CWR 4204 – Hydraulic Engineering – Spring 2024

Engineering Project: Some Suggested Themes and Ideas

Reminder 1:

For details on water systems (e.g., water supply distribution network, sewer system, etc.) and on any hydraulic component (e.g. pump station, culvert, etc.), you may refer to textbook Chapters 4, 5 6, 7, 8, 9, 10 and 11. You may also refer to any of the references listed in our syllabus or other hydraulic references of your choice.

Reminder 2:

For details of the main contents of your project, refer to the section "Guidelines" of our Engineering Project Addendum. Crucial sections of your report are Objective(s), Theory, Methodology and Applications.

A. Design and/or analysis of any hydraulic component of a water system (existing or hypothetical). You may approach your design or analysis by considering a wide range of flows, such as low, medium and high.

1. Pipeline

2. Pump (or lift or booster) stations

3. Surge tanks

4. Culverts

5. Weirs

6. Spillways

7. Open channels, streams or rivers, in general "open channels" (sections or whole system, say a few kilometers or miles)

8. Detention or retention ponds

9. Ocean outfall

10. Sea water intrusion.

11. Drainage areas (small in urban or non-urban settings (less than 1000 hectares) - *this project topic is an option for the students who have already passed CWR3540-Water Resources Engineering.*

B. Design and/or analysis of any hydraulic component of a water system (existing or hypothetical). You may approach your design or analysis by considering a wide range of flows, such as low, medium,

and high. This option is like the above A, except that you will learn and use software in your design or analysis or both.

1. Pipeline

2. Pump (or lift or booster) stations

3. Surge tanks

4. Culverts

5. Weirs

6. Spillways

7. Gates (including Salinity Control Structures of South Florida)

8. Open channels, streams or rivers, in general "open channels" (sections or whole system, say a few kilometers or miles)

9. Detention or retention ponds

10. Ocean outfall

11. Sea water intrusion.

12. Drainage areas (small in urban or non-urban settings (less than 1000 hectares) - *this project topic is an option for the students who have already passed CWR3540-Water Resources Engineering.*

C. Design and/or analysis of any of the following systems (either existing or hypothetical). You should consider selecting, learning and implementing an available computer model.

1. Water supply distribution network (i.e., network) for a small community, residential area, commercial mall, airport (e.g., "Florida City, one of the Florida Keys like Marathon, City of Sunrise, Dolphin mall, etc.).

2. Water supply distribution system for a single dwelling, park, condo, high rise, farm, agricultural area. You may consider various scenarios of either design or analysis, for instance, assessing the effect of water conservation, effects of either population increase or decrease over years (e.g., 5, 10, 15, 20, 30 years, etc.)

3. Sanitary sewer collection system(s). For a conveyance pipeline like the one that provides water supply from the Biscayne Aquifer (extracted by wells) to the Florida Keys. You may consider assessing impacts by either water conservation scenarios or effects in water use caused by either population increases or decreases years (5, 10, 15, 20, 25 years).

4. Water reclamation and distribution system(s) like the system that is being built in the City of Miramar, Florida, that reclaims wastewater for irrigation of common areas within the city boundaries.

5. Dams and Hydroelectric power plants (e.g., small, medium, and large dams). You may study specific cases in either Florida, USA, or any other countries of your personal interest. You may characterize the

dam and then evaluate its technical performance analyzing to handle low, medium, or large flows. Both the hydraulic and the energy aspects in hydroelectric generation may be objectives of your project. Dams collect storm water, which is required to secure storage, hydroelectric power generation, water supply, etc.

6. Drainage system(s) (i.e., storm water collection) for a given urban or non-urban are (e.g., residential area, airport, mall, airport, school campus, park, farm, etc.). You could consider assessing the impacts of the variability of storms over time, including due to climate variability in space and time. *this project topic is an option for the students who have already passed CWR3540-Water Resources Engineering.*

D. Inventory and assessment of current and state-of-the-art measurement technologies (e.g., sensor technologies to measure depth of water in lakes and canals, velocity, and volumetric flow rate. The project must present the detailed theoretical explanation with examples of application in either laboratory or field settings. Literature review MUST include, at least, 5 peer-reviewed related journal articles on the related technologies.

E. Identification and analysis of the process of developing and testing physical models in studies of Hydraulic Similitude and Modeling, with detailed theoretical explanation and description, as it may be applicable. Literature review MUST document, at least 10 peer-reviewed journal articles that are related to the specifically focused physical model. Refer to Chapter 10 for basic information.

F. Examples of ideas and information about water systems, students may access and tour the following websites, among many others, in our South Florida region, state and country.

[FKAA, FL | Official Website](#)

[City of Sunrise, FL | Home (sunrisefl.gov)](#)

[Hollywood, FL - Official Website | Official Website (hollywoodfl.org)](#)

[Miramar, FL | Official Website (miramarfl.gov)](#)

[Hallandale Beach, FL - Official Website | Official Website (hallandalebeachfl.gov)](#)

[Water and Sewer Department (miamidade.gov)](#)

H. Consideration: *For those who already passed the required CWR3540-Water Resources Engineering, with Professor Fuentes, you may complete the hydrologic design of a drainage area (i.e., rural or urban). You may use consider implementing the computer model of TR-55, as part of your project; feel free to discuss it with the instructor.*