For your capstone design projects, we have partnered with the Center for Disability Services. They serve a large population of people ranging from children to adults with a wide range of disabilities. The Center solicited requests for project ideas from their therapists, nurses, and aides. They have an expert for each project that you will be working with. This person will show you the problem as they see it, help you meet with the patient(s), and give you feedback on your design proposals. Here are the six project ideas they passed along to us.

**Capstone Design Projects Descriptions:**

**Communication Device:**
We have a consumer who communicates by eye movement/spelling. Could this be read electronically and interfaced with an off the shelf communication device? This would possibly increase communication speed and definitely increase the number of people the consumer could talk with.

**Durable Wheel Chair:**
Doug G has received many chairs and repairs to those chairs throughout the years (often many more of each than his peers). That said the team was thinking that maybe the Union team could develop a chair that Doug would have difficulty breaking. His disability causes him to have severe spastic movements that cause an above average amount of wear and tear on his chair. These movements include uncontrolled arm movements that cause him to slam on his tray often breaking the arms of his chair. These same arm movements cause drastic front to back movement that often cause excessive strain on the chair and the systems that were developed to counter these movements (these systems however no longer work). There is also a side to side movement that there is no system to counter that puts lots of stress on the frame and wheels of the chair, Doug's wheels are bent and the bearings in the hub barely work due to this stress. I feel that this is the perfect kind of project for the Union team as it would make use of skills that they are learning/have learned and put them to work for a consumer who would benefit greatly from their aid.

**Mechanical Lift for Cerebral Palsy Quad:**
My husband has a client who needs to be able to transfer himself from his bed to his chair using a mechanical lift. He suffers from spastic quadriplegia, the most severe type of cerebral palsy, and has minimal upper extremity control. To my knowledge, there is not a lift on the market that addresses this need. Frequently, our clients who live alone and depend on aids may stay in bed for up to 24 hours if an aid doesn't show up on a weekend. The need is for an independent means for transferring out of bed using a mechanical lift for the severely physically disable, but minimally cognitively disabled.

**Wheelchair Anchoring Alert:**
Individuals traveling in wheelchairs via public and private vans/buses must have their wheelchairs secured with anchoring systems. Failure to properly secure wheelchairs with those systems can result in the wheelchairs tipping and injury to the person in the wheelchair once the vehicle is in motion. This can, and unfortunately, does occur on a regular basis. We are looking for a system that would monitor the wheelchairs to ensure
they are correctly anchored into the locking mechanisms and that would alert the driver (and perhaps NOT allow the van/bus to start) if w/c’s were not securely fastened.

**Water Safety Alarm:**
The objective of this project would be to design a water safety alarm that can be worn as a lanyard or necklace to prevent accidental drowning while bathing in a tub. The motivation for this device arises from a “could this happen to you” scenario in which the bather attempts to pull an alarm on the wall, at which point he/she slips lower into the tub. His/her safety harness then fails, and the pull cord on the wall alarm fails, and the bather slips low enough in the tub for the water to reach the nose and mouth. This situation has occurred on at least one occasion; when the staff found the bather, she had been under water for at least several minutes. Thus, the device should be designed to sound an alarm when a predetermined amount of water reaches or touches it. A working device would thus provide an additional level of safety while maintaining the privacy of the individual.

**Improved Wheelchair Wheel Design for Obese Patients:**
The Center for Disability Services and other medical care organizations have many patients who are considered obese and who rely on manual wheelchairs for mobility, often necessitating the use of bariatric classification chairs. As a result of the excess weight, the wheels often literally “give out from under them”, even with the added benefit of being classified as a “bariatric chair”. The way of the wheelchair breaks the wheels and makes them unusable, often resulting in a consumer being homebound. The objective here is thus to improve the design of current wheels to better suit those who need a more durable wheel.

**Project Proposal:**
Over break, we would like you to choose two (2) projects that interest you. Note that in some cases you may need to do a bit of independent reading to learn the relevant background information – for example, doing a basic google search to learn about bariatric versus normal wheelchairs in the last project description. Then, **for each project, we want you to write up a two-page project proposal.** The project proposal should contain the following:

- Background research in the current technology available
- If a disability is noted, details about the disability
- A restatement of the problem as you read it
- Questions you would ask the expert for the project when you get to meet with them
- Initial thoughts of how you would like to proceed with the design/project

Please submit your proposal via e-mail to both khetans@union.edu and curreyj@union.edu by **Friday, January 3 at 5pm**. Also, please bring a hard copy of your proposal to the first day of class. We will spend time talking about the project ideas, seeing where students are in terms of what projects they are interested in, and begin to think about groups. There will be 4 students assigned to one project; we hope to base team selection on project interest because success will come when you have a desire to work on the project. However, keep in mind that there may be some students who get their “second” choice.