Proposed Senior Design Projects for Spring 2024

	Title	Sponsor	Description
Industrial Projects			
1	CAN Bus Labs	John Deere (Brian Morlock)	Develop demos and labs for undergraduate courses around CAN operations. This will include CAN interface at both the physical layer and of the different SW stack layers. CAN functionality will be added to generic device, such as a Raspberry Pi and used to setup CAn networks for use in the demos and labs developed. Software efforts will include address claim, J1939 operation, and OBD-II (on road vehicles) lab work. The output wll be available to be incorporated into various ECE and ABEN courses.
2	Sensor Fusion	John Deere (Nick Butts)	Develop a Kalman filter that utilizes multiple (2+) different position inputs and outputs the most accurate position. This position information will then be used in a demo system to find something in the area. The exact form of the demo system will be proposed by the group and approved by the sponsor.
3	Traffic Control Simulator	Apex Engineering Group	Design a simulation of a small city with traffic lights, sensors, and controllers. Should work with small RC cars to simulate a small town.
ECE Faculty Projects			
4	Mini Elevator - PLC Based	Jeff Erickson	This project will demonstrate how a PLC is used in the agriculture setting with a 2' x 3' mini elevator that has an auger, conveyer, grain leg, solenoids, sensors, switches, and LEDs. Conveyers and augers will transport rice from bin to bin controlled by a PLC.
5	Robotic Arm (joint with ME)		Set up and program a robotic arm from Amazon for images, writing out NDSU, drawing logos, etc. Needs to be portable so it can be taken to high-schools and career fairs.
6	Ice Fishing Transport (joint with ME)		Build a lightweight tracked wheel vehicle which can transport four people across the ice along with a tip-up style ice house. ECE portion is design focuses on electric motors to drive the tracks.
7	Precision Capacitance Meter		Measure capacitance with as many decimal places as possible Multiple readings, filtering, statistical analysis
8	F150 Emulator		Electric Vehicles are quiet. Too quiet. To give the feeling of an overpowered gas engine, this project seeks to produce sounds of an F150 truck based upon the acceleration of the vehicle. Also applicable to scooters and tricycles.
9	Geo-Sensor		Hoofed animals have sensors in their feet to detect ground vibrations. This allows them to tell when another animal is approaching, a storm is coming, etc. In this project, try to duplicate this with a sensor (or 2 or 3) to detect ground vibrations and determine the direction of the source.
10	Power Quality Meter		Provide a real-time display of the voltage on the 120V lines in a building. Also display the harmonic content of that signal.
11	Raspberry Pi Weather Station		Use mid-level programming to get data to a Raspberry Pi (temperature, humidity, light) and from a Raspberry Pi (touch-screen, LEDs). Optional: Also send and receive data from a cell phone app. Could be the basis for a course on Advanced Embedded Systems.
12	HP42S		RPN calculators currently sell for over $400. Design a knockoff HP42S calculator that someone can build and use on midterms (i.e. not a cell phone app)
13	Egg-Bot		Design and build a robotic system to color an Easter egg using Sharpie pens. Colored ceramic eggs could be used as souvenirs
14	LED Spinner		Design a finger-spinner with LEDs that produce color patterns and maybe spell out NDSU
15	Cat-Off-The-Table II		Detect when your cat has jumped onto the table Squirt the cat when detected
16	Variable Frequency Drive		Generate a 3-phase AC waveform from 10V to 48V peak, 1Hz to 300Hz, controlled by a voltage / serial port / cell phone. Used to drive BLDC motors.
17	Signal Generator		Create a kit for use in Circuits & Electronics online courses. Input is a waveform from your cell phone and a frequency generator app. Output is -5V to +5V, capable of +/- 500mA.