

ENMA 6050: Reliability, Failure Analysis, and Risk Assessment

Course Projects

Team Projects

Industry and business sponsored student team projects form a core element of this course. These projects provide students with first-hand real-world experience in applying the knowledge, tools, and techniques described in course lectures.

Students will be assigned to 3-5 person teams, and will prepare semi-weekly deliverables due on the date specified by the course schedule. Deliverables will be submitted to the associated D2L discussion forums for this course.

There are two primary sources of team projects:

- Course instructor – Before the course starts, your instructor will have worked closely with sponsors in industry and business to identify and define projects. Students will have an opportunity to volunteer for projects, but the course instructor has ultimate responsibility for insuring that each team project is appropriately staffed.
- Students – Students are encouraged to bring real-world projects to the course. Project teams will be finalized by the first week of class, so students bringing projects must have documented problem definitions by that date.

A key to successful team projects is identification of a particular individual who will act as the sponsor for the project. The sponsor's primary responsibilities are to provide the team with "voice-of-the-customer" information, and to connect team members with other individuals who can provide relevant information. For projects proposed by the course instructor, the instructor will have identified the project sponsor. For projects proposed by a student, the student must identify the sponsor. For this case, the student may be the sponsor.

Deliverables should be prepared as follows:

- Teams should be prepared to present their deliverables in class on the due dates.
- All deliverables should be submitted before 5:00 on the due date by depositing in the associated D2L discussion section.
- All deliverables should contain *no references* to the name of the project sponsor, and should contain *no information* that would allow the sponsor company to be identified, unless specifically requested by the sponsor.

Personal Projects:

In addition to team projects, each student will execute a personal project. Personal projects are executed in the same way that team projects are done, except that they are more limited in scope. Students are free to select a project of their choice, or can work with their instructor to select a topic.

All team deliverables will be presented by teams in class on the dates shown on the course schedule. As time permits, individuals may also be asked to present personal project deliverables in class on the due date.

Team Project Deliverables

The following is a brief description of ENMA 6050 team project deliverables. Links to detailed descriptions of each deliverable are provided.

1. Project description

At the beginning of this course, students are assigned to a project team, given a brief outline of the nature of the project, and given a contact name at the project sponsor. To complete this deliverable, teams need to communicate with the project sponsor to verify the general nature of their project, and to add pertinent information to the general description gained through discussions with the sponsor. For the first project deliverable, teams will prepare a PPT presentation with 5 slides:

- Project name and team name.
- The purpose/function of the process that will be analyzed.
- The starting point and ending point of the process that will be analyzed.
- The primary problem that needs to be solved.
- Why this problem is important.

2. Process flow diagram

As part of your team's "Project Description" deliverable, you identified the start and end points of the process that you will be analyzing. Here, you will draw a process flow diagram for the process between these points. When drawing your process flow diagram, use major step blocks and/or swim lanes as appropriate. The diagram should be accompanied by a glossary defining any terms that might not be understood by someone unfamiliar with the process. Prepare your diagram using Visio, and print your diagram as a 40" wide by 30" high poster (request a poster via e-mail from Tom Silman in the Discovery Learning Center at least 2 days before the deliverable due date). You will also prepare a PowerPoint presentation describing your process flow diagram, using major steps and or swim lanes to break the diagram up across multiple slides. Submit the Visio diagram and PowerPoint presentation to the D2L folder for this deliverable.

3. Process variables / fishbone diagram

For this deliverable, you will examine *each* of the activities in your process flow diagram and identify the *primary* sources of process variation that could impact the *primary* problem you are trying to solve. Prepare your results as a fishbone (Ishikawa) diagram using one of the problem segmentation schemes covered in the associated lecture. On the fishbone diagram, be sure to indicate all of the measurement/inspection points associated with each variable, and provide a brief description of each point as illustrated in the associated course lecture. You can draw your fishbone diagram by hand on a poster-sized sheet of paper (you don't need to draw the diagram using Visio at this time, since you will be modifying the diagram in the following deliverable). The description of the measurement/inspection points should be documented as a PowerPoint presentation which you will use for the next deliverable. Bring your poster to class and be prepared to explain it. Note that a *following* team deliverable will focus on human factors, so you will not have to cover human factors for this deliverable. Given the limited time available for your project, you will need to perform this assessment using incomplete and ambiguous information. Don't sweat this - just take your best shot!

4. Human factors analysis

For the previous deliverable, you identified critical variables for your process and documented the variables on a fishbone diagram. For the first part of this deliverable, you will complete this element of your analysis by focusing on human factors that can degrade your process. For each activity in your process flow diagram, use the human factors analysis form *template* provided in the associated lecture to document the *primary* sources of human error. Add your findings to the PowerPoint presentation you started in the previous deliverable. For the second part of this deliverable, use your human factors analysis to add a human factors branch to the fishbone diagram you prepared for the previous deliverable. As with the preceding process variables deliverable, be sure to indicate and describe all of the measurement/inspection points associated with each human source of error. Prepare your completed fishbone diagram using Visio and print it out as a 40" wide by 30" high poster. Finally, add your completed fishbone diagram to your PowerPoint presentation, and also add the descriptions of variable measurement/inspection points

associated with human factors to the descriptions you provided in the previous deliverable. Submit the Visio diagram and the PowerPoint presentation to the appropriate D2L folder.

5. Process FMEA

Using the information from the previous deliverables, you are now ready to conduct a process FMEA. Given the limited amount of time that you have available for this deliverable, you will perform the FMEA for *only* the activities in your process for which you have evidence indicating a *major failure effect*. Further, you will analyze *only* the *primary* failure mode for each activity that you will be analyzing. To do this screening, use your judgment and the input of the project sponsor. Use the standard process FMEA form *template* provided in the course lecture associated with this deliverable, and complete steps 1-10 only (you will complete Step 11 as part of your final presentation). Note that this deliverable should be considered as the first iteration of a continuous improvement effort for your process, so don't sweat the details! Your ultimate goal is to recommend to your sponsor what they should do *first* to achieve maximum improvement of the process. Complete your FMEA as a Word document or Excel spreadsheet and print it out as a poster. Prepare a PowerPoint presentation for your FMEA which includes only the failure modes with the highest risk priority number. Submit the Word/Excel document and the PowerPoint presentation to the appropriate D2L folder.

6. Root cause analysis / fault tree analysis

Based on your process FMEA, you will now know which activities in your process pose the top reliability problems. Here, you will conduct a root cause analysis on just these top reliability problems. You will conduct your root cause analysis using either action/condition diagrams and/or fault tree diagrams, as described in the lecture associated with this deliverable. Prepare your diagrams using Visio and print it out as a poster. Summarize your findings in a PowerPoint presentation. Submit the Visio and PowerPoint documents to the associated D2L folder.

7. Final presentation

Teams will prepare a final presentation containing their findings associated with the preceding project deliverables, and will recommend specific next actions for their project sponsor based on these findings (Step 11 in the standard process FMEA form). It is anticipated that the PowerPoint presentations prepared for each of the preceding deliverables will form the basis for the PowerPoint final presentation. Project sponsors and interested parties are strongly encouraged to attend the final presentation. Deliverables should contain *no* references to the name of the project sponsor, and should not contain any information that would allow the sponsor company to be identified, unless specifically requested by the sponsor.

8. Supplemental materials

In the process of completing the preceding project deliverables, teams may generate a variety of support materials that will not appear in the team's in-class presentations. These materials should be put in the "supplemental materials" D2L folder for the project. The primary purpose of collecting supplemental materials is to assist future project teams. The basic rule of thumb is this: If YOU were inheriting this project from last semester's project team, what would YOU find valuable?

Personal Project Deliverables

The deliverables for your personal project will be essentially the same as those of your team project, except that they will contain much less detail since they are being completed by just one individual.

You do *not* need to complete the supplemental materials deliverable for your personal project.
