ABE591S Principles of Synthetic & Systems Biology

***Group Lit Review – BioCAD tools* – Due Thurs 27 Sep 2018**

There has been rapid development of BioCAD (Biological Computer Aided Design) tools for Synthetic Biology that aim to simplify the design process. Many of these tools will select optimal compatible parts, propose a complete circuit, and predict the part performance using various models of the parts and chassis. To familiarize yourselves with these tools and identify ones that may be beneficial for your own research and design project, complete a literature review and in-class demonstration of the tool of your choice. Teams are the same as those for your design project. Students are graded on a brief 15 min presentation + brief 2 pg report (see grading scheme below, and pg 2-3).

Students should consult the reference paper(s)/documentation for their tool and provide:

- An overview of your tool's specific capabilities
- a walkthrough of the tool workflow (i.e. how does one use the tool – feel free to include screenshots in your presentation) with a pertinent design example (e.g. the repressilator)
- description of how the tool works
- any limitations (e.g. chassis, accuracy of predictions, etc)

You must demonstrate these concepts by simulating the performance of the Elowitz repressilator AND at least one system from your design project.

Students must select a group and a tool and post it to Blackboard Mon. Sep 24, 2018 5:00 PM for final approval of your choice so as to prevent overlap. You may choose **any** synthetic biology CAD tool. You may choose any tool but some more popular options include:

- Cello (http://www.cellocad.org; Nielsen et al, *Science*, 2016)
- TinkerCell (http://www.tinkercell.com/; Chanandran, Bergmann, Sauro, *JBE*, 2009)
- Antimony (http://antimony.sourceforge.net/index.html; Smith et al, *Bioinformatics*, 2009)
- GEC (https://www.microsoft.com/en-us/research/project/genetic-engineering-of-living-cells/; Pederson & Phillips, *Interface*, 2009)
- GenoCad (http://genocad.com/; Cai et al., *Bioinformatics*, 2009)
- SynBioSS (http://synbioss.sourceforge.net/; Hill et al, *Bioinformatics*, 2009)
- CellDesigner (http://www.celldesigner.org/; Funahashi et al., Biosilico, 2003)

Grading Scheme

1-2 page technical memo	**20 points**
Overview of tool capabilities	4
Algorithm description	4
Example/Instructions on how to use/Screenshots	4
Discussion of limitations	4
Recommendations for use	2
Memo format/organization	2
Presentation	**20 points**
Slides are clear/well laid out	5
Organization/Structure	3
Delivery/Transition between speakers	2
Content – tool adequately described/example thoroughly described	10
	/40 points total

ABE591S Principles of Synthetic & Systems Biology

Memo Style Reports

This type of report is intended to summarize the strengths and weakness of a new technology without providing the exhaustive detail that normally accompanies a more formal report. The physical style is that of a long memorandum or business letter and makes use of a continuous narrative rather than sections with formal headings. The report usually runs about two pages in length with tables, figures, data, and sample calculations included. Your report should include up to three key figures in the body of the report; other pertinent figures can be placed in the appendix. An example memo is included. The following sequence of development is suitable:

1. Brief introduction of the tool (4 points); a concise description of its capabilities, required inputs and expected outputs.

2. A brief description of the tools algorithm (4 points); feel free to use a computer drawn sketch to show the flow of information/connections to databases.

3. Describe how to use the tool (4 points). Use examples and screenshots as appropriate. Assess ease of use and how it streamlines design process.

4. Discuss any limitations of use (4 points) such as chassis, types/source of parts, etc.

5. Suggest recommendations for when this tool may be useful (2 points)

Overall format of the report (2 points)

This type of report is often useful if your boss or supervisor needs to quickly understand your work when going into a meeting or conference. This style of report can help continue funding on your project if the information is concisely worded.

ABE591S Principles of Synthetic & Systems Biology

Example of a Technical Memo (adapted from ABE 304)

Principles of Synthetic & Systems Biology
Agricultural & Biological Engineering
West Lafayette, IN 47907

To: I.N. Tegral

From: A.M. Early

Date: April 7, 2016

Subject: Pump Formation Effects on the Pressure Drop in a Length of Pipe

Pump formation plays a key role in the pressure drop in a length of pipe. In this work, the effect of the pump placement – either in series or in parallel – was studied to determine how the pressure changed over the length of the connected pipe. An extensive series of experiments was conducted and the results were compared to several theoretical models.

Pressure drop often occurs as the length of pipe increases. The configuration of the pumps can greatly affect how much the pressure decreases over the pipe length. As a result of the pump configuration, …

(The body of the memorandum continues – usually for several pages. Appendices are attached).