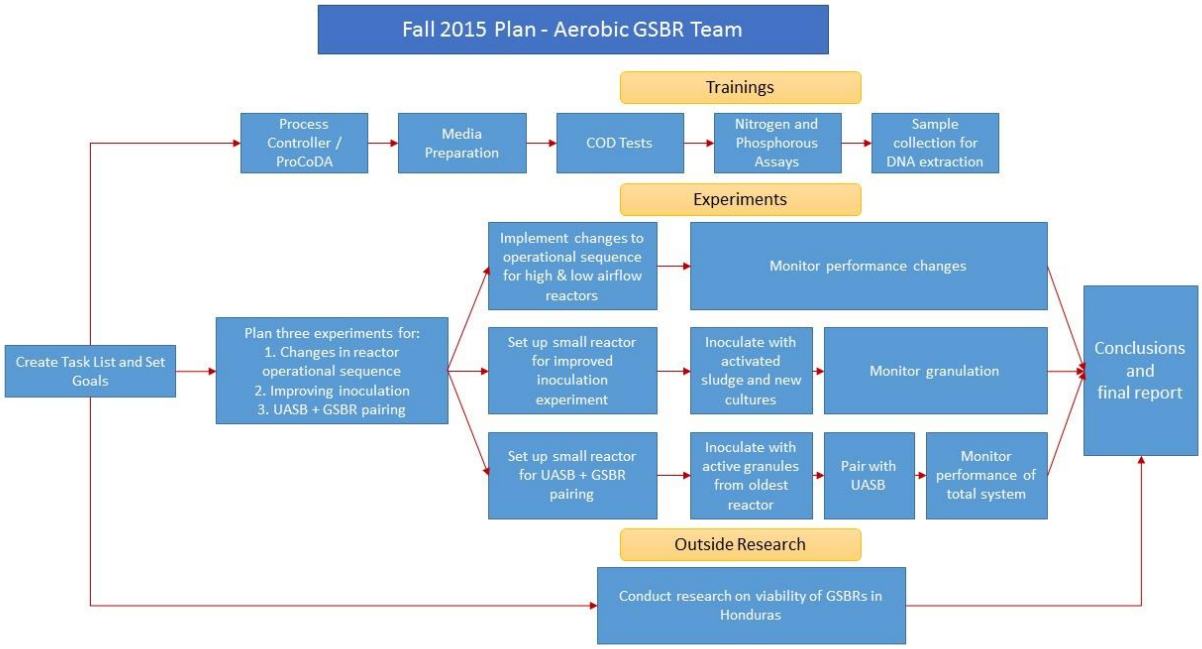
## Task Map

Note: **Week 1** is week of 9/7/15




## Task Details

Trainings

1. Process controller / ProCoDA (9/14/15) - **Week 2** **Complete**
2. Media preparation (9/16/15) - **Week 2** **Complete**
3. GSBR operation and aeration setup (9/23/15) - **Week 3** **Complete**
4. COD analysis (9/21/15) - **Week 3** **Complete**
5. Dissolved Oxygen Measurement (9/30/15) - **Week 4** **Complete**
6. Ammonium and Nitrate/Nitrite Assays **Complete**
7. Collecting samples for DNA extraction (TBD later in semester) **Incomplete**

Operational Optimization of GSBR - Andrea

The goal is to investigate what operational changes can be made to the GSBRs that will improve performance or reduce theoretical costs. Our aim will be to re-evaluate the operational sequence used for the reactors which we have held constant for nearly each granulation experiment.

1. Overview of reactor operation and maintenance (9/16/15) - **Week 2**
    a. This includes reviewing process control methods, media preparation, sampling, and cleaning the reactors. The focus will be on the two reactors operating with high and low air flow rates.
2. Present experiment goals and procedure (10/8/15) - **Week 4**

. Here we will propose a detailed list of objectives along with the experimental procedure. Preliminary plan is to implement a shortened aeration time and post-aeration anaerobic time to

the sequence for both high and air flow reactors. Experimental procedure will outline methods of sampling and frequency of samples taken.

3. Implement changes to reactor sequence and begin sampling (10/5/15) - **Week 5**

. Sampling will be ongoing for at least 4-6 weeks before changes may be made to the experimental setup.

a. Data will be analyzed to measure success of denitrification throughout experiment.

4. Present next experiment goals and procedure (11/5/15) - **Week 9**

. Preliminary plan is to implement either a higher strength influent mix (to mimic blackwater characteristics) or introduce temporal spikes in influent concentration and monitor performance effects. This experiment could be introduced to the reactors while they are still being tested for operational sequence changes.

5. Begin final data analysis for conclusions (11/23/15) - **Week 12**

. Give our team enough time at the end of the semester to begin data analysis and conclusions for final report.

<u>UASB + GSBR Testing - Amiel</u>

The goal is to monitor performance of a paired UASB / GSBR reactor system to see if the reactors could successfully operate in sequence. Furthermore, the next objective is to investigate whether the paired system could be net energy neutral or even positive.

<u>Update 11/20/15:</u> This experiment may be tested over the last week of classes if there is still interest and the UASBs are operating.

1. Coordinate with UASB team to discuss reactor setup (9/16/15) - **Week 2**

a. This task includes deciding what size of reactor will be used for both the UASB and the GSBR as well as calculating the flow rate that will be used through both processes. Furthermore, a decision will need to be made for where this experiment will take place.

2. Present experiment goals and procedure (10/8/15) -**Week 5**

. Propose a full experimental procedure and objectives that outline what will be measured and how. This includes a full explanation of the setup for the paired reactor system.

3. Set up small airlift reactor to later be paired with UASB (10/19/15) - **Week 7**

. Before pairing the GSBR with the UASB, set up in the lab the GSBR on its own in order to operate for at least 1-2 weeks with synthetic media.

4. Inoculate small reactor with active granules from oldest reactor (10/26/15) - **Week 8**

. Perform inoculation and startup with active granules. Operate this reactor and monitor performance for 1-2 weeks before pairing with UASB. One idea would also be to reduce the strength of synthetic influent mix to match the COD levels of previous UASB effluent data.

5. Pair GSBR with UASB and measure performance through entire process (TBD when UASBs are operating) - **Approx Week 9**

. This task is dependent on the timing for UASB operation, which should operate for some time separate from the GSBR before pairing as well.

6. Perform energy balance between potential energy from methane and required energy for operation and aeration (11/23/15) - **Week 12**

. Data to be conducted throughout the semester with final calculations completed near end.

a. Analyze methane generation data and aeration requirements in order to perform and energy balance on the system. Also make preliminary estimates for operation costs of other processes including pumping and controls

<u>Improving Inoculation - *Now future plans*</u>

The goal is to experiment with methods to reduce the startup time for granulation by imposing operational changes to the reactors as well as inoculating with new specific cultures of microorganisms other than activated sludge.

1. Present experiment goals and procedure

a. The goal will be to inoculate most likely a small reactor for solely testing the granulation phase. This also includes deciding what added cultures we will be utilizing and what changes to the influent mix and operational parameters we might consider.

2. Set up small reactor and conduct “dry-run” without biomass

. This includes setting up a fridge for stock, pumping, and tubing, as well as process controller.

3. Explore new parameters for measuring granulation

. This includes finding new methods for measurement of granulation success beyond images of biomass and treatment performance.

4. Inoculate small reactor and begin observing granulation phase

. This task will include travel to the Ithaca Area WWTP and retrieval of activated sludge.

a. Ongoing observation and sampling of granulation phase with performance (COD removal at the least) and granule imaging. Possibly will include new methods for granule assessment.

5. Time permitting, operational changes to the reactor may be made based on findings from other experiments

<u>Viability of GSBRs and other Wastewater Treatment Systems in Honduras - Amiel</u>

The goal is to research how viable GSBRs are in a resource limited setting like Honduras compared to other wastewater treatment methods. Efforts will include investigating low cost ways to operate and maintain a GSBR system in Honduras including low cost aeration methods. Furthermore, research should be conducted into other potential wastewater treatment methods for AguaClara to explore. Lastly, by the end of the semester a plan should be made for Wastewater Team members traveling to Honduras in January including what type of research they could conduct while in country.