

## INTEGRATED WATER AND SOIL MANAGEMENT

Chapter (topic)		Lecture	Learning Activities	Learning objectives	Assesment	time allocated
global Water resources	1	Global Water Resources	Introduction lecture about WR and small quiz	to understand the concepts of the Hydrological cycle and different WRs nationally and internationally	Gamification	3 hours
Global water issues	2	Water scarcity	lecture about water shortages and international and national disputes and small quiz	discuss the future of global water resources, including problems of water scarcity and water security nationally and internationally.	Gamification	3 hours
	3	The impact of climate change on water resources	Lecture about the concepts and formalisms in atmosphere and climate sience; Climate Change: the Physsical science bassis + Quiz	Understand the basic concepts and formalisms employed in meteorology and climate science Understand the physical science basis underlying current knowledge on climate change	Gamification	3 hours
water resources management	4	Introduction to transdisciplinary WRM	introduction lecture about WRM	critically reflect on different disciplines involved in water management and identify role for own expertise	Gamification	3 hours
	5	Stakeholders analysis	Lecture and group work	Analyse different uses and users of water and argue the role different stakeholders play in WRM	Group assignment	3 hours
	6	Water governance and economy	Lecture and group work	water governance: Critically assess governance arrangement in transboundary water management and link to legal and policy frameworks  Water Economics: Explain basic principles of water economics, Assess water demand and productivity and its evolution over time	Group assignment	3 hours
integrated of water and soil management	7	DPSIR concept analysis	Lecture and group work	Apply DPSIR in the analysis of water management issues	Group assignment	3 hours
	8	SWAT Model Introduction	Lecture: Introduction, modle set up and process decription + Quiz		Gamification	3 hours
	9	Modeling procedures & model output analysis	Lecture about Modeling procedures & model output analysis		practical exercise	3 hours

River basin management using SWAT	10	Sensitivity analysis and calibration, SWAT-CUP, model procedures	Lecture and video about Sensitivity analysis and calibration, SWAT-CUP, model procedures	<p>(1) learns to go through the full procedure of applying surface water modelling tools including the building, the calibration and the use for scenario analysis</p> <p>(2) Learns the theoretical and the practical aspects behind the application of the SWAT (Soil and Water Assessment Tool) software</p> <p>(3) learns to do an evaluation/quality assessment and critical analysis of the modelling results</p> <p>(4) learns to do the editing of scientific reports and on the presentation of research results.</p> <p>(5) get experienced with project management by working in a multidisciplinary group work, and the independent search for information (including the use of the website).</p>	practical exercise	3 hours
	11	Introduction to QSWAT	a short introductory tutorial on how to set up the SWAT model.		practical exercise	3 hours
	12	SWAT model Building	Practical exercise: Model Building		Group assignment	3 hours
	13	SWAT model Building	Practical exercise: Model calibration and validation		Group assignment	3 hours
	14	Scenario analysis	Practical exercise and Intermediate group presentations		Group assignment	3 hours
Final Presentation	15	Final Presentation	Final presentation and final report	Final report + presentations	3 hours	

**Books**

IWA Specialist Groups, 2016. *Global Trends and Challenges in Water Science, Research and Management*. The Clyvedon Press Ltd, Cardiff, UK.

**Alternative Water Resources (P1-3)  
Groundwater (P44-48)**

Eslamian S. and Eslamian F. A., 2017. *Handbook of drought and water scarcity: environmental impacts and analysis of drought water*. CRC Press, New York, ISBN 9781315404226

**Chapter 1: Definition of Drought**

**Chapter 2: Desertification and Drought**

**Chapter 3: Meteorological Drought**

**Indicates: Definitions**

**Chapter 4: Hydrological Drought: Water Surface and Duration Curve Indices**

Link:

[https://books.google.com.vn/books?id=iyEvDwAAQBAJ&pg=PT5&hl=vi&source=gbs\\_selected\\_pages&cad=3#v=onepage&q&f=false](https://books.google.com.vn/books?id=iyEvDwAAQBAJ&pg=PT5&hl=vi&source=gbs_selected_pages&cad=3#v=onepage&q&f=false)

Grafton R. Q., Wyrwoll P., White C., Allendes D., 2014. *Global Water: Issues and Insights*. ANU Press. DOI:

<http://dx.doi.org/10.22459/GW.05.2014>

**Chapter 2 Economics**

**Chapter 3 Transboundary governance**

<https://press-files.anu.edu.au/downloads/press/p281381/pdf/book.pdf>

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F. Alternatively, they can sign up at  
<https://canvas.instructure.com/register> and use the following join code: DWXRRF