on time and don’t leave early.

3.2 Presentations

In senior design, there are three presentations to the faculty: proposal, interim, and final. After you get feedback on the pre-proposal developed in 4800, you will prepare a presentation to be used as the proposal presentation in the second week in 4106. You will get feedback from this presentation and use that feedback to develop a version of the presentation for the client. You will similarly get feedback for the interim and final presentations to help you develop the client versions.

3.2.1 File Name Convention

Good file names facilitate file management and searching. After your pre-proposal in ISyE 4800, a team number and a project name will be given to you. The project name has two parts: client name/abbreviation and the nature of the project. For example, the proposal file name of a team working with Children’s Health Care of Atlanta (CHOA) on patient management efficiency might be 12 CHOA Flow Proposal. Failure to properly name your submitted files will result in a grade deduction.

3.2.2 Presentation file and delivery

You will create three presentations to faculty and three presentations to client: proposal, interim, and final. The format, audience, and duration of the three faculty presentations are listed in Table 2.2.
Table 2.2 Presentation time and format

<table>
<thead>
<tr>
<th></th>
<th>Time (min)</th>
<th>Format</th>
<th>PowerPoint slides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal</td>
<td>5 + 14</td>
<td>Sitting at conference table</td>
<td>Handout to faculty; no projection</td>
</tr>
<tr>
<td>Interim</td>
<td>12 + 16</td>
<td>Standing in conference room</td>
<td>Project on screen, handout to faculty</td>
</tr>
<tr>
<td>Final</td>
<td>18 + 10</td>
<td>Standing in front of class</td>
<td>Project on screen, handout to faculty</td>
</tr>
</tbody>
</table>

You should also comply with the following.

- All presentations should be approved by your faculty advisor before being turned in to the examiner or the client.
- If your project has an NDA between your client and Georgia Tech, the final presentation should not include proprietary information. If your NDA allows, you can include proprietary information in the proposal and interim presentation and get everyone in the presentation room to sign on the signature sheet (SS). If each member signed the NDA individually with the client, do whatever the NDA you signed tells you to do.
- Since the faculty and client audiences have different knowledge, experience, and needs, you are required to create two separate presentations for each milestone: one targeted to the faculty and the other targeted to the client.
- When selecting the color scheme of your slides, be sure that they not only have a pleasing appearance on screen, but also print well too. Large areas of dark color do not print well and waste a lot of ink.
- You do not need to bring handouts to faculty presentations.
- You should bring handouts to client presentations for client attendees. Handouts must be legible. Two slides per page may work well for most. For elaborate design or sketches, you may want to have a special printout of that slide.
- Teams schedule the client presentations on their own. The client presentation must be after the faculty presentation. Advisor should go to the client presentations. Teams should work with the client and advisor weeks in advance to secure an acceptable time for everyone. Note that some clients want many people on-site to listen to your final presentations. Sometimes, it is best to present on campus due to the lack of an appropriate facility at the client site or the distance to travel. Video conferencing should be considered as a last resort.
- The proposal presentation is in conference or meeting style. Only 1 or 2 members should present.
- The interim and final presentations to the faculty are formal. Each team member who presents to the faculty in the interim must present to the client in the final, and vice versa. You can determine who will present to the faculty or client. Approximately half of the members must present to the faculty and the rest to the client.
- Speakers should not use any notes for presentations; it gives the impression that you don’t know enough about your project. You can position the computer in front of you to serve as a reminder.
Engage your audience. **Presentations should not sound memorized or recited;** as above, it gives the impression that you don’t know enough about your project and have only “learned your lines” like an actor. Practice will make you more comfortable with content.

### 3.3 Reports

There can be a proposal, an interim report and a final report. Each has a faculty and client version. To avoid a major time burden on teams, only two reports are required in 4106—one for interim and one for final. The body of the report is intended for the client. However, faculty need the information to assess your technical contents. Therefore, you must organize the technical part clearly in the appendices and referenced from the report. Your Examiner, Advisor and writing coach provide writing feedback on your pre-proposal. There is also a “check list” on Canvas that goes over content necessary in the report as well as writing tips. Be sure to study these carefully. There are also commented sample reports from previous semesters. Technical writing has unique features that are quite different from the essays you may have written previously. Please learn these features. Almost all alumni consistently tell us that technical communication (reports, presentations, emails, memos, and discussions) is the most important part of their jobs.

#### 3.3.1 Audience for the Reports

To write a good report, you must first understand your audience. The body of both reports should be targeted to the **client**. The client may not have the technical background to fully understand your complicated models or algorithms. They are more interested in the opportunity that you are taking on, the relevant assumptions, the interesting results of your analyses, the solutions you are proposing, and the impact of your solutions. However, detailed descriptions of the client, models, technical assumptions, mathematical equations, code, and algorithms are important for the faculty so that they can understand and verify your work. Therefore, these should be included in **appendices** with good structure.

#### 3.3.1 File Name Convention

The file naming convention described in the Presentations Section applies here.

#### 3.3.2 Report Contents

The report should have a title page, Executive Summary, Table of Contents, introduction or overview of the project, description of the opportunities and design solutions, evaluations, and suggestions. Please refer to the Report Checklist in Section 3.3.

Please refer to Non-Disclosure Agreement Section under ISyE 4800 about the statement on the cover page of the report. If your project has an NDA, please also add a footnote on the first page of the report (Introduction or Overview) about what types of information are considered proprietary. For example demand data, customer locations, labor cost, etc.

- All reports should be approved by your faculty advisor before being turned in to the Senior Design examiner or delivered the client.
- The checklist includes what should be included on the title page.
- The executive summary should be one page in length. It should not include proprietary information.
- Please use proper utilities for the table of contents. This can ensure the proper pagination and ease of navigation.
You should provide the reports to the client no later than the time of the client presentation.

4. GRADING

The Senior Design Examiners and Coordinator are responsible for determining final grades for all teams and team members with input from faculty Advisor, other faculty members, students (via peer evaluation), and the client. At a high level, the grading rubric addresses four areas: work product, written report, oral presentation, and professionalism. Quality assessment is based on output, not input (i.e., you earn credit for what you accomplish, not for your effort – but lack of effort may lower your grade, as described below).

4.1 Assessment Categories

There are four main categories: Work Product, Written Report, and Oral Report, and Professionalism. Each category has three sub-categories.

Table 4.1 Grading Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Final Sub-Category</th>
<th>Interim Sub-Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Product</td>
<td>Scope &amp; Challenge, Methodology, Value</td>
<td>Difficulty, Progress/Correctness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential</td>
</tr>
<tr>
<td>Written Report</td>
<td>Content, Style, Mechanics</td>
<td></td>
</tr>
<tr>
<td>Oral Report</td>
<td>Content, Style, Mechanics</td>
<td></td>
</tr>
<tr>
<td>Professionalism</td>
<td>Attitude, Honesty, Integrity</td>
<td></td>
</tr>
</tbody>
</table>

- **Work product** (~34%) evaluation includes the scope and challenge of the project, the correct analysis and proper application of methods, and the value provided to the client in the measure most relevant to the project. More credit is given for difficult projects, creative solutions, comprehensive analyses, and high value, and a narrowly-scoped or “safe” project will receive less credit than a more ambitious project. The Senior Design coordinator will also consider any factors outside the control of the team that might have influenced the project’s outcome.

Work Product definitions for the interim report are somewhat different because the report describes a work in progress, rather than a completed project. Scoring includes Difficulty, Progress and Correctness, and Potential. A difficult project will require students to learn significant information on their own. Progress is how much the team has accomplished compared to the time elapsed since the proposal. The Potential is the projection of the project value if the project outcome is as outlined in the interim report.

- **Written report** (~17%) includes the content, style, and mechanics of your report. This includes completeness, conciseness, clarity, flow, and writing quality (including spelling, grammar, word usage, formatting, etc.). **Hint**: Use rigorous, simple language and include specific details and quantitative content (but not equations) whenever possible. Remember, the report should be written for a general client audience, not for the faculty. Do NOT get bogged down in the narrative of your process (first we analyzed this data, then we did this other type of analysis, then we created this model using these very technical steps, etc.).
- **Oral report** (~17%) includes the content, style, and mechanics of the slides and the delivery. The grade focuses on how well the presentation covers the project, how easy it is to understand, and how interesting and engaging the speakers are. It includes speaker quality and slide quality.
- **Professionalism** (~32%) includes the team’s attitude, initiative, responsiveness, reliability, work ethic, preparation, independence, honesty, ethics, and integrity (including intellectual integrity).

### 4.2 Assessment Rating Scale

The rating scale shown in Table 4.2 illustrates the high standards of our number one ranked BSIE program. Satisfactory work for a senior design project will only receive a 3.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Outstanding</td>
<td>Worthy of a senior design finalist.</td>
</tr>
<tr>
<td>4</td>
<td>Highly Satisfactory</td>
<td>Few, relatively minor mistakes/conceptual difficulties.</td>
</tr>
<tr>
<td>3</td>
<td>Satisfactory</td>
<td>Several mistakes, but no serious deficiencies.</td>
</tr>
<tr>
<td>2</td>
<td>Un satisfactory</td>
<td>Many mistakes OR at least one serious deficiency.</td>
</tr>
<tr>
<td>1</td>
<td>Unacceptable</td>
<td>Serious deficiencies not worthy of a senior design team.</td>
</tr>
</tbody>
</table>

Project assessments will be based mainly on the contributions of the team; credit may not be given for ideas, suggestions, or work contributed by the advisor or other faculty in support of the team.

### 4.3 Assessment Value for Each Rating

Each rating for each sub-category is associated with a value, shown below. Note, this is not linear. There are no fractions. A rating of 1 carries a very large negative value.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Work Product</th>
<th>Written Report</th>
<th>Oral Report</th>
<th>Professionalism</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>24</td>
<td>12</td>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-60</td>
<td>-30</td>
<td>-30</td>
<td>-60</td>
</tr>
</tbody>
</table>

### 4.4 Team Grade Assignment

Your team grade will be based on your total score, as follows.

<table>
<thead>
<tr>
<th>Project Grade</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>200 ≤ S ≤ 210</td>
</tr>
<tr>
<td>A</td>
<td>190 ≤ S ≤ 199</td>
</tr>
<tr>
<td>A-</td>
<td>180 ≤ S ≤ 189</td>
</tr>
<tr>
<td>B+</td>
<td>170 ≤ S ≤ 179</td>
</tr>
<tr>
<td>B</td>
<td>160 ≤ S ≤ 169</td>
</tr>
<tr>
<td>B-</td>
<td>150 ≤ S ≤ 159</td>
</tr>
<tr>
<td>C+</td>
<td>130 ≤ S ≤ 149</td>
</tr>
</tbody>
</table>
**C**  
$110 \leq S \leq 129$

**C-**  
$90 \leq S \leq 109$

**D+**  
$75 \leq S \leq 89$

**D**  
$60 \leq S \leq 74$

**D-**  
$40 \leq S \leq 59$

**F**  
$S \leq 39$

### 4.4 Weight Distribution at Pre-proposal, Proposal, Interim and Final Stage

The pre-proposal developed during 4800 does not have letter grade. However, unprofessional conduct after a warning can carry grade implications toward senior design. This is the same for proposal presentation in 4106. The first formal feedback to the team using the assessment rubric takes place after the interim presentation and report in ISyE 4106. The feedback and grades provided at the interim stage are for your reference to help you improve. The interim grades on the work product, report, and presentations are not cumulative. They carry no weight in the final grade for the class. However, the **Professionalism grade** is cumulative in the sense that lack of professionalism during pre-proposal, proposal, and interim will impact the final grade. Lack of professionalism can also show in the attitude toward the deliverables at the earlier stage. For example, a sloppy job at the interim can be considered unprofessional because your team did not treat the project seriously. The other measures of professionalism can include punctuality, attendance, meeting the deadlines, conformity to requirements, attitude, initiative, responsiveness, reliability, tolerance, work ethic, preparation, independence, honesty, and ethics/integrity, including intellectual integrity. These apply to your dealings with everyone, including your Advisor, client, your fellow students, resource staff, other faculty members, etc. For example, you should submit all deliverables exactly as requested, including the specified file names. Failure to do any of these, or any other unprofessional team behavior, will result in penalties that may apply to either/both the team and specific individual’s grade.

In general, the ideal is for all team members to receive the same grade. **However, based on their relative overall contributions to the project, as determined from the Advisor, peer evaluation and Senior Design Examiner or Coordinator, team members can receive a different grade (higher or lower) than the team grade.** Grading is not zero-sum; an increase or decrease to one student’s grade will not necessarily affect their team members’ grades. **It is clear from the grading system (posted on the course web site) that everyone must contribute significantly to the engineering solution in order to pass this capstone engineering design course.**

In addition, individual grades can be adjusted downward for professionalism issues like missing mandatory meetings (or coming late or leaving early) without prior approval; missing a presentation to the faculty and/or class (even for an interview; companies understand that you need to schedule your interviews around immovable academic commitments); missing peer evaluations; unprofessional behavior, attitude, or dress during a formal or informal meeting; violating course rules; failing to respond in a timely manner to a request from the client, faculty Advisor, or Senior Design coordinator; other unprofessional behavior; etc.

**Modifications to teams’ and individuals’ grades will be assessed by the Senior Design Examiner and Coordinator, depending on the severity of the situation. They may be assessed relative to the team’s grade (e.g., ½ letter-grade higher, 2 letter grades lower, etc.) or on an absolute scale (e.g., an F in the**
course irrespective of your team’s grade), or even include termination from the course midway through the semester.

Since Georgia Tech does not currently use plus or minus grades on transcripts, the difference in the grades of team members may not coincide exactly with the grade adjustments; for example, if a team’s project grade is C- and one team member received a one-third-letter grade reduction to D+, then that team member’s transcript will show a grade of D and all other team members’ transcripts will show a C.

An established ISyE alumnus recommended an excellent book “Unwritten Laws of Engineering: Revised and Updated Edition” (King and Skakoon 2001). The small book of 69 pages was initially published in 1944. The republication is due to the continuous demand. You can find the details in the References. Here are quotes:

- A reputation for dependability and reliability can be your most valuable asset.
- If you do not know, say so, or I’ll find out...
- Confirm instructions in writing
- (answer) The trick is to convey the maximum of significant information in minimum time
- Refrain from stating and opinion or promoting an undertaking until you have had a reasonable opportunity to obtain and study the facts
- Meeting is a failure without definite understanding what will be done, who, when, …, should be in minutes.
5. PROJECT MANAGEMENT

You will develop a preproposal in ISyE 4800, then develop it into a proposal and deliver the interim and final results to the client. The project development and management are critical to the success of this project. Project development involves finding a client, identifying the opportunities, planning the actions and estimating values. Project management involves the above plus execution, controlling and closing of the project. The areas of management include integration, scope, time, cost, quality, human resources, risk, communications, procurement and stakeholder.

ISyE has created ISyE 4802 Project Development and Management course, starting in fall 2017. The objective of this course is to learn how to develop a project and manage a project through effective planning, communication, and teamwork. It will prepare you for a strong performance in project work in your professional career and makes you eligible to take the exam for Certified Associate in Project Management (CAPM)®. It will be taught by a team of expert in project management, communications, teamwork and leadership. By the end of this course, students are able to

- Develop the business case for a senior design project for spring semester
- Communicate technical and business information effectively through
  - Reports
  - Presentations
  - Emails
  - Discussions
- Present the financial plan of a project
- Make a business case for the project
- Work effectively in a team
- Develop the skills to manage a project
- Pass the aptitude test for senior design
- Apply to take exam for Certified Associate in Project Management (CAPM)® (having met the requirement of 23 hours of project management education)
6. TEAMWORK (BY RON JOHNSON)

Teams do most large projects—not individuals. Those teams who learn to operate interdependently are most successful.

We have heard from some students that team projects were the most stressful part of their Georgia Tech experience. Students complain about people in their group/team who contributed nothing to the project as well as those who provoked unproductive or heated discussions (or no discussion) with their team members, problems typical of badly formed or badly functioning teams.

Part of the reason that students encounter these negative experiences is because they receive little or no cohesive instruction about team dynamics and ways to form and work on effective teams. Students are not bemoaning challenging projects; instead, they are responding to their lack of strategic knowledge about ways to deal with a poorly functioning team, the lack of useful tools, and their frustration about not knowing ways to strengthen an adequate team.

When most of our students approach a team project, they look at the end goal and ask, “What tasks need to be done and who is going to do them?”—an approach in which team members work independently towards a common goal. Although these teams get results, research shows that interdependent teams yield better results. When approaching a group activity/project, we want our students to ask “What resources, strategies, ways of thinking, motivations and interests does our team have, and what can we do with them to meet the overall goals of the team?” This approach leads to better outcomes for the team. Our senior design project helps to bridge the gap between the independent, common-goal approach and the interdependent approach of teamwork as well as to incorporate collaborative factors that are relevant to success in both the workplace and academia.

In our Senior design course, we focus on teamwork because we believe this focus will enable a large percentage of our students to gain refined strategies in teamwork and team leadership and will lead to outcomes that support Georgia Tech’s strategic objectives of preparing our students for global leadership, inspiring creative and entrepreneurial thinking, and leveraging technology to enhance knowledge transfer and learning. During initial lectures, you will be introduced to the Tuckman’s model of team development to enhance your situational awareness. Your various requirements for senior design will create some excursions, where you will be challenged to experience the stages of team development and to enhance your skills to solve these challenges.

We believe that helping our students improve their strategies in forming and working in teams will have ramifications not only in their immediate classroom experiences, but these strategies will benefit them for many years after their graduation. In any workplace, but particularly now in a complex global economy, the ability to work effectively with others on a common task, often across diverse backgrounds and international borders, is a requirement. Explicitly experiencing these collaborative, team-building, and team-management strategies during senior design will help students begin to develop to their highest potential and become those asked by others to provide leadership and guidance. Our students aspire to become innovators and change agents; we want to provide them with all of the necessary tools and experiences. Effectively integrating team dynamics experiences and team communication and leadership into our senior design will enrich our students’ experiences.

Further, our focus on teamwork in senior design will address the Institute’s desire to “encourage more interaction among students to develop teamwork, leadership, and communication skills.” Our senior design course will complement current communication and leadership programs on campus and further
expand their reach with specific integration of team-building skills in the classroom at all levels of the curriculum. We hope that with a more thorough infusion of team dynamics and leadership training opportunities on campus—in the classroom as well as in student activities and the residence halls—that students will gain more sophisticated and transferable team building strategies that will serve them a lifetime.
7. REPORT CHECK LIST (BY BRANDY BLAKE)

Note: Individual advisors may have additional requirements

Front Matter: Do you have
- A cover page that includes the title, authors (team), team number, team liaison email, date, client ID & contact info, team advisor & contact info, NDA statement, and required disclaimer?
- A one-page executive summary that highlights the problem, solution, and value of the project?
- A Table of Contents with page numbers?

Body: (Intended to "sell" the students' ideas, analysis, results, and impact to the client audience.) Do you include:
- A description of the project, which should provide information on the client (e.g. the division you're working with), the motivation of the project, the current state, the scope, etc.?
- A description of the "Take Aways" -- the "so what" for the reader? This includes:
  - The changes, opportunities, initiatives, or recommendations you propose.
      - A list of deliverables, including key components and how they should be used.
      - Why these initiatives are the most appropriate path forward (as opposed to other alternatives). [Remember, you need to convince the client that your ideas are the most fitting way to proceed given the project's motivation/objective.
  - Results of data analysis that would benefit the client.
  - A roadmap of the steps the client needs to take to implement changes.
- Other pertinent information that the client might find helpful? This might include
  - Information on the data collected for analysis and design.
  - Client-friendly descriptions of methodology and/or validation.
  - Quantification that shows the client-specific details related to your analysis or your design.
- An explanation of how your deliverables could be used by the client to create value?

Back Matter: Do you have
- Appendices, which could include specific detail too technical for the client audience, a glossary of terms, clarification of ideas in the report, process-focused detail, and/or pertinent client information?

Important Reminders:
1. Audience: The audience for the report is the "Client" (not the Coordinator, not the Examiner, not your advisor, not your client contact); in other words, the paper should be written so that busy executives and non-experts (non-IEs) can easily understand it.
2. Brevity: Say everything you need to say to make your story clear and complete, and not one word more. Your readers—both client and faculty—will not appreciate reading words, sentences, and paragraphs that do not add value.
3. Organization: Organize your report in a way that makes sense to your project. Do not blindly follow old templates. As you organize the body of the report, consider the question: What does my client need/want to know?
4. Required Disclaimer: This project has been created as a part of a student design project at the Georgia Institute of Technology.
5. **NDA statement:**
   a. If your project has an NDA between Georgia Tech and your client, please add the following statement on the title page of the report and the presentation: “This project is subject to a Non-Disclosure Agreement between [client] and Georgia Tech [document number].”
      i. The document number is in the file name of your Fully Executed (FE) PIA form or Signature Sheet (SS).
   b. If you signed an NDA with your client individually, please add the following statement on the title page of the report and the presentation: “This project is subject to individual Non-Disclosure Agreements between each individual student and [client].”

6. **Appendices:**
   a. The technical details that are likely to be of interest to the Coordinator, the Examiners, and your Advisor (not your client) should be in appendices and clearly referenced in the body of the report.
   b. Appendices need to be as well-written as the rest of the report, providing introductions to the material there and explanation of why that material is important to your project.

7. **Process vs. Results:** The report should not focus on the narrative of what you did during the project (We collected data, we analyzed data, we designed a model, we created a simulation). It should instead focus on the results (The data shows, the solution provides, the simulation indicates, etc.). Your report should be a logical argument, not a memoir or chronology.
   a. "We": First person is allowed when appropriate. Just remember: the report isn’t about you, so try not to talk about yourselves or the team very much. As Dr. Vande Vate says, "The story is about THE CLIENT not about the team."
   b. **Active Voice:** Active voice is usually clearer than passive voice. Don’t make the sentence passive just to avoid saying "We"—just try to focus more on the results and on the client’s needs than on what your group did.

8. **File naming:** Team# ClientName Project Type
   a. Project type: Flow, Plan, etc.
   b. Example: 5 Delta Plan Interim Report

9. **Formatting:**
   a. Remember to use page numbers throughout the report. The first page of the report itself is page 1. The Executive Summary and Table of Contents are front matter and should be paginated with lower-case Roman Numerals (ii, v, ix, etc.).
   b. Use headings and subheadings to break up your report into clear, unified sections.

10. **References:** You need to include a citation if you are adapting a solution that was originally suggested by someone else, if you are using a specialized method of analysis or algorithm that was developed by someone else, or if you are paraphrasing/quoting someone else’s words.
    a. Cite the original author(s) in the text and include the reference at the end of the body of the report. E.g., “We have used Moinuddin’s value chain model (Moinuddin, 2006) adapted to reflect the outsourced value-adding operations.”
    b. Use APA or IEEE Style—whichever you choose, use it consistently.

**APA Style** (needs to be in hanging format): [https://owl.english.purdue.edu/owl/resource/560/01/](https://owl.english.purdue.edu/owl/resource/560/01/)


**IEEE Style:** [http://www.ijssst.info/info/IEEE-Citation-StyleGuide.pdf](http://www.ijssst.info/info/IEEE-Citation-StyleGuide.pdf)

APPENDIX A1. SAMPLE STUDENT PIA FORM

Top part

Student Proprietary Information Agreement

THIS AGREEMENT entered into by and between 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 (“Georgia Tech”) and the Georgia Tech student as identified below, (“Student”):

WHEREAS, Georgia Tech may receive information that is proprietary to (“Company”), for use in a Senior Design Course Project (“Project”) in [Fill in Fall/ Spring Semester of 2017]

WHEREAS, Georgia Tech and Company have entered or will enter into a Proprietary Information Agreement (hereinafter called “PIA”), which is incorporated herein for reference, to protect the confidentiality of Company’s Proprietary Information as defined in the PIA;

WHEREAS, Student desires to have access to such Proprietary Information by virtue of his/her participation in the Senior Design Course, ISYE 4106, in the School of Industrial and Systems Engineering at Georgia Tech;

NOW THEREFORE, in consideration of the mutual covenants herein, Student and Georgia Tech agree as follows:

1. Georgia Tech shall grant the Student access to the Proprietary Information.

2. Student covenants with Georgia Tech to perform all obligations placed upon Georgia Tech in the PIA between Company and Georgia Tech.

Each team member fills out, without date

Bottom part

GT Legal fill this out

Written above, and shall expire at the expiration of the PIA. However, the expiration of this Agreement shall not relieve Student of his/her obligations hereunder regarding the protection and use of Proprietary information disclosed hereunder prior to the expiration date.

6. This is the entire Agreement between the parties relative to the exchange of Proprietary Information concerning the Project and it supersedes any prior or contemporaneous written or oral agreements thereon and may not be amended, modified except by subsequent agreement in writing by duly authorized officers or representatives of the parties.

BY MY SIGNATURE BELOW, I HEREBY AGREE THAT I HAVE CAREFULLY READ, UNDERSTAND AND AGREE TO ALL OF THE TERMS AND CONDITIONS HEREIN AND CERTIFY THAT I AM 18 YEARS OF AGE OR OLDER, LEGALLY COMPETENT TO EXECUTE THIS AGREEMENT, AND I FREELY AND VOLUNTARILY ENTER INTO THIS AGREEMENT.

Student’s Signature:

Student’s Printed Name:

Student’s Home Address:

Date:
APPENDIX A2: SAMPLE SIGNATURE SHEET OF AN EXECUTED NDA

You should get signatures from all GT personnel who you discussed proprietary information with.

![Signature Sheet Image]

*The information as specified in the NDA overrides any information listed on the signature sheet. It is your responsibility to review the terms of the NDA itself so that you are aware of your obligations. Please contact the attorney who processed your file if you would like clarification on any of the terms in the NDA.*
APPENDIX B: NOTES ON PROJECTS REQUIRING HEALTH DATA

Health data in the United States is protected, e.g., through the Health Insurance Portability and Accountability Act of 1996 (HIPAA). If you are working with a system that has patients, patient records, or data such as individualized surveys, then you may be working with health data that is protected. Projects with health data can be viable but you may need special training and other preparations.

In addition, if you will be visiting locations where there will be patients, your client may ask you to provide records of immunization, Tuberculosis shot, etc. Please see below for additional information.

Clients:

1) CDC: Most of the data that the CDC makes available for student projects has already been cleaned. Ask your CDC contact if you think you will be receiving protected health information and if so whether any additional steps need to be taken.

2) Hospitals and other medical provider offices: if you will be visiting a clinic or hospital, then you will be seeing patients and could potentially identify them. In addition, your client may be providing you with information from electronic health records or administrative claims (used for billing). You will likely have contact with Protected Health Information. Finally, if your project is considered “research” they may need to have approval from an Institutional Review Board (IRB); if your project is considered operational and for quality improvement then you may not.
   a. Children’s Healthcare of Atlanta: ask your client what paperwork you will need to do to visit on-site and collect time studies. Children’s has some standard things they usually collect from team members for student projects (like immunization records). In addition, ask them what type of training they want you to do for Protected Health Information. There may also be forms to fill out (separate from the NDA process). See below for what you can do on the Georgia Tech side even if they don’t request you to do their training.
   b. Emory: Emory has had many student projects in the past also, so they may have a standard set of documents you need to provide. In addition, ask them what type of training they want you to do for Protected Health Information.

Training for Protected Health Information:

Each individual student needs to take responsibility for protecting health data. In addition, the team has a whole has responsibility. Georgia Tech also could face liability if there were breaches with health data, so the university may want training even if your client does not require it.

You may wish to become familiar with some topics related to health data. One good resource is this page: https://privacyruleandresearch.nih.gov/pr_08.asp. For example, if you receive data that contains a service date (or a zip code, or a birth date), then that data is not considered de-identified. It may be a “Limited Data Set” (which is still protected) or may be considered identifiable.

If you are working with a provider of health services (hospital, physician, etc.), then you should do training for health data. If your organization did not ask you to do their training, then you can do training to work with health data from online systems available at Georgia Tech. If so, these are some relevant steps. It may take from 2 to 6 hours to complete the two programs.
1) Go to https://www.citiprogram.org/.
2) Login via SSO (Single Sign On) using your GT username and password (look for Georgia Institute of Technology).
3) Once logged in, under Georgia Institute of Technology courses, click on "Add Course or Update Learner Groups".
4) Check the box for "Human Subjects Research".
5) Select "NO, I have NOT completed the basic course".
6) Select "Group 2: Social/Behavioral Research Investigators and Key Personnel".
7) Go back and do the additional training called Health Information Privacy and Security.
8) Print your certificates to a pdf or do a screenshot showing the data of completion.
APPENDIX C1: TEAM COMPOSITION REPORT

Each team submits one composition report to the ISYE 4800 website by the team liaison person

File name: team liaison’s last name + Team, e.g., ZhouTeam

Date:

Team members in a table (including Liaison) and information in alphabetical order

<table>
<thead>
<tr>
<th>Last name*</th>
<th>First name</th>
<th>Working GT e-mail</th>
<th>Preferred 4106 section**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 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 12:10 – 2:55, W 6:00 – 8:45
Section type TR: TR 12:00 – 2:45, WR 6:00 – 8:45

Resume for all members in alphabetical order.

Compile everything into a single file to submit via the T-square Assignment page.
APPENDIX C2: CLIENT NOTIFICATION REPORT

File name: TeamNumber Client Name (Abbreviation is acceptable). The team number will be given after your Team Composition Report; e.g., 21Alibaba.

Title page contents

Client name:

Liaison’s name: Last, Given; Liaison’s email

Team Members

Date

Body contents

Who is the client?
Give a brief description of the client company or organization—nature of business, size, history, market share or other information that provides a clear picture of the client. For a large company, please describe the division you are working with, say GE plastics.

Who is the client contact?
Give the name, position, and contact information for the person who will be your primary working contact.

What is the system?
What system within the client organization will you be studying, designing, or re-designing?

What is the opportunity?
Give a brief statement of what you believe to be the opportunity for improvement in this system. What are the symptoms of the opportunity? What is the current state of the system?

What is this opportunity worth?
What is the nature of the value you will create for your client. The value can be saving, additional revenue or market, people served, jobs created, environmental foot print reduced, etc.

What will you deliver to your client?
Describe briefly the deliverables you will present to the client such as an application, a new process or system design, etc.

What is the relationship to the ISyE curriculum?
Explain how the work you will do depends upon knowledge gained in the ISyE curriculum. What specific “IE methods and tools” will you use, why will you use them, and what will you gain from using them?
APPENDIX C3: PREPROPOSAL

File name: TeamNumber Client Name Project, e.g., 27FordAssembly

Title page:

Client name:

Liaison: Name (Last, Given); email; phone

Team Members:

Date:

1. **Who is the client?**
   
   Describe the client and the division you are working with – the nature of the organization, history, size, or other information that provides a clear picture of the client.

2. **Who is the client contact?**
   
   Give the name, position, and contact information for the person who will be your primary contact.

3. **What is the system?**
   
   What system will you be studying, designing, or re-designing?

4. **Is an NDA required?**
   
   Does your client request an NDA, confidentiality agreement or intellectual property agreement? If yes, where are you with respect to the steps outlined in the NDA process?

5. **What is the opportunity statement?**
   
   Describe the motivation for the project, the goal(s), and the opportunities that your design project will focus on? How does your design manifest in terms of cost, profit, injuries, environmental hazard or other ways that are important?

6. **What type of information do you need to take on the challenge?**
   
   Describe what information you need to explore the opportunities: the production history, the customer orders, patient flows, the resources the client own, work standard, the layout, etc.

7. **What is the value of the opportunity you identified?**
   
   What is the value you will create for your client? Traditionally, this is cost savings. In many systems, it can also be quality or service improved, market expanded, etc. Georgia Tech’s mission is “improving human conditions”. Georgia Tech’s education enhancement is Serve-Learn-Sustain. From these perspective, the value can be number of people served, environmental footprint reduced. The rule of thumb is if the client hired a consultant, the project would cost over $100,000.

8. **What will you deliver to your client?**
   
   Describe briefly the deliverables you will present to the client: a report, a model, an application extension, scheduling tools, etc.
8. What is the relationship to the ISyE curriculum?
Explain how the work you will do is supported by the ISyE curriculum. What specific “IE methods and tools” will you use, why will you use them, and what will you gain from using them?

REFERENCES

Publisher: American Society of Mechanical Engineers; Revised edition (June 1, 2001).