WSE 442/542 Composite Manufacturing

OSU College of Forestry

WSE 442/542 Team Projects

A Survival Guide

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Team Projects Guide, Fall 2009

Introduction to the Composites Manufacturing Team Project:

In this exercise mixed teams of graduate and undergraduate students, work on a real life problems submitted by our industry partners. We believe that the exposure to the real life industry environment will better prepare you for your future professional life than another set of academic assignments.

The primary objectives of the team project experience are to:
1. To enhance your problem solving skills (by providing you with an opportunity to combine your knowledge, intelligence and common sense in a creative team effort working on "real life" industrial problems);
2. To enhance your ability to work in a team environment and to engage in an effective collaborative effort solve advanced problems related to composites manufacturing;
3. To enhance your technical writing, as well as your critical and creative skills.

This term project requires systematic inputs from the entire team from week 1 to week 10. The problem solving process involves sound teamwork, background literature search, drafting a problem solution strategy with short and long range objectives; devising the necessary research program; performing the problem solving research (as time allows) and writing progress and final reports with conclusions and recommendations.

Team work and team dynamics:

The term project assignments are problem solving oriented, and are performed in teams of three or more students. Larger groups may be created if justified by the project size.

The emphasis of the project is on combining your knowledge, intelligence and common sense in a creative team effort to propose a solution strategy to real life industrial problems. Important outcomes for this course are learning from your team experiences and being able to solve problems collaboratively, as well as growing as a learner. Collaborating with others and contributing positively to support your team and its goals are as important as writing the reports or giving the presentation. The process of collaboration, therefore, is recognized as a distinct outcome and it graded separately. In other words, the stress is more on the chase than on the finish line.

The teamwork is structured following the cooperative learning methodology developed by R.M. Felder (www.ncsu.edu/felder-public/Cooperative_Learning.htm), which determines a set of rules and specific roles for each team member to play. The roles are described in the attachment. The team membership and the roles of each individual in the team are assigned by the instructors in week 1 of the course. Each team then chooses a project from the list of topics submitted by collaborating companies. Specific term project schedule is attached below.

The general features of the teamwork are outlined below:
1. Each team member has a role to play and guidelines for what that means (attachments).

2. Teams will function as they see best throughout the term. However, it is expected that there will be meetings (e.g. once a week) where all team members are present, or are expected to be present. This is simply good administration to keep everyone in the loop and to brainstorm and strategize together as a team. The instructors should be informed ahead of time about the time and place of these meetings (by email). They will attend if they can and may contribute to the meeting in terms of alignment with the course structure and intention. They will not work on solving the problem.

3. In addition to these formal meetings, there will probably be a number of less formal meetings, or meetings of task groups where the entire team is not present. Instructors do not need to be invited for these meetings.

4. Team work may at times be frustrating. If you feel frustrated with your team, think how to contribute in a way that puts the team on the right path (without taking everything on your shoulders which will be considered a bad team strategy).

5. Please report any problems to the instructors as soon as you are aware of them. (Let's shovel our piles while they are small.)

The teamwork is to be documented on several levels.

1. Regular weekly meetings which will be documented in the weekly *team meeting reports* and *self evaluation forms* (templates in the attachments). The editable form is available in BlackBoard and on the T: drive.

    a. The team as a whole should contribute to filling out the *team meeting report* form at the end of each meeting. This report should not take more than 5 minutes of meeting time to complete. These forms will not receive grades in and of themselves, but the timely and faithful submission will be considered in the final term project grade. (see the attachment for details)

    b. In addition, for each formal team meeting, each team member should file a *self evaluation form*. Its primary purpose is to allow the instructors an insight in your personal progress as a team player and help to keep the process on track. Please fill it out and email it to both instructors. These forms are confidential. You should not spend more than two minutes filling out this form. It will not be graded in and of itself, but the faithful submission will be considered in the overall grade. (see the attachment for details)

    These two reports are not intended to take up valuable time or impede your work efforts on the term project. They are intended to help you (and the instructors) learn about and monitor the team and teamwork process, as opposed to the team product, which is the final report.

2. The teams are expected to maintain professional contact with the assigned company liaison, which will be documented in the *contact log* (guidelines and templates in the attachment)

3. The progress of the projects will be documented in three progress reports and summarized in the final report, which is handed over to the collaborating company liaison. These reports should follow the structure outlined in the attached guidelines, different for the progress reports and for the final report. One report per team. These reports are cumulative and each report should contain the information (although you may revise it as you see fit) submitted in the previous report. Each team member is expected to contribute to the progress reports and final report by authoring sections of the report. Authorships and other forms of contributions (such as testing samples in the lab) will be identified in an appendix to the report. See the attached Report Guidelines for detailed instructions.

4. The project culminates in the team presentations in front of invited company liaisons.

Participation:

All members are expected to participate in and contribute to the success of the team.

WSE 442: Undergraduate students- active participation in the team and required reports, assuming group leadership is encouraged but optional.

WSE 542: Graduate students- required higher level of performance and compile/produce the report summarizing the project design and principal findings.

Each team will develop specific criteria for dismissing an uncooperative member (subject to approval by the instructor). See the attached *dismissal policy agreement* template. The dismissed team member will receive a grade of zero for the term project.

Grading

The grades based on a composite of the team products (all team members share the same grade) and individual participation and contribution (each team member graded individually). The detailed grade distribution is attached below.

ATTACHMENT #1:

Term Project Schedule:

1. Monday week 1: Term project topics announced

2. Thursday week 1: Topics, team membership and team roles are confirmed

3. Week 2: Team organization work, defining the objectives, tasks and responsibilities

4. Monday, week 3: Progress report 1: Preliminary literature review, objectives and preliminary problem solving scenario including draft Gant chart & task assignments; (approvals, comments and grades by Friday, week 3);

5. Wednesday, week 6: Progress report 2: Progress to date, including updated literature review, progress on tasks and updated Gant chart; (comments and grades by Friday week 7);

6. Wednesday, week 8: Progress report 3 (Draft final report); Progress to date, updated literature review, progress on tasks updated Gant chart, discussion of results, conclusions; (comments and grades by Monday week 8);

7. Wednesday, week 10: Project presentation (10 minutes + 5 minutes for questions and comments per group);

8. Friday, week 10: Final report due (grades at the final Quiz).

ATTACHMENT #2:

Grading:

The term project grade constitutes 24% of the total possible grade for the course. The grades based on a composite of the team products (all team members share the same grade) and individual participation and contribution (each team member graded individually). The detailed grade distribution is summarized below.

Project component	Graded as:	WSE 442/542	
		fraction of term project grade	*fraction of total grade*
Progress reports, and process	Team	**30%** (10% each)	*7.2 %*
	Individual	**15%** (5% each)	*3.6 %*
Final report	Team	**15 %**	*3.6 %*
	Individual	**10 %**	*2.4 %*
Final report presentation	Team	**20 %**	*4.8 %*
Weekly meeting reports	Team	**5 %** (0.5 % each)	*1.2 %*
(Each timely submitted and acceptable report earns you 0.5 pt. The content is not graded though unsatisfactory forms may be returned for resubmission)	Individual self evaluations	**5 %** (0.5 % each)	*1.2 %*
	Totals	**100%**	*24%*

ATTACHMENT #3

GROUP DISMISSAL POLICY

Group Number: _____

Groups work most productively when members attend class, take part in out of class meetings, stay in contact with other group members, and hold each other accountable for the entire group performance.

In order to avoid conflict or confusion, your group needs to create a policy that the members can follow in order to dismiss a person if he/she fails to perform at an acceptable level. Please fill out the Group Dismissal Policy below and turn it in for approval. This document will be placed in your Group=s Portfolio and will be used in the event that problems arise because of a group member=s absences or refusal to participate.

Sample Group Dismissal Policy

1. More than two unexcused absences will result in being dismissed from the group. Meetings will be set one week in advance.

2. Unexcused absences include in class time as well as out of class meetings.

3. The first time a member is noticed not performing his/her job, a group meeting to discuss it will be called. The second time, the teacher will be notified. The third time will result in dismissal from the group.

We, the members of Group _____, have written, read and understood the above policy, and we agree to abide by its terms. We understand that if a group member becomes a candidate for dismissal, he/she has the right to make an appeal. We also acknowledge that the professor will not deviate from the terms of this Group Dismissal Policy when listening to appeals. Moreover, we agree that this agreement in no way absolves a student form his/her regular responsibility of attending class. We know that a student may FAIL the course if he/she accrues excessive absences. We recognize that if a student is dismissed from a group, he/she will still have to complete the course assignments, but will have to do so on his/her own.

Name Date	Name Date

Name Date	Name Date

I have read and approved this Group Dismissal Policy

Name   Date

ATTACHMENT #4

Plant contact guidelines

When contacting the company please be respectful and conduct yourself in a professional manner.

Have your questions prepared ahead of time.

Introduce yourself as an OSU student and the project captain or spokesperson.

Ask if the time is convenient for conversation.

Keep your conversation concise and to-the-point.

Take notes.

Ask for a preferred form of communication (phone or email) and a convenient date/time for the following contacts.

Keep log of all contacts made with the plant (see the attached template). For email contacts, collect and attach with your reports printouts of messages sent and received.

Please immediately report any communication problems to the instructor.

ATTACHMENT #5

Communication log template
Keep a copy of the communication log on the group collaboration space in BB and make it an attachment to your Progress Reports

Log entry #:

The general purpose of the contact (e.g. initial contact):

Team contact name:

Plant contact name:

Mode of communication:

For phone conversation
Prepared Questions:
1. …
2. …
…

Contact Date and Time (record dates and times of unsuccessful attempts):

Notes:

Summary and Action Items:

For email contacts, simply attach copies of messages sent and received.

ATTACHMENT #6

Literature review

The general methodology of conducting and writing an effective literature review may be found in:

http://www.unc.edu/depts/wcweb/handouts/literature_review.html

http://library.ucsc.edu/ref/howto/literaturereview.html

http://library.concordia.ca/help/howto/litreview.php

http://web.pdx.edu/~dbls/HowtoWriteLiteratureReview.htm

The literature review is most effective when it is **objective oriented** and guided by specific questions regarding the subject matter identified during the meeting. Start with sorting out your knowns and unknowns. Form specific questions. Sort them by the level of importance and urgency. Decide which questions are general enough that can potentially be resolved through the literature review and/or other sources (think: web, handbooks, lexicons, encyclopedias, lecture notes, contacts with instructors and other faculty... make a list). Only the questions most specific to the plant you are working with will be left for the interview with your client liaison.

Proper questions give the literature review direction and make it more effective than random or "general" searches. It also allows assigning specific tasks. Rather than "find 2 papers in the general area of surface deactivation", assign "find answers to the following questions: ..." It will allow you skim through the literature more swiftly and focus on the issues. You will find out quickly that instead reading and then summarizing random papers from "the general area" you will be able to 1) scan papers you come across, 2) assess the likelihood they bring the answers to your questions (yes or not), 3) focus on the sections that are likely to bring the answers and 4) report the answers found. It is a good idea to keep a list of all papers scanned in the process in order to avoid redundancies and parallel work. The most important thing about an efficient literature review is to keep it focused and to the point. Organize the narrative around the issues and list the references that support the statements you make. Do not re-write the summaries of the papers.

The easiest way to start your search would be probably Google Scholar. It is very general and it is likely that with the handful of relevant references you will be netting lots of stuff accidentally connected by a funny use of your keywords.

If you use Google scholar you may test your keywords right away. But it is most effective if you use the [Advanced search] option, where you can combine or exclude keywords in various ways.

Other, more specialized databases may be found in the Valley Library web pages:

http://osulibrary.oregonstate.edu/

Check databases and e-journals.

Be sure to check the "Dissertation abstract" (in Databases under D). While this is a very general source it contains many otherwise unpublished works and links to the authors.

Also note the Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables (Databases under H; useful not only in this project)

Proceedings First (Databases under P) will link you to published conference proceedings, which may not be included by other databases.

Here are some other useful resources and databases with contents relevant to the general area of wood science, engineering and bio-based composites:

AGRICOLA

Compendex (engineering Index)

Dissertation abstract (while this is a very general source

Forest Science

IRIS (Illinois Researcher Information Service): contains data on research currently conducted (searchable by keywords)

Patent Database

Scifinder

Web of Science

Even better results may be achieved by searching directly specialized electronic journals (some may require a membership login for full text access):

Wood and Fiber Science (http://www1.fpl.fs.fed.us/swst/journal.html)
Forest Products Journal (http://www.forestprod.org/FPJonline.html)
Holzforschung (http://www.reference-global.com/loi/hfsg?cookieSet=1)
Wood Science & Technology (http://www.springerlink.com/content/0043-7719)
European Journal of Wood and Wood Products (aka Holz als Roh- und Werkstoff: http://www.springerlink.com/content/0018-3768)

ATTACHMENT #7

Guidelines for productive meetings:
1. **Plan the meeting ahead of time and come prepared:** It is the captain's responsibility to prepare the agenda and topics for the meeting, to assess how much time will be needed to discuss all items, and to communicate it to the team members when calling the meeting. It is the team members' responsibility to show up on time and come prepared.

    The agenda should be made before each meeting. Make copies of the agenda for each of your members. This gives an overview of the meeting and a place to take notes. The Agenda Should Contain the Following:
    a. Review of the agenda (make sure you can complete the meeting in the assigned time, be open to changes and updates)
    b. Summarizing the tasks and assignments from the last meeting last meeting (review the last Team Meeting Report)
    c. Old Business: report the progress on the assigned tasks
    d. Discussion leading to…
    e. New Business: Revision of the general objectives, approach, long term tasks, tasks and assignments for the next week ("action items")
    f. Special Announcements
    g. Draft the Team Meeting Report and vote on the group meeting self assessment items

2. **Meeting Flow:** The Captain is responsible for guiding the flow of the team meetings. To do this effectively, use the following guidelines:
    a. Remain impartial
    b. Recognize all who have comments or questions
    c. Keep the group on the topic at hand (make sure all agenda items are covered in a timely manner)
    d. Keep order in the discussion and be alert to members' reactions
    e. Clarify questions. Re-state them, if necessary, to be understood
    f. Summarize the discussion as you go from one item to another
    g. Summarize the meetings outcomes

3. **Take notes:** Although it is the Recorder's task to take notes and prepare meeting reports it is good practice for all members to take notes during the meeting. Comparing the notes may help the Recorder to have more complete record of the meeting and include other team members' perspective.

4. **Keep track of time:** Start all meetings on time and finish on time.

First meeting tasks (preparing agendas and tasks for the consecutive meetings are responsibility of the team captains):

Decide how much time should the meeting take and keep track of the time.

Exchange contact information, and determine preferred communication mode.

Compare your weekly schedules and determine preferred meeting times and places.

Read and discuss the Project topic.

Do you understand the objective of the project? Brainstorm the preliminary strategies to reach the objective: Note indiscriminately all ideas you come up with. Then have a discussion and make a list beginning with most promising.

What do you need to learn in order to get better understanding of the project? Make a list of questions that that need to be answered.

Which of these questions (in your judgment) are general and fundamental enough that you may relatively easily find the answers in the general sources (encyclopedias, lexicons, handbooks, databases, professional journals)?

Which are specific to the unique product and manufacturing process, and require an interview with the plant contact or the instructor?

Make a list of key words for literature research and relevant databases.

Prepare a list of questions for the plant contact.

Determine plan of action for and assign tasks for the next week (e.g. keywords, keyword combinations and sources/databases to check for each team member). Make a list.

Pick a time and place for the next meeting.

Fill in and submit the Team Meeting Report form (note that the group self-assessment items should be voted on).

Fill in and submit the individual self-evaluation forms.

ATTACHMENT #8

Team Meeting Report

Team Number:
Date of Meeting:
Team Project:
Place of Meeting:

Team Members/Roles:

Name	Role

Use complete sentences to answer the following:

1. Define the purpose and goals of this meeting (*one or two sentences*).

2. Discuss what decisions your team arrived at. Did you fulfill the goals of the meeting? (*List the decisions made and briefly comment on the goals fulfilled or not*)

3. What tasks need to be accomplished by the next meeting and what are your roles in accomplishing these tasks? (*list*)

4. Team Rubric: The team as a whole is to select the number which best reflects your team's performance at this session. (*if there is a tie vote, the Reflector gets to break the tie but can record that there was a tie*).

Mark with an "x" the column that best reflects your assessment of the team performance:

	weak	1	2	3	4	5	strong
Communication between members							
Participation by all members							
Solved problems effectively							
Open to new ideas							
Task oriented skills							

If you have any other comments, please write them on the back of this sheet.

Team Meeting Report ctd.

5. What insights did your team have about the teaming process?

6. What improvements can the team make to improve its performance?

7. What strengths does you team demonstrate in a problem-solving session?

Instruction:
Please remember that unlike the Project progress reports the Team meeting reports and Self evaluation forms are designed primarily to help you in the process of learning the difficult art of team work. Self assessment (as teams or as individuals), conscious reflection on the team dynamics, recording your goals and checking how they are met from one meeting to another are useful tools in the process. They ensure quick progress. It works best if you:

1. fill the forms at the end of the meeting or right after the meeting when all the good ideas and impressions are still in your heads (letting couple days to pass between the meeting and filling in the report is of little help)
2. think of yourselves (teams or individuals) as the ultimate addressees – chart down things you would like to remember, do, improve when meeting the next time
3. if you run out of space attach additional sheet of paper; you can attach a copy of your meeting notes
4. retain a copy of your team meeting report and your self-evaluation form for your record
5. discuss/vote on the team meeting report and post the major decisions and assignments on the group file exchange space in BB
6. read the stuff and refresh your memories as you go for the next meeting

Note the internal logic of the team meeting report:

1. The purpose and goals of the meeting should be prepared ahead of the meeting by the captain, so this part is a plug and play. Instead of squeezing tiny handwriting in between the lines of the template you can simply attach captain's meeting agenda. The meeting objectives should be formulated in a way that are easy to check as complete or incomplete. An example of an open-ended agenda item that will always be difficult to assess as "complete/incomplete" starts with "discuss..."
An example of specific and measurable goal will start with "decide...", "assign..." etc. you either manage to do it or not.

2. This part should closely correspond with items in section 1. Go by the agenda items and list the outcome: what was the outcome of each and every one.

3. This part projects into the future: list all "action items". All actions and tasks you decided to undertake together with milestones, deadlines, and assigned responsibilities you agreed on during the meeting. As explained above, this will help you measure your progress, assess if you are on track or not, and take measures (press, devote more time or adjust your objectives) if you find out you are not.

4. Team rubric is pretty straight forward. Just remember to vote the grades over at the end of the meeting, so that all of you have the sense of "ownership".

5.-7. This sections are concerned with the team dynamics beyond the actual topic. Focus on your experience as a team and the aspects of team chemistry that make you strong or pose a problem. Try to discuss ways of improving your performance in the areas of weakness.

The weekly submission of the self evaluation forms and team meeting reports allows the instructors to monitor the group dynamics and provide most effective support when needed. It also ensures that you are not tempted to skip the procedure

ATTACHMENT #9

Self-Evaluation Form

Name:
Team Role played:
Team Number:
Date of Meeting:
Team Project:
Place of Meeting:

Use complete sentences to answer the following:

1. What are my greatest strengths in the group, and what have I contributed to the group today? (*two to three sentences*).

2. What areas can I work on to improve my performance for the next meeting?

3. What will I try to accomplish before the next meeting?

4. Please rate yourself today:.

Mark with an "x" the column that best reflects your self-assessment as a team member:

	weak	1	2	3	4	5	strong
Preparation for the meeting							
Participation to group activities							
Effort given							
Overall performance							

5. What insights did I have regarding teaming and my participation in this process?

Instruction:
Please remember that unlike the Project progress reports the Team meeting reports and Self evaluation forms are designed primarily to help you in the process of learning the difficult art of team work. Self assessment (as teams or as individuals), conscious reflection on the team dynamics, recording your goals and checking how they are met from one meeting to another are useful tools in the process. They ensure quick progress. It works best if you:

1. fill the forms at the end of the meeting or right after the meeting when all the good ideas and impressions are still in your heads (letting couple days to pass between the meeting and filling in the report is of little help)
2. think of yourselves (teams or individuals) as the ultimate addressees – chart down things you would like to remember, do, improve when meeting the next time
3. if you run out of space attach additional sheet of paper; you can attach a copy of your meeting notes
4. retain a copy of your team meeting report and your self-evaluation form for your record
5. discuss/vote on the team meeting report and post the major decisions and assignments on the group file exchange space in BB
6. read the stuff and refresh your memories as you go for the next meeting

Keep in mind that the self-evaluation forms are designed as confidential documents. They should be filled in individually in a situation free from peer pressure. Therefore it is also best if they are submitted individually by each team member.

Sections in the self evaluation form also have some internal logic:

1. Section one should focus on your contributions as a team player. Your personal qualities and talents that add value to the team. You may list your specific tasks in here but it is not necessarily the point. Hopefully, with time you will notice that the list is getting longer and your contribution is becoming richer. You may discover that some qualities you would not normally associate with the team work come up very handy. Others may with time prove less useful than you thought.

2. This section helps you identify the weak spots in your team performance that could and should be improved on. Be honest with yourself. This form is confidential for a reason. Hopefully this section will sharing with time as you will see your team player skills grow.

3. This is not your team assignment list. This part should closely correspond with the previous section. Do not try to tackle all problems at once. Focus on things you can change between now and the next week.

4. The self-assessment grade table is easy and self explanatory.

5. Here you are invited to express your reflection on your learning experience in the team environment. What have you learned from the process about the team dynamics and about yourself as a team player. Keep in mind that this is not a place for finger pointing. However do not be afraid to be a whistle blower if you see problems that the team as a whole has hard time to acknowledge. We can help you get back on tracks.

The weekly submission of the self evaluation forms and team meeting reports allows the instructors to monitor the group dynamics and provide most effective support when needed. It also ensures you are not tempted to skip the procedure :)

ATTACHMENT #10
TERM PROJECT PROGRESS REPORT

Team Number:
Topic # & title:
Progress report #:

Authors (captain first):

1. Background: (Problem statement, literature review)
For the first progress report a copy of the original problem statement would do. In the next reports it is expected that this description will be updated with the information obtained from the plant contact. You may also include a summary of the discussions you have with the instructors.
The literature review: The reviewed articles should be summarized or at very least listed here. It is expected that new content is added here with each progress report. The literature review should be objective oriented and focused on the topic at hand. Assess relevancy of the literature you review. Extensive summaries of less relevant papers sap out your precious time. Focus on the relevant issues. Seek information that is helpful towards the solution of the problem at hand. Use proper reference format.

2. Objective:
Concise statement of objective derived from the initial problem statement (the way you understand it at the current stage). Refine the statement as necessary.

3. Problem solution strategy, including tasks, assignments and time lines (Gantt chart)
Be specific here. Even if it feels like you do not have enough information at this point, list the questions and unknowns and lay out your plan on how you are going to find it. Specify short term tasks and assignments: who is going to do what. It is understandable that it may be hard to project a detailed Gantt chart for the entire project with your first progress report however you can plan your activity timelines for the coming week(s). Brainstorm the solution ideas and report the best ideas here.
Once you get better idea on how to proceed with your project break the general process into specific tasks and assignments. Assess the necessary time, cost and resources to complete the project.
If you plan testing do some math:
- *How many specimens are needed? (Will they be delivered or manufactured at OSU)?*
- *How many tests you will need to perform?*
- *How much time would a single test take?*
- *How much time will be needed for learning the procedures, setup the testing environment and trials?*
- *How much time will be needed to complete the entire test series?*
- *How many people need to work on the specimen manufacturing and testing at a time?*

- *How much time per week can the team members commit to this effort? Be realistic! [Please be open and considerate to schedules and time constrains of all team members. Also please keep in time that this term project is part of a 4 credit course. All extra time may be committed exclusively on a voluntary basis.]*
- *Assess whether you can pull out the entire test series within the time constrains discussed in the previous step.*

What kind of equipment and technical help will be necessary?
What costs may be involved?
Adjust your plans if necessary.

Revisit and refine this section with subsequent submissions.

4. Progress to date:
Report the status of the tasks outlined in the previous section. Don't be shy. List all activities you engaged in. Refer to the Meeting reports and Contact logs. Report other contacts you consulted to-date. Refer specifically to the list of literature acquired. Which of these have been actually reviewed?

5. Current results:
Be specific! Everything you have accomplished to-date is a fair game to report as progress. Include all tangible results, everything you have learned (it is OK to reiterate some most important findings already covered in literature review).

6. Discussion:
Qualify your findings. Put them in the context of the stated objectives. Highlight points of discussion. Are you closing on a solution or finding more unknowns as you go? List the outstanding questions.

7. Conclusions and Recommendations:
On progress reports, summarize the current results and discussion. Set tasks and assignments for the next step. On the final report provide final conclusions and recommendations for the partner company. If specific actions or more research are needed – make specific recommendations.

8. List of references:
List all relevant references you collected to-date and marked those reviewed and actually quoted in the text.

9. Appendices/Attachments (team member inputs/contributions, and copies of papers referenced in literature**)**
Attach contact logs. Follow the Contact log template provided in BB and on T: drive. For planned or unsuccessful contacts with the plant representatives you should still be able to have at least the "general purpose of the contact" and the new set of "Prepared questions" plugged in your contact log. List the dates and times of unsuccessful contact attempts.

The attachments should be arranged in a way that reflects individual contributions. It is expected that as you agree on individual tasks and assignments, each team member returns the results as mini reports in writing. These individually submitted contributions are then graded. Otherwise it is impossible to assign your individual grades for the report.

Declared group members' contribution:

Team member:	Assigned task/contribution

Signatures:

Print team member name	signature

ATTACHMENT #11

The Final Report is a document you will be sending to your industrial partners/clients. In contrast to the Progress Reports, which were working documents meant to summarize progress to-date and set tasks for the next couple of weeks, the Final Reports should include only most relevant information that may be of interest to your clients. The material from your recent Progress Report should be updated with the latest findings and slightly reorganized. The Final Report should include: Refined problem statement, relevant literature review, refined statement of objectives, materials and methods used, presentation of results, discussion and conclusions/recommendations. Keep in mind that the team formation and dynamics, task distribution and timelines are of little interest for your industrial partner.

Following is the suggested format.

TERM PROJECT FINAL REPORT

Team Number:
Topic # & title:
Progress report #:

Authors (captain first):

1. Background: (Problem statement, literature review)
Begin with the current edition of the problem statement (it is expected that your understanding of the problem has evolved with time)). Include review of RELEVANT literature only. The reviewed articles should be summarized. Extensive summaries of less relevant papers sap out your precious time. Use proper reference format.

2. Objective:
Include the latest, most refined statement of objective. The objectives should refer to actions actually taken. List the specific objectives if necessary. If for any reasons your project could not address all aspects of the problem described in the "Problem statement" this is a good place to say which aspects did you chose to address (and why).

3. Materials and Methods (or Approach)
This section is a refined version of the Problem solution strategy from your Progress reports. Now you report WHAT and HOW you have actually done to address achieve the objectives as listed above. List materials, equipment and procedures used. If you relied primarily on literature review, data mining, interviews and/or surveys, brainstorming – say so and describe the sources and research method you used. Be specific.

[Keep in mind that the team formation and dynamics, task distribution and timelines are of little interest for your industrial partner]

In the Final report drop the "Progress to-date section".

5. Results
List all your findings here. Include all tangible results, everything you have learned (it is OK to reiterate some most important findings already covered in literature review, things you have learned from your contacts etc.).

Make sure you address all items listed in objectives. Summarize numerical data in easy to read tables or graphs and explain their content in the text. If the proposed solution is a device or adjustment of the existing device – provide diagrams and clear descriptions. Explain how it is supposed to work. Be specific!

6. Discussion:

Qualify your findings. Put them in the context. Highlight points of discussion. Describe specific actions needed to address the issue set in the problem statement. If you did not manage to achieve as much as you originally planned do not feel sorry, apologize or play a blame game. List the outstanding questions. If needed, describe additional research and outline steps necessary to complete the project.

Do not discuss your team dynamics tasks, assignments or timelines.

7. Conclusions and Recommendations:
Briefly summarize the results, discussion in clear conclusion statements. If specific actions or more research are needed – summarize the recommendations and outline the future work. [Again, avoid apologetic tones]

Signatures:

Print team member name	Signature

8. List of references:
List all relevant references you collected to-date and marked those reviewed and actually quoted in the text.

9. Appendices/Attachments (team member inputs/contributions, and copies of papers referenced in literature)
In the Final Reports attach only copies of the most relevant papers. If your Results section presented only summarized data tables and graphs, attach the original/raw data tables and graphs or detailed diagrams and drawings as an Appendix.

Drop the contact logs Gantt charts and individual contribution write-ups.

On a separate page summarize the contributions of individual tem members. This part will not be passed with the Final Report.

Declared group members' contribution:

Team member:	Assigned tasks/contribution

Individually, return a 1 page summary of what you have learned from the WSE 442/542 team project experience in terms of:
1. Your personal growth as a team player
2. The team dynamics
3. Dealing with wood composites industry

ATTACHMENT #12

Effective project execution

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┌──────────────────────────────────┐
│ Problem Statement                │
└──────────────────────────────────┘
            │
            ▼                                    On your
┌──────────────────────────────────┐            lucky day
│ Background research              │
│ What is already known about it?  │─────────────┐
│ (Lit. review)                    │             │
└──────────────────────────────────┘             │
            │                                     │
            ▼                                     │
┌──────────────────────────────────┐             │
│ Objectives                       │◄────────┐   │
│ Define the scope of the project  │         │   │
└──────────────────────────────────┘         │   │
            │                                 │   │
            ▼                                 │   │
┌──────────────────────────────────┐         │   │
│ Approach                         │         │   │
└──────────────────────────────────┘         │   │
            │                                 │   │
            ▼                                 │   │
┌──────────────────────────────────┐         │   │
│ Materials & Methods              │         │   │
└──────────────────────────────────┘         │   │
            │                                 │   │
            ▼                                 │   │
┌──────────────────────────────────┐         │   │
│ Tasks & timelines (budget?)      │         │   │
└──────────────────────────────────┘         │   │
            │                                 │   │
            ▼                    fail         │   │
         ◇ Reality check ◇──────────────────┘   │
            │                                     │
            │ pass                                │
            ▼                                     │
┌──────────────────────────────────┐             │
│ Action (research, testing, etc.) │◄────────────┘
└──────────────────────────────────┘
            │
            ▼
┌──────────────────────────────────┐
│ Reporting:                       │
│ Results, Discussion, Conclusions,│
│ Recommendations, Final report    │
└──────────────────────────────────┘
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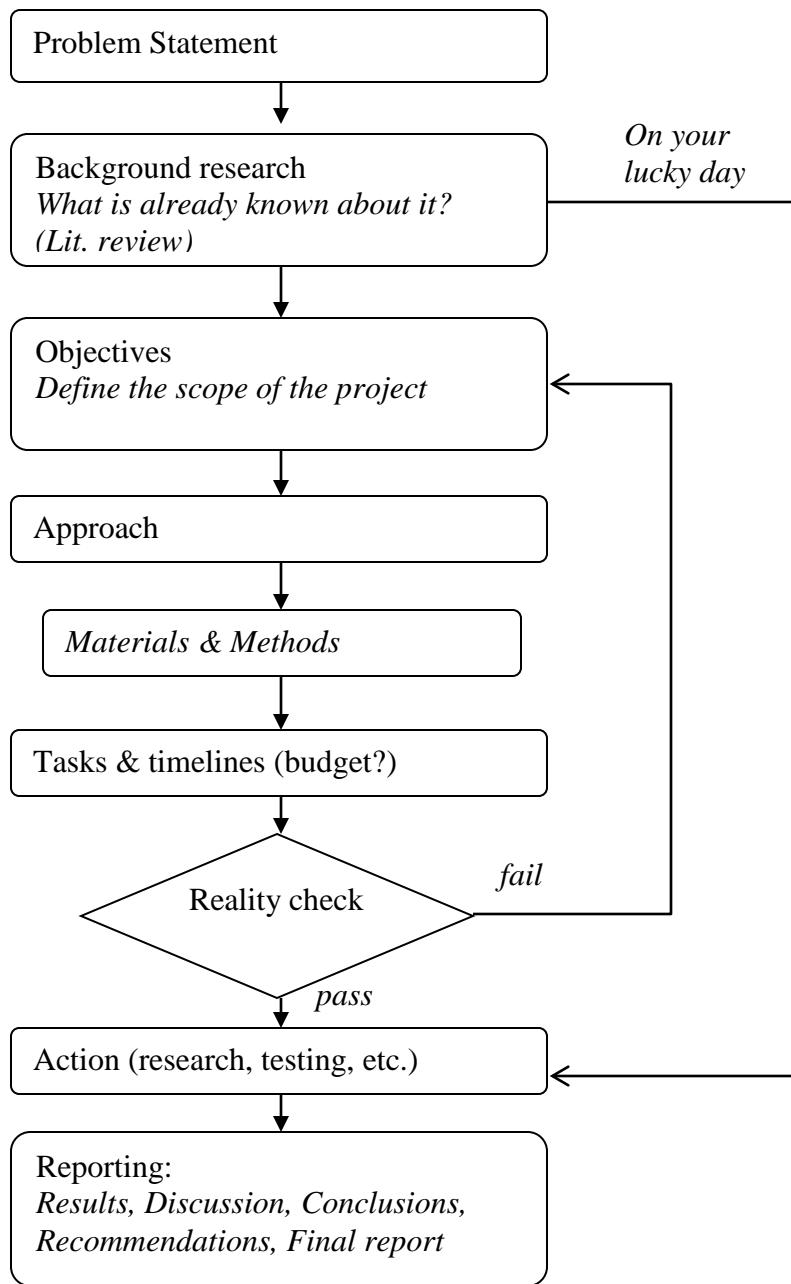
ATTACHMENT #13

GANTT CHART
"Henry Laurence Gantt (1861-1919) was a mechanical engineer, management consultant and industry advisor. He developed Gantt charts in the second decade of the 20th century as a visual tool to show scheduled and actual progress of projects. Accepted as a common-place project management tool today, it was quite a radical concept and an innovation of world-wide importance in the 1920s. Gantt charts were first used on large construction projects like the Hoover Dam, started in 1931 and the interstate highway network which started in 1956." (more at www.ganttchart.com)

A good Gantt chart will help you in many aspects of the project. You can use it on the planning stage of the project in order to decide if you have enough time and resources to complete all planned activities, identify "the critical path" or the sequence of project tasks, which determine the overall project duration, and to modify the objectives and approach in a way that will warrant a successful and timely execution of the project. Gantt chart is also a great tool for day-to-day management of the project. It helps in tracking project progress, in early detection of problems, and assists in planning corrections.

In order to develop a Gantt chart you need to gather the following information:
1. A complete list of tasks necessary to achieve the objectives of your project
2. Completion time estimates for each of the tasks from the list
3. Dependencies between tasks (tasks that need to be completed in a specific sequence)
4. A list of resources necessary/available to complete these tasks:
    a. Personnel (person-hours)
    b. Facilities & equipment (availability, schedules etc.)
5. Time frame of the project (10 weeks)

The following example will illustrate the basic concepts related to creating a useful Gantt chart.

Assume that the project is to compare bending properties (MOE and MOR) of two wood-based panel products (A and B).

Here is a typical list of tasks related to this project with estimated time durations:
1. Identify ASTM standard method for flexural tests on wood-based products (including required number of specimens and analytical procedures): 3 student-hours
2. Identify the tools needed for specimen fabrication, equipment and instrumentation for the test: 3 student-hours
3. Determine shop, lab and equipment schedules: 3 student-hours
4. Develop shop/lab specific procedures for specimen fabrication and testing: 6 student-hours
5. Fabricate specimens (A and B): 6 student-hours

6. Test equipment setup (incl. preliminary tests; you may need lab technician assistance): 8 student-hours
7. Testing specimens A: 6 student-hours
8. Testing specimens B: 6 student-hours
9. Shop/lab cleanup: 4 student-hour
10. Data analysis: 25 student-hours
11. Reporting: 40 student-hours
12. Meetings: 10 student-hours

Total project time = 120 student-hours.

While some dependencies between the tasks are quite obvious, other are not and may require some discussion. For instance, it is clear that that the tools, equipment and instrumentation necessary to perform the test may be identified only after the specific test method is determined. And that only then you will be able to schedule the use of the labs and equipment. So, task 2 should naturally follow task 1, and that task 3 should follow task 2. However, the specimen fabrication (task 5) and the test equipment setup (task 6) could be performed in parallel provided you have enough personnel in your team to do so.

List of the resources needed to complete your project should include the facilities and equipment (as identified in task 2) but also personnel, their schedule and availability for the project. Let us assume that you have a team of 4 to work on this project (Alice, Brian, Cindy and Derek). Note that apart from your team members you may need the help of a lab technician, who may need to be scheduled ahead of time.

Now, the most tricky part of the planning is determining the time available for the project. It may seem that for 4 team members 10 weeks to complete the project is more than enough. Think twice. The team project is not the only assignment related to this course and for most of you this course is not the only thing to take care of during the term. The commonly accepted formula is that you study 2-3 hour per week for each course credit hour. Let us further assume that you can devote about 1 of these 2-3 hours to the term project. That would give you 4 hours a week per team member (WSE442/542 is a 4-credit course), or 16 hours per week for the entire team. Your collective time pool for the entire term is 160 student hours. Note however that a quarter of this time (1 hour x 4 team members x 10 weeks) will be consumed by mandatory weekly team meetings. So, there is just 120 student-hours (or 12 student-hour per week) left for all other tasks and activities. The actual amount of time will further decrease if some activities require two or more team members to work together on the same task.

Now you are ready to draft the Gantt chart:

Task#	Week 1			Week 2			Week 3			Week 4			Week 5			Week 6			Week 7			Week 8			Week 9			Week 10		
1	A																													
2		B																												
3			C																											
4				D	D																									
5					A	B																								
6*					C	C	D																							
7										A	B																			
8													C	D																
9															x															
10																C	D	A	B			A	B	C	D					
11							A	B								A	B		C	D					A	B	C	D		x
12			x			x			x		x			x			x			x			x			x			x	

One cell represents approximately 3 student-hours. "x" = all team members participate. Double frame marks activities performed in a shop or in the lab, which may need to be scheduled ahead of time. * = lab technician assistance needed.

Remember to assign the task to specific team members (A, B, C and D on the chart). Note also, that the schedules for the shop or lab access may force rearranging the task sequence to some degree. Note also, that even though the lab cleaning activity may take the team just one hour to complete, it "burns" four Student Hours of your Gantt chart.

Although there is a variety of specialized software packages for creation and maintaining professional Gantt charts (http://en.wikipedia.org/wiki/List_of_project_management_software) basic charts can be created in Excel or even using MS Word table tool (as demonstrated above). It is the content that matters.

6. ATTACHMENT #14

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