Environmental Monitoring (7.5 ECTS credits)

Course code: 746G47 and 746G29 (Swedish version)

Main responsible teacher and examiner: David Bastviken (DB)

Other teachers: Åsa Danielsson (ÅD), Magnus Gålfalk (MG)

Study administrator: Inger Rehnström and Susanne Eriksson

Course time: December 2019 to January 2020 (see TimeEdit at [www.liu.se](http://www.liu.se) for schedule).

# Literature

# **(NOTE: Not all literature below is mandatory – the literature will be discussed in detail when the course starts)**

* Framework document for the course - an example from the Council of Managers of National Antarctic Programs (COMNAP) and its Antarctic Environmental Officers Network (AEON) on how to design an environmental Monitoring program: https://www.comnap.aq/Publications/Comnap%20Publications/comnap\_guidelines\_practicalmonitoring\_2005.pdf
* Dodge R. I. and Congalton R. G. "Meeting Environmental Challenges with Remote Sensing Imagery" by Rebecca L. Dodge and Russell G. Congalton. AGI Environmental Awareness Series 2013. (<http://www.americangeosciences.org/sites/default/files/RemoteSensing.pdf>)

Recommended pages to read:

* + "What is Remote Sensing", p.1-27

Selected Case studies:

* + "Remote Sensing identifies Hail Damage to Crops", p.36-37
  + "Remote Sensing identifies Agricultural Problem Areas", p.48-49
  + "Remote Sensing Enables Census of Lake Water Quality", p.50-53
  + "Remote Sensing Monitors Vegetation Changes Over Time", p.58-61
  + "Remote Sensing Enables Space Shuttle Columbia Recovery", p.80-81
* Hemond H. F. and Fechner-Levy E. J. Chemical fate and transport in the environment. 2nd Edition. Academic Press. 433 pages. 2000. (Other Editions are fine as well.)
* Kraemer, H. C and Thiemann, S. (1987 or 2015). How many subjects? Statistical Power Analysis in Research. SAGE Publications. Any edition is fine.
* Meadows, D. H. (2008). Thinking in Systems. Chelsea Green, White River Junction, Vermont. 210 pp.
* Nirmala Khandan, N. (2001). Modeling Tools for Environmental Engineers and Scientists [online]. CRC Press, Boca Raton. Available from in the LiU library E-book collection from Taylor & Francis. Can be found via Databases on the LiU library web page.
* Statistical handbook: [www.statsoft.com/Textbook/Elementary-Statistics-Concepts](http://www.statsoft.com/Textbook/Elementary-Statistics-Concepts)
* Steinle, S., Reis, S. and Sabel, C.E. (2013) Quantifying human exposure to air pollution-Moving from static monitoring to spatio-temporally resolved personal exposure assessment. Science of the Total Environment 443, 184-193. (A glimpse into the future of environmental monitoring using sensor networks.) <http://nora.nerc.ac.uk/id/eprint/20732/1/N020732PP.pdf>
* The EMAP website describing a program to improve environmental monitoring of aquatic systems in the USA (<http://archive.epa.gov/emap/archive-emap/web/html/index.html>). Includes many documents of interest including a bibliography and research strategy documents (e.g. <http://archive.epa.gov/emap/archive-emap/web/pdf/emap_research_strategy.pdf>).
* The US EPA web portal with many links to monitoring of various environments (<http://www2.epa.gov/aboutepa/our-mission-and-what-we-do> ).
* Examples of Swedish environmental monitoring with related documents and databases
  + <https://www.naturvardsverket.se/Miljoarbete-i-samhallet/Miljoarbete-i-Sverige/Miljoovervakning/>
  + <https://www.slu.se/en/departments/aquatic-sciences-assessment/>
  + <https://www.slu.se/en/departments/soil-environment/environment/data-host/>
  + Vatteninformation i Sverige: <http://www.viss.lansstyrelsen.se/>
* Wheater, C. P. and Cook, P. A. (2000). Using Statistics to Understand the Environment. London: Routledge. Recommended reading for Block 3: Chapter 1, 5(p. 89-114) and 7 (p.135-150). For Block 5: Chapter 5 (p. 114-116), 6(p.159 – 170),