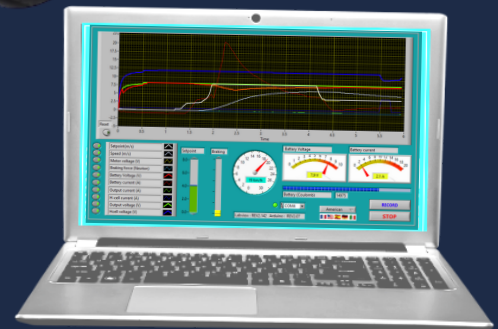


H2Hybrid - Fuel Cell Automotive Trainer SET



- Advanced Fuel Cell Education
- Hydrogen Hybrid Technology
- Advanced Curriculum With Computer Modeling

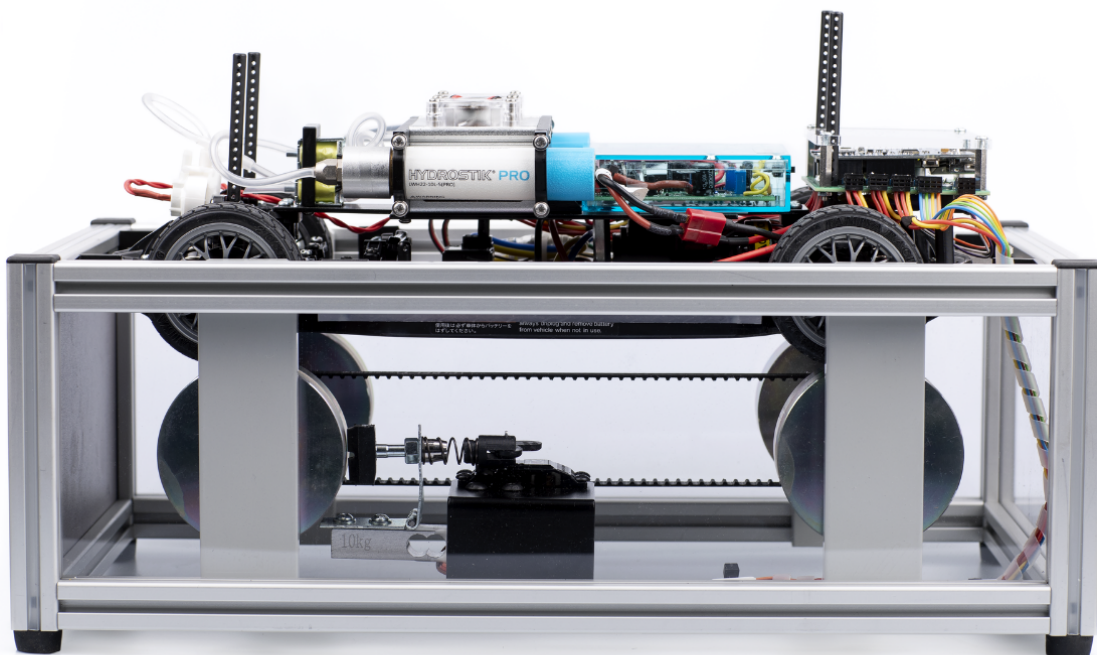




H2Hybrid Fuel Cell Automotive Trainer

UNDERSTAND HYBRID VEHICLES LIKE NEVER BEFORE

The H2Hybrid Fuel Cell Automotive Trainer is the ultimate tool for exploring science and engineering concepts through hands-on activities with a working fuel cell car. An impressive array of hardware, software, and digital curricular materials allow for hours of activities for students from high school vocational-technical up through college-level engineering.



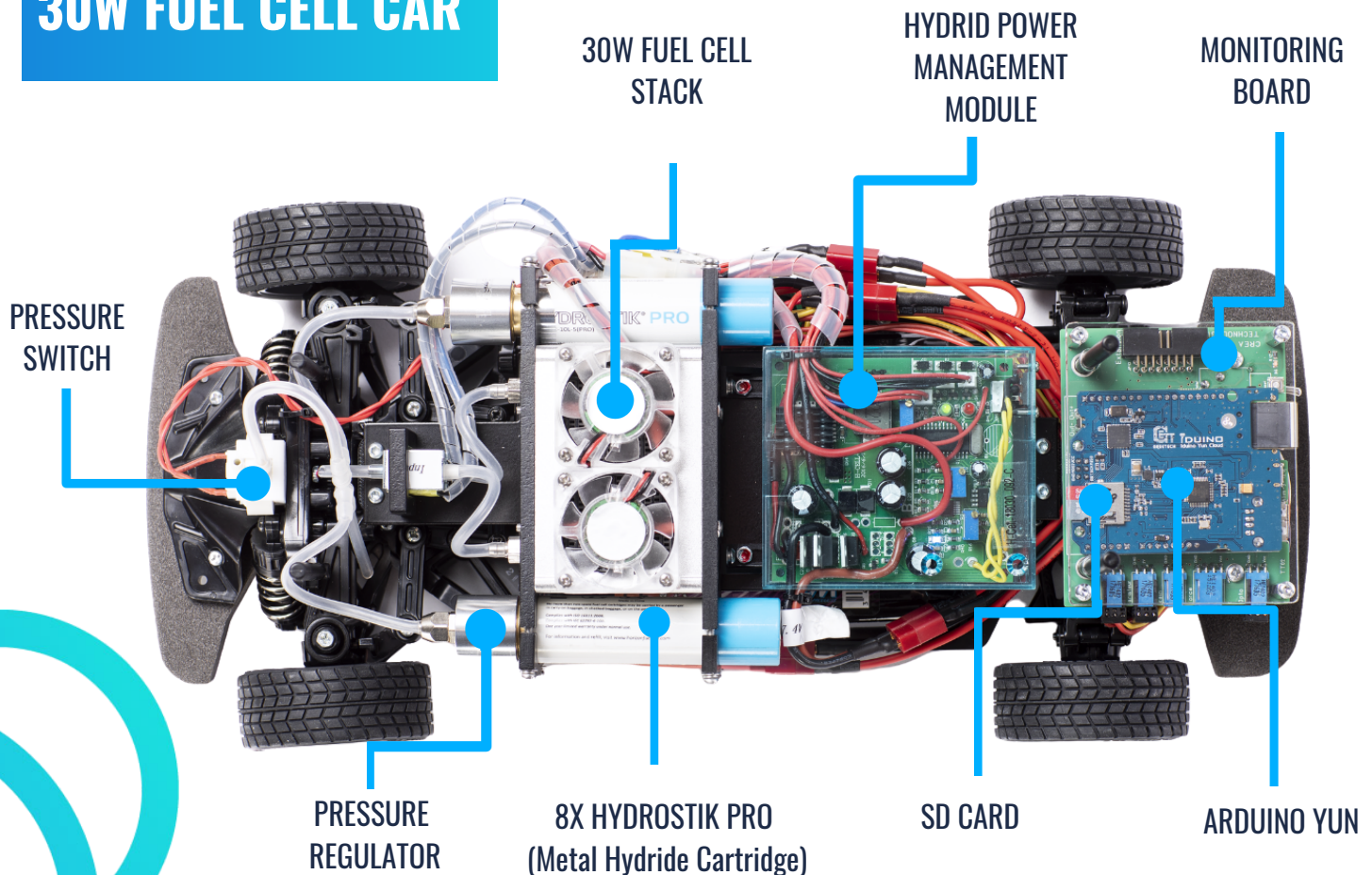
AREAS OF STUDY

- ✓ Engineer new solutions for optimization of car's performance
- ✓ Examine the three fields of energy management
- ✓ Comprehend hybrid propulsion technology and work to minimize environmental impacts
- ✓ Learn about data acquisition and discover how to manipulate, analyze and interpret graphs and data gathered from the car on the road and on the bench
- ✓ Understand the expected performance of a fuel cell system and how to get to optimum operation
- ✓ Explore the difference between expected performance and experimental results



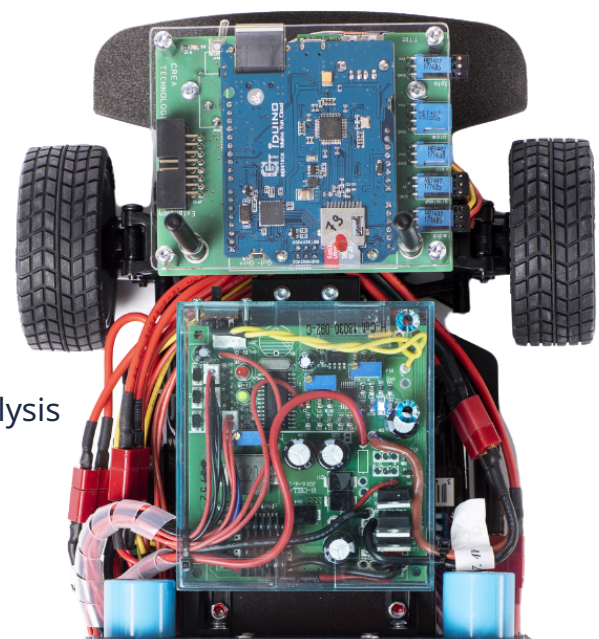
INCLUDED COMPONENTS

30W FUEL CELL CAR



MONITORING BOARD

- ✓ Arduino YUN board with HTML WEB server interface
 - ✓ Measure voltage and current from the motor, fuel cell and battery, as well as distance travelled
 - ✓ Included SD card stores the data as a .csv file
- Data can also be transferred in real time to PC for analysis

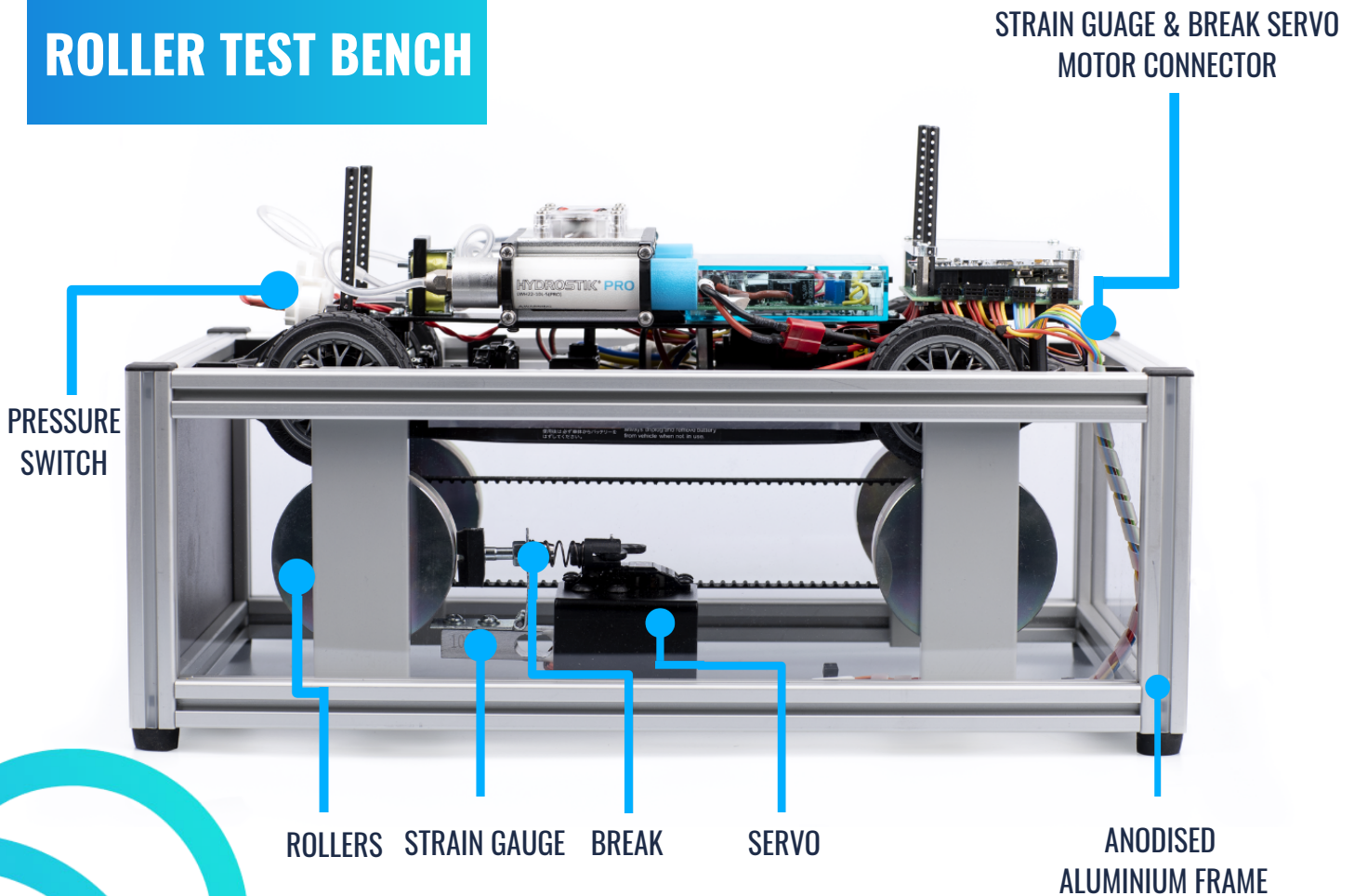




H2Hybrid Fuel Cell Automotive Trainer

FEATURES

ROLLER TEST BENCH



HYDROFILL PRO

- ✓ Produces hydrogen safely
- ✓ Input is just water and electricity
- ✓ Indispensable for HYDROSTIK based engineering

ALSO INCLUDES

- ✓ 2 pressure regulators
- ✓ NiMH battery
- ✓ battery charger

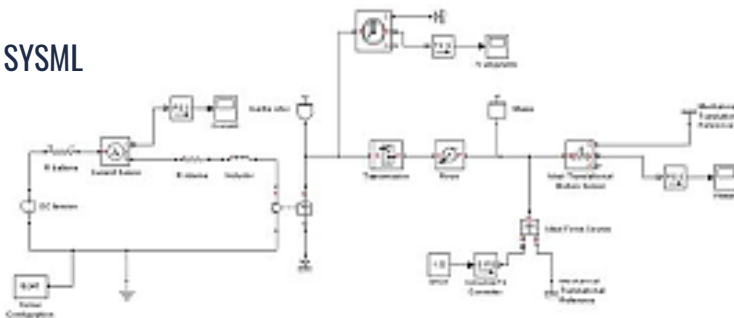




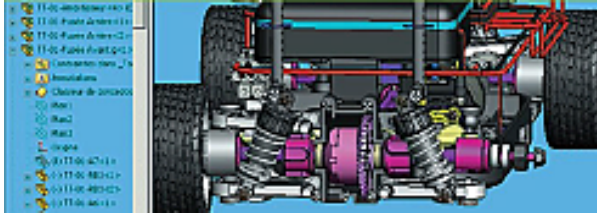
SOFTWARE AND COMPUTER MODELS

- ✓ Modeling for SYSML, PSIM, OpenModelica, MATLAB, and Excel
- ✓ Diagram of a complete Hydrogen Hybrid Car
- ✓ Modeling of energy flow

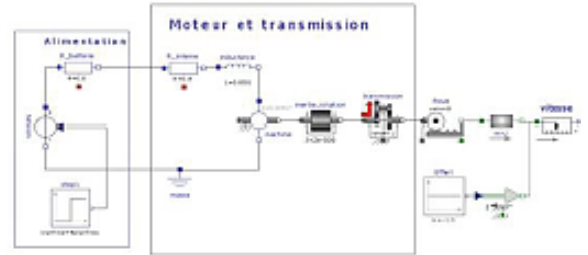
SYSML



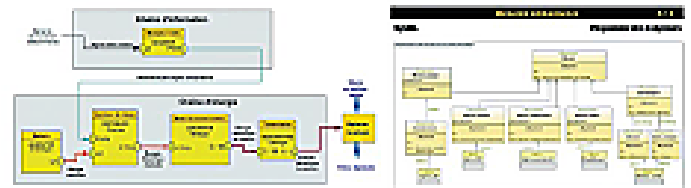
SOLIDWORKS




OPENMODELICA

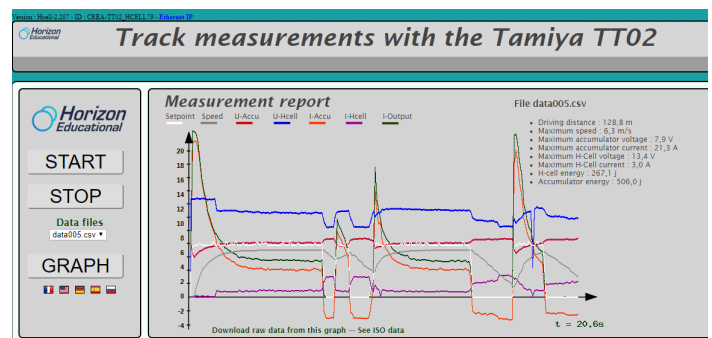
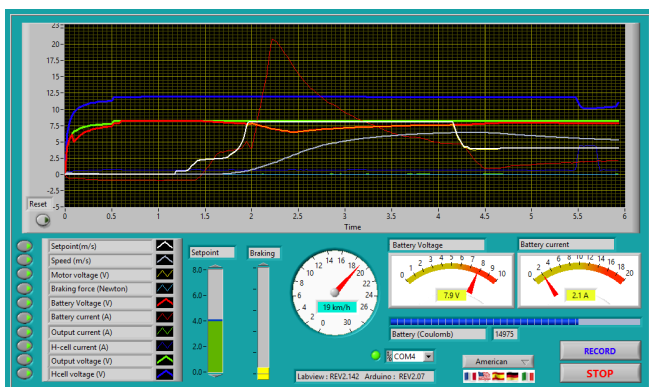


MATLAB



LAB VIEW/HTML WEB SERVER DASHBOARD

- ✓ LabVIEW dashboard with real-time graphs of speed, current, and braking force
- ✓ LabVIEW data collected: speed, battery voltage, fuel cell voltage, current, motor voltage, battery charge
- ✓ HTML WEB server interface connected via wi-fi 





H2Hybrid Fuel Cell Automotive Trainer

LESSON PLANS

- ✓ Students and teachers' material
- ✓ 6 months of curriculum in physics, chemistry and engineering
- ✓ Hands-on experiments and problem based learning



CAR SYSTEMS

Steering and Propulsion
Using Electrical Energy to Power the Vehicle
Transmitting Mechanical Energy
Speed and Consumption of Energy
Measuring Changes in Electrical Energy

THE ROLE OF HYDROGEN

Understanding the hydrogen fuel cell
Understanding modern batteries
Comparing sources of electricity

ENERGY NEEDS

Using models to describe the car's motion
MATLAB & OpenModelica:
Simulating the car's motion
Making measurements on the track
Making measurements on the charging bench

SYSTEM ADAPTABILITY

Providing power
H-Cell power
Influence of the arrangement of the components of the fuel cell
Effects of the arrangement of the Hydrostiks

MANUFACTURER'S DECISION

Making measurements on the track
Making measurements on the charging bench
Energy consumption
Sustainable development

CUSTOMIZING YOUR CAR

Changing how you drive
Changing the components of the energy system of the car
Reducing various forms of resistance to motion
Changing the mode of hydrogen consumption





H2Hybrid Fuel Cell Automotive Trainer

DATASHEET

30W FUEL CELL STACK

| | |
|-----------------------------------|------------------------------|
| Type of Fuel Cell | PEM |
| Number of Cells | 14 |
| Rated power | 30W |
| Rated performance | 8.4V@3.6A |
| Purging valve voltage | 6V |
| Blower voltage | 5V |
| Reactants | Hydrogen and Air |
| Ambient temperature | 50-30°C (41-86°F) |
| Max stack temperature | 55°C (131°F) |
| Hydrogen pressure | 0.45-0.55 Bar |
| Humidification | Self-humidified |
| Cooling | Air (integrated cooling fan) |
| Stack weight (with fan&casing) | 280g (±30g) |
| Stack size | 80x47x75mm |
| Flow rate at max output | 0.42L/min |
| Hydrogen purity | ≥99.995% dry H ₂ |
| Start up time | ≤30s (ambient temp.) |
| Efficiency of system | 40% at full power |



FCAT-30 SET

CONTROLLER BOARD



Controller weight 90g(±10g)

HYDROGEN STORAGE HYDROSTIK PRO



| | |
|-------------------------|-------------------|
| Capacity | 10L hydrogen |
| Hydrogen purity | ≥99.995% |
| Cartridge size | Ø22x88mm |
| Weight | Approx. 105g |
| Storage material | AB5 metal hydride |
| Rated charging pressure | 3.0 MPa |
| Working temperature | 0-55°C (0-131°F) |
| Service life | 10 years |

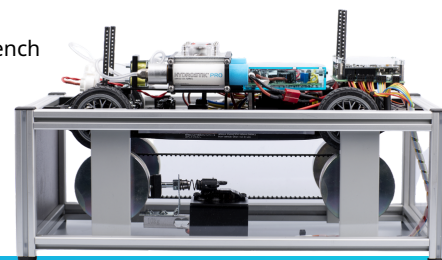
HYDROFILL PRO



| | |
|------------------------------------|--|
| Stack type | PEM electrolysis cell |
| Dimensions (WxDxH) | 145x153x208 mm (5.7x6x8.2in) |
| Weight | 1.8kg ±5% (3.97Lbs ±5%) |
| Rated power | ≤23W |
| Input voltage | DC: 10V-19V |
| Water input | De-ionised or distilled water |
| Water temperature | 10-40°C (50-104°F) |
| Water consumption | Approx. 20ml/hr (1.2in ³ /hr) |
| H ₂ output pressure | 0-3.0 MPaG (0-435.11 PSI) |
| H ₂ generation capacity | Up to 3L/hr (0-183in ³ /hr) |
| Purity | 99.995% |
| Compatible cartridge | HYDROSTIK & HYDROSTIK PRO |
| Refilling time for one | Around 4 hours |

OTHER COMPONENTS

Hybrid power management module
LabVIEW software dashboard
HTML WEB server dashboard
SD Card
Roller test bench





Complete resources for advanced experiments

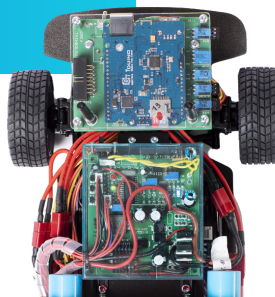
FCAT-30 SET

DATASHEET

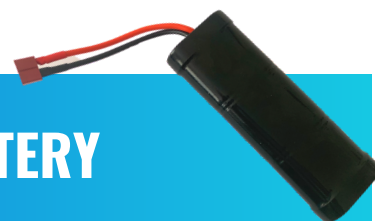


MONITORING BOARD WITH ARDUINO YUN

3 inputs Current measurement 0-20A
3 inputs Voltage measurement 0-13V
1 input PWM
1 input Incremental encoder
2 outputs PWM
Connection Wifi, MicroUSB and Ethernet 100Mb



NIMH BATTERY



Output voltage 7.2V
Capacity 3300mAh
Weight 0.31kg



ONE STEP PRESSURE REGULATOR 2X

Weight 27.6g
Screw type M6
Size $\Phi 22 \times 38\text{mm}$
Max. input pressure 30Bar
Output pressure 0.4-0.55Bar
Hydrogen flow rate 0-8L/min
Materials plastic/copper/aluminum
Sealing material Propionitrile rubber



BATTERY CHARGER

Input AC 100-240V, 50/60Hz
Output max. 16W, 2A
Weight 0.13kg

The H2Hybrid Fuel Cell Automotive Trainer is the ultimate tool for exploring science and engineering concepts through hands-on activities with a working fuel cell car. An impressive array of hardware, software, and digital curricular materials allow for hours of activities for students of everything from high school vocational-technical up through college-level engineering.



**HORIZON ENERGY
CURRICULUM**

STUDENT'S & TEACHER'S MATERIALS

EASY TO DOWNLOAD

