Title of the course: **Hydrobiology**	*NEPTUN-code:* RKWHB1EBNE	*Teaching hours:* *l+cw+lb* 2+0+1 Semester: 6	***Credit*:** 4 ***Exam type:*** midterm grade
Course leader: Prof. Hosam Bayoumi Hamuda PhD	***Position:*** associate professor	***Required preliminary knowledge:*** RKXOK1ABNE- Ecology	

Curriculum:

The water quality management is an extremely increasingly complex challenge and it has policy priority facing global society. Unprecedented climate, economic, technological and demographic change require a new generation of dedicated professionals who are committed to and trained in the interdisciplinary nature of water science and management. At the end of this course, students should be able to:

1. Develop a basic knowledge of the significance of fresh water systems, global distribution of fresh water and global water balance;
2. Describe the physical characteristics and chemical properties of water in relation to aquatic ecosystems;
3. Demonstrate an understanding of the dynamics of aquatic organisms and their interactions in fresh waters and related hydro-ecosystems;
4. Evaluate the impact of anthropogenic activities on fresh water resources including pollution, eutrophication and acidification of fresh waters

Professional competencies

Principles of hydrobiology: Introduction and Background: Scope and fields of hydrobiology. Types of natural water supplies and their main characteristics. Hydrological Cycle and its components. Global water Balance. Physical and chemical properties of water. Flowing water – Lotic Systems and Standing water – Lentic Systems. Hydro-ecosystem and Climate changes. Analysis of biodiversity in relation to environmental conditions. Structure and functions of communities in different hydro-ecosystems: size spectrum of organisms; Biodiversity, occurrence and role of virioplankton, bacterioplankton and eukaryotic organisms in hydro-ecosystem. Life strategies of aquatic organisms in relation to environmental factors

Applied hydrobiology: Relationship between phytoplankton and zooplankton biomass. Climatic changes and Environmental factors influences on total life diversity and community in hydro-ecosystem. Changes in the functional features of macrophyte communities. Adaptations of total life in water bodies. Production and energy flow in aquatic ecosystems. Biodiversity of various hydro-ecosystems. Biotic interactions and trophic relationships in various hydro-ecosystems. Trophic interactions: herbivory, grazing and competition; Resources versus predation; Control of food webs; Trophic cascade hypothesis. Bioindication of the ecological state of biotopes and assessment of the effects of anthropogenic factors on hydro-ecosystems. Problems associated with freshwater ecosystems: Water linked diseases; Antimicrobial activity of novel freshwater planctomycete phylogenetic bacteria. Water pollution: Causes; Effects of pollution on aquatic ecosystems. Pollution assessment of heavy metals in water bodies. Eutrophication, Parameters for measuring and monitoring eutrophication; Effects of eutrophication on receiving hydro-ecosystem; Problems of eutrophication on human societies; Control of eutrophication: Problems of restoration of eutrophic lakes. Measurement of water quality (Collection of water samples; Determination of water quality; Factors affecting water quality; Enumeration of microfauna in aquatic ecosystem; Acoustic sensor system to detect bacteria in an aquatic environment. Methods and parameter to assess the water and sediment quality according to European regulation (EU Water Framework Directive and EU Marine Strategy Directive); Different risk assessment procedures according to international and national regulation: for pesticides, wastewater; Persistence, Bioaccumulation, Toxicity and "veryP veryB"; Technologies for providing drinking water from different water sources. Domestic, industrial and agricultural wastewaters. Wastewater treatments. Biological methods. Treatment of sewage sludge (biogas production, composting). Future tasks of hydrobiology (effects of global warming, biomanipulation, drug residues in hydro-ecosystem)

Bibliography:

Working material of lecturers

Christer Brönmark; Lars-Anders Hansson (2005): The biology of lakes and ponds. 2. ed., reprint (with corr.). Oxford Univ. Press. ISBN: 0- 19-851612-6 0-19-851613-4

Drinan J.E., Spellman F. (2012): Water and Wastewater Treatment: Guide for the Nonengineering Professional. CRC Press, USA ISBN 9781439854006

Edzwald K. (2011): Water Quality and Treatment. Handbook of Drinking Water. American Water Works Assosiation, USA ISBN:9780071630115

Jacob Kalff (2003): Limnology: inland water ecosystems. Prentice Hall. Pearson Education. ISBN 0-13-033775-7

Michael J.and Mills D., (1990): Freshwater Ecology: Principles and Applications, Wiley-Blackwell,

Moss, B. (2010): Ecology of Fresh Waters: A View for the Twenty-First Century, Wiley-Blackwell,

Robert G. Wetzel (2001): Limnology: lake and river ecosystems. 3. Aufl., Acad. Press. ISBN: 0-12-744760-1

Winfried Lampert; Ulrich Sommer (2007): Limnoecology: the ecology of lakes and streams. 2. ed. Univ. Press. ISBN: 978-0-19-921393-1
Comment: