Capstone Project Ideas

2012-13

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Canada Excellence Research Chair (CERC) in Hybrid Powertrain Program

- 100+ researchers and $150+ million in programs and infrastructure
- Collaboration with more than 30 private and public sector organizations including unique relationships with automotive and electrical industry
- 80,000 sq-ft McMaster Automotive Resource Centre (MARC) – $26 million
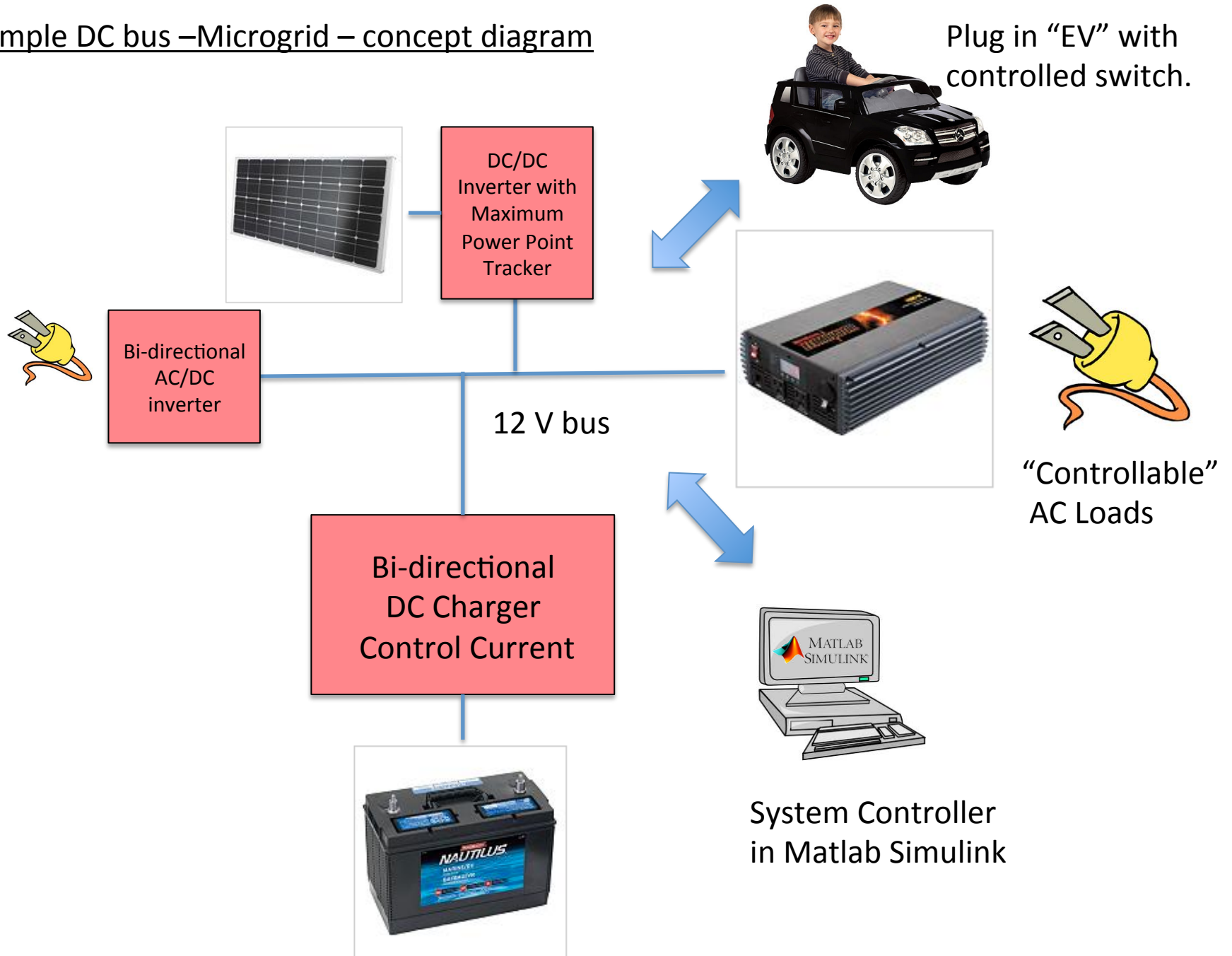
- Example Research Thrusts:
    - Transportation Electrification – EV, PHEV, HEV
    - Power and Energy Technologies – Smart Grid, V2G, ESS
    - Hybrid Powertrains and Electric Motor Machines

Low voltage DC Bus Microgrid

Undergrad Project Proposal

Example DC bus –Microgrid – concept diagram

Plug in "EV" with controlled switch.

Solar Panel

DC/DC Inverter with Maximum Power Point Tracker

Bi-directional AC/DC inverter

12 V bus

"Controllable" AC Loads

Bi-directional DC Charger Control Current

System Controller in Matlab Simulink

Project Goals:

-Power and Energy management within a Low voltage/low-power microgrid. Up to a few hundred Watts.
-Potential applications areas include RVs, boats, cottages.
-Small scale demonstration of power management concepts applicable to larger systems

Sub-components to be designed:

-Bi-directional current Controlled Battery Charger
-Bi-directional AC/DC inverter
-Uni-directional DC/DC MPPT for Solar Panels
-Optional "plug-in" Electric Toy Vehicle as a Controlled Load
-Control and Power Management system interfaced via Matlab and Simulink. Example tasks:
-Decide when to charge EV
-Decide where Solar power flows (grid or battery)
-Optimal buying/selling electricity via time-of-use pricing

Example Microgrid Components:

Blue Planet Solar Panel, 15 Watt

PRODUCT #11-1882-8

Only at Canadian Tire

★★★★☆

Read all reviews

Reg. $139.99

12 V output

Group 31 Deep Cycle Battery

PRODUCT #10-3199-6

★★★☆☆ ☐ Compare

Read all reviews

Reg. $139.99

1.38 kWh
12 V

MotoMaster 300W Mobile Power Outlet and In...

PRODUCT #11-1870-6

Only at Canadian Tire
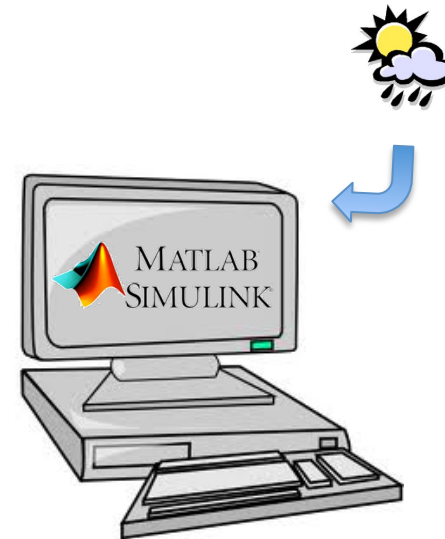
★★★★⯪

Read all reviews

Sale $32.99
Reg. $54.99
Save 40%

Used to power AC loads

User Interface App for Home Energy Management System

Undergrad Project Proposal

Concept:

WiFi, Bluetooth, Internet connection between App and Matlab/Simulink.

Link Weather forecasting data.

Simple model of microgrid in Simulink.

    Possible Microgrid components:
        -Solar/Wind Power
        -Storage elements: e.g. Battery
        -Controllable Loads. e.g. EV, smart appliances

Project Goals:

-Design intuitive user interface and control algorithm for microgrid power and energy management
-Integrate Multi-modal communication methods.
-Effectively engage-user in power management.
-Forecast energy usage, forecast and predict energy produced from solar/wind power.

Sub-components to be designed:

-Simulink model of microgrid
-Layout and capabilities of "power management" app. Info to be displayed to user, what user controls, e.g. controllable loads, battery usage settings, Electric Vehicle charging preferences etc...
-Prediction algorithms for energy usage/power generation using forecasting data, e.g. weather, user behavior, location, etc..
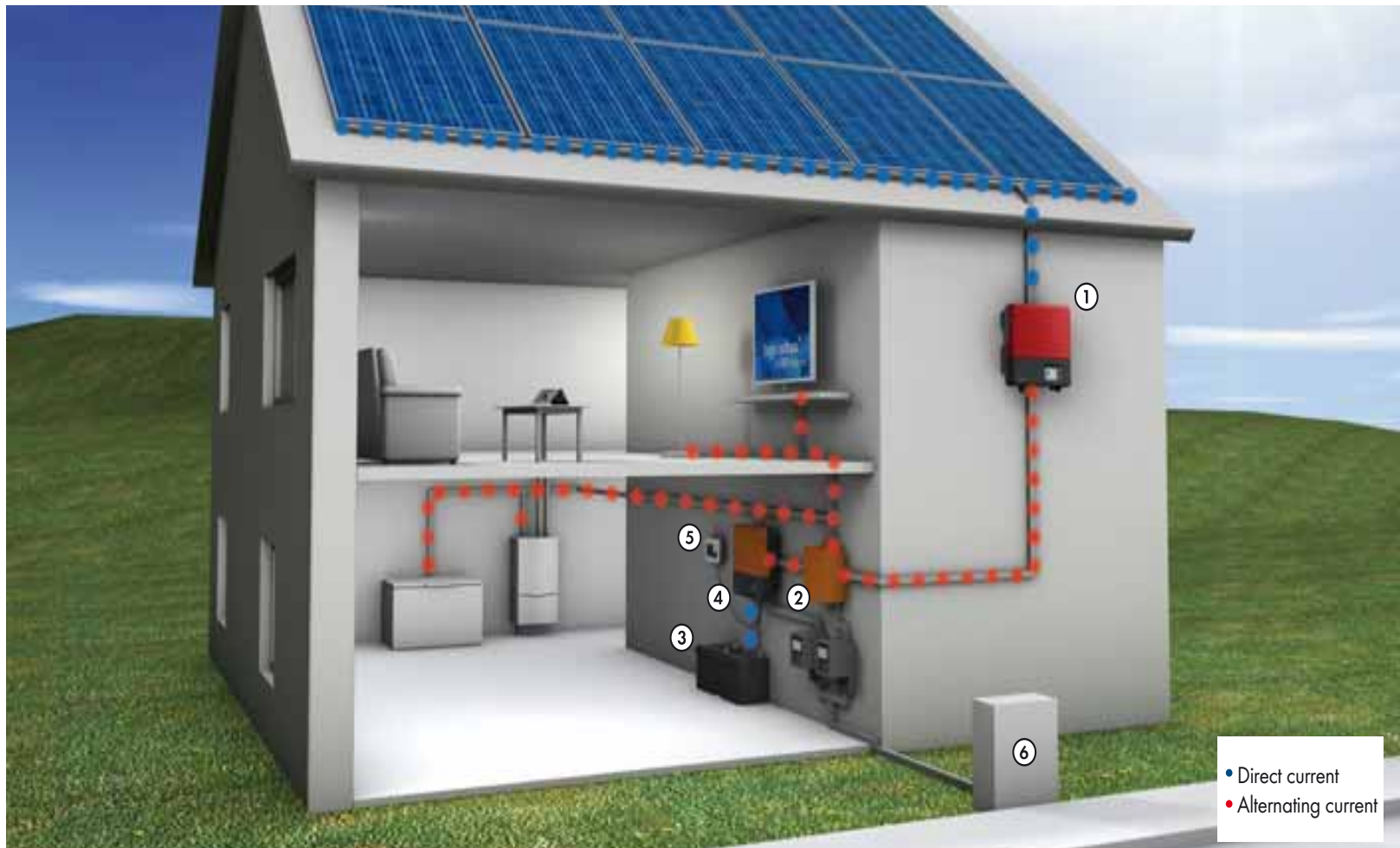
EMS Products and Services

A Quick Market Review

Denso EMS
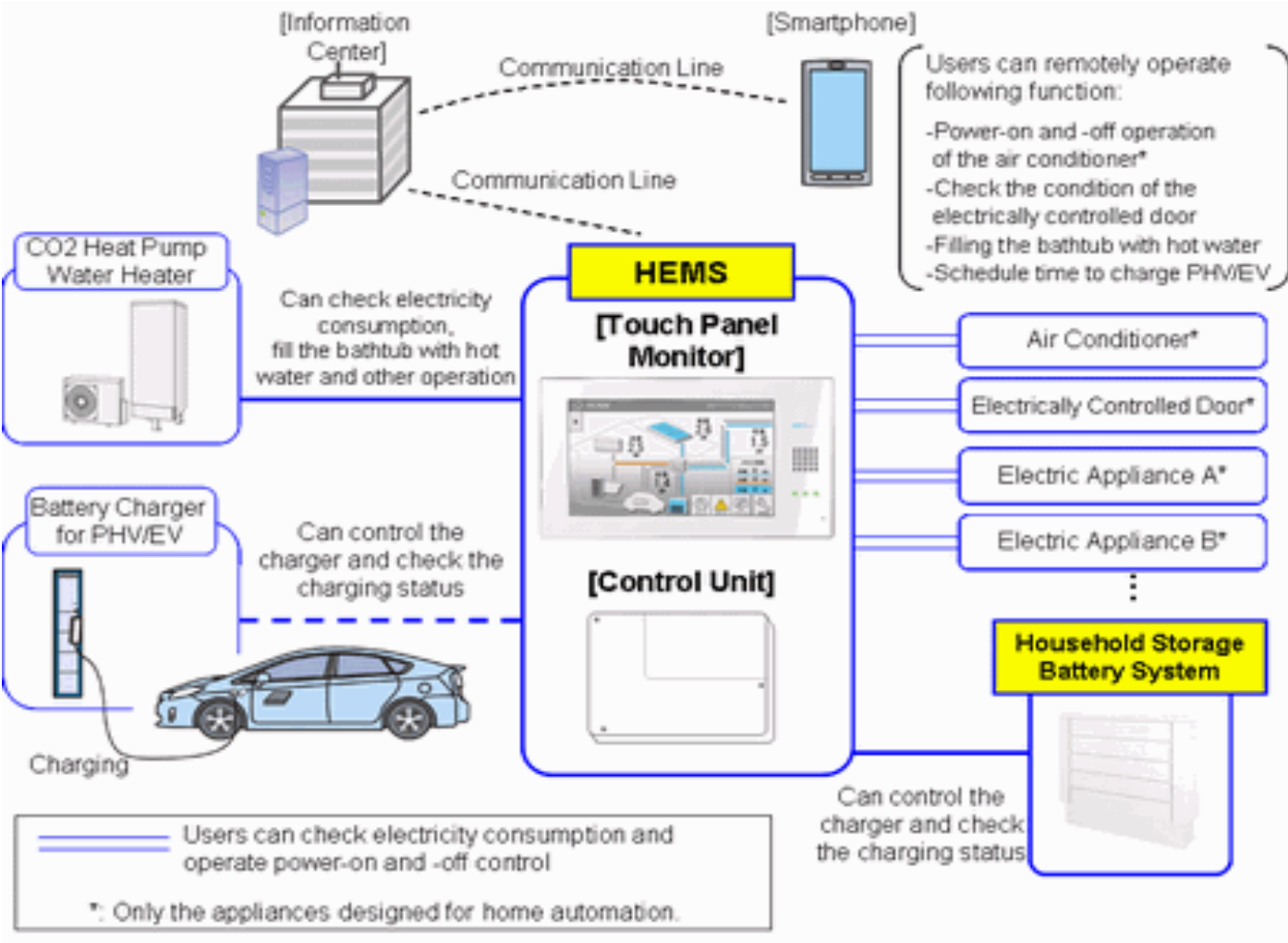
SMA Sunny Backup

Components: 1. Sunny Boy PV inverter, 2. Sunny Backup automatic transfer switch, 3. Sunny Backup battery set, 4. Sunny Backup 2200, 5. Sunny Remote Control, 6. Grid connection

Nest
Nest Learning Thermostat T100577
★★★★☆ ⌄ (178 customer reviews) | 👍 Like (331)

Price: **$249.00** & this item ships for **FREE with Super Saver S**

In Stock.
Ships from and sold by **Amazon.com**. Gift-wrap available.

Want it delivered Wednesday, July 25? Order it in the next 7 hours an

12 new from **$239.00**

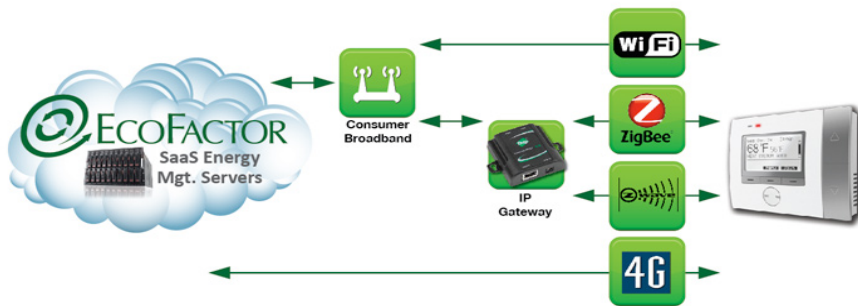| Web Portal	Email	Mobile Browser

Utility Call Center	In-home Devices

EcoFactor
SaaS Energy
Mgt. Servers

Consumer Broadband — WiFi

IP Gateway — ZigBee

4G

The brain of your smart home

Whether you're automating one room or a whole home, every Control4 systems starts with one of these. A controller is what makes it possible for everything to work together.

Learn more ❯

You can touch this... or this

Now that can control virtually anything, you get to decide how you want to control them: a remote, a keypad, a touch screen... And yes, some come with cameras, too!

Show me ❯

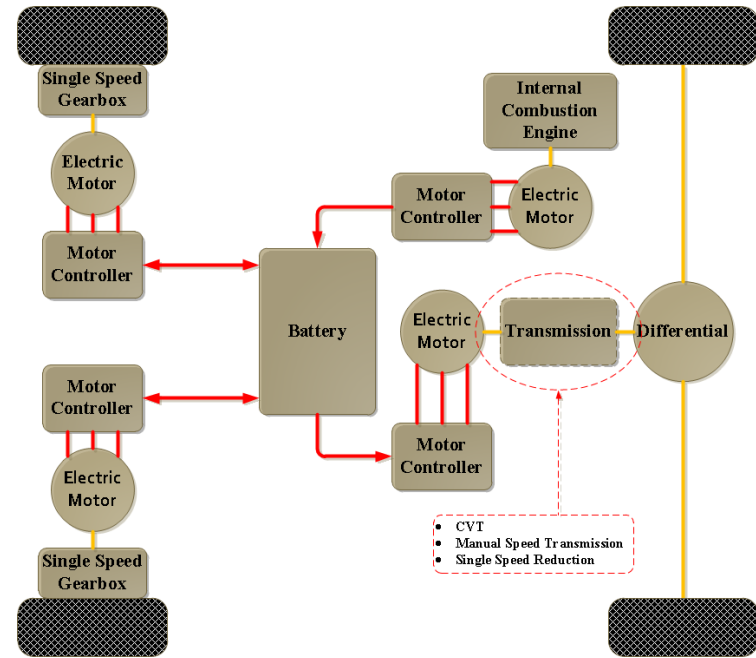## Home theater & music control

Where would we be without quality sound and pictures? These products make it easy to distribute movies and music to any room in the house.
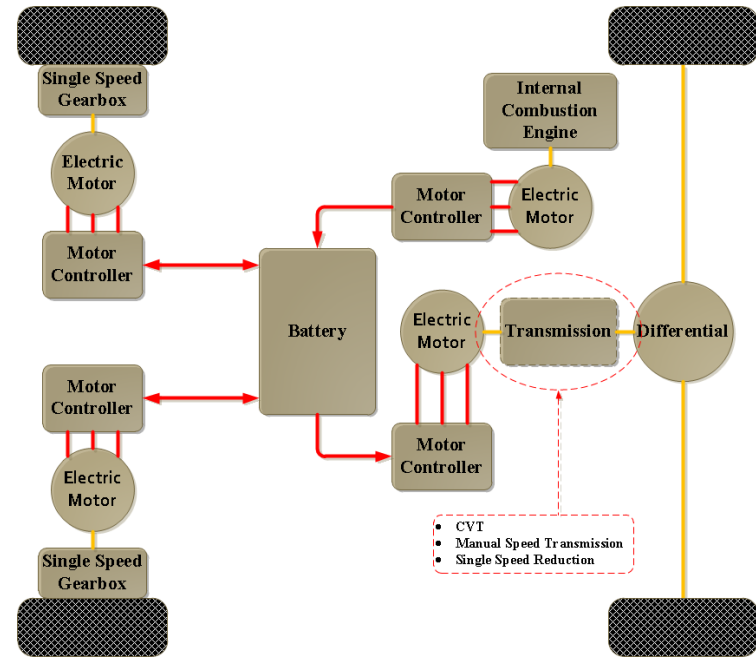
Learn more ❯

Formula Hybrid Car

Electrical Engineers Needed!

Formula Hybrid Car

- All Electrical systems need to be designed or redesigned.

- Project #1 – Powertrain Electrical Sub-systems
  - Electric Motor Power-electronics and Controllers
  - Battery power-electronics, interfacing, charging

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- Project #2 – LCD Interface for Steering Wheel
    - Enhanced User Interface for Driver for enhanced performance
    - Fuel/charge Levels, power, speed, anything to make us WIN!!

- Check out Current Team at **ENG FEST – JHE – WEDNESDAY – 10 AM**

Why Electrify Cars?

- Fast as *Lightning!* ⚡
- Rimac Concept One All Electric Supercar !!!
- 1088 hp (811 kW)
- 0-100 km/h (62.8 mph) in **2.8 s**