

## ECE419 Survey

This exit survey will not count as part of your grade in this class, it is being administered in order to determine the current state of your knowledge within the ECE Department curriculum.

The results will be used to access how our curriculum is preparing you, and may factor in future curriculum changes.

Give an encompassing answer to the following questions:

1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)
  - a. Search internet and texts for background information to gain knowledge of problem.
  - b. construct and implement solution
  - c. Verify results

2. From your previous classes' experience, describe advantages and disadvantages of teamwork  
Advantages: Constructive inputs from different points of view, overall reduced workload, often enjoyable social experience  
Disadvantages: Time taken in explanation, schedule issues, occasional slacker for teammate

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

It is the responsibility of the expert in his field to inform teammates to an appropriate level of detail of the works he completes. Programmers in different fields (languages) are often represented as well as experts in the hardware involved.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Circuit simulation software is plentiful but often expensive. Most computing can be done in C, but Matlab (also expensive) can be convenient in some cases. FPGA's are extremely valuable as the price of ASIC's is extreme.

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

Generally speaking, the first thing to do is precisely define the problem to be solved. You can't solve a problem if you don't know what it is. The next thing to do is to break down each task into subtasks so that everything can be solved simply. Once each problem is solved you can integrate each smaller solution to solve the main problem. From there all you need to do is write up documentation, etc.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages: ability to share the work load of a project, different perspectives to help in problem solving, different areas of prior knowledge, team building experience, communication skills.

Disadvantages: lazy team member(s), inflexible schedules, inflexible and bad attitudes, unclear or lack of communication between team members, different mindsets, "bossyness".

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Roles/responsibilities: General organization, monetary details, resource management, fabrication, public relations, human relations...

Professional fields: Accounting, managing, engineering, etc.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

There is a wide variety of tools available to today's engineers. Some of the tools that are available are software like MATLAB and MultiSim for mathematical calculations and circuit simulations. LabView is also very useful because it combines the flexibility of software and the ease of use of hardware into one. NI makes some very useful and easy to use lab equipment too.

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--1. Find out what is being asked, 2. Analyze what data is given, 3. Decide what tasks and equipment/equations are needed to achieve what was requested in 1). 4. After the data/answer/design has been obtained, analyze to see if what you have is what was asked for in 1. and also if the answer is reasonable (such as using faulty equipment for example) 5. If all of these criteria are not met, return to step 1. and repeat until the criteria are met.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

--Teamwork can bring in resources and pool knowledge that otherwise wouldn't be obtained. But then there is the problem of usually at least one student slacking off and not doing any work in the group.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

--The roles include the team leader/project manager, the designers and the technicians. Many times this will include an electrical engineer, a computer engineer/programmer, and a mechanical engineer. A chemical engineer or chemist is also sometimes included depending on what is being designed.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

--There are many software programs that aid in design and calculation. These include Matlab, Multisim, Labview, proE Wildfire, and Microsoft Project. Other tools such as hardware typically used include fpgas and microcontrollers.

Oct. 28, 2008

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

Define the problem

Identify possible solutions or expected outcomes

Conduct an experiment to test your hypothesis

Observe the results

Evaluate the data to see if it proves or disproves your original hypothesis

Duplicate the experiment to see if the same results can be obtained

If the results are different, reevaluate your hypothesis and the experiment

Verify the efficacy of the experiment, if it is properly conducted, repeat it

Collect as many data points as possible and then modify your hypothesis

Try different possible solutions to see if one is optimal or eliminate invalid ones

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Teamwork offers clear advantages, by discussing a problem together, it can be easier to figure out the solution, usually because every member of the team has different knowledge that can be combined to form a complete picture of the problem. Teamwork can allow greater parallelism with tasks because work can be divided and the task can be completed faster and with each team member having less work than if the task was completed individually. By explaining concepts to others, it enhances your own understanding because you are forced to learn the concept well enough in order to accurately explain to others.

Teamwork also entails some distinct disadvantages. For instance, some people might not do their share of the work, if a task is divided up, which forces the other group members to compensate by doing more work. Also, studying with other group members might be a distraction rather than a benefit, sometimes it is tempting to socialize instead of studying or doing work. Also, functioning in a group might stifle individuality in favor of the group agenda.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Usually, there is a leader who coordinates group activities and ensures that the other group members are on task. Some group members might have experience with drafting or designing, some might have experience with technical writing or research, others might have a familiarity with the science and engineering involved in a specific problem. Generally speaking, a multi-disciplinary team can solve problems better because each member has a unique perspective on the issue.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have learned that engineers have many different tools at their disposal, such as simulation tools like matlab, programming environments, and ISEs, to hardware tools such as oscilloscopes, multimeters, function generators, probes, sensors, etc. Computers are an invaluable tool because they can interface with almost all of the other tools and allow an engineer to collect data, conduct simulations before any resources are invested, and then to coordinate and catalogue research activities. Mathematics and physics are also important tools that the engineer uses to approach a problem; in fact problems couldn't be solved without them. Reasoning and problem-solving skills are also critical and are two of some the most important skills that engineers develop.

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

The first step would be to evaluate the possible methods to solve the problem and choose the best method. Then the method would be used to solve the problem and determine an answer or collect data from the problem. This answer or data would be checked to make sure it fits the correct format or possible output for the problem, i.e. the correct units or an answer that made sense for the problem.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

The advantages of team work are that you have sources of multiple input on how to solve the problem or perform the project. It provides a collective knowledge in which more information can be provided to help in the task that the team is set to do. The disadvantages of teamwork are that the amount of work each team member does is not always balanced. Some team members do very little, which leaves a great deal of work for other team members to make up. This can be a problem for the team member making up the work for the others but also that the member not doing much work does not learn as much in the process either.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Typically team member have responsibilities that correspond with their area of expertise. Therefore each team member takes part of the project they feel most comfortable working on and they do that part of the project. There is little communication between the team member on what they are doing unless all the pieces that the team is working on have to come together in the end to form one unit.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have learned that there are some very powerful new tools that are now and becoming available to engineers. Some of these tools I have had the chance to work with in some classes at UNM. However sometimes you are taught how to use these new tools but in not enough detail or there is not enough time to fully explore what the tools are capable of and how they can be used in real world engineering fields.

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- A. Determine what the problem is or what data you are trying to gather.
- B. Develop a basic plan/brainstorm to solve the problem or design an experiment.
- C. Block Diagram
- D. Detail Design
- E. Experiment and Testing (Computer simulation first)

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages- More people, more ideas. The ideas of others can prompt your own ideas. Division of labor allows for work that is more efficient. Allow people with certain knowledge or experience to be placed in the right tasks.

Disadvantages- The more people that are involved the harder it becomes to hold people accountable. NASA had an issue with the Mars probe where half the team did the calculations in US and the other half did it in Metric. It was never caught and the probe crashed. All individuals involved need to work within the same specifications.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Electrical and Mechanical would probably be the most common. Both of these groups would work with Civil and building projects and infrastructure projects. Chemical might come into play. Each type will cover the areas under their expertise, the project manager would have overall authority.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Multisim, Pro-E, P-spice, MATLAB, FPGAs and many others. Other resources include IEEE, ASME, and any other professional groups.

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Trust the scientific method: characterize the problem, develop hypotheses, determine predictions via logic and preliminary analyses, perform physical testing or thought experiments, rethink problem if results do not coincide with predictions or conclude with empirical results or logical inference.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages of teamwork include sharing the workload, gaining insight into other's perspectives, learning about other people and cultures. Any disadvantages are a result of un-sportsman like competition, laziness, and inflexibility from any individual on the team.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

A lean, multi-disciplinary team would include individuals who specialize in something to work toward a common goal. Personality and operations management are a must in any team. Work also needs to get accomplished to attain the goal. A good multi-disciplinary team, with respect to engineering, should probably include a representative from mechanical, chemical, electrical, and computer engineering...depending on the nature of the project. A lawyer may need to be brought into the team, depending on the legal implications of the project. The management can be undertaken by any of the engineers within the team or by non-engineer types who can help in a highly ambitious project or when the engineers lack management ability.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

The engineering tools are great, but having an idea as to what the solutions should be, determined from the scientific method, help in determining if the results from the tools are accurate or precise.

Analysis, calculation, and simulation tools like: MATLAB and SPICE are very powerful, but only if you know how to use them. I use MATLAB to perform calculations, either with the provided or user-defined functions. MATLAB is also useful for prototyping filters and SIMULINK provides verification. I am not as skilled at SIMULINK as I'd like to be. SPICE has been useful for me with circuit analysis. Other variants like MULTISIM or LABVIEW are available, but I haven't had the need or opportunity to explore them as much as I'd like.

VHDL is good for digital prototyping and the simulation tool MODELSIM allows logical verification. CHIPSCOPE is good for register analysis of the digital design. Perhaps simulation is useless if the design doesn't work on hardware. With the FPGA learner-boards in the lab and available through FPGAMAC, exploring digital design is easy and convenient.

The TI-89 calculator is also a great tool. I've used it to solve many algebraic and calculus problems from signal processing, control systems, and circuit analysis classes. There is also available software that is specific to engineering tasks. I plan on exploring more of the software as time permits and tasks demand.

Programming in a high-level language like C++ can be useful to solve problems. Developing a problem solving algorithm may be the most challenging part of the problem, but with high amounts of data acquisition the resultant program may make things more manageable.

The brain is also a great problem solving tool. I've learned that critical thinking can be applied anywhere. More than one brain increases the problem solving potential. In conjunction with the acquired skills and tools described above, the brain can solve many problems. Time is also useful too. Managing time is a tool that can make or break the success of a project.

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1. Figure out what the problem is asking for.
2. Figure out what you will need to solve the problem.
3. Solve the problem one part at a time instead of trying to solve the whole thing at once

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

The advantage of teamwork is that different members can work on different parts and figuring out the solution can be easier. Also if you don't understand something your team members can help you find a solution.

The disadvantages of teamwork is that you have to work together and figure out common times to meet, whereas by yourself you can work on whatever you need to whenever you feel like it. Also sometimes some team members don't contribute as much as others and this can lead to resentment. Also sometimes some team members will want to do all the work by themselves rather than working as a team, and not all the team members will get to participate.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Well it depends on what you are working on. If you are doing a senior design project that uses a lot of programming, it would be good to have a computer engineer on your team, whereas if you are going to be building and designing some circuits an electrical engineer will do.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I don't feel like I have learned very much about various engineering tools. The only tools I know of are FPGA boards, computers, and various lab equipment tools like waveform generators and oscilloscopes. Other than that, not much.

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A strict outline of the problem and requirements must be made. Following that, a design approach must be constructed. This includes formulating multiple solutions for the problem. Once a solution is picked, the engineer implements the solution, creates documentation and testing, and finally delivers the final product.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Teamwork usually leads to synchronization issues and narrow time allotments for working; however, teamwork allows work to be divided between members and leads to improved quality of work by virtue of multiple people approving anything done.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Depending on what the team is trying to accomplish, there will be engineers familiar with various working parts to a complete system. A power engineer may be responsible for supplying power to a circuit board. A software engineer may create the operating system and drivers. A hardware engineer will link modules together in VHDL. Various team members will come from different fields to bring a finished product to fruition.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

There are many software tools that help smooth design of a system, particularly circuit design, software design, and module linkage. Many general hardware solutions are available to use for bringing the power of a processor/computer to a problem (a FPGA for instance).

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State the Problem: look at the problem carefully

Redefine the Problem: redefine it to eliminate bias

Identify Constraints and Set General Specifications – find all given parameters and find needed equations

Identify Alternative Solutions

Is there a better way to solve the problem?

Analyze the alternatives

Select the Most Viable Alternative

Iterate the cycle until you find a solution

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

The advantages of teamwork are that a large or complex task can be split up between several people and accomplished much faster, many different ideas on solving a problem may be discussed among a team while someone working on something independently may only see one way of approaching a problem that may be flawed or not as efficient.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

In many of my past team projects, we had a software and a hardware design section of the project. For larger projects, we can have construction.

Computer Engineer – in charge of software design

Electrical Engineer – in charge of hardware design

Civil and/or Mechanical Engineer – type of field depends on specific project. In charge of physical non-electrical design and construction

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have learned about LabView, MultiSIM, NI Elvis, Aglient instruments (oscilloscope, function generator, multimeters, ect.), C, C robot & C++ programming, logic design, I use my TI-89 calculator more efficiently.

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To solve an engineering problem, the steps to be taken are to first evaluate the problem, then come up with possible solutions to this problem. Next, these possible solutions must be evaluated to find which solutions would solve the problem while reducing cost and complexity. Once a viable solution has been chosen, work may then begin to design and build the product. When completed, the product must be thoroughly tested to ensure that it meets all requirements and functions as intended.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages: Many different points of view can be used to analyze the same problem giving a better chance of finding the best solution to the problem. Also, work can be checked by others to reduce the chance of making mistakes.

Disadvantages: Disagreements can often occur when individuals have a difference in opinion. It is also more difficult to coordinate the various steps in a project between multiple people. It is more expensive to have an entire team working on a project as opposed to just one individual.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

A multi-disciplinary team would usually consist of either a manager or some sort of a team-leader who has knowledge of the project that is underway. The rest of the team would consist of engineers or other experts that would have a beneficial contribution to solving the problem. There may also be a member of the financial

division on the team to work with budget and allocating resources. Finally, there may be technologists or someone of that nature who would do some of the actual construction of the designed solution.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

This is an area that I believe UNM could improve. I feel that UNM could cover in more depth the various engineering tools and how they are operated. The hardware that I have used at UNM includes oscilloscopes and multimeters. The software that I have used includes Matlab, LabView, and circuit simulation software such as Pspice.

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*First we need to analyze the requirements for the design, and then redefine the problem to eliminate bias. We need to identify constraints and specifications for the project before working on the solution.*

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

*The advantages of teamwork are: works are distributed among each other, decrease the workload for every members.*

*The disadvantages are: project can be harder when putting together, the process depends on more factors, the project can take longer to finish.*

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

*Working as a team, it is required every members to be responsible for what they are assigned/appointed to. They should understand that the whole project also depends on their work. If one member fail, the whole project could fail.*

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

*I had have chance to learn about UML diagram with Omondo. It was a very good tool that assist programmer in coding along with UML diagrams. It supports Java and can automatic generate codes from UML and generate UML from codes.*

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Clearly define the problem and the expected outcome.

Devise a test plan that addresses the problem with a solution set that meets the expected outcome type.

Peer review of the test plan.

Execute the test plan and gather data.

Evaluate the data.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages are less time to solve a problem, different approaches and skill-sets from members of the team, and shared responsibility for the outcome.

Disadvantages are team members that are difficult to work with or don't do their part.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Program management oversees budgeting and scheduling of tasks.

Technical lead provides the vision for the project.

Software engineer to provide code.

Analog engineer to provide circuitry.

Digital engineer to also provide circuitry.

Mechanical engineer to provide structure.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Matlab for computations, Spice and simulink for simulation, C for programming, assembly for microprocessors, VHDL for FPGA

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Evaluate the problem (understand what you are trying to solve). Research what you don't know or understand about it (gather data to help you solve the problem). Measure/gather data then, compare data to calculated data. If measured data does not match calculated data go back and try to figure out why they do not concur.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork  
Advantages- different view points, different suggestions to solve a problem, someone may also have more knowledge in a subject and help teach other students.

Disadvantages- members of a team may not agree on how the problem will be solved, there may be one member in the group with more knowledge in the subject and "take over" the project not allowing much input from other team members, not all team members contribute to the project having someone not doing anything while still putting their name on the assignments.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?  
Hardware and Software design.  
Circuit design, Mechanical design.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)
  - a. Define the problem
  - b. Document current situation
  - c. Identify causes
  - d. Develop solutions
  - e. Implement Solutions
  - f. Test solutions

2. From your previous classes' experience, describe advantages and disadvantages of teamwork.

The advantages are we divided and conquered the tasks. We shared ideas, assigned each task to team member who has the best knowledge about the subject.

The disadvantages are the project would fall behind if one of the team members could not carry the task as expected; sometime personal issues would also affect the project.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Preschool, kindergarten, and elementary schools teachers play a very important role in the development of children. What children learn and experience during their early years can affect their later success or failure in school, work, and their personal lives. Teachers act as facilitators or coaches, using classroom presentations or individual instruction to help students learn and apply concepts in subjects such as science, mathematics, or English. They plan, evaluate, and assign lessons; prepare, administer, and grade tests; listen to oral presentations; and maintain classroom discipline. Teaching is the represented professional field.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have used Matlab software which available to all students but the issue is I have to learn how to use the software individually. I believe UNM should teach Matlab course so engineering students don't have to do a lot of self-study and be able to use the software fluently for their undergrads projects

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*I have to develop a very good understanding of the problem I'm doing in order to solve it, I will break down the problem into many parts, this way it would be easier for me to solve it.*

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

*There are many advantages of the team work, the work gets to be divided into many parts, this way it will be easier, the team members learn from each other, the work gets to be done faster. There are not as many disadvantages in team work. The disadvantages could be the disagreements in some members' opinions, some members might be lazy and the other members end up doing all the work, and some members might not be as skillful as the other members so it might slow down the work.*

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

***Software:***

***I have learned many programming languages***

***For example: C, C++, MATLAB, and some LabView***

***Hardware:***

***I have learned a lot about circuit design, its behavioral, and simulation, computer organization and architecture.***

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Give an encompassing answer to the following questions:

1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

Identify the requirements

Examine them and determine the best way to solve them

Design block diagram of a system to identify inputs and outputs

Closely analyze what is given and what is needed

Design a system to take what is given and get what is needed.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Advantages

More people means more ideas.

Some people think differently than others.

Break a project down into parts

Disadvantages

Sometimes many different ideas

Some people don't carry weight

Project gets broken down too much

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

Electrical and Computer some times mechanical  
Nice to have a good leader

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Lab view is good for a visual style of programming and setting up experiments  
Multisim should always be used first before breadboarding a circuit  
VHDL is great for hardware and good for FPGA  
TI 89 calculators are good for making math easier

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*Step 1) Analyze and understand problem requirements*

*Step 2) Determine method for solving problem*

*Step 3) Implement method for acquiring solution*

*Step 4) Verify accuracy of results*

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

### Advantages

- *Team members bring a different perspective to the group which often allows for enhancing ideas by combining the different approaches.*
- *Splitting the work load allows for maximum project efficiency*
- *Groups allow for larger projects to be accomplished in the given time frame*
- *If the team has worked together before then a lot of typical group problems do not cause any issue*

### Disadvantages

- *People within the group may not complete their share of the work thus straining the remaining team members*
- *Reliance on the other team members to adequately and effectively complete their task without errors*

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

*The roles depend upon the project or task assigned to the group. In general there are two types for most engineering projects: the technical experts and the business experts. The responsibilities are then distributed accordingly.*

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

*There are loads of resources available to engineers. These resources include software such as PSpice and Multisim, hardware such as circuit boards and different components, and professional experts such as university professors. Different resources can be utilized depending on the information desired.*

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

The first step is to understand what the problem is and what the goals of solving the problem are. Once requirements are made for the problem, a design can be created. The design phase is a crucial phase and it must solve the problem given. Once a design has been formed it is fabricated into a solution of the problem. This fabricated result must be tested to be sure that the problem is solved. If the problem is solved the goal is achieved and the engineer is done. If the problem is not solved then the truly difficult aspect of solving any problem is finding the error in the design.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

The advantages of teamwork almost always seem to be disadvantages as well. The greatest advantage is having a free exchange of ideas of how to solve the problem the group needs to solve. There are many different solutions to a problem and a team can help point out the flaws in other people's design. This can lead to greater efficiency. Another good aspect of team projects are that work can be divided amongst people to use resources wisely.

The greatest disadvantage of teamwork is team reliability. There can be times where it is very difficult to rely on people to do their tasks. This might not be their fault; it may just be a lack of understanding of the problem. If a member is tasked with a problem that became much more difficult than estimated, they can fail to meet their goals.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

There is almost always a leader whose job is to keep the group organized. Other members will be grouped together to solve problems that relate to their fields. These fields could include electrical engineers, mechanical engineers, and computer engineers (scientists). The truly difficult part is how these sub problems will interact with each other to solve the project problem.

There is almost always a need for someone to develop software for the project. Everything today is measured and calculated with computers. They are a great resource that should be used to save time analyzing data.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have learned that there are great tools for project planning. It is nice to know that there is software available that helps keeps projects organized and scheduled. There was a great amount of discipline obtained in having to research if problems have already been solved with tools available to students. For example, there are a lot of projects that could have been very difficult if we did not have Matlab. Computer software keeps improving and it eliminates sub problems that allow for students to solve the real problems they are tasked with.

Oct. 26, 2008

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  1. Evaluate the problem
  2. Gather any relevant information or data
  3. Form an initial solution or hypothesis for solving the problem
  4. Evaluate your solution to see if the problem was solved
  5. Make any necessary changes
  
2. From your previous classes' experience, describe advantages and disadvantages of teamwork

**Advantages:**

1. Get a wider variety of prospective on a problem and solutions to it.
2. The workload is split among a group so hopefully more can be accomplished.
3. A group brings many different levels of knowledge and experience.

**Disadvantages:**

1. The group may encounter personality issues among group members that must be addresses in order for the group to work efficiently.
2. Not all ideas form everyone in a group is used all the time, which sometimes causes people to feel left out.
3. Sometimes evenly distributing work and ensuring everyone does their part can be difficult.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

In order to accomplish a project there are many different roles that must be filled. In order to get the funding for a project accounting is probably going to be involved. In order to get parts the purchasing department will contribute. In order to ensure a project is split between individuals or groups capable of accomplishing a task there will be a manager. To design and solve a problem engineers will be employed. To assemble a project assembles will be employed. To test and troubleshoot a project technicians will be used. Finally to get a final project to a customer a packing and shipping department will be utilized.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Some tools available to engineers are excel, word, matlab, cad, spice, and other programs that can be used to aid in calculations, design, simulation, and schematics.

Some hardware tools available to engineers are multi-meters, o-scopes, computers, breadboards, and soldering tools.

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

From the standpoint of a large scale project, the following steps may be required: requirements, proposal, design, development, test, delivery, and maintenance. However, these are only some of the factors that are necessary in a large scale project and they are free to be revised, included within more steps, and often are repeated before completion.

In the case of my work experience I have seen these steps in practice and have become aware of the necessary steps required to move from one phase to another. For instance, the customer and the developer can spend a lot of time in revisions before reaching agreement on the requirements. Then in certain cases, the customer could possibly change their requirements again late in design.

In high school, it was not uncommon to be able to complete a project without much planning, revisions to design, or validation because the assignments were often on such a small scale. College has taught me the importance and necessity of careful planning and design before working towards completing a project. I have also come to learn the value of testing for both plausible and unlikely scenarios in order to ensure that the final product does meet the initial requirements.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

In my opinion, the greatest advantage to working in teams is the possibility to allow each team member to work on a specific task in the process. In doing so, I believe that every member can gain great experience on that aspect of the project and ideally create a better product compared to one person designing and building the entire system. For instance if a particular person is better suited to write code, then their resources are more greatly used by having them write code for the project and not worry about the hardware aspect as much. The same works for a member who may be more inclined on the hardware or mechanical aspect. Technically this is why there are specific majors in college that allow people to develop experience in a particular field rather than having to learn a little bit about everything. Teamwork is also beneficial because it often generates greater results when trying to troubleshoot since there are multiple people working on the project. Finally, teamwork is beneficial in the sense that it is less stressful to each individual and less likely that the overall project will hit dead ends where all members become simultaneously "stuck" and cannot solve a problem. Often at times one team member will use another team member for help in order to avoid bottlenecks.

On the downside, teamwork usually results in some members taking advantage of the fact that they are in a team. It is often the case that the person who cares most about the consequences of the project will be left to shoulder the most work since other team members may not have the same goals. Working on a project as a team can also develop problems if members find themselves in disagreement or other conflicts that affect the outcome or delivery time of the product. It's very unlikely for people to work on a project together for months or even years without encountering any sort of conflicts. However, in some cases this may lead to discovering certain flaws in the overall system if team members cannot agree with how the product should be designed or tested.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

A multi-disciplinary team must have a good leader and individuals with balanced strengths who can work together in a respectful and productive manner. Often the team must consist of people that not only work well together, but also are able to work on

different aspects of the same project due to differing experience and skill sets. For instance, a project on the order of the Mars Rover would require personnel with Mechanical Engineering backgrounds to build the rover, Electrical Engineering to design the components needed for communication back to Earth as well as power, Computer Science in order to program the rover to be controlled and able to retrieve data just to name a few. Without these various skill sets the rover would be unable to complete its requirements.

There are no set requirements for a particular team. One can compare the requirements of the system to that of particular skill sets and determine which type of people would be beneficial, although it is hard to say for certain how many people of each background would be needed until later in the development process. Ideally these team members can work together with respect and have the same goals as far as project completion. Interpersonal conflicts and communication are often a source of problems which is why management is so important to make sure all team members can maintain focus and continue to work diligently towards the common goal.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

Engineers have a wide variety of tools available to them in either software or hardware. In the few years I have been at UNM I have noticed that the most common tools in software seem to be: Matlab, LabVIEW, ProE, Modelsim for VHDL, Multisim for SPICE, and then the various computer languages such as C++, Java, PHP, Perl, etc. Engineers also have many hardware tools at their disposal including but not limited to Multimeters, Current Probes, Oscilloscopes, Function Generators, Power Supplies, and standard lab equipment such as circuit components and microprocessors.

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1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection)

You always got to look at the context of the problem. The things to look at are:

- a) What is trying to be solved
- b) How it's going to be solved

It's always easy to jump straight to the conclusion without first analyzing the problem at hand. When collecting data, the engineer must be organized with his interpretation of the data. A bunch of numbers is useless unless you know what to do with them.

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

Teamwork is great for distributing the workload and getting advice/input on things from other teammates. However, sometimes disputes can arise in groups of two or more because of conflicting goals, motivation, etc. It's also easy for one of the group members to not work as hard as the others and slack off.

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

The roles and responsibilities of the members of a team are the following:

- a) Get to know one another and set up communication links.
- b) Set up times to meet and go over the project.

- c) Evenly distribute the workload (break the project off into modules and assign certain ones to the people that are good at it).
- d) Go over requirements; come up with a design and methods for testing and implementation.

The professional fields that are typically represented are ones where a boss manages a set of employees and assigns a project to a certain group of his employees if not all of them. This includes most engineering jobs out there now.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

I have learned that if you come up with an idea and you want to design and test it, there are almost no limits to what you can do. The tools these days that engineers have can practically simulate anything and build anything. The classes I have taken at UNM have greatly broadened my horizon when it comes to engineering. Multiple hardware components can be attached and the overall system can be manipulated via some sort of software interface and operating system. The world of engineering has made the communication between hardware and software, man and machine possible.

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Give an encompassing answer to the following questions:

1. While trying to solve an engineering problem, evaluate a process, or gather a new set of experimental data, give a brief description of steps that are required to achieve these goals. (i.e. describe steps in experiment design and data collection) **When solving an engineering problem, the first step is to define what the problem is and what one is trying to solve. The better the problem is defined at the beginning, the easier the problem solving process will be. It is also important to clearly state all goals, objectives, and requirements. If one doesn't know exactly where they are going with their solution, then it will be impossible to get there. These steps are important at the beginning of a solution, but will be revisited and revised as new restrictions and alternatives are explored throughout the problem solving process. Next, it may then be important to research aspects of your problem and brainstorm on viable solutions to it. After a viable solution is conceived, the solution must be carried out (designed, built, measured, etc), then tested and analyzed against the original problem solving requirements to determine if all goals have been met and the problem has been solved. Redesign or revisions may need to be made to the design in order to meet the goals of the solution.**
2. From your previous classes' experience, describe advantages and disadvantages of teamwork. **The advantages of teamwork I have encountered are increased brainstorming capabilities. It is also good to have a separate point of view to your ideas to provide constructive criticism. On a large project, teamwork makes it possible for one person to focus on one aspect of the project, which allows them to become specialized in that area. Breaking up large projects in this way allows a better end result. A disadvantage of team work is that you may encounter situations where one member of the team is not pulling his weight. It is beneficial to have a strong leader in the group, even if it is not officially stated, so that tasks are assigned and carried out in a specified time frame.**
3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented? **A multidisciplinary team is a**

group of professionals that come together to solve a problem. There are several aspects in project development that must be addressed by professionals. Scientists such as Chemists and Physicists among others, and engineers must research and experiment on the fundamentals of the problem to define it thoroughly so it is well understood. Then engineers take these results, and design a solution to a problem. Electrical engineers deal with any electrical and control aspects of a design, while mechanical engineers may be part of the team to deal with any moving parts and heating/cooling problems. Skilled technical writers must be part of the team to accurately describe the design in terms which can be understood by any potential customers. An example of a multidisciplinary team of which I am currently a part, is a team which builds and sells FPGAs. Scientists in the labs must experiment on new semiconductor materials and their properties, and convey these to the engineers. Electrical engineers design circuits at the transistor level, and implement them into one circuit. The specifications of these circuits are handed off to the Computer Engineers which then develop embedded systems with them. Computer scientists and electrical and computer engineers in a separate department take the specifications of the design and develop software which can be sold with the design which allows it to be easily programmed. Technical writers must work with the software and hardware engineers in order to develop documentation which must be included with the software in order to operate it as well as implement the chip in a design. Business professionals define product goals, make deadlines, provide product marketing, provide product support, make sales, and dictate the operation of the company as a whole.

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc) **The most beneficial tools that I have learned at UNM are SPICE circuit simulators (text and graphical), Xilinx's EDK design suite, VHDL, MatLab, and LabView. All of this software I use on a regular basis at my profession as an Integrated Circuit designer at Xilinx. In addition, I gained basic knowledge of physical tools such as Oscilloscopes, millimeters, and other test equipment which is necessary to function as an electrical engineer. I have also learned a great deal about microprocessors and computer logic, and how to implement them to solve problems.**

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**Defining the solid problem statement is important to solve an engineering problem. First step is to clarify the actual existing problem then the next step is to set the goal to solve the problem then the last step is to find the approach how the problem will be analyzed and how can it be solved.**

2. From your previous classes' experience, describe advantages and disadvantages of teamwork

**The advantage of teamwork is that it is more efficient to generate more ideas. And constantly the problem is analyzed by the group members so that it is less likely to make mistakes. Also the viewpoint is wider than single person working on the project so that more feedback is available. The disadvantages is that decision making process is slow because the result and the approach has to satisfy all the group members**

3. Describe typical roles and responsibilities in a multi-disciplinary team. What professional fields are typically represented?

**Typical roles and responsibilities in a multi disciplinary team are documentation and organizing the task between the members.**

4. Based on the all previous classes you have taken at UNM, describe what you learned about the engineering tools are currently available to engineers? (this includes software, hardware, etc)

**The most trained engineering skilled that I learned from UNM will be the circuit analysis, and the analog based electronics. Also the software tool like MATLAB, and assembly languages for the microprocessor is available to the engineers. At last the basic math subject as calculus and vector analysis, complex variables, probability, differential equation is available as well**