

MATE Center Summer Institute
ROV Building: The SeaMATE TriggerFish
 July 12th – July 18th, 2015
Draft Agenda



Day 0	Sunday, July 12, 2015	
TIME	ACTIVITY	LOCATION
	Everyone checks into the hotel	Hilton Garden Inn

All labs will be at Monterey Peninsula College, Life Science (LS) Building Room 101, unless otherwise noted.

Pre-workshop Homework:

- Read UW Robotics Textbook: Chapter 1, 2, Working in Water p.120-141, Chapter 6, Electric motors p.319-323, Electricity p.377-388, Transmitting power p.425-428 (7.4), Printed Circuit Boards p.440-1, **Motor Control p.466-527**, Payloads and hydraulics p. 534-546.
- *Recommended: MAKE Electronics read experiments 1-6; soldering p.106, 107, 109, motors and magnetism p. 236-241.*
<http://brweb.haltonrc.edu.on.ca/202204/ICE4/MAKEFULL.pdf>
- Programming Arduino Getting Started with Sketches
- Watch Video on H-Bridges: <https://www.youtube.com/watch?v=iYafyPZ15g8>

DAY 1	Monday, July 13, 2015	MPC LS 101
TIME	ACTIVITY	Presenter
8:30 - 9:15 am	Goals for the course, logistics, and your presentation. <i>Participant Expectations: why are you here, what do you want out of this?</i>	Deidre
9:15 – 10:15 am	<ul style="list-style-type: none"> • What is Technology • Technology in a Bag • What is an Engineer 	Matt
10:15 am	Break	
10:30 - noon	<ul style="list-style-type: none"> • Building an ROV Frame: Ortho & Vector Designs • Engineering Design Process - Jim 	Matt / Jim
12:00 - 1:00 pm	LUNCH	
1:00 - 1:30 pm	ROV Mission Brief	Matt
1:30 - 2:00 pm	Design for performance, sources of design ideas, and Innovation vs Engineering	Jim
2:00 - 2:15 pm	Break	
2:30 - 5:00 pm	Electronics: <ul style="list-style-type: none"> • Multimeters - Scott • Electronic circuits – Deidre • Batteries, fuses, and power – Jim • Potentiometers and joysticks - Matt • Switch control - Scott • Why go to electronic control - Scott • Soldering and care of a soldering station - Matt • Joining and waterproofing wires – Matt • Soldering a practice board - Matt 	Scott, Matt, Jim, Deidre

Homework:

Review MATE Competition Tech reports.

Review PPT on comparing motor size and current.

Review H-Bridges <https://www.youtube.com/watch?v=iYafyPZ15g8>

PhET:

- <https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc>
- <https://phet.colorado.edu/en/simulation/ohms-law>
- <https://phet.colorado.edu/en/simulation/resistance-in-a-wire>

DAY 2	Tuesday, July 14, 2015	MPC LS 101
TIME	ACTIVITY	PRESENTER
8:30 – 10:45	Overview of ROV Motor Controllers <ul style="list-style-type: none"> • Simple to complex • H-Bridges • Sabertooth controllers overview • Joystick controller • Effects of voltage on motor control • PWM worksheet (finish as homework) • SID - Jim 	Scott, Jim
10:45 – 11:00	BREAK	
11:00 – 12:00	Designing the Control Box <ul style="list-style-type: none"> • Mounting motor controllers • Wire joysticks • Adding a kill switch • Wire ammeter • Building a motor simulator 	Scott, Matt, Jim
12:00 - 1:00 pm	LUNCH	
1:00-4:15 pm	Continue building the control box	
4:15 – 4:30 pm	Shroud designs and considerations	Jim
5:00 – 7:00 pm	Build TriggerFish ROV Frames & Pizza Dinner	Matt

Homework: PWM Worksheet

Day 3	Wednesday, July 15, 2015	MPC LS 101
TIME	ACTIVITY	Presenter
8:30- 9:00	<ul style="list-style-type: none"> Using a Motor Simulator to enable parallel development paths Arduino Control Sabertooth Switch Wizard 	Scott
9:00 - noon	<p>Motor Control and Oscilloscopes</p> <ul style="list-style-type: none"> Connecting the Motor Simulator Using an Oscilloscope to monitor signals on the control box Using an Oscilloscope as a Voltmeter Monitoring four crucial H-Bridge points (no scheduled break, break as needed from exercises) 	Scott, Jim
12:00 - 1:00 pm	LUNCH	
1:00-5:00 pm	<p>Integrating the Arduino with the control box</p> <ul style="list-style-type: none"> Review of the Arduino Components and development environment Connecting the Arduino between the Joysticks and controllers Uploading a pre-built sketch Testing the controller with the Arduino Comparing signals with the Oscilloscope 	Scott Matt, Jim
5: 15 – 6:30 pm	<p>Why do we need a camera power filter? Waterproofing a camera</p>	Jim

Homework: Tour MBARI website www.mbari.org

- What is the MBARI Mission and who defined that mission?
- What are the names of MBARIS ships, ROVs, and AUVs.
- Browse the MBARI research projects pages to get an idea of the projects underway.

Day 4	Thursday, July 16, 2015	MPC LS 101
TIME	ACTIVITY	Presenter
8:30 – 9:30 am	Using the Arduino as a development platform <ul style="list-style-type: none"> • Writing code for vectored thrusters vs orthogonal thrusters. • Safety considerations 	Scott
9:30 am	Break	
9:45- noon	Buoyancy calculations on the ROV <ul style="list-style-type: none"> • Calculate buoyancy of vehicle in water • Attach buoyancy 	Deidre
12:00 - 1:00 pm	LUNCH	
1:45 pm	Depart from hotel to MBARI for field trip	Hilton Garden Inn
2:30 – 5:00 pm	MBARI Tour	MBARI

Homework:

PhET Buoyancy: <https://phet.colorado.edu/en/simulation/buoyancy>

Day 5	Friday, July 17, 2015	MPC LS 101
TIME	ACTIVITY	Presenter
8:30 – 10:30 am	Troubleshooting the ROV <ul style="list-style-type: none"> • Removing the Motor Simulator and connecting the thrusters to the controller. 	Scott and Jim
10:30	Break & walk up to the pool	
11:00 - 1:45 pm	ROV Demonstration & Lunch	MPC Pool
2:00 – 3:00 pm	Integrating ROV activities into the classroom or club: <ul style="list-style-type: none"> • How to get started and organized. 	Jim
3:00 – 3:45 pm	The Marine Workforce	Deidre
3:45 – 4:30	MATE ROV Competitions	Jill
6:00 pm	Dinner in the Sam Kara Room & Participant Presentations	Sam Karas Room

Departure Day, Optional trip to the Monterey Bay Aquarium

Day 6	Saturday, July 18, 2015	
TIME	ACTIVITY	LOCATION
9:00 am - ?	Monterey Bay Aquarium, Meet at Hilton Garden Inn Lobby	Monterey Bay Aquarium