

# Structure of Higher Education System at Technische Universitaet Dresden

TEMPUS Project

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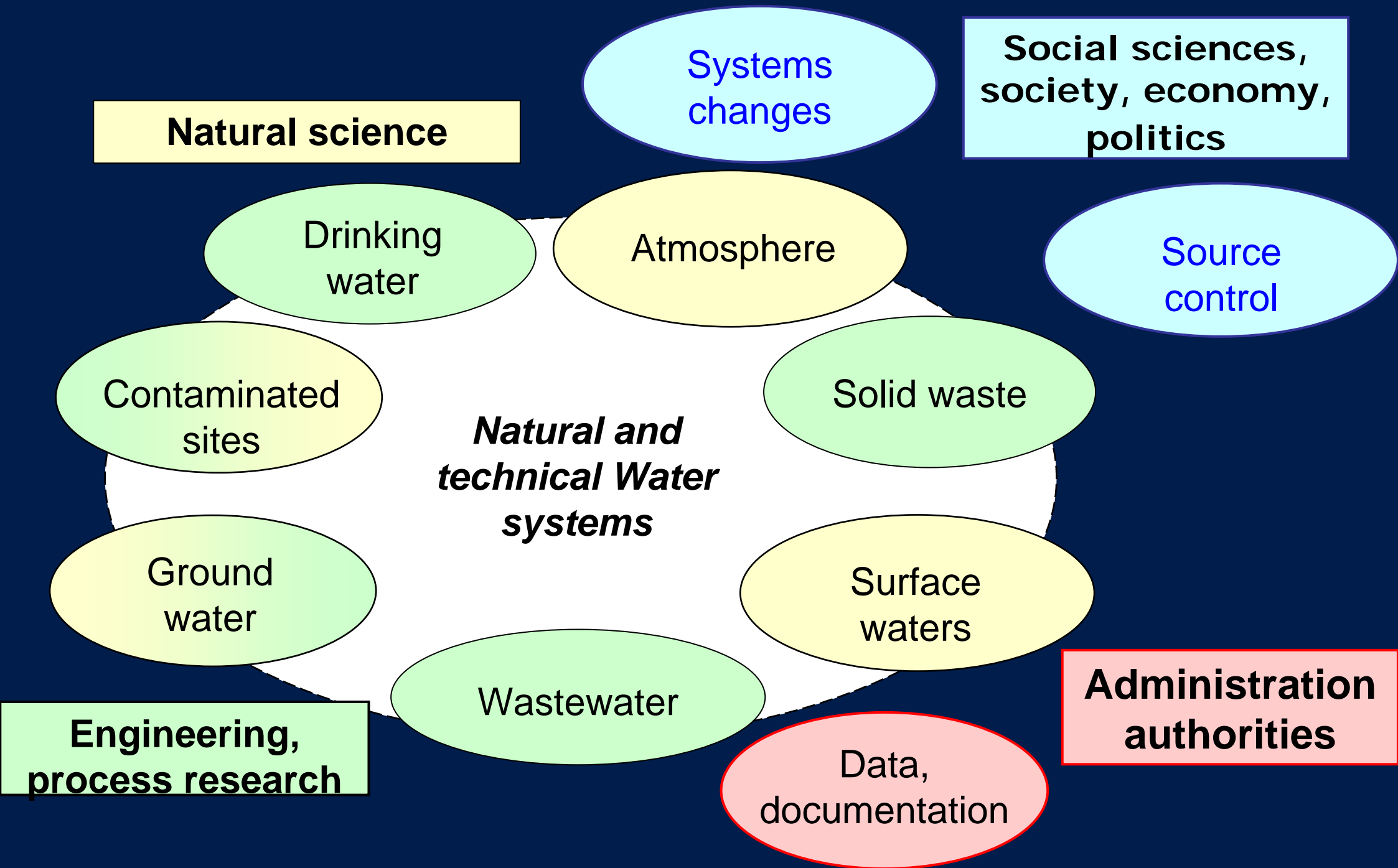
Damascus , January 10 2011

# Department of Hydro Sciences - Institutes

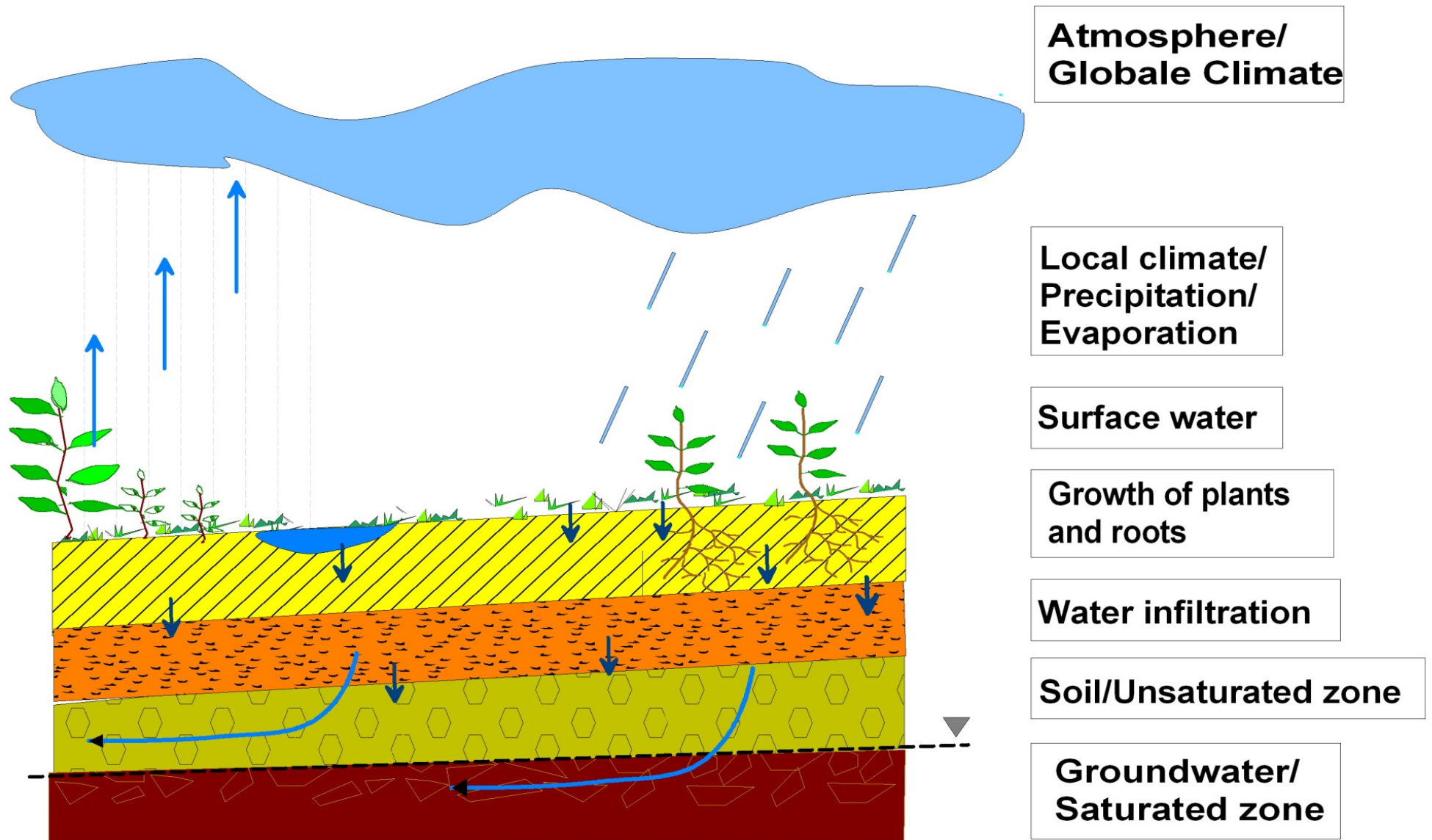
- Urban and Industry Water Engineering
- Hydrology and Meteorology
- Ground Water Management
- Hydrobiology
- Water Chemistry
- Waste Management & Contaminated Site Treatment

# Topics of Department of Hydro Sciences

- Risk management and development of concepts to protection of resources and to sustainable using of surface and subsurface water as well as soil
- Documentation and modelling in the field of environment and urban areas
- Regeneration and protection of soil
- Water resources management and rationing
- Effect of the climate change
- Consequence of desertification und salinisation
- Research of causes and effects as well as developing of solutions for local, regional and global context
- Interdisciplinary and transdisciplinary cooperation of engineers and natural scientists



# Water Cycle Sytem



# Higher Education – Bologna Process

- Consecutive Education with Bachelor (6 semesters) and Master's degree (4 semesters)
- Bachelor degree as interface for incoming und outgoing students
- Graduation: Master of Sciences
- Launching of Credit-Points (ECTS)
- Modularization of education
- Increasing of mobility
- Introduction and enhancement of quality assurance

# Study Programs - Hydro Sciences

## **Bachelor** ( 6 semesters)

1. Water Management
2. Waste Management and Contaminated Site Treatment
3. Hydrology

## **Master** (4 semesters)

1. Water Management
2. Waste Management and Contaminated Site Treatment
3. Hydrology
4. Hydro Biology
5. Hydro Sciences & Engineering

# Bachelor of Water Management

## 1. Modules with Basics in Mathematics and Natural Sciences

Mathematics – Physics –  
Hydrochemics - Hydrobiology

## 2. Modules with Basics in Engineering

Basics of Meteorology and Hydrology  
- Basics of Waste Management and  
Contaminated Site Treatment -  
Aquifers and Soil Science - Hydro  
Informatics – Geodesy - Basics of  
Engineering Mechanics - Basics of  
Hydromechanics - Basics of Water  
and River Engineering - Soil  
Mechanics and Engineering

## 3. Modules with specialized Basics

Basics of Water Supply - Basics of  
Water Management - Basics of Waste  
Water Systems - Basics of Urban  
Water Management - Water Contents  
- Applied Limnology - Dynamics of  
Subsurface Water - Drinking Water  
Supply - Waste Water Treatment -  
Applied Industrial Water Management  
- Applied Environmental Systems  
Analysis

## 4. Modules for general Qualification

Public law and water rights for non-  
Jurists



# Bachelor of Waste Man. and Cont. ST

## 1. Modules with Basics in Mathematics and Natural Sciences

Mathematics – Physics - Mathematical Statistics - Inorganic Chemistry and Hydro Chemistry - Physical Chemistry - Organic Chemistry and Biochemistry

## 2. Modules with Basics in Hydro Sciences

Basics of Meteorology and Hydrology - Aquifer and Soil Sciences - Basics of Water Supply - Basics of Water Management – Hydroinformatics - Basics of Waste Water Systems - Basics of Industrial Water Management

## 3. Modules with specialized Basics

Basics of WM and CST - Waste and Resources Management - Waste Disposal Technology – Recycling Technologies - Remediation of Contaminated Sites - Groundwater Remediation and new Technologies - Environmental Planning - Project Study Waste Management and Contaminated Site Treatment

## 4. Modules for general Qualification

Introduction in Professional and Scientific Languages  
Economical Basics for Engineering  
Public law and water rights for non-Jurists

# Bachelor of Hydrology

## 1. Modules with Basics in Mathematics and Natural Sciences

Mathematical Statistics – Physics -  
Hydro Chemistry - Hydro Biology

## 2. Modules with Basics in Engineering

Basics of Waste Management and  
CST - Aquifers and Soil Science -  
Basics of Water Supply - Hydro  
Informatics – Geodesy - Advanced  
Basics of Hydro Mechanics -  
Basics of Geo Informatics

## 3. Modules with specialized Basics

Basics of Meteorology and Hydrology  
- Basics of Water Management -  
Water Pollution Substances - Applied  
Limnology - Dynamics of Subsurface  
Water - Measuring Methods –  
Hydrometry – Meteorology –  
Hydrology - Hydrologic-meteorological  
Field Experience - Project Study  
Hydrology

## 4. Modules for general Qualification

Public law and water rights for non-  
Jurists

# Master „Water Management“ – Structure/Modules

|                |  |   |   |  |   |                      |
|----------------|--|---|---|--|---|----------------------|
| 1.<br>Semester | Groundwater<br>Management<br>by Computer<br>Models | Hydrogeologic<br>and<br>Hydrogeoche<br>mic Methods                | Modelling of<br>Waste<br>Water<br>Systems | Process Water<br>Treatment and<br>Internal Water<br>Management | Water<br>Transport<br>and<br>Distribution | Mandatory<br>Modules |
| 2.<br>Semester | Study<br>Project                                   | Seminar<br>Module Water<br>Management                             | Internship Water<br>Management            |  | Mandatory<br>Modules                      | Mandatory<br>Modules |
| 3.<br>Semester |  | Management<br>and<br>Optimization<br>of Waste<br>Water<br>Systems |   |  | Mandatory<br>Modules                      | Mandatory<br>Modules |
| 4.<br>Semester | Master Thesis                                      |   |   |  |   |                      |
| Credits        | 5  | 5   | 5   | 5  | 5   | 5                    |

# Offers for Mandatory Modules in Water Management

Case Study in Ground Water Management - Advanced Water Treatment - Water Transport and Distribution - Integrated Water Resource Management - Water, Energy and Resource Management for Enterprises - Systems Analysis for Hydro Geochemical Processes - Hydro Meteorology and Landscape Climate - Database Management and Analysis - River Basin Management - Soil Water Balance - Hydro Melioration - Flood Risk Management - Planning of Waste Treatment Plants - Assessment of Waste Management Processes - Assessment of Contaminated Sites - Applied Groundwater and Soil Remediation – Ecotoxicology - Ecological Modelling

# Master „Hydrology“ – Structure/Modules

|                |                        |                      |                              |                                |   |  |
|----------------|------------------------|----------------------|------------------------------|--------------------------------|---|--|
| 1.<br>Semester | Applied<br>Hydrology   | Climatology          | Hydrological<br>Models       | River Bassin<br>Management     | Applied<br>Meteorology<br>for<br>Hydrologists | Ground<br>Water<br>Management<br>by Computer<br>Models |
| 2.<br>Semester |                        |                      | Soil Water<br>Balance        | Seminar<br>Module<br>Hydrology | Mandatory<br>Modules                          | Mandatory<br>Modules                                   |
| 3.<br>Semester | Watershed<br>Modelling | Hydro<br>Melioration | Practical Training Hydrology |                                | Mandatory<br>Modules                          | Mandatory<br>Modules                                   |
| 4.<br>Semester | Master Thesis          |                      |                              |                                |   |  |
| Credits        | 5                      | 5                    | 5                            | 5                              | 5   | 5  |



# Offers for Mandatory Modules in Hydrology

Deepening Practical Training in Meteorology - Especially Aspects in Hydrology - Global Monitoring Systems - Flood Risk Management - Database Management and Analysis - Hydrogeological and Hydrogeochemical Methods - Modelling of Waste Water Systems - Management and Optimization of Waste Water Systems - Systems Analysis for Hydro Geochemical Processes - Case Study in Ground Water Management- Advanced Water Treatment - Water Transportation and Distribution - Integrated Water Resource Management - Applied Ground Water and Soil Remediation - Hydrobiology and Water Quality - Ecological Statistics and Systems Analysis – Ecotoxicology - Ecological Modelling - Ecology and Water Quality

# Master „Waste Management and Contaminated Site Treatment“ – Structure/Modules

|                |  |   |   |  |                                 |                      |
|----------------|--|---|---|--|---------------------------------|----------------------|
| 1.<br>Semester | Planning of<br>Waste<br>Treatment<br>Plants                | Evaluation of<br>Waste<br>Management<br>Processes | Evaluation of<br>Contaminated<br>Sites                    | Applied<br>Remediation of<br>Groundwater<br>and Soil | Mandatory<br>Modules            | Mandatory<br>Modules |
| 2.<br>Semester | Practical Training in<br>Environmental Technology<br>– CST |   | Practical Training in<br>Environmental Technology -<br>WM |  | Seminar<br>Module WM<br>and CST | Mandatory<br>Modules |
| 3.<br>Semester | Case Study<br>WM and<br>CST                                | Study Project WM and<br>CST                       |   | Internship WM and CST                                |                                 | Mandatory<br>Modules |
| 4.<br>Semester | Master Thesis  |   |   |  |                                 |                      |
| Credits        | 5  | 5   | 5   | 5  | 5                               | 5                    |

WM = Waste Management

CST = Contaminated Site Treatment

# Mandatory Modules in WM and CST

Waste and Resources Management - Waste-disposal Technology – Recycling Technologies - Exploration and Remediation of Contaminated Sites - Environmental Planning - Technical Thermodynamics - Fluid Mechanics - Energetic Wood Use - Process and Plant Engineering - Basics of Energy Machines - Paper-making Technique - Energy Machines - Nuclear Engineering - Engineering Thermodynamics - Ecology-oriented Information and Decision Tools - Planning and Optimization of Waste Water Systems - Process Water Treatment and Internal Water Management - Systems Analysis for Hydro Geochemical Processes - Advanced Water Treatment - Water, Energy and Resource Management for Enterprises - Operation of Wastewater Facilities - Database Management and Analysis - Environment and Radiochemistry - Wood and Plant Chemistry - Water Analytics - Chemical Water Technology



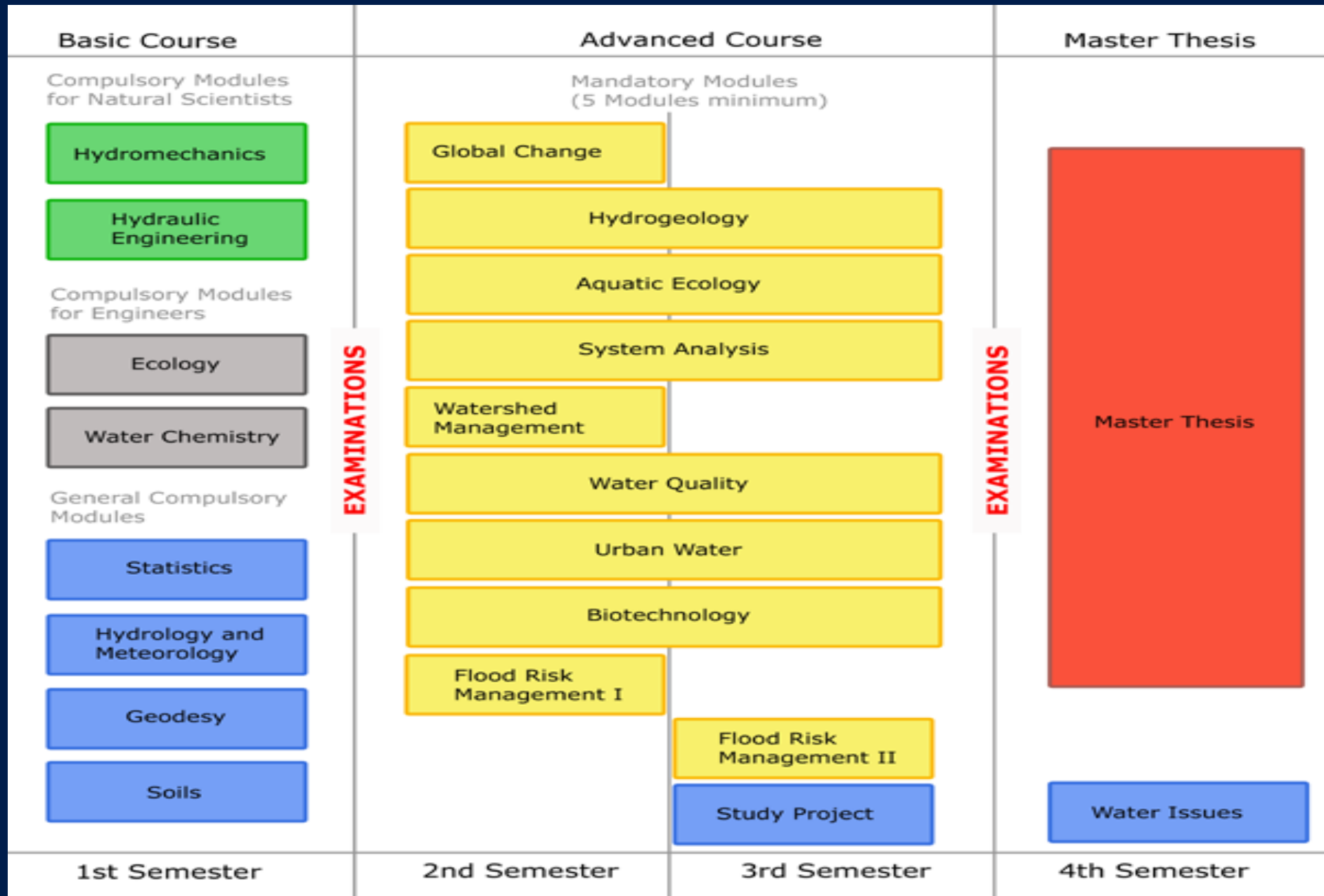
# Master „Hydrobiology“ – Structure/Modules

|                |  |  |  |   |                      |                      |
|----------------|--|--|--|---|----------------------|----------------------|
| 1.<br>Semester | Hydrobiology<br>and Water<br>Quality                 | Ecological Statistics<br>and Systems<br>Analysis |  |   | Ecotoxicolo<br>gy    | Mandatory<br>Modules |
| 2.<br>Semester |  |  | Ecological and Molecular<br>Biodiversity |   | Mandatory<br>Modules | Mandatory<br>Modules |
| 3.<br>Semester | Practical Training and<br>Seminar in<br>Hydrobiology |  | Research Internship in<br>Hydrobiology   |   | Mandatory<br>Modules | Mandatory<br>Modules |
| 4.<br>Semester | Master Thesis  |  |  |   |                      |                      |
| Credits        | 5  | 5  | 5  | 5 | 5                    | 5                    |

# Offers for Mandatory Modules in Hydrobiology

Deepening in Ecotoxicology - Ecological Modelling - Ecology and Water Quality - Deepening in Biodiversity - Hydro Meteorology and Landscape Climate - Database Management and Analysis - Assessment of Waste Management Processes - Assessment of Contaminated Sites - Applied Groundwater and Soil Remediation - Applied Hydrology - Hydrological Models - River Basin Management - Watershed Modelling - Applied Meteorology for Hydrologists - Soil Water Balance - Ground Water Management by means of Computer Models - Hydrogeological and Hydrochemical Methods - Treatment Plant Design - Systems Analysis for Hydro Geochemical Processes - Case Studies in Ground Water Management - Advanced Water Treatment - Water Transport and Distribution - Water, Energy and Ressource Management for Enterprices - Water Resource Management for Enterprices - Environmental Planning

# Master „Hydrosience and Engineering“ – Structure/Modules



# Research at Technische Universität Dresden

# The TU Dresden is one of the three biggest universities in Germany

- 4 sciences (natural, medicine, Humanities and Social, engineers)
- 14 faculties
- 35.000 students
- 8.000 employees
- **Total budget 500 mill. Euros,**
- **Approx. 108 mill. Euros third-party-funded**  
(third-party funds for research and other specific projects by industry, enterprise, governances as well as EU)

# Faculty of Forest, Geo and Hydro Sciences

The association of the scientific fields forest, geo and hydro sciences under one umbrella is uniquely in Germany

Research areas are derived from global problems:

- Developing and sustainable protection of the human living space
- Regeneration and protection of the limited resources soil and water
- Consequence of the industrialisation, environmental pollution as well as urbanisation
- Effect of the climate change and the Global change
- Preservation of the biological variety in flora and fauna

# The Faculty Profile Lines

- The Faculty is concerned with TU Dresden Profile Lines  
No. 5 - Water, Energy and Environment  
and  
No. 4 - Population, Infrastructure and Transport
- It touches, however, also the Profile Line  
No.3 - Information Systems Technology  
as well as Profile Line  
No. 2 - Material engineering, biomaterials,  
nanotechnology

# The Faculty Topics:

- Monitoring, modelling and visualization of the system Earth
- Integrated management of water resources including ecotechnology
- Water balance and change of physical, chemical and biological components in aquatic systems
- Forests and trees as tools for global, regional and urban risk management
- Sustainable development and value added in rural regions: resources and energy from forests
- Geo-information technologies for the generation of geo-data infrastructure
- Regional development, regional planning, and environmental management as associated with demographic change and sustainability



# Innovation at the TUD

- Mechatronics, an interdisciplinary course with the faculties of mechanical engineering, transport and traffic engineering and electrical engineering
- research at the BIOTEC Center: joint co-operation between chemists, physicists, doctors, materials scientists and biologists
- business start-up initiative „Dresden exists“: active support for converting research results into the formation of a company
- the Patent Information Centre (PIZ), has a very high number of yearly patents (approx. 70 per year)



# Knowledge builds bridges

- This LOGO of TUD is an expression for the Mission Statement:
  - to promote interdisciplinarity in teaching and research and to contribute to the integration of science and society.
  - to foster the international character of the university
  - to combine tradition with innovation, thereby benefiting from the historic cultural landscape of the Free State of Saxony and the city of Dresden
  - to contribute to the performance and power of enterprises and institutions of the region and beyond by pursuing knowledge and research transfer
  - Excellence is born of the conjunction between outstanding research and passionate teaching
  - Companies gain from the TU Dresden graduates with high professional and social skills

# TUDAG: "Marketing knowhow - Designing the future,,

TUDAG = Association of Friends and Promoters of TU Dresden (registered association) and, on the basis of an effective company network of university-related enterprises and the responsibility of the Friends and Promoters of TU Dresden

- Implements an optimal combination of opportunities and chances of the university as an institution of public law and the private sector of law of the partners.
- It makes possible the effective transfer of knowledge from research and teaching to the commercial market, which allows meeting the ever-growing needs of the society in a flexible manner.

The result is a TUDAG Enterprise Group which is oriented toward steady growth and a process of value creation for accomplishments by TU Dresden, whose results are again returned to the university in manifold ways