# CEE 165C/265C
# WATER RESOURCES MANAGEMENT
# Summer 2017
# Syllabus and Reading Assignments

Note on the Readings

The assigned readings from the Class Notes cover the material that we will discuss in class. You must read this material before you come to class on the date indicated in the table below.

The PowerPoint slides summarize the same material in bullet form and include some additional plots, maps and diagrams, some of which we will discuss in class. You must also review them before each class.

The time we will spend in class will be mostly to discuss the material you have read, to answer questions and expand on some key points. We will be asking you questions on the assigned reading material, so you must be well prepared for class.

Also, some weeks you will be assigned one more reading. These readings are four papers published in peer reviewed journals in the last three years. The purpose of the readings is to expose you to typical current technical publications related to the topics covered in class. You must read this additional material and write a 500-word reflection on it, which you will post on Canvas Discussions by midnight on Tuesday of the week of the assignment. In this reflection you are expected to express your opinion on the paper, whether you think it has value and whether you agree or disagree with the author's approach and conclusions. Please read each other's posts and comment/discuss these using the Canvas Discussions before the following class; we will discuss the readings together during the following class. Discussion on the Canvas Discussions of each other's posts will count towards your class participation grade.

# Day-by-Day Topics, Readings and Other Assignments

| | Date | Class Discussion Topic | Assignments | Required Readings |
|---|---|---|---|---|
| 1 | Tuesday<br>June 27 | Overview of CEE165C/265C<br>BASIC PRINCIPLES & CONCEPTS<br>▪ Water resources management principles; sustainability; supply vs. demand management; integrated water resources management<br>▪ Introduction to basic concepts of water resources management | | |
| 2 | Thursday<br>June 29 | BASIC PRINCIPLES & CONCEPTS (cont.)<br>▪ The hydrologic cycle; surface & groundwater resources; the non-uniform distribution of water resources in space and time; water budgets Hydrologic uncertainty<br>▪ Water scarcity; use of indicators; the severity of water scarcity in different countries around the world<br>▪ Uncertainty associated with climate change | ▪ Complete online Student Profile Survey by midnight.<br>▪ Select the topic of your term paper and sign up on the spreadsheet for term paper topics using Google doc by midnight | ▪ Class Notes: Chapter 1<br>▪ PPT slides: Units 1 & 2 |
| 3 | Thursday<br>July 6 | *Discussion of the term paper assignment selected by each student.*<br>RESERVOIR & LAKES<br>▪ Reservoir operation studies; operation rules (flood control, municipal and industrial water supply, irrigation, hydroelectric power<br>▪ Factors affecting the reservoir yield | ▪ Prepare to tell the class the topic of your term paper. | ▪ Class Notes: Chapter 2, Sections 2.1 through 2.4.2<br>▪ PPT slides: Units 3 & 4 |
| 4 | Tuesday<br>July 11 | RESERVOIR & LAKES (cont.)<br>▪ Deterministic resource assessment<br>▪ Probabilistic resource assessment<br>▪ Optimization of reservoir operation<br>▪ Water quality management | ▪ Upload a 500-word reflection on the assigned paper to Canvas Discussions by midnight | ▪ Class Notes: Chapter 2 Sections 2.4.3 through 2.7<br>▪ PPT slides: Units 5 & 6<br>▪ Werkheiser, I and Z. Piso, 2015: "People Work to Sustain Systems: A Framework for Understanding Sustainability", J. Water Resour. Plann. Manag., 2015, 141(12) |

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|---|---|---|---|---|
| 5 | Thursday July 13 | *Class discussion of Werkheiser and Piso, 2015*<br>RIVER BASINS AS MANAGEMENT UNITS<br>▪ River basin simulation models<br>▪ Management of small river basins | ▪ Prepare to discuss in class the 2015 paper by Werkheiser and Piso | ▪ Class Notes: Chapter 3<br>▪ PPT slides: Unit 7 |
| 6 | Tuesday July 18 | INTER-BASIN WATER TRANSFERS<br>▪ Examples of inter-basin water transfers around the world<br>▪ Water transfers from Northern to Southern California | ▪ Upload a 500-word reflection to Canvas Discussions by midnight.<br>▪ *Submit a brief description of your project with an annotated outline of your paper and selected references (up to two pages).* | ▪ Class Notes: Chapter 4<br>▪ PPT slides: Units 8<br>▪ George, M.W, R.H. Hotchkiss, and R. Huffaker, 2017: "Reservoir Sustainability and Sediment Management", J. Water Resour. Plann. Manag., 2017, 143(3) |
| 7 | Thursday July 20 | *Class discussion of George et al., 2017.*<br>TRANSBOUNDARY RIVER BASINS<br>▪ Interstate water allocation and management issues; example: the Colorado River basin<br>▪ Transnational issues in river basin management; example: the Nile River<br>▪ The Aral Sea basin | ▪ Prepare to discuss in class the 2017 paper by George et al | ▪ Class Notes: Chapter 5<br>▪ PPT slides: Units 9 |
| 8 | Tuesday July 25 | GROUNDWATER MANAGEMENT<br>▪ Basic concepts of subsurface hydrology relevant to groundwater management<br>▪ Groundwater resource assessment; aquifer characteristics; aquifer yield, etc<br>▪ Renewable groundwater resources; sustainable use | ▪ Upload 500-word reflection to Canvas Discussions by midnight. | ▪ Class Notes: Chapter 6, Sections 6.1, 6.2<br>▪ PPT slides: Units 10 &11<br>▪ Taye, M.T., T. Tadesse, G.B. Senay, and P. Block, 2016: "The Grand Ethiopian Renaissance Dam: Source of Cooperation or Contention?", Journal Water Resources Planning and Management, 142(11) |
| 9 | Thursday July 27 | *Class discussion of Taye et al, 2016.*<br>GROUNDWATER MANAGEMENT (cont.)<br>▪ Aquifer overexploitation; examples | ▪ Prepare to discuss in class the 2016 paper by Taye et al | ▪ Class Notes: Chapter 6, Sections 6.3, 6.4<br>▪ PPT slides: Units 11 and 12 |

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|---|---|---|---|---|
| | | ▪ Non-renewable groundwater resources; the pros and cons of aquifer mining; examples of fossil water mining<br>▪ Groundwater quality issues; groundwater quality degradation; monitoring; well head protection programs<br>▪ Artificial groundwater recharge; conjunctive use of surface and groundwater | | |
| 10 | Tuesday August 1 | NON-CONVENTIONAL SOURCES OF WATER<br>▪ Desalination; methods and technologies; the cost of desalination; environmental impacts of desalination plants; current trends in the desalination industry<br>▪ Treated Wastewater reuse; urban, industrial and agricultural reuse<br>▪ Rainwater management and rainwater harvesting | ▪ Upload 500-word reflection to Canvas Discussions by midnight. | ▪ Class Notes: Chapter 7<br>▪ PPT slides: Unit 13<br>▪ Sugg, Z.P., S. Ziaja, and E.C. Schlager, 2016: "Conjunctive groundwater management as a response to socio-ecological disturbances: a comparison of 4 western U.S. states", Texas Water Journal, vol 7, no 1, pp. 1-24. |
| 11 | Thursday August 3 | *Class discussion of Sugg et al, 2016.*<br>WATER USE<br>▪ Urban water use; overview and factors affecting urban use; examples of urban water use around the world<br>▪ Irrigation; overview of present irrigation use; parameters affecting irrigation requirements; water quality impacts of irrigation return flows<br>▪ Ecological demand | ▪ Prepare to discuss in class the 2016 paper by Sugg et al | ▪ Class Notes: Chapter 8<br>▪ PPT slides: Unit 14 |

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|---|---|---|---|---|
| 12 | Tuesday<br>August 8 | DEMAND MANAGEMENT<br>▪ Economic management options; water as an economic good; water supply and demand curves; the economic value of water; opportunity costs<br>▪ Demand management in urban water supply; cost recovery and pricing of urban water supply; water metering<br>▪ Demand management in irrigation from surface water; cost recovery; pricing practices in different countries<br>▪ Demand management in irrigation from groundwater | ▪ | ▪ Class Notes: Chapter 9, Section 9.1.1 through 9.1.5<br>▪ PPT slides: Unit 15 |
| 13 | Thursday<br>August 10 | DEMAND MANAGEMENT (cont.)<br>▪ Water markets; examples in California, Chile, India<br>▪ The concept of virtual water and the water footprint<br>▪ Technical tools and options for demand management;<br>▪ Administrative management tools and options | ▪ | ▪ Class Notes: Chapter 9, Section 9.1.6 through the end of the chapter<br>▪ PPT slides: Units 16 |
| 14 | Tuesday<br>August 15 | THE LEGAL FRAMEWORK OF WATER MANAGEMENT<br>▪ Water rights in the United States; surface water rights; groundwater rights; Federal reserved water rights; Interstate compacts and dispute resolution<br>▪ Water quality regulations in the United States;<br>▪ The legal framework in other countries<br>▪ Trans-national issues | | ▪ Class Notes: Chapter 10<br>▪ PPT slides: Unit 17 |
| 15 | Thursday<br>August 17 | THE INSTITUTIONAL FRAMEWORK OF WATER MANAGEMENT<br>▪ Organizations involved in water management; water infrastructure operation and maintenance organizations; water service organizations; organizations with regulatory responsibility; user associations | ▪ Upload an electronic version of your paper on Canvas, as well as all the references you used that are available electronically | ▪ Class Notes: Chapter 11<br>▪ PPT slides: Unit 18 |

| | Date | Class Discussion Topic | Assignments | Required Readings |
|---|---|---|---|---|
| | | ▪ The institutional framework of water management in the United States and other countries;<br>▪ Participatory management<br>▪ Private sector participation; examples | | |
| | Friday<br>August 18<br>3:30-- 6:30 pm | *<u>Final</u>: term project presentations* | ▪ *The presentation will be followed by questions*<br>▪ *Upload an electronic version of your PPT slides to Canvas.* | |