Math 3550 – Group Project

As a group, develop a full model in one of the above three areas. See below. Your group's chosen area may or may not match the area of your individual report. You will have an opportunity to make a presentation to the class. I encourage you to develop a version for publication. I will be inclined to give extra credit for presentations and developing a publishable version. Follow the general style of the sample report in the course website. However, be sure to include the following.

- One-page Executive Summary
- Table of contents
- Restatement and clarification of the problem: state in your own words what you are going to do.
- Clearly list and describe all variable and hypotheses.
- State the assumptions that bear on the problem and their rationale/justification.
- Present an analysis of the problem motivating your model design. Explain your model.
- Present derivations, computations, or illustrative examples. You may need to summarize some of it and leave lengthy derivations and/or calculations in appropriate appendices.
- Describe model testing and discuss sensitivity analysis, error analysis, and/or stability.
- Discuss the strengths and weaknesses of your model or approach.
- Provide a conclusion and report results explicitly.
- Document resources and references

Your entire submission cannot exceed **25** pages.

Problem A: Thirsty Utah

This is based on the Water Usage area. Your group, called Thirsty Utah Advisory Group, is formed to provide unbiased analysis. If you are going to develop a model for another state, you must get my permission.

Task 1: Determine all sources of water in the state of Utah. Find all water usage, culinary, secondary, agricultural and industrial, information. Determine what happens to all waste water. Determine the rate at which water resources are being replenished. Determine expected growth in water usage.

Task 2: Develop a model for overall water usage (culinary, secondary, agricultural and industrial) in the state of Utah. This model should take into account the growing population and other expected changes in future.

Task 3: (a) Based on your model, determine the level of availability/scarcity of water in future. (b) Conservation and water price have significant impact on water usage. In addition, development of new resources may increase water resources. Determine how these factors, and others, can influence future water usage.

(c) Present a water plan for the state of Utah. The focus of the plan has to be to provide sufficient culinary water for the growing population while meeting the agricultural and industrial needs. The plan may include, conservation, waste water treatment and reuse, changes in landscaping, agricultural and industrial practices.

Task 4: Analyze state of Utah reports and water plans and comment on their feasibility and consistency. Can any of the plans, including yours, accommodate expected growth in the state of Utah? If not, provide possible solutions to be explored by the next Thirsty Utah Advisory Group.

Problem B: Save the Great Salt Lake

This is based on the Disappearing Salt Lakes area. Your group, called Save the Great Salt Lake, is formed to provide unbiased analysis. If you are going to develop a model for another Salt Lake, you must get my permission.

Task 1: Determine sources of water of the Salt Lake. Determine changes to its water resources over the years. Determine the portion of available water used for other purposes; farming, secondary water, industry, and culinary water. Develop a model for the amount of water needed to maintain the lake at different levels and (monthly/quarterly/annual) average temperatures or other variables you deem important.

Task 2: (a) Develop a model for the annual precipitation (rain and snow). Develop a model for the availability of water for the Great Salt Lake based on total available water and diversions for human usage. Your model has to take account of our growing population, growing square footage of lawns, etc.

(b) Conservation may have significant impact on overall water usage. In addition, development of new or unused resources may increase water availability. Determine how these factors, and others, can influence future of the Great Salt Lake.

(c) Develop a Great Salt Late Water Plan for the state of Utah. The focus of the plan has to be to save the lake while still providing sufficient culinary water for the growing population. The plan may include, conservation, waste water treatment and reuse, changes in landscaping, agricultural and industrial practices, undoing changes to the water system, and limiting/stopping the growth of human consumption of fresh water.

Task 3: (a) There must be correct incentives to implement a plan. For example, "use it or lose it" system for farmers only encourages maximum use of water resources. Present a system of incentives to help implement your plan.

(b) Based on the earlier models, determine the future of Salt Lake under different scenarios.

(c) Analyze existing reports and plans, and comment on their feasibility and consistency. Can any of the plans, including yours, prevent the inevitable drying of the lake? If not, provide possible ways of dealing with its health effects and other consequences.

Problem C: Utah Clean Energy

This is based on the Green Energy area. Your group, called Utah Clean Energy, is formed to provide unbiased analysis. You may consider just solar energy or wind power. But a combined green energy model will be more effective. If you are going to develop a model for another state or country, you must get my permission.

Task 1: Explore the viability (costs, benefits, competitiveness, etc.) of green energy production. Do include (health) cost of fossil fuel energy production. What are the possible obstacles: regulatory, environmental or community wise, both in rural and urban areas?

Task 2: Recommend a viable plan to increase green energy production.

(a) Determine whether we should develop large plants, smaller ones close to urban areas, encourage private homes and businesses to build their own, or a combination of them.

(b) Determine optimal locations (rural and urban areas) and number and types of solar farms and/or wind turbines for the state of Utah to come close to its green energy potential. Include how to incorporate/expand/modify existing green energy production facilities. What are the key factors that shaped your proposal?

(c) Based on projected growth rate, what is the timeline you propose for achieving the maximum green energy potential in the state? To get started, you may wish to consider how long it will take to achieve 30%, 50%, or 70% of total potential? Propose ideas to accelerate the growth of clean energy, if you feel the current rate is too low.

Task 3: The technological world continues to change and the mix of energy production from fossil fuels, renewables (solar, wind), hydropower and nuclear (fission or fusion) energy will change. Comment on how these technologies might impact your analyses of the increasing wind power energy production.

Groups

Not every group member will earn the same score on their group project. The individual scores for group projects will vary based on the level of participation and contribution of each member.

Group Alpha	**Group One**	**Group A**
Ivan Centeno	Ali Bonkoski	Kourtnee Eden
Amber Deamer	Cinder Hartner	Aaron Jones
Draven Ochoa	Timothy Hatch	Logan Jones
Kyle Smith	Ai Vo	Reilly Williams
		Michael Wittig

Dates

Week of Sept 14:	Choose your individual area. Collect many relevant articles, information, data, etc. **Our science librarian Miranda Kispert**, mirandakispert@weber.edu **can be helpful.**
Week of Sept 21:	**Each student must meet me to discuss their individual area, information collected, etc.** Plan the write-up for your individual report.
Week of Sept 28:	Start writing your individual project.
	Groups will be finalized. Exchange information. Devise a plan for sharing information. **Choose a group project.** Assign roles to group members. All individual work should be carefully read and checked by one other person. There must be someone tasked to keep the group on schedule. Discuss how to proceed and what type of model to use. Start search for relevant articles. **Our science librarian Miranda Kispert**, mirandakispert@weber.edu **can be helpful.**
Week of Oct 5:	Plan your project. Start the modeling process.
Week of Oct 12:	**The groups must meet me and discuss their work.** Reassess your plan, as needed. Continue the modeling process.
Mon, Oct 19:	**Individual reports are due.**
Week of Oct 19:	Improve the model, test it, and develop the final model. Start the write up.
Mon, Oct 26:	Finish your model and consider how to improve it.
Week of Nov 2:	**The groups must meet me to once again discuss their work.** Finalize your model and finish the write up.
Week of Nov 9:	**Improve the write up and finalize your project.**
Week of Nov 16:	Verify calculations and check the spelling, grammar, etc. At least two people should read each part of the project. Check the resources. **Finish your project.**
Week of Nov 23:	Develop new versions for classroom presentation and submission for publication or presentation.
Nov 30 or Dec 2:	**Group Project are due.**
Dec 2 or 4:	**Opportunity for presentation in the classroom. Work on submitting your paper to appropriate journal**

Group Project Publication Submission

Choose one of the following to submit your work for publication. However, you are not limited to this publication list. Your work has to be re-arranged and rewritten to meet the publication or presentation requirement. Please carefully read requirements for each one. Be sure to include me in all emails regarding your submission.

Ergo, https://weber.edu/OUR/ergo-overview.html.

Involve: A Journal of Mathematics, https://msp.org/involve/about/cover/cover.html (Mathematical Science Publishers)

The Mathematics Exchange, https://lib.bsu.edu/beneficencepress/mathexchange/ (Ball State University)

Minnesota Journal of Undergraduate Mathematics, https://mjum.math.umn.edu/index.php/mjum/index (University of Minnesota)

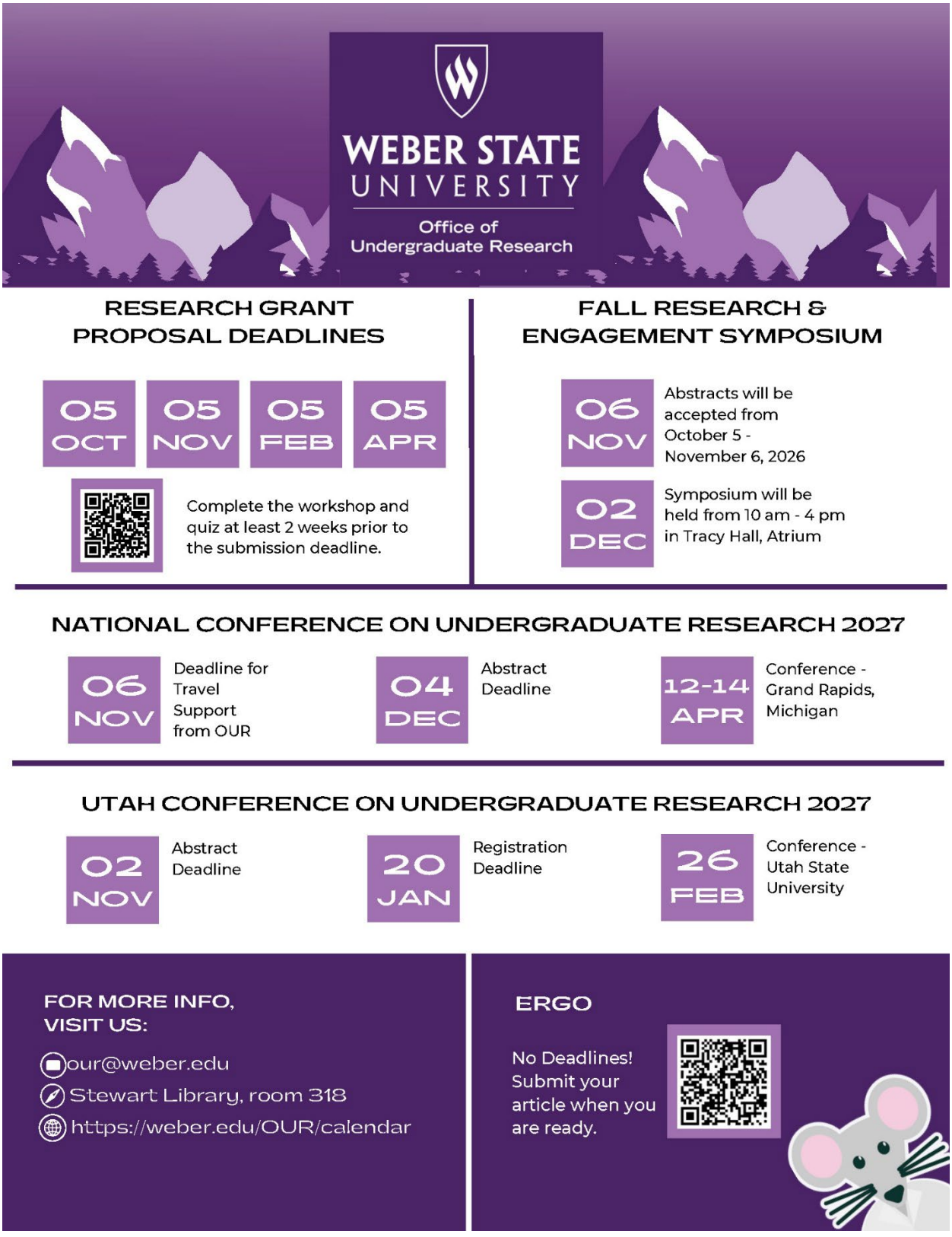
The Rose-Hulman Undergraduate Math Journal, https://scholar.rose-hulman.edu/rhumj/ (Rose-Hulman Institute of Technology)

SIAM Undergraduate Research Online, https://www.siam.org/publications/siuro (Society for Industrial and Applied Mathematics)

Utah academy of Sciences, Arts & Letters, http://www.utahacademy.org/academy-journal/

Intermountain Sustainability Summit, https://weber.edu/ISSummit/contact.html, Student Posters

A list of Opportunities in Undergraduate Research in WSU is below.



The spring semester dates are not included in above. Check their website later.


ERGO
Weber State University's Undergraduate Research Journal
SUBMIT YOUR RESEARCH
Get published. Share your research. Build your academic portfolio.
Now accepting Full-Length Articles from undergraduate students in ALL disciplines!
2,000 words of text or less
References, figures, tables, and graphics do not count toward the limit.