

# Bradley J Bazuin

Western Michigan University

Department of Electrical and Computer Engineering

Spring 2016 - Spring 2021

Elson S. Floyd Hall

brad.bazuin@wmich.edu

## Contact Information

Department of Electrical and Computer Engineering  
1903 W. Michigan Ave.  
Floyd Hall B-236, MS 5329  
Kalamazoo, MI 49008-5329  
Phone: (269) 276-3141

## Current Position

Position: Chairperson Applied Science

Current Academic Rank: Chair

Faculty Rank: Associate Professor

## Degrees

- 1989 Ph.D., Electrical Engineering, Stanford University, Stanford, California, United States
- 1982 M.S., Electrical Engineering, Stanford University, Stanford, California, United States
- 1980 B.S., Electrical Engineering, Intensive, Yale Univerisy, New Haven, Connecticut, United States

## Courses

### Fall 2020

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Fall 2020	ECE	2990	100	Cooperative Education	
Fall 2020	ECE	2990	110	Cooperative Education	
Fall 2020	ECE	3800	100	Prob Sig & Sys Analysis	
Fall 2020	ECE	4600	100	Communications Syst	
Fall 2020	ECE	5640	100	Communication Systems	
Fall 2020	ECE	7300	135	Doctoral Dissertation	

## Summer II 2020

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2020	ECE	2990	100	Cooperative Education	
Summer II 2020	ECE	7300	125	Doctoral Dissertation	

## Summer I 2020

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer I 2020	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Summer I 2020	ECE	7300	130	Doctoral Dissertation	Not Applicable

## Spring 2020

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Spring 2020	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Spring 2020	ECE	3800	100	Prob Sig & Sys Analysis	Not Applicable
Spring 2020	ECE	7300	125	Doctoral Dissertation	Not Applicable

## Fall 2019

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Fall 2019	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2019	ECE	2990	105	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2019	ECE	3800	100	Prob Sig & Sys Analysis	Not Applicable
Fall 2019	ECE	6565	100	Adaptive Filters and Systems	Not Applicable

## Summer II 2019

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2019	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Summer II 2019	ECE	2990	105	Cooperative Education	Students Worked on Projects for Companies or External Clients

## Summer I 2019

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer I 2019	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients

## Spring 2019

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Spring 2019	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Spring 2019	ECE	2990	110	Cooperative Education	Students Worked on Projects for Companies or External Clients
Spring 2019	ECE	3800	100	Prob Sig & Sys Analysis	Not Applicable
Spring 2019	ECE	6970	105	Problems-El-Computer Enginrg	Not Applicable

## Fall 2018

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Fall 2018	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2018	ECE	2990	105	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2018	ECE	2990	110	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2018	ECE	2990	115	Cooperative Education	Students Worked on Projects for Companies or External Clients
Fall 2018	ECE	6560	100	Multirate Signal Processing	Not Applicable

## Summer II 2018

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2018	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2018	ECE	2990	105	Cooperative Education	Students Worked on Projects for Companies or External Clients
Summer II 2018	ECE	7250	100	Doctoral Research Seminar	Not Applicable

### Summer I 2018

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer I 2018	ECE	2990	100	Cooperative Education	Not Applicable

### Spring 2018

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Spring 2018	ECE	2990	100	Cooperative Education	Not Applicable
Spring 2018	ECE	3800	100	Prob Sig & Sys Analysis	Not Applicable
Spring 2018	ECE	6970	120	Problems-El-Computer Enginrg	Not Applicable

### Fall 2017

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Fall 2017	ECE	2990	100	Cooperative Education	Not Applicable
Fall 2017	ECE	2990	105	Cooperative Education	Not Applicable
Fall 2017	ECE	4820	100	Elect-Computer Engrg Desgn II	Not Applicable

### Summer II 2017

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2017	ECE	2990	100	Cooperative Education	Not Applicable
Summer II 2017	ECE	2990	105	Cooperative Education	Not Applicable

### Summer I 2017

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer I 2017	ECE	2990	100	Cooperative Education	Students Worked on Projects for Companies or External Clients, Other
Summer I 2017	ECE	2990	105	Cooperative Education	Students Worked on Projects for Companies or External Clients, Other

### Spring 2017

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Spring 2017	ECE	6640	100	Digital Communications	Not Applicable
Spring 2017	ECE	7100	115	Independent Research	Not Applicable
Spring 2017	ECE	7300	125	Doctoral Dissertation	Not Applicable

### Fall 2016

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Fall 2016	ECE	3800	100	Prob Sig & Sys Analysis	Not Applicable
Fall 2016	ECE	6560	100	Multirate Signal Processing	Not Applicable
Fall 2016	ECE	6970	120	Problems-El-Computer Enginrg	Not Applicable
Fall 2016	ECE	7100	125	Independent Research	Not Applicable
Fall 2016	ECE	7300	125	Doctoral Dissertation	Not Applicable

### Summer II 2016

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer II 2016	ECE	7300	110	Doctoral Dissertation	Not Applicable

### Summer I 2016

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Summer I 2016	ECE	7300	130	Doctoral Dissertation	

### Spring 2016

Semester	Course Prefix	Course Number	Section	Course Title	Course Attributes-Classification
Spring 2016	ECE	3800	100	Prob Sig & Sys Analysis	
Spring 2016	ECE	6640	100	Digital Communications	
Spring 2016	ECE	7300	130	Doctoral Dissertation	

## **Dissertation Committees**

### **Fall 2019 - Fall 2020**

Name of Student: Amer Kais Obaid Aljumaili, Thesis/dissertation title: Automatic Food-Intake Monitoring Based IOT Embedded System for Alzheimer's Patients, Date/expected date of completion: 2020-12-19, Degree Sought: Doctoral

### **Spring 2018 - Fall 2020**

Name of Student: Benjamin Joseph Sanda, Thesis/dissertation title: Real-Time Atmospheric Turbulence Mitigation, Date/expected date of completion: 2020-12-19, Degree Sought: Doctoral

Name of Student: Dinesh Maddipatla, Thesis/dissertation title: DEVELOPMENT OF FUNCTIONAL MATERIALS FOR OXYGENATION OF CHRONIC WOUNDS AS WELL AS FLEXIBLE OXYGEN AND COPPER SENSORS USING PRINTING TECHNIQUES FOR BIOMEDICAL APPLICATIONS, Date/expected date of completion: 2020-12-19, Degree Sought: Doctoral

### **Spring 2014 - Fall 2017**

Name of Student: Sepehr Emamian, Thesis/dissertation title: Development of Flexible Sensing Systems and Energy Harvesters Using Printing Techniques, Date/expected date of completion: 2017-12-16, Degree Sought: Doctoral

### **Spring 2016 - Fall 2017**

Name of Student: Mohammed Falih Hassan, Thesis/dissertation title: OPTIMAL COMBINERS FOR MULTIPLE CLASSIFIER SYSTEMS, Date/expected date of completion: 2017-12-16, Degree Sought: Doctoral

### **Spring 2012 - Summer II 2017**

Name of Student: Zeinab Ramshani, Thesis/dissertation title: Fluid Manipulation Using Piezoelectric Devices for Sensing and Spray Generation Applications , Date/expected date of completion: 2017-08-18, Degree Sought: Doctoral

### **Spring 2013 - Summer I 2017**

Name of Student: Amer Abdulmahdi Jabbar Chlaihawi, Thesis/dissertation title: Development of Flexible Sensing Systems for, Date/expected date of completion: 2017-06-24, Degree Sought: Doctoral

### **Fall 2012 - Spring 2017**

Name of Student: Amean Shareaf Ghazi Al-Safi, Thesis/dissertation title: ARCHITECTURE, SIMULATION, AND IMPLEMENTATION OF COMMODITY COMPUTER

COMPONENTS IN SOFTWARE DEFINED RADIO SYSTEMS, Date/expected date of completion: 2017-04-29, Degree Sought: Doctoral

#### **Fall 2015 - Fall 2016**

Name of Student: Osamah Ali Abdullah, Thesis/dissertation title: Indoor Localization of Mobile Devices Based on Wi-Fi Signals via Convex Optimization and Bregman Divergence, Date/expected date of completion: 2016-12-17, Degree Sought: Doctoral

### **Thesis Committees**

#### **Fall 2019 - Summer I 2020**

Name of Student: Valliammai Palaniappan, Thesis/dissertation title: FLEXIBLE CAPACITIVE PRESSURE SENSORS AND TRIBOELECTRIC ENERGY HARVESTERS USING LASER-ASSISTED PATTERNING PROCESS FOR FLEXIBLE HYBRID ELECTRONIC APPLICATIONS, Date/expected date of completion: 2020-06-27, Degree Sought: Master's

#### **Spring 2019 - Fall 2019**

Name of Student: Martin Joseph Cowley, Thesis/dissertation title: Extending the Capabilities of Von Neumann with a Dataflow Sub-ISA, Date/expected date of completion: 2019-12-14, Degree Sought: Master's

Name of Student: Anthony Joseph Hanson, Thesis/dissertation title: PORTABLE ELECTROCHEMICAL SYSTEM FOR FLEXIBLE HYBRID ELECTRONICS, Date/expected date of completion: 2019-12-14, Degree Sought: Master's

#### **Spring 2017 - Summer II 2018**

Name of Student: Vikram Shreeshail Turkani, Thesis/dissertation title: Implementation of Additive Print Manufacturing Processes for the Development of Flexible Thermal Sensors , Date/expected date of completion: 2018-08-17, Degree Sought: Master's

#### **Fall 2017 - Spring 2018**

Name of Student: Muhammad Usman Tariq, Thesis/dissertation title: Power-Efficient and Highly Scalable Parallel Graph Sampling using FPGAs , Date/expected date of completion: 2018-04-28, Degree Sought: Master's

#### **Fall 2015 - Summer II 2017**

Name of Student: Farah Mazin Aljanabi, Thesis/dissertation title: DEVELOPMENT OF A NOVEL PRINTED AND FLEXIBLE SURFACE ENHANCED RAMAN SPECTROSCOPY

(SERS) SUBSTRATE FOR DETECTION OF COCAINE , Date/expected date of completion: 2017-08-18, Degree Sought: Master's

### **Summer I 2016 - Spring 2017**

Name of Student: Moath Hashim Ibraheem Al-Safasfeh, Thesis/dissertation title: MULTICORE REAL TIME VISION BASED SYSTEM , Date/expected date of completion: 2017-04-29, Degree Sought: Doctoral

Name of Student: Ammar W. Hashim, Thesis/dissertation title: Solar Module Condition Monitoring, Date/expected date of completion: 2017-04-29, Degree Sought: Master's

### **Fall 2014 - Fall 2016**

Name of Student: Dinesh Maddipatla, Thesis/dissertation title: Development of Fully Printed and Flexible Strain, Pressure and Electrochemical Sensors , Date/expected date of completion: 2016-12-17, Degree Sought: Master's

### **Fall 2014 - Summer I 2016**

Name of Student: Mohammed Mudher Mohammed Ali, Thesis/dissertation title: DEVELOPMENT OF STRAIN AND PRESSURE SENSORS ON FLEXIBLE AND STRETCHABLE PLATFORMS, Date/expected date of completion: 2016-06-25, Degree Sought: Master's

### **Fall 2014 - Spring 2016**

Name of Student: Sean T Fuller, Thesis/dissertation title: A Parameterized Implementation of a Hybrid Fuzzy Boolean Finite State Machine Using an FPGA, Date/expected date of completion: 2016-04-23, Degree Sought: Master's

## **Non-Credit Research or Mentoring**

### **Spring 2020 - Spring 2020**

Group or Individual: Individual, Student or Group Name: JustOne M. Crosby, Description:

Senior Engineering Design Project, LSAMP Summer Project, CASSS Student

### **DEVELOPMENT OF A FLEXIBLE PRINTED PAPER-BASED BATTERY**

Many of the batteries manufactured today are harmful to the environment, expensive, and too rigid to satisfy the evolution of the electronics industry. A battery that incorporates printed electronics technology, flexible characteristics, and fiber-based substrates (i.e. paper) in one cell is not commercially available. Zinc-based chemistry provided an excellent pathway to develop a disposable battery that can be discarded in existing waste streams. Printed techniques, flexible

packaging, and fiber-based substrates have been combined to fabricate a zinc electrochemical cell that is thin, elastic, high performing, sustainable, and feasible for large scale manufacturing. A process to commercially produce these batteries is designed, and key economic indicators for the designed process are estimated.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

### **Fall 2019 - Spring 2020**

Group or Individual: Group, Student or Group Name: Alysia Zimmerman and Michael Callaway,  
Description:

Senior Engineering Design Project

#### **IV CURVE TRACER**

Solar cell, panel, and array expected efficiency and maximum power point can be determined by measuring the current-voltage (IV) curve. The IV Curve Tracer has been constructed for the Sunseeker Solar Car Team to support the manufacturing and testing of current and future solar panels for the car and determine car solar array performance. The battery operated, portable system uses an embedded processor to vary an electronic load and take voltage and current readings. The collected data are transmitted by the system using Bluetooth to allow a smart phone or tablet computer to relay the information for cloud storage or provide immediate visual feedback of the data collected.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Nathan Heffington, Alec Kwapis, and Conner McCarthy,  
Description:

Senior Engineering Design Project

#### **SUNSEEKER DISPLAY AND DRIVER CONTROLLER**

Digital dashboard displays with critical driver information are found in all modern vehicles. The 2020 Sunseeker solar car required a next generation driver display that supports strict power, weight, and space considerations. The new Display and Driver Control (DDC) unit integrates in a single subsystem driver switches, controls, accelerator measurements, and CAN bus communications with interfacing for a 7-inch full-color LCD touch-screen display. CAN bus data and software programming allow multiple screens of customized vehicle information to be available to the driver. A custom-printed circuit board and housing has been designed, developed, and tested, resulting in a DDC with fewer electronic modules, fewer wires and cables, and significantly greater capability than before.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

## **Spring 2019 - Fall 2019**

Group or Individual: Group, Student or Group Name: Logan McInnis, Bryan Nearing, Tyler Thompson,  
Description:

Senior Engineering Design Project

### **SOLAR GARDEN DATA COLLECTION, ANALYSIS, AND LED SIGNAGE**

The Educational Solar Garden at WMU has been lacking both the real-time, continuous data analysis of the available weather and solar data collected and a means of displaying current system performance. This project has implemented a single server and database where solar and weather data is collected and new software performs solar data analytics. The resulting information is then directly displayed on an LED information sign to inform the public about the real time performance of the Solar Garden. The outcome of this project greatly enhances the ability of WMU faculty and students to study the behavior of our educational solar arrays while also providing highly visible public information on their performance.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Abdull Alzاهر, Brian Coots, Matthew McConnell,  
Description:

Senior Engineering Design Project

### **SUNSEEKER PUBLIC DISPLAY SUPPORT SYSTEM**

The WMU SunSeeker team makes numerous public displays and presentation where solar energy to power support electronics would be useful. This project will utilize the Sunseeker solar array and spare system modules to develop and charge an auxiliary spare battery, provide a graphical display of car or solar power collection information, provide power and communication for a sound system and charge cell phones. Monitoring and operation of the support electronics will be based on smart phone command and control using Bluetooth.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

## **Spring 2018 - Fall 2018**

Group or Individual: Group, Student or Group Name: Neal Benson and Cameron Boot,  
Description:

Senior Engineering Design Project

### **Mobile Solar Single-Axis Tracking System (MoSSATS)**



Solar power generation is at the forefront renewable energy technologies. Traditional fixed axis solar systems are heavily dependent on the angle of incoming sunlight. The adjustment of a solar panel on as little as one axis of rotation can have a significant increase on panel efficiency. A mobile solar single-axis tracking system was developed to provide a platform for the research of tracking system issues. Additionally, the project is portable using a small trailer and stores collected energy in batteries to provide a mobile solar energy demonstrator for various public and community events and displays.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

### **Fall 2017 - Spring 2018**

Group or Individual: Group, Student or Group Name: Paige Coffeen, Nicholas Neppach, and Jordan Wagner,  
Description:

Senior Engineering Design Project

Rocking, Sensing, Soothing

A device has been designed that can monitor, detect, and sooth autistic children during sensory overload. The device is comprised of a vest containing a microcontroller and a 9-axis IMU (inertial measurement unit) to detect repetitive motions. These motions can be trained to the vest so that a detected pattern triggers output vibration in strategic locations on the body. This stimulates the nervous system to calm the child. A smart phone application has been developed that interfaces with the vest for caretaker monitoring, notification, and control. The device provides a tool for caretakers to help soothe autistic children with no emotional outlet in stressful social situations.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

### **Spring 2017 - Fall 2017**

Group or Individual: Group, Student or Group Name: Benjamin Weisberg, Mike Tapper, and Ben Norton,  
Description:

Senior Engineering Design Project

SOLAR GARDEN CONTINUOUS DATA COMPARATIVE ANALYSIS CODE DESIGN

Two distinct solar arrays from the WMU Education Solar Garden at Floyd Hall were installed in Fall 2016. The arrays provide a small portion of power needed by Floyd Hall. The arrays, along with weather station, provide continuous streams of data on performance for analysis and for research that are now being collected by a server. This project has automated data collection and analysis to perform actual versus expected power output based on weather, provide return-on-investment and cost savings estimates, and provide daily, monthly, and yearly solar array output

information for display on the WMU Educational Solar Garden web site that has also been significantly enhanced and improved by the team. The critical hardware, computer, network and software elements required will be briefly described.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Abdulelah Alnoaim, Larry Armstrong, and Miguel Quintero,  
Description:

Senior Engineering Design Project

#### AUTONOMOUS NAVIGATION SYSTEM FOR ROBO BRONCO

With automation on the rise in the US Economy every field is looking towards automating their processes. Robo bronco will serve as an automated tour guide of the College of Engineering and Applied Sciences building. This is a continuation project and the main goal of this project is to develop the autonomous navigation system for the robot to use to travel throughout the building.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Dustin Thomas Bremer, Andrew James Cabush, and Kyle Michael Christianson,  
Description:

Senior Engineering Design Project

#### SOLAR ENERGY GENERATION AND CONVERSION EDUCATION AND DEMONSTRATION SYSTEMS

Solar energy systems have experienced tremendous growth in the United States and the world. Educational material and multiple classroom and laboratory demonstration system components have been developed to provide hands-on learning opportunities for college and pre-college students and the community at large. Each demonstration system includes small custom solar panels, a light source, if needed, meters for measuring current and voltage, energy conversion and regulation modules, and electronic devices that can use either unregulated power directly from the solar panel or converted and regulated power from modules. The material has been developed to train and inspire students and the community to embrace solar energy and consider related career choices and opportunities

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

**Fall 2016 - Spring 2017**

Group or Individual: Group, Student or Group Name: Bradley Beerman, Jonathan Kellogg, and Caleb Martin,  
Description:

Senior Engineering Design Project

## SOLAR ENERGY GENERATION AND CONVERSION LAB STATIONS

This project has provided educational materials and hands - on laboratory stations for solar energy and solar energy powered electronics. With a focus on high school education and community demonstrations, the laboratory stations combine light sources, solar pan els, and a range of electronic modules to demonstrate basic concepts in electronics, energy generation, energy conversion, and the solar powering of small consumer devices and products. Each station includes a custom solar panel constructed of solar cells similar to those

found in larger commercial solar panels. Electronic modules include a cell phone charger, fan, and LED light displays. For an instructor's station, a slot car race track.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Zachary LaPointe, Guerin Rowland, and Anas Ahmed Algethmi,

Description:

Senior Engineering Design Project

## SUNSEEKER DISPLAY MODIFICATION

The new Sunseeker 2016 was in desperate need of new driver displays and driver control module. The new electronic systems developed provide readily reproducible display modules that have improved interfacing, visibility, and mounting. It can also be used for a wide range of embedded microcontroller applications. The new driver control module uses an embedded TI MSP430 microcontroller to provide all the previous functionality along with additional interfaces and features that should support current and future Sunseeker solar cars.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

Group or Individual: Group, Student or Group Name: Bryan Birchmeier, Diana Kangogo, and Kevin Watson,

Description:

Senior Engineering Design Project

## DATA ANALYSIS & FEEDBACK SYSTEM FOR WMU SOLAR GARDENS

The installation of the WMU Educational Solar Garden not only provides power to Floyd Hall but also allows student access to a wide range of information and data on daily solar power collection and the operation and efficiency of installed system components. The data analysis and feedback system is an automated computer server designed to continuous collect available weather and solar operational data and provide long term data storage in a database management system. From the collected data, the system also provides regularly updated charts and graphs showing power generated, cost savings, and return on investment for WMU website displays. Finally, the historical database collected will be a resource for future solar energy research and development at WMU.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

**Spring 2016 - Fall 2016**

Group or Individual: Group, Student or Group Name: Josh Holovka, Sam Hoff, and Jake Hunter,  
Description:

Senior Engineering Design Project

**ROBOBRONCO II: DRIVE SYSTEM AND AUTONOMOUS NAVIGATION**

A new generation RoboBronco is being constructed from the wheels up in collaboration between electrical, computer, industrial and manufacturing engineering students and faculty. Intended as a mobile, autonomous guide and information robot, a four wheeled base capable of moving throughout Floyd Hall has been constructed. The RoboBronco base and driving systems consist of multiple drive motors with embedded computer controls, a lithium - ion battery based power supply system, an inertial measurement unit and additional sensors that support fully autonomous motion and navigation, and WiFi connectivity for remote video monitoring and manual control if and when desired.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

**Spring 2008 - Ongoing**

Group or Individual: Group, Student or Group Name: Sunseeker Solar Car Team & Project,  
Description:

Adviser to the WMU Sunseeker Solar Car team and project.

Active support for the development of multiple vehicles; including, fund raising, public and publicity displays and events, mentoring, electrical system design and definition, printed circuit board development, embedded software programming, etc.

Attendance and support at yearly track (7-10 days, even years) or track and cross-country races (17-20 days, odd years) at locations across the United States.

[Research or Mentoring Type: Mentoring ] [Student Level: Undergraduate ]

**Fall 2007 - Ongoing**

Group or Individual: Group, Student or Group Name: CAPE,  
Description:

Founding member of the Center for the Advancement of Printed Electronics.

[Research or Mentoring Type: Research ] [Student Level: Graduate]

### **Fall 2003 - Ongoing**

Group or Individual: Group, Student or Group Name: CASSS,  
Description:

Member of the Center for Smart Sensors and Structures

[Research or Mentoring Type: Research ] [Student Level: Graduate]

## **Student Supervision**

### **Spring 2016 - Spring 2017**

Student Name(s): Hamid Mehmood Pasha,  
Brief Description of the Supervision :

PhD Candidate investigating power applications.

[Supervision Type: Graduate Teaching/Research Assistant]

## **Professional Recognition**

### **Publications - Journals**

#### **Completed/Published**

Masihi, S. et al. "Development of a Flexible Tunable and Compact Microstrip Antenna via Laser Assisted Patterning of Copper Film." *IEEE Sensors Journal* 20.14 (2020): 7579–7587.

Palaniappan, V. et al. "Laser-Assisted Fabrication of a Highly Sensitive and Flexible Micro Pyramid-Structured Pressure Sensor for E-Skin Applications." *IEEE Sensors Journal* 20.14 (2020): 7605–7613.

Bose, A. K. et al. "Screen-Printed Strain Gauge for Micro-Strain Detection Applications." *IEEE Sensors Journal* 20.21 (2020): 12652–12660.

Maddipatla, Dinesh et al. "Development of a Novel Wrinkle-Structure Based SERS Substrate for Drug Detection Applications." *Sensing and Bio-Sensing Research* 24 (2019): n. pag.

Turkani, Vikram S. et al. "A Highly Sensitive Printed Humidity Sensor Based on a Functionalized MWCNT/HEC Composite for Flexible Electronics Application." *Nanoscale Advances* (2019): n. pag.

- Maddipatla, Dinesh et al. "Development of a Novel Wrinkle-Structure Based SERS Substrate for Drug Detection Applications." *Sensing and Bio-Sensing Research* 24 (2019): n. pag.
- Maddipatla, Dinesh et al. "Development of a Novel Wrinkle-Structure Based SERS Substrate for Drug Detection Applications." *Sensing and Bio-Sensing Research* 24 (2019): 100281 (7).
- Maddipatla, Dinesh et al. "Development of a Novel Wrinkle-Structure Based SERS Substrate for Drug Detection Applications." *Sensing and Bio-Sensing Research* 24 (2019): 100281.
- Turkani, Vikram S. et al. "Nickel Based RTD Fabricated via Additive Screen Printing Process for Flexible Electronics." *IEEE Access* 7 (2019): 37518–37527.
- Alsafasfeh, Moath et al. "Unsupervised Fault Detection and Analysis for Large Photovoltaic Systems Using Drones and Machine Vision." *Energies* 11.9 (2018): 2252.
- Ali, Sam et al. "Flexible Capacitive Pressure Sensor Based on PDMS Substrate and Ga--In Liquid Metal." *IEEE Sensors Journal* 19.1 (2018): 97–104.
- Turkani, Vikram S. et al. "A Carbon Nanotube Based NTC Thermistor Using Additive Print Manufacturing Processes." *Sensors and Actuators A: Physical* (2018): n. pag.
- Chlaihawi, Amer Abdulmahdi et al. "Development of Printed and Flexible Dry ECG Electrodes." *Sensing and Bio-Sensing Research* 20 (2018): 9–15.
- Ali, Mohammed Mohammed et al. "Printed Strain Sensor Based on Silver Nanowire/silver Flake Composite on Flexible and Stretchable TPU Substrate." *Sensors and Actuators A: Physical* 274 (2018): 109–115.
- Abdullah, Osamah Ali, Ikhlal Abdel-Qader, and Bradley Bazuin. "Convex Optimization Via Jensen-Bregman Divergence for WLAN Indoor Positioning System." *International Journal of Handheld Computing Research (IJHCR)* 8.1 (2017): 29–41.
- Emamian, Sepehr et al. "Screen Printing of Flexible Piezoelectric Based Device on Polyethylene Terephthalate (PET) and Paper for Touch and Force Sensing Applications." *Sensors and Actuators A: Physical* 263 (2017): 639–647.
- Chlaihawi, Amer Abdulmahdi et al. "A Screen Printed and Flexible Piezoelectric-Based AC Magnetic Field Sensor." *Sensors and Actuators A: Physical* 268 (2017): 1–8.
- Chlaihawi, A A. et al. "Novel Screen Printed Flexible Magnetoelectric Thin Film Sensor." *Procedia Engineering* 168 (2016): 684–687.
- Meindl, James D. et al. "Implantable Telemetry." *Methods of Animal Experimentation* 7 (2016): 37–112.

## Publications - Conference Proceedings

### Completed/Published

- Turkani, V. S. et al. "A Screen-Printed Nickel Based Resistance Temperature Detector (RTD) on Thin Ceramic Substrate." *2020 IEEE International Conference on Electro Information Technology (EIT)* (2020): 577–580.
- Hajian, S. et al. "Flexible Temperature Sensor Based on Fluorinated Graphene." *2020 IEEE International Conference on Electro Information Technology (EIT)* (2020): 597–600.
- Masihi, S. et al. "A Highly Sensitive Capacitive Based Dual-Axis Accelerometer for Wearable Applications." *2020 IEEE International Conference on Electro Information Technology (EIT)* (2020): 557–561.
- Masihi, S. et al. "A Novel Printed Fabric Based Porous Capacitive Pressure Sensor For Flexible Electronic Applications." *2019 IEEE SENSORS* (2019): 1–4.
- Palaniappan, V et al. "Laser-Assisted Fabrication of Flexible Micro-Structured Pressure Sensor for Low Pressure Applications." *2019 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)* (2019): 1–3.
- Palaniappan, V. et al. "A Flexible Triboelectric Nanogenerator Fabricated Using Laser-Assisted Patterning Process." *2019 IEEE SENSORS* (2019): 1–4.
- Masihi, S et al. "Rapid Prototyping of a Tunable and Compact Microstrip Antenna by Laser Machining Flexible Copper Tape." *2019 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)* (2019): 1–3.
- Maddipatla, D et al. "Development of a Flexible Force Sensor Using Additive Print Manufacturing Process." *2019 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)* (2019): 1–3.
- Bose, A K. et al. "Laser-Assisted Patterning of a Flexible Microplasma Discharge Device for Heavy Metal and Salt Detection in Ambient Air." *2019 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)* (2019): 1–3.
- Bose, A K. et al. "Highly Sensitive Screen Printed Strain Gauge for Micro-Strain Detection." *2019 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS)* (2019): 1–3.
- Narakathu, Binu Baby et al. "Development of Flexible Microplasma Discharge Device for Sterilization Applications." *IEEE Sensors Conference, 2018* (2018): n. pag.
- Zhang, Xingzhe et al. "Digital Signal Processing and Analysis of Cardiopulmonary Audio Using a Multi-Channel Stethograph System." *2018 IEEE SENSORS* (2018): 1–4.
- Hajian, S. et al. "Impact of Different Ratios of Fluorine, Oxygen and Hydroxyl Surface Terminations on Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene as Ammonia Sensor: A First-Principles Study." *IEEE Sensors Conference, 2018* (2018): n. pag.

- Narakathu, Binu Baby et al. "Development of Flexible Microplasma Discharge Device for Sterilization Applications." *IEEE Sensors Conference, 2018* (2018): 1161–1164.
- Maddipatla, D. et al. "A Flexible Copper Based Electrochemical Sensor Using Laser-Assisted Patterning Process." *IEEE Sensors Conference 2018* (2018): 356–359.
- Hajian, S. et al. "Impact of Different Ratios of Fluorine, Oxygen and Hydroxyl Surface Terminations on Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> MXene as Ammonia Sensor: A First-Principles Study." *IEEE Sensors Conference, 2018* (2018): 1043–1046.
- Atashbar, Massood Z. et al. "Nickel Based Resistance Temperature Detector (RTD) on Flexible Polyimide Substrate." *IEEE Sensors Conference 2018* (2018): 356–359.
- Maddipatla, D. et al. "A Flexible Copper Based Electrochemical Sensor Using Laser-Assisted Patterning Process." *IEEE Sensors Conference 2018* (2018): n. pag.
- Turkani, V.s. et al. "A Printed and Flexible CNT Based Negative Temperature Coefficient Thermistor." *28th Anniversary World Congress on Biosensors, 2018* (2018): n. pag.
- Bazuin, Bradley J. "Development of a Fully Printed Flexible Paper Based Electrochemical Sensor." *28th Anniversary World Congress on Biosensors, June 12-15, Florida, USA, 2018* (2018): n. pag.
- Maddipatla, D. et al. "A Gravure Printed Flexible Electrochemical Sensor for the Detection of Heavy Metal Compounds." *Euroensors Conference, Austria, 2018* (2018): 1201–1204.
- Bose, A K. et al. "Modelling and Simulation of Microplasma Discharge Device for Sterilization Applications." *Euroensors Conference, 2018* (2018): 1197–1200.
- Al, Safi, Amean, and Bradley Bazuin. "Toward Digital Transmitters with Amplitude Shift Keying and Quadrature Amplitude Modulators Implementation Examples." *Computing and Communication Workshop and Conference (CCWC), 2017 IEEE 7th Annual* (2017): 1–7.
- Alsafasfeh, Moath, Ikhlas Abdel-Qader, and Bradley Bazuin. "Fault Detection in Photovoltaic System Using SLIC and Thermal Images." *Information Technology (ICIT), 2017 8th International Conference on* (2017): 672–676.
- Abdullah, O, Ikhlas Abdel-Qader, and B Bazuin. "A Probability Neural Network-Jensen-Shannon Divergence for a Fingerprint Based Localization." *Information Science and Systems (CISS), 2016 Annual Conference on* (2016): 286–291.
- Abdullah, O, Ikhlas Abdel-Qader, and B Bazuin. "K-Means-Jensen-Shannon Divergence for a WLAN Indoor Positioning System." *Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), IEEE Annual* (2016): 1–5.
- Abdullah, O, Ikhlas Abdel-Qader, and B Bazuin. "Fingerprint-Based Technique for Indoor Positioning System via Machine Learning and Convex Optimization." *Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), IEEE Annual* (2016): 1–6.



Ali, Mohammed M. et al. "Eutectic Ga-In Liquid Metal Based Flexible Capacitive Pressure Sensor." *SENSORS, 2016 IEEE* (2016): 1–3.

Alsafasfeh, Moath, Ikhlas Abdel-Qader, and Bradley Bazuin. "Multicore Real Time Feature Detection System Using Thermal Video for Nondestructive Testing." *Computational Science and Computational Intelligence (CSCI), 2016 International Conference on* (2016): 567–571.

Aljanabi, Farah et al. "Detection of Cocaine Using Gravure Printed Silver Nanoparticle Based SERS Substrate." *SENSORS, 2016 IEEE* (2016): 1–3.

Emamian, Sepehr et al. "A Piezoelectric Based Vibration Energy Harvester Fabricated Using Screen Printing Technique." *SENSORS, 2016 IEEE* (2016): 1–3.

Chlaihawi, Amer A. et al. "Novel Screen Printed and Flexible Low Frequency Magneto-Electric Energy Harvester." *SENSORS, 2016 IEEE* (2016): 1–3.

Al-Safi, Amean, Lalith Narasimhan, and Bradley Bazuin. "Design and Implementation of Prototype Potable Base Station for Catastrophic Situation." *Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), IEEE Annual* (2016): 1–6.

Al-safi, Amean, Lalith Narasimhan, and Bradley Bazuin. "Software Defined Community Radio Using Low Cost Hardware and Free Software." *2016 Universal Technology Management Conference (UTMC)* (2016): 51.

Maddipatla, Dinesh et al. "Development of a Printed Impedance Based Electrochemical Sensor on Paper Substrate." *SENSORS, 2016 IEEE* (2016): 1–3.

Al, Safi, Amean, and Bradley Bazuin. "FPGA Based Implementation of BPSK and QPSK Modulators Using Address Reverse Accumulators." *Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), IEEE Annual* (2016): 1–6.

## **Presentations - Poster**

### **Completed/Published**

Turkani, V. et al. "A Fully Printed Carbon Nanotube (CNT) Based Thermistor." *Flexible and Printed Electronics Conference (FlexTech) 2018* (2018): n. pag.

Maddipatla, D. et al. "Development of a Flexible Strain Gauge on Paper Based Platform Using Additive Printing Process." *Flexible and Printed Electronics Conference (FlexTech) 2018*. (2018): n. pag.

Bazuin, Bradley J. "A Novel and Flexible Screen Printed Electrochemical Sensor on Paper Substrate", *Flexible and Printed Electronics Conference (FlexTech) 2018* (2018): n. pag.

## **Funded Research and Creative Scholarship**

### **Completed**

A smart helmet impact sensing system for real-time monitoring of concussion risk in teen and young football players, Funded by U.S. Food and Drug Administration grant (July 1, 2016 - May 30, 2017) (\$8,640.00), Completed, Summer I 2017, PI Bradley Bazuin with CoInvestigator Massood Atashbar [Funding Type: External Grants & Fellowships]

WMU Educational Solar Garden - Installation, Funded by Consumer Energy (October 1, 2015 - October 1, 2016), awarded October 1, 2015 (\$55,000.00), Completed, Fall 2016, PI Peter Strazdas with CoPI Bradley Bazuin [Funding Type: Gift]

### **Funded - In Progress**

Enabling Advanced Electrode Architecture through Printing Technique, Funded by Department of Energy - Energy Efficiency and Renewable Energy (July 1, 2020 - June 30, 2023), awarded July 1, 2020 (\$8,596,972.00), Funded - In Progress, Fall 2020, PI Qingliu Wu (40%) with CoPI Massood Atashbar (35%), CoPI Bradley Bazuin (5%), CoPI Clement Burns (5%), CoPI Paul Fleming (5%), CoPI Kecheng Li (5%), CoPI Alexandra Pekarovicova (5%) [Amount Requested/Funded: 8596972] [Date of Submission for Funded Research or Creative Scholarship: 2019-09-05] [Funding Type: External Grants & Fellowships] [If Awarded, number of student funded : 12] [Scope: National]

Sunseeker Solar Car Project - HONES, Funded by Michigan Space Grant Consortium (May 10, 2020 - April 30, 2021), awarded May 5, 2020 (\$5,000.00), Funded - In Progress, Summer I 2020, PI Bradley Bazuin (50%) with CoPI Mitchel Keil (50%) [Amount Requested/Funded: 5000] [Date of Submission for Funded Research or Creative Scholarship: 2019-11-13] [Funding Type: External Grants & Fellowships] [Scope: Regional]

WMU Educational Solar Garden, Funded by Consumers Energy (October 1, 2015 - October 1, 2021), awarded October 1, 2015 (\$120,000.00), Funded - In Progress, Spring 2017, PI Bradley Bazuin [Funding Type: Gift]

## **Institutional Services**

### **College**

#### **Fall 2010 - Fall 2016**

College Curriculum Committee—CEAS, (College Of Engineering/App Sci)

### **Department**

#### **Spring 2018 - Present**

Chair, (Electrical & Computer Engr)

**Spring 2017 - Fall 2017**

Interim Chair, (Electrical & Computer Engr)

**Fall 2010 - Fall 2016**

Undergraduate Curriculum Committee, (Electrical & Computer Engr)