Geo-Informationssysteme (Geoinformation Systems)

RESE M T3a

Relevance for ResEngin curriculum: compulsory elective

Administration
Inst. f. Photogrammetrie & Fernerkundung

Contact: joachim.wiesel@kit.edu

Term(s) offered: 3rd (Winter Oct-Mar)

Duration: 1 term; every year

Language of instruction: German

Prerequisites: Bachelor, German language proficiency at DSH level

Module coordinator: WIESEL, Dr.-Ing. Joachim; IPF

Learning outcomes: Description see p. 2.

Literature / Course materials: Reference list see p. 3.

Basis for module(s): not applicable

Intersection with module(s): not applicable

M3 Geoinformatics

Lecture courses
(training mode)

20712/3 GIS für Studierende aller Fachrichtungen
(lecture, exercise)

SUM 5.0 CP 2+2 WCH

Workload specification
(30 work hours → 1 CP acc. to ECTS) 5 x 30 h 150 h

Lecture Phase:
Contact hours
Self instruction hours 42 h
Lab work 21 h
Exam Preparation 21 h

Exam Phase:
Self instruction hours 45 h

Module examination(s)
(mode | scope | weighting)

“Geo-Informationssysteme”
written | 90 min | 5.0/5.0 CP

Lecturers
(in alphabetic order)

RÖSCH, Dr.-Ing. Norbert; IPF
WIESEL, Dr.-Ing. Joachim; IPF

Individual lecture courses

Descriptions + Recommended background knowledge see p. 4.
### Module T3a: “Geoinformation Systems” (cont.)

#### Module topic

Specific requirements in Geo-Information-Systems (GIS).

#### Learning outcomes

**Disciplinary knowledge**
- **concepts, theories & definitions**
  reference systems, computer science.
- **subject matter (factual data, examples)**
  spatial data modeling, acquisition of spatial data, spatial analysis; cartographic visualization; application software, 3D extension.
- **methods & procedures**
  handle spatial data and apply software (e.g. ArcGIS); analysis and presentation of spatial data; focusing on topological and statistical (2D) analysis methods in GIS; handling database systems; conducting a GIS project.

**Professional skills**
- Diagnostic competence, problem solving, analytical skills, decision competence, IT and computer skills.

**Personal competence**
- n.a.
Module T3a: “Geoinformation Systems” (cont.)

**Literature/ Course material**


**Lecture notes**

- ESRI ArcGIS Tutorials (www.esri.com)
Module T3a

**Course**

Geo-Informationssysteme
(Geo-Information-Systems)

**Course**

**GIS für Studierende aller Fachrichtungen**
(GIS for students of all disciplines)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>Relevance</th>
<th>Prerequisites</th>
<th>Term(s)</th>
<th>Language</th>
<th>Training mode</th>
<th>Workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>20712/13</td>
<td>compulsory elective</td>
<td>Bachelor, German proficiency (DSH level)</td>
<td>3rd term (winter)</td>
<td>German</td>
<td>Lecture, 2 WCH, Exercise, 2 WCH</td>
<td>5.0 CP  ⇒  150.0 h</td>
</tr>
</tbody>
</table>

**Workload specification**

<table>
<thead>
<tr>
<th>LECTURE PHASE</th>
<th>Contact (based on 2 WCH)</th>
<th>21.0 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self instruction</td>
<td>42.0 h</td>
<td></td>
</tr>
<tr>
<td>Lab work</td>
<td>21.0 h</td>
<td></td>
</tr>
<tr>
<td>Exam preparation</td>
<td>21.0 h</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAM PHASE</th>
<th>Self-instruction</th>
<th>45.0 h</th>
</tr>
</thead>
</table>

**Contact**

norbert.roesch@kit.edu
joachim.wiesel@kit.edu

**Lecturer(s)**

RÖSCH, Dr.-Ing. Norbert; IPF
WIESEL, Dr.-Ing. Joachim; IPF

**Course topic**

Specific requirements in Geo-Information-Systems (GIS). Use GIS as a decision support tool for land management, hydrology, infrastructure planning, and management.

**Recommended background knowledge**

n.a.

**Learning outcomes**

- **Disciplinary knowledge**
  - concepts, theories & definitions
    - reference systems, computer science.
  - subject matter (factual data, examples)
    - spatial data modeling, acquisition of spatial data, spatial analysis; cartographic visualization; application software, 3D extension.
  - methods & procedures
    - handle spatial data and apply software (e.g. ArcGIS); analysis and presentation of spatial data; focusing on topological and statistical (2D) analysis methods in GIS; handling database systems; conducting a GIS project.

- **Professional skills**
  - Diagnostic competence, problem solving, analytical skills, decision competence, IT and computer skills.

- **Personal competence**
  - n.a.

**Assessment specification**

- written 90 min = module exam "Geo-Informationssysteme"
- oral ---
- other ---

* WCH = Weekly Contact Hours
### Straßenbau
(Road Construction Management)

<table>
<thead>
<tr>
<th>Relevance for ResEngin curriculum</th>
<th>compulsory elective</th>
<th>Administration</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Inst. f. Straßen- &amp; Eisenbahnenwesen</td>
<td><a href="mailto:matthias.zimmermann@kit.edu">matthias.zimmermann@kit.edu</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term(s) offered</th>
<th>2nd (Apr–Sept) + 3rd (Winter Oct–Mar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration Cycle</td>
<td>2 terms; every year</td>
</tr>
<tr>
<td>Language of instruction</td>
<td>German</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German language proficiency at DSH level</td>
</tr>
</tbody>
</table>

| Module coordinator | Roos, Dr.-Ing. Dr.h.c. (Sofia) Ralf, Ord.; ISE [Modulverantwortlicher] |
| Learning outcomes | Description see p. 2. |
| Literature / Course materials | Reference list see p. 3. |

| Basis for module(s) | not applicable |
| Intersection with module(s) | M 6 Infrastructure Engineering & Management |

| Lecture courses | 19605 Entwurf & Bau von Straßen (lecture, exercise) | 3.0 CP 1+1 WCH |
|                | 19309 Entwurf einer Außerortsstraße (exercise) | 2.0 CP 0+2 WCH |
| SUM            | 5.0 CP 4 WCH |

| Workload specification | (30 work hours → 1 CP acc. to ECTS) |
|                       | 5 x 30 h 150 h |

| Lecture Phase | Contact hours 42 h |
| Self instruction hours | 63 h |

| Exam Phase | Self instruction hours 45 h |

| Module examination(s) | “Straßenbau” oral | 20 min | 3.0/5.0 CP |
|                       | „Außerortsstraße“ oral | 20 min | 2.0/5.0 CP |

| Lecturers | Roos, Dr.-Ing. Dr.h.c. (Sofia) Ralf, Ord.; ISE |
|          | ZIMMERMANN, Dr.-Ing. Matthias; ISE |

| Individual lecture courses | Descriptions + Recommended background knowledge see pp. 4. |
Module T3b: “Road Construction Management” (cont.)

Module topic

Highway design as a basis for decision making under variant conditions and challenges in real highway design and road construction.

Learning outcomes

Disciplinary knowledge

- concepts, theories & definitions
  Learning the steps of practical design of a real road.

- subject matter (factual data, examples)
  Testing of highway designs (spatial road alignment, road safety); at-grade and grade-separated junctions; cross section and junction layout (criteria: safety and economy); mineral aggregates and binder, asphalt, concrete and cobble stone pavements; drainage.

- methods & procedures
  Methods in further tasks of highway design and road construction; testing methods of highway design effects.
  Design of a real-case rural road in practice.

Professional skills

- Analysis of complex interrelationships; critical thinking and decision making in this context.
- Analysis of complex interrelationships concerning traffic impact, safety, environment.
  Problem identification and solution finding under real conditions. To plan and to design a bypass road (layout in location and elevation, cross section layout, junction design, drainage).

Personal competence

- To get ready to test the effects of highway design on safety and traffic aspects.
- Team Work.
Module T3b: “Road Construction Management” (cont.)

Literature/ Course material


Richtlinien für die Standardisierung des Oberbaus von Verkehrsflächen (RStO 2001)
Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) Nr. 499
FGSV-Verlag

Richtlinien für die Anlage von Stadtstraßen (RASt 2006)
Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) Nr. 200
FGSV-Verlag, ISBN 978-3-939715-21-4

Richtlinien für integrierte Netzgestaltung (RIN 2008)
Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) Nr. 121

Richtlinien für die Anlage von Autobahnen (RAA 2008)
Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) Nr. 202
FGSV-Verlag, ISBN 978-3-939715-51-1

Lecture notes

Module T3b
(Road Construction Management)

Course
Entwurf und Bau von Straßen
(Highway Design & Road Construction)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19065</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Lecture, 2 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>3.0 CP ⇒ 90.0 h</td>
</tr>
</tbody>
</table>

**Workload specification**

<table>
<thead>
<tr>
<th>LECTURE PHASE</th>
<th>21.0 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact (based on 2 WCH)</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>42.0 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAM PHASE</th>
<th>27.0 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-instruction</td>
<td>27.0 h</td>
</tr>
</tbody>
</table>

**Contact**
matthias.zimmermann@kit.edu

**Lecturer(s)**
ROOS, Dr.-Ing. Dr.h.c. (Sofia) Ralf, Ord.; ISE
ZIMMERMANN, Dr.-Ing. Matthias; ISE

**Course topic**
Highway design and road construction as a basis for decisions under variant conditions.

**Recommended background knowledge**
Road Infrastructure Management.

**Learning outcomes**

**Disciplinary knowledge**
- concepts, theories & definitions
- subject matter (factual data, examples)
  testing of highway designs (spatial road alignment, road safety); at-grade and grade-separated junctions; cross section and junction layout (criteria: safety and economy); mineral aggregates and binder, asphalt, concrete and cobble stone pavements; drainage.
- methods & procedures
  methods in further tasks of highway design and road construction; Testing methods of highway design effects.

**Professional skills**
Analysis of complex interrelationships; critical thinking and decision making in this context.

**Personal competence**
To get ready to test the effects of highway design on safety and traffic aspects

**Assessment specification**
written ---
oral 20 min = partial module exam “Straßenbau”
other ---

*WCH = Weekly Contact Hours*
Module T3b
(Straßenbau
(Road Construction Management))

Course

Entwurf einer Außerortsstraße
(Design of a Rural Road)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>Relevance</th>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>19309</td>
<td>compulsory elective</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Term(s)</th>
<th>Language</th>
<th>Training mode</th>
<th>Workload</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor,</td>
<td>3rd term (winter)</td>
<td>German</td>
<td>Exercise, 2 WCH</td>
<td>2.0 CP  ⇒ 60.0 h</td>
<td></td>
</tr>
<tr>
<td>German proficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DSH level)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LECTURE PHASE
Contact (based on 2 WCH) 21.0 h
Self instruction 21.0 h

EXAM PHASE
Self-instruction 18.0 h

Contact
matthias.zimmermann@kit.edu

Lecturer(s)
ROOS, Dr.-Ing. Dr.h.c. (Sofia) Ralf, Ord.; ISE
ZIMMERMANN, Dr.-Ing. Matthias; ISE

Course topic
Challenges in real highway design. Economic ways of highway design with special emphasis on traffic safety.

Recommended background knowledge
Road Infrastructure Management.

Learning outcomes
Disciplinary knowledge
- concepts, theories & definitions
  learning the steps of practical design of a real road.
- subject matter (factual data, examples)
  s. Entwurf und Bau von Straßen.
- methods & procedures
design of a rural road in practice with real background.

Professional skills
Analysis of complex interrelationships concerning traffic impact, safety, environment. Problem identification and solution finding under real conditions. To plan and to design a bypass road (layout in location and elevation, cross section layout, junction design, drainage).

Personal competence
Team Work.

Assessment specification
written ---
oral 20 min = partial module exam “Außerortsstraße”
other ---
## Transportation

### Relevance for ResEngin curriculum
- compulsory elective

### Administration
- Inst. f. Verkehrswesen
- peter.vortisch@kit.edu

### Term(s) offered
- 2nd (Apr–Sept) + 3rd (Winter Oct–Mar)

### Duration | Cycle
- 2 terms; every year

### Language of instruction
- English

### Prerequisites
- Bachelor, German language proficiency at DSH level

### Module coordinator
VORTISCH, Dr.-Ing. Peter, Ord.; IfV

### Learning outcomes
- Description see p. 2.

### Literature / Course materials
- Reference list see p. 3.

### Basis for module(s)
- not applicable

### Intersection with module(s)
- M 6 Infrastructure Engineering & Management

### Lecture courses
- (training mode)
  - xxxxx Traffic & Transport Planning (lecture)
    - 3.0 CP 2 WCH
  - xxxxx Traffic Modeling & Simulation (labcourse)
    - 2.0 CP 2 WCH
  - **SUM** 5.0 CP 4 WCH

### Workload specification
- (30 work hours → 1 CP acc. to ECTS) **5 x 30 h 150 h**
- **Lecture Phase:**
  - Contact hours 42 h
  - Self instruction hours 42 h
  - Exam preparation 21 h
- **Exam Phase:**
  - Self instruction hours 45 h

### Module examination(s)
- (mode | scope | weighting)
  - "Transportation" written | 60 min | 5.0/5.0 CP

### Lecturers
- (in alphabetic order)
  - VORTISCH, Dr.-Ing. Peter, Ord.; IfV

### Individual lecture courses
- Descriptions + Recommended background knowledge see pp. 4.
Module T3c: “Transportation” (cont.)

Module topic

Concepts of strategically transport planning and planning processes, techniques of transport supply and demand analysis, principles of transportation modeling and integrated network planning, techniques used to control traffic in road networks, the role of modeling in transport planning, the stochastic nature of simulation results, and data required for transport models.

Learning outcomes

Disciplinary knowledge

- **concepts, theories & definitions**
  Transportation planning, transportation models, traffic engineering. Macroscopic and microscopic models of travel demand and road traffic.

- **subject matter (factual data, examples)**
  Analysis of transportation supply and demand, travel demand, surveying the travel demand, mode choice, route choice and assignment, traffic flow and traffic control, ecological impact of transport, traffic flow fundamentals, traffic control. Car-following and lane-change models, macroscopic traffic flow models, stochasticity in simulation models, network modelling, public transport modelling, pedestrian behaviour models, evaluations from simulations, modelling heterogeneous traffic.

- **methods & procedures**
  Estimating and forecasting travel demand, assessing the impacts of transport planning measures, design of signal control programs. Modelling of traffic infrastructure, calibration of simulation models, organization of simulation studies and projects.

Professional skills

- Expertise in problem solving capability in urban transportation.
- Written and verbal expression for the presentation of transport planning processes.

Personal competence

- n.a.
Module T3c: “Transportation” (cont.)

Literature/ Course material

### Course

#### Module T3c

#### Traffic & Transport Planning

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19612</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Lecture, 2 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>3.0 CP → 90.0 h</td>
</tr>
</tbody>
</table>

#### Workload specification

<table>
<thead>
<tr>
<th></th>
<th>LECTURE PHASE</th>
<th>EXAM PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contact (based on 2 WCH)</td>
<td>Self instruction</td>
</tr>
<tr>
<td></td>
<td>21.0 h</td>
<td>42.0 h</td>
</tr>
<tr>
<td></td>
<td>Self instruction</td>
<td>27.0 h</td>
</tr>
</tbody>
</table>

| Contact             | peter.vortisch@kit.edu |

#### Lecturer(s)

VORTISCH, Dr.-Ing. Peter, Ord., IfV

#### Course topic

(a) Concepts of strategically transport planning and planning processes, (b) techniques of transport supply and demand analysis, (c) principles of transportation modeling and integrated network planning, and (d) techniques used to control traffic in road networks.

#### Recommended background knowledge

n.a.

#### Disciplinary knowledge

- **concepts, theories & definitions**
  - transportation planning, transportation models, traffic engineering,
- **subject matter (factual data, examples)**
  - analysis of transportation supply and demand, travel demand, surveying the travel demand, mode choice, route choice and assignment, traffic flow and traffic control, ecological impact of transport, traffic flow fundamentals, traffic control.
- **methods & procedures**
  - estimating and forecasting travel demand, assessing the impacts of transport planning measures, design of signal control programs.

#### Professional skills

Expertise in problem solving capability in urban transportation; written and verbal expression for the presentation of transport planning processes.

#### Personal competence

n.a.

#### Assessment specification

- **written** 60 min = module exam "Transportation" together with LV Transport Modeling & Simulation
- **oral** ---
- **other** ---

* WCH = Weekly Contact Hours
## Course

**Transport Modeling & Simulation**

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxxxx</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevance</th>
<th>compulsory elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>3rd term (winter)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Labcourse, 2 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>2.0 CP =&gt; 60.0 h</td>
</tr>
</tbody>
</table>

**LECTURE PHASE**
- Contact (based on 2 WCH) 21.0 h
- Exam preparation 21.0 h

**EXAM PHASE**
- Self instruction 18.0 h

**Contact**
peter.vortisch@kit.edu

### Lecturer(s)

VORTISCH, Dr.-Ing. Peter, Ord.; IfV

### Course topic

(a) role of modelling in transport planning,
(b) stochastic nature of simulation results,
(c) data needs for transport models.

Transport simulation models are a common tool in transport planning and traffic engineering. Especially in rapidly growing urban agglomerations transport planning must use computer models to cope with the steadily increasing travel demand since transport planning cannot rely on decades of planning experience as in developed countries.

### Recommended background knowledge

n.a.

### Learning outcomes

**Disciplinary knowledge**
- concepts, theories & definitions
  - macroscopic and microscopic models of travel demand and road traffic.
- subject matter (factual data, examples)
  - car-following and lane-change models, macroscopic traffic flow models, stochastics in simulation models, network modelling, public transport modelling, pedestrian behaviour models, evaluations from simulations, modelling heterogeneous traffic.
- methods & procedures
  - (a) modelling of traffic infrastructure, (b) calibration of simulation models, (c) organization of simulation studies and projects.

### Professional skills

n.a.

### Personal competence

n.a.

### Assessment specification

<table>
<thead>
<tr>
<th>written</th>
<th>60 min</th>
<th>= module exam “Transportation” together with LV Traffic &amp; Transport Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>oral</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>other</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

* WCH = Weekly Contact Hours
## Environmental Disaster Management

**RESE M T3d**

<table>
<thead>
<tr>
<th>Relevance for ResEngin curriculum</th>
<th>compulsory elective</th>
<th>Administration</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ResEngin-Office</td>
<td><a href="mailto:res.eng@kit.edu">res.eng@kit.edu</a></td>
</tr>
</tbody>
</table>

**Term(s) offered**: 2nd (Summer Apr–Sept)

**Duration | Cycle**: 1 term; every year

**Language of instruction**: English/ German

**Prerequisites**: Bachelor, German language proficiency at DSH level

**Module coordinator**: KÄMPF, Dr.rer.nat. Charlotte; IWG_WK

**Learning outcomes**: Description see p. 2.

**Literature / Course materials**: Reference list see p. 3.

**Basis for module(s)**: not applicable

**Intersection with module(s)**: M 7 Integrated Projects

### Lecture courses

- **19613 Environmental Disaster Management**
  - Lecture, excursions
  - 5.0 CP
  - 5.0 CP
  - 2+1 WCH
  - SUM
  - 5.0 CP
  - 4 WCH

**Workload specification**: (30 work hours → 1 CP acc. to ECTS)
- 5 x 30 h = 150 h

**Lecture Phase**: Contact hours
- 21.0 h
- 42.0 h
- 10.5 h
- 31.5 h

**Exam Phase**: Self instruction hours
- 45.0 h

**Module examination(s)**
- "Disaster Management" report | 4.000 words | 5.0/5.0 CP

### Lecturers

- KÄMPF, Dr.rer.nat. Charlotte; IWG-WK
- KRON, Dr.-Ing. Andreas; IWG-WK/CEDIM
- NOLTE, Eike Marie; CEDIM
- WENZEL, Dr.rer.nat. Friedemann, Ord.; CEDIM

### Individual lecture courses

- Descriptions + Recommended background knowledge see p. 4.
Module T3d: “Environmental Disaster Management” (cont.)

Module topic

Effectiveness of disaster management through optimization strategies for implementation measures, management procedures, risk communication, synthesis, and support of decision making. Transdisciplinarity of disaster management.

Learning outcomes

Disciplinary knowledge
- concepts, theories & definitions
  possibilities, challenges and problems of disaster management; risk, danger, and vulnerability; risk management strategies (e.g., UN institutions).
- subject matter (factual data, examples)
  actual information on disaster management techniques and research results; hazard and risk assessment related to earthquakes (tsunamis), floods, storms; effects on society, infrastructure, economy; risk typologies (e.g., traffic light); the multifaceted term “uncertainty” at the example of natural hazards; ways how “risk” is communicated online and in print; examples for communication of risk-related data.
- methods & procedures
  geo data management; disaster reduction measures.

Professional skills
- critical thinking, problem identification, definition of solutions.

Personal competence
-
Module T3d: “Environmental Disaster Management” (cont.)

Literature/ Course material

......

......

......

Lecture notes

- Course pack, including printouts of .ppt presentations given by experts
**Course: Environmental Disaster Management**

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19613</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td>Language</td>
<td>English/ German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Lecture, 2 WCH, Excursions, 1 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>5.0 CP (\Rightarrow 150.0) h</td>
</tr>
</tbody>
</table>

**Workload specification**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LECTURE PHASE</strong></td>
<td></td>
</tr>
<tr>
<td>Contact (based on 2 WCH)</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>42.0 h</td>
</tr>
<tr>
<td>Excursions</td>
<td>10.5 h</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>31.5 h</td>
</tr>
<tr>
<td><strong>EXAM PHASE</strong></td>
<td></td>
</tr>
<tr>
<td>Self instruction</td>
<td>45.0 h</td>
</tr>
</tbody>
</table>

**Contact**

charlotte.kaempf@kit.edu

**Lecturer(s)**

KAMPF, Dr. rer. nat. Charlotte; IWG-Hydrologie
WENZEL, Dr. rer. nat. Friedemann, Ord.; GPI
+ NOLTE, Eike Marie; CEDIM

**Course topic**

Transdisciplinary field of disaster management; effectiveness of disaster management through optimization strategies for implementation measures, management procedures, risk communication, synthesis, and support of decision making.

**Recommended background knowledge**

n.a.

**Disciplinary knowledge**

- **concepts, theories & definitions**
  - possibilities, challenges and problems of disaster management; risk, danger, and vulnerability; risk management strategies (e.g., UN institutions).
- **subject matter (factual data, examples)**
  - disaster management techniques and research results; hazard and risk assessment related to earthquakes (tsunamis), floods, storms; effects on society, infrastructure, economy; risk typologies (e.g., traffic light); the multifaceted term “uncertainty” at the example of natural hazards; ways how “risk” is communicated online and in print; examples for communication of risk-related data.
- **methods & procedures**
  - geo data management; disaster reduction measures.

**Professional skills**

Critical thinking, problem identification, definition of solutions.

**Personal competence**

n.a.

**Assessment specification**

- written ---
- oral ---
- other report = module exam “Disaster Management” (2,000 words)

* WCH = Weekly Contact Hours
Naturnahe Gewässer  
(Nature-oriented River Works)  

Relevance for ResEngin curriculum: compulsory elective  

**Term(s) offered**: 2nd (Apr–Sept)  
**Duration | Cycle**: 1 term; every year  
**Language of instruction**: German  
**Prerequisites**: Bachelor, German language proficiency at DSH level  

<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>LEHMANN, Dr.-Ing. Boris; IWG-WK [Modulverantwortlicher]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning outcomes</td>
<td>Description see p. 2.</td>
</tr>
<tr>
<td>Literature / Course materials</td>
<td>Reference list see p. 3.</td>
</tr>
<tr>
<td>Basis for module(s)</td>
<td>not applicable</td>
</tr>
<tr>
<td>Intersection with module(s)</td>
<td>not applicable</td>
</tr>
</tbody>
</table>

| Lecture courses | 19212 Naturnahe Gewässer  
(lecture, exercise)  

SUM  
4.0 CP 2+2 WCH |
| Workload specification | (30 work hours → 1 CP acc. to ECTS) 5 x 30 h 150 h |
| Lecture Phase: | Contact hours 21 h  
Self instruction hours 42 h  
Exercise 21 h  
Exam preparation 21 h  
|
| Exam Phase: | Self instruction hours 45 h  
|

| Module examination(s) | “Naturnahe Gewässer” oral | 30 min | 5.0/5.0 CP |
| Lecturers | LEHMANN, Dr.-Ing. Boris; IWG-WK |
| Individual lecture courses | Descriptions + Recommended background knowledge see p. 4. |
Module T4a: “Nature-oriented River Works” (cont.)

Module topic

This module aims at exemplifying how engineering practices contribute to the planning and implementation of river restoration projects.

Learning outcomes

**Disciplinary knowledge**

- **concepts, theories & definitions**
  requirements of the EU-WFD and its implementation in the federal states; river development and maintenance: strategies, concepts and planning of measures.

- **subject matter (factual data, examples)**
  rivers as natural open space: interrelation of biotic and abiotic elements; hyporheic zone as biotope: biotic and abiotic properties and their importance for river engineering; field excursions: to the river „Alb“ (tributary of the river “Rhine”) between Ettlingen and its mouth, and to mountainous streams in the Northern Black Forest (“Nordschwarzwald”).

- **methods & procedures**
  near-natural construction for river bed protection measures; construction measures to restore ecological longitudinal connectivity of rivers.

**Professional skills**

- planning of nature-orientated river development measures.

**Personal competence**

- n.a.
Module T4a: “Nature-oriented River Works” (cont.)

**Literature/ Course material**

- **Lecture notes**
**Module T4a**

**Course**

**Naturnahe Gewässer: Grundlagen, Planung, Maßnahmen**  
(Nature-oriented River Works)

**KIT lecture ID** 19212

**Relevance** compulsory elective

**Prerequisites** Bachelor, German proficiency (DSH level)

**Term(s)** 2nd term (summer)

**Language** German

**Training mode** Lecture, 2 WCH  
Exercise, 2 WCH

**Workload specification**

<table>
<thead>
<tr>
<th><strong>LEcTURE PHASE</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact (based on 2 WCH)</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>42.0 h</td>
</tr>
<tr>
<td>Exercise</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>21.0 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>EXAM PHASE</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-instruction</td>
<td>45.0 h</td>
</tr>
</tbody>
</table>

**Contact** b.lehmann@kit.edu

**Lecturer(s)** LEHMANN, Dr.-Ing. Boris; IWG-WK

**Course topic** Contribution of engineering practice to planning and implementation of river restoration projects.

**Recommended background knowledge** Fundamentals of open channel flow (hydraulics) and river morphodynamics

**Learning outcomes**

**Disciplinary knowledge**
- **concepts, theories & definitions**
  requirements of the EU-WFD and its implementation in the federal states; river development and maintenance: strategies, concepts and planning of measures.
- **subject matter (factual data, examples)**
  rivers as natural open space: interrelation of biotic and abiotic elements; hyporheic zone as biotope: biotic and abiotic properties and their importance for river engineering; field excursions: to the river „Alb“ (tributary of the river “Rhine”) between Ettlingen and its mouth, and to mountainous streams in the Northern Black Forest (“Nordschwarzwald”).
- **methods & procedures**
  near-natural construction for river bed protection measures; construction measures to restore ecological longitudinal connectivity of rivers.

**Professional skills**
Planning of nature-orientated river development measures

**Personal competence**

**Assessment specification**

<table>
<thead>
<tr>
<th><strong>written</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30 min</td>
<td>= module exam “Naturnahe Gewässer”</td>
</tr>
</tbody>
</table>

**other** ---

* WCH = Weekly Contact Hours
### Verkehrswasserbau (Waterway Engineering) RESE M T4b

<table>
<thead>
<tr>
<th>Relevance for ResEngin curriculum</th>
<th>compulsory elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact</td>
<td><a href="mailto:andreas.kron@kit.edu">andreas.kron@kit.edu</a></td>
</tr>
</tbody>
</table>

**Term(s) offered**
- 2nd (Apr–Sept)

**Duration | Cycle**
- 1 term; every year

**Language of instruction**
- German

**Prerequisites**
- Bachelor, German language proficiency at DSH level

**Module coordinator**
- KRON, Dr.-Ing. Andreas; IWG-WK [Modulverantwortlicher]

**Learning outcomes**
- Description see p. 2.

**Literature / Course materials**
- Reference list see p. 3.

**Basis for module(s)**
- not applicable

**Intersection with module(s)**
- M 1 Hydraulic & Environmental Engineering

**Lecture courses**
- 19209 Verkehrswasserbau (lecture, exercise) 5.0 CP 2+1 WCH

**Workload specification**
- (30 work hours → 1 CP acc. to ECTS) 5 x 30 h 150 h
- **Lecture Phase:** Contact hours
  - Self instruction hours 42.0 h
  - Exercise 10.5 h
  - Exam preparation 31.5 h
- **Exam Phase:** Self instruction hours 45.0 h

**Module examination(s)**
- "Verkehrswasserbau" oral | 20 min | 5.0/5.0 CP

**Lecturers**
- KRON, Dr.-Ing. Andreas; IWG-WK

**Individual lecture courses**
- Descriptions + Recommended background knowledge see p. 4.
**Module T4b: “Waterway Engineering” (cont.)**

**Module topic**

This module aims at expounding the multiple uses of rivers with an emphasis on rivers' function as waterways.

**Learning outcomes**

**Disciplinary knowledge**
- **concepts, theories & definitions**
  design and operation of waterway constructions, ship induced fluid dynamics.
- **subject matter (factual data, examples)**
  waterways and transportation of cargo; watergates and ship-lifts; lock-filling systems, interaction ship - waterway, waterway administration in Germany.
- **methods & procedures**
  construction principles of waterway constructions, hydraulic design.

**Professional skills**
  planning and integrated system thinking.

**Personal competence**
  n.a.
Module T4b: “Waterway Engineering” (cont.)

Literature/ Course material


**Course**

**Verkehrswasserbau**  
(Waterway Engineering)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19209</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relevance</strong></td>
<td>compulsory elective</td>
</tr>
</tbody>
</table>
| **Prerequisites** | Bachelor,  
German proficiency  
(DSH level) |
| **Term(s)**    | 2nd term (summer) |
| **Language**   | German |
| **Training mode** | Lecture, 2 WCH *  
Exercise, 1 WCH * |
| **Workload**   | 5.0 CP ⇒ 150 h |

**Workload specification**

<table>
<thead>
<tr>
<th><strong>LECTURE PHASE</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact [based on 2 WCH]</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>42.0 h</td>
</tr>
<tr>
<td>Exercise</td>
<td>10.5 h</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>31.5 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>EXAM PHASE</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-instruction</td>
<td>45.0 h</td>
</tr>
</tbody>
</table>

**Contact**

andreas.kron@kit.edu

**Lecturer(s)**

KRON, Dr.-Ing. Andreas; IWG-WK

**Course topic**

Various uses of rivers, rivers serving as waterways.

**Recommended background knowledge**

Fundamentals of hydraulics.

**Learning outcomes**

**Disciplinary knowledge**

- **concepts, theories & definitions**
  design and operation of waterway constructions, ship induced fluid dynamics.
- **subject matter (factual data, examples)**
  waterways and transportation of cargo; watergates and ship-lifts; lock-filling systems,  
interaction ship – waterway, waterway administration in Germany.
- **methods & procedures**
  construction principles of waterway constructions, hydraulic design.

**Professional skills**

planning and integrated system thinking.

**Personal competence**

n.a.

**Assessment specification**

written ---  
oral 20 min = module exam “Verkehrswasserbau”  
other ---

* WCH = Weekly Contact Hours
## Management of Riverine Landscapes

### Relevance for ResEngin curriculum
- compulsory elective

### Administration
- ResEngin-Office
- res.eng@kit.edu

### Term(s) offered
- 2nd (Apr–Sept)

### Duration | Cycle
- 1 term; every year

### Language of instruction
- English/ German

### Prerequisites
- Bachelor, German language proficiency at DSH level

### Module coordinator
- KÄMPF, Dr.rer.nat. Charlotte; IWG-WK

### Learning outcomes
- Description see p. 2.

### Literature / Course materials
- Reference list see p. 3.

### Basis for module(s)
- not applicable

### Intersection with module(s)
- M 7 Integrated Projects
- M 8 Intercultural Communication
- M 9 International Project Management

### Lecture courses
- **19614 Governmental Resources Engineering** (excursions) 1.5 CP 1 WCH
- **19615 International Nature Conservation** (seminar) 1.5 CP 1 WCH
- **xxxxx Excursions « Riverine Landscapes »** 2.0 CP 1 week

**SUM** 5.0 CP 2 WCH + 1 wk

### Workload specification
- (30 work hours → 1 CP acc. to ECTS) **5 x 30 h** 150 h

**Lecture Phase:** Contact hours 61.0 h 63.0 h
- Self instruction hours 40.5 h

**Exam Phase:** Self instruction hours 40.5 h

### Module examination(s)
- “Management of Riverine Landscapes”
- poster presentation | 15 min | 5.0/5.0 CP

### Lecturers
- KÄMPF, Dr.rer.nat. Charlotte; IWG-Hydrologie
- SCHNEIDER, Dr.rer.nat. Erika; WWF-Aueninstitut, Rastatt
- + Sen. Res. Assoc. of IWG-WK / IWG-SWW / IfH
- + representatives of KA research institutions

### Individual lecture courses
- Descriptions + Recommended background knowledge see pp. 4.
Module T4c: “Management of Riverine Landscapes” (cont.)

Module topic

This module aims at explaining variations in organizations and societal research tasks in the field of riverine landscapes; the rationale of applying specific policy instruments and local, regional, national and supranational legislation as instrument for nature conservation, environmental protection, and sustainable development.

Learning outcomes

Disciplinary knowledge
- **concepts, theories & definitions**
  objectives and main strategies of national and international bodies, policy making.
- **subject matter (factual data, examples)**
  (a) research institutions in the Technology Region KA
  (b) German water resources research
  (c) International conventions (protection of species, habitats, landscapes).
- **methods & procedures**
  Main strategies for nature conservation: Red lists for endangered species, biodiversity protection, resources management, restoration: assessment and evaluation of ecological status; implementation, monitoring as success control.

Professional skills
- critical reading of complex legal texts;
  transfer of knowledge (e.g., adaptation of relevant policies).

Personal competence
- n.a.
Module T4c: “Management of Riverine Landscapes” (cont.)

**Literature/ Course material**

Course packs for all 3 course units
Module T4c

Management of Riverine Landscapes

Course

Governmental Research Engineering
(Research & Development)

KIT lecture ID 19614
Relevance compulsory elective
Prerequisites Bachelor, German proficiency (DSH level)
Term(s) 2nd term (summer)
Language English/ German
Training mode Seminar 1 WCH
Workload 1.5 CP \( \Rightarrow 45.0 \) h

<table>
<thead>
<tr>
<th>LECTURE PHASE</th>
<th></th>
<th>EXAM PHASE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact (based on 1 WCH)</td>
<td>10.5 h</td>
<td>Self instruction</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>13.5 h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contact charlotte.kaempf@kit.edu

KAMPF, Dr.rer.nat. Charlotte; IWG-WK
+ representatives of KA research institutions

Course topic

German policy making for resources management. Differences among organizations and societal research tasks.

Recommended background knowledge
M 1 … M3.

Learning outcomes

Disciplinary knowledge
- concepts, theories & definitions
  German water resources research.
- subject matter (factual data, examples)
  FRAUNHOFER-INSTITUT FÜR SYSTEM UND INNOVATIONSFORSCHUNG (FhG ISI), Karlsruhe: Technik und deren soziologische Auswirkungen auf das Leben der Betroffenen; Abt. Nachhaltiges Wirtschaften und Infrastrukturen;
  LANDWIRTSCHAFTLICHES TECHNOLOGIEZENTRUM LTZ/MLR, Augustenberg, Pflanzenbau, Pflanzenernährung, Energiepflanzenbau, erneuerbare Energien;
  LANDESANSTALT FÜR UMWELT, MESSUNGEN UND NATURSCHUTZ BADEN-WÜRTTEMBERG (LUBW), Karlsruhe: Abt. Wasser und Altlasten;
  MAX RUBNER-INSTITUT (BUNDESANSTALT FÜR ERNÄHRUNG UND LEBENSMITTEL (BFEL)), Karlsruhe: Lebensmittelqualität und –hygiene;
- methods & procedures

Professional skills
n.a.

Personal Competence
n.a.

Assessment specification
written ---
oral ---
other poster = module exam “Management of Riverine Landscapes”
together with LV International Nature Conservation & LV Wasserbauekursion

* WCH = Weekly Contact Hours
Module T4c

Management of Riverine Landscapes

Course

International Nature Conservation

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19615</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Training mode</td>
<td>Seminar, 1 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>1.5 CP (\Rightarrow 45.0 \text{ h})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LECTURE PHASE</strong></td>
</tr>
<tr>
<td>Contact (based on 1 WCH)</td>
</tr>
<tr>
<td>Self instruction</td>
</tr>
<tr>
<td><strong>EXAM PHASE</strong></td>
</tr>
<tr>
<td>Self instruction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:charlotte.kaempf@kit.edu">charlotte.kaempf@kit.edu</a></td>
</tr>
</tbody>
</table>

Lecturer(s)

KÄMPF, Dr.rer.nat. Charlotte; IWG-Hydrologie
SCHNEIDER, Dr.rer.nat. Erika; WWF-Aueninstitut, Rastatt

Course topic

The rationale of applying specific policy instruments and local, regional, national and supranational legislation as instrument for nature conservation, environmental protection, and sustainable development.

Recommended background knowledge

Biology.

Learning outcomes

**Disciplinary knowledge**

- **concepts, theories & definitions**
  objectives and main strategies of national and international bodies for nature conservation:
  Red lists for endangered species, biodiversity protection, resources management, restoration.

- **subject matter (factual data, examples)**

- **methods & procedures**
  assessment and evaluation of ecological status; monitoring as success control.

**Professional skills**

critical reading of complex legal texts;
transfer of knowledge (e.g., legal frame from one country to another).

**Personal competence**

n.a.

Assessment specification

written ---
oral ---
other poster = module exam "Management of Riverine Landscapes"

together with LV Governmental Research Engineering & LV "Riverine Landscapes"

* WCH = Weekly Contact Hours
**Module T4c**

**Course**

**Management of Riverine Landscapes**

**Riverine Landscapes**

*(Excursions)*

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>n.a.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relevance</strong></td>
<td>compulsory elective</td>
</tr>
<tr>
<td><strong>Prerequisites</strong></td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td><strong>Term(s)</strong></td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td><strong>Language</strong></td>
<td>German</td>
</tr>
<tr>
<td><strong>Training mode</strong></td>
<td>Excursions 1 week</td>
</tr>
<tr>
<td><strong>Workload</strong></td>
<td>2.0 CP $\Rightarrow$ 60.0 h</td>
</tr>
</tbody>
</table>

**Workload specification**

<table>
<thead>
<tr>
<th>LECTURE PHASE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact</td>
<td>40.0 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>21.0 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAM PHASE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self instruction</td>
<td>13.5 h</td>
</tr>
</tbody>
</table>

**Contact**

charlotte.kaempf@kit.edu

**Lecturer(s)**

Senior Research Associates of IWG-WK / IWG-SWW and IfH

**Course topic**

Local and regional riverine landscapes.

Recommended background knowledge

n.a.

**Learning outcomes**

**Disciplinary knowledge**

- concepts, theories & definitions:

- subject matter (factual data, examples)
  excursion in the Upper Rhine Valley and along other main rivers in Germany;
  e.g. WWF-Aueninstitut, Rastatt; Riedmuseum, Ottersdorf.

- methods & procedures

**Professional skills**

n.a.

**Personal competence**

n.a.

**Assessment specification**

written ---
oral ---
other poster ---

= module exam "Management of Riverine Landscapes" together with LV Governmental Research Engineering & LV International Nature Conservation

* WCH = Weekly Contact Hours
Umweltökonomie & -politik  
(Environmental Economy & Politics)  

Relevance for ResEngin curriculum: compulsory elective  
Administration: Inst. für Wirtschaftspol. & -forschung, KIT  
Contact: rainer.walz@isi.fraunhofer.de

Term(s) offered: 2nd (Summer Apr–Sept) + 3rd (Winter Oct–Mar)  
Duration | Cycle: 2 terms; every year  
Language of instruction: German  
Prerequisites: Bachelor, German language proficiency at DSH level

Module coordinator: WALZ, PD Dr.rer.pol. Rainer; FhG-ISI  
[Modulverantwortlicher]  
Learning outcomes: Description see p. 2.  
Literature / Course materials: Reference list see p. 3.

Basis for module(s): not applicable  
Intersection with module(s): M 7 Integrated Projects

Lecture courses  
(training mode)  
25548 Umwelt- & Ressourcenpolitik  
(lecture, exercises)  
2.0 CP 1+1 WCH  
25547 Umweltökonomie & Nachhaltigkeit  
(lecture, exercises)  
3.0 CP 1+1 WCH  
SUM 5.0 CP 4 WCH

Workload specification: (30 work hours → 1 CP acc. to ECTS)  
5 x 30 h 150 h  
Lecture Phase: Contact hours  
Self instruction hours  
Exercises  
Exam preparation  
Exam Phase: Self instruction hours  
45.0 h

Module examination(s)  
(mode | scope | weighting)  
„Umweltpolitik“ oral | 30 min | 2.0/3.0 CP  
„Umweltökonomie“ written | 60 min | 3.0/5.0 CP

Lecturers: WALZ, PD Dr.rer.pol. Rainer; FhG-ISI  
(in alphabetic order)

Individual lecture courses: Descriptions + Recommended background knowledge see pp. 4.
Module T4d: “Environmental Economy & Politics” (cont.)

Module topic

This module aims at demonstrating the rationale of applying specific policy instruments and the logic of the political processes in environmental and infrastructure policies. Various interpretation approaches and operationalization modes of the sustainable development concept and the role of technology.

Learning outcomes

Disciplinary knowledge

- concepts, theories & definitions
  
  Neoclassical environmental economics; political economy; systems of innovation
  Sustainability concept in politics and economics.

- subject matter (factual data, examples)
  
  Empirical case studies; actors and instruments of environmental policies; the political economy of environmental and infrastructure politics; overview of traditional environmental policies.
  Operationalizing and measuring sustainability; technological learning and the relationship of technology and economic growth with sustainability; macroeconomic and innovation effects of sustainability policies.

- methods & procedures
  
  New approaches of sustainable infrastructure policies and regulation.
  Strategic sustainability assessment.

Professional skills

- Assessment of policies and regulations.
- Analysis of various interpretations of social science concepts, critical review and assessment of empirical results.

Personal competence

- Ability to read and analyze relevant academic papers.
Module T4d: “Environmental Economy & Politics” (cont.)

**Literature/ Course material**


**Lecture notes**

**Module T4d**  
Umweltökonomie und -politik  
(Environmental Economics & Policy)

**Course**  
Umwelt- und Ressourcenpolitik  
(Environmental & Resources Policies)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>25548</td>
<td></td>
</tr>
</tbody>
</table>

**Relevance**  
compulsory elective

**Prerequisites**  
Bachelor,  
German proficiency  
(DSH level)

**Term(s)**  
2nd term (summer)

**Language**  
German

**Training mode**  
Lecture, 1 WCH  
Exercise, 1 WCH

**Workload**  
2.0 CP  
60.0 h

**Lecturer(s)**  
WALZ, PD Dr.rer.pol. Rainer; FhG ISI

**Course topic**  
The rationale of applying specific policy instruments and the logic of the political processes in environmental and infrastructure policies. The choice of the policy instrument and the experiences in regulating infrastructure systems are important aspects to prevent developing countries from the pitfalls of traditional environmental and infrastructure policies.

**Recommended background knowledge**  
Fundamentals of economics.

**Disciplinary knowledge**
- **concepts, theories & definitions**  
  neoclassical environmental economics; political economy; systems of innovation.
- **subject matter (factual data, examples)**  
  empirical case studies; actors and instruments of environmental policies; the political economy of environmental and infrastructure politics; overview of traditional environmental policies.
- **methods & procedures**  
  new approaches of sustainable infrastructure policies and regulation.

**Professional skills**  
Assessment of policies and regulations.

**Personal competence**  
Ability to read and analyse literature.

**Assessment specification**  
written  
oral 30 min  
other  

= partial module exam "Umweltpolitik"

---

* WCH = Weekly Contact Hours
**Course**

**Umweltökonomie und Nachhaltigkeit**
(Environmental Economics and Sustainability)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>25547</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>3rd term (winter)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Lecture, 1 WCH, Exercise, 1 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>3.0 CP ⇒ 90.0 h</td>
</tr>
</tbody>
</table>

**Workload specification**

<table>
<thead>
<tr>
<th>LECTURE PHASE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact (based on 1 WCH)</td>
<td>10.5 h</td>
</tr>
<tr>
<td>Self instruction</td>
<td>21.0 h</td>
</tr>
<tr>
<td>Exercises</td>
<td>10.5 h</td>
</tr>
<tr>
<td>Exam preparation</td>
<td>21.0 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAM PHASE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-instruction</td>
<td>27.0 h</td>
</tr>
</tbody>
</table>

**Contact**

rainer.walz@isi.fraunhofer.de

**Lecturer(s)**

WALZ, PD Dr. rer. pol. Rainer; FhG ISI

**Course topic**

Interpretations and the operationalization of the sustainable development concept and the role of technology. Global environmental problems, infrastructure needs and development strategies are discussed worldwide within the sustainable development paradigm forming the background of the millennium development goals.

**Recommended background knowledge**

Fundamentals of economics.

**Disciplinary knowledge**

- **concepts, theories & definitions**
  sustainability concept in politics and economics.
- **subject matter (factual data, examples)**
  operationalizing and measuring sustainability; technological learning and the relationship of technology and economic growth with sustainability; macroeconomic and innovation effects of sustainability policies.
- **methods & procedures**
  strategic sustainability assessment.
- **critical awareness of**

**Professional skills**

Analysis of various interpretation of social science concepts, critical review and assessment of empirical results.

**Personal competence**

Ability to read and analyze relevant academic papers.

**Assessment specification**

- **written** 60 min = partial module exam "Umwelt- und Ressourcenökonomie"
- **oral** ---
- **other** ---

* WCH = Weekly Contact Hours
Humangeographie & Humanökologie
(Human Geography & Human Ecology)

Relevance for ResEngin curriculum: compulsory elective

<table>
<thead>
<tr>
<th>Administration</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst. f. Geographie &amp; Geöökologie</td>
<td><a href="mailto:carolin.kramer@kit.edu">carolin.kramer@kit.edu</a></td>
</tr>
</tbody>
</table>

Term(s) offered: 3rd term (winter)

Duration: 1 term; every year

Language of instruction: German

Prerequisites: Bachelor, German language proficiency at DSH level

Module coordinator: KRAMER, Dr. Caroline, Ord.; IfGG

Learning outcomes:
- Description see p. 2.
- Reference list see p. 3.

Basis for module(s): not applicable

Intersection with module(s): M 7 Integrated Projects

Lecture courses (training mode):
- 8004/5 Humangeographie & Humanökologie
  (lecture, exercises)

SUM 5.0 CP 2+2 WCH

Workload specification:
- (30 work hours → 1 CP acc. to ECTS) 5 x 30 h 150 h

Lecture Phase:
- Contact hours: 21.0 h
- Self instruction hours: 42.0 h
- Exercises: 21.0 h
- Exam preparation: 21.0 h

Exam Phase:
- Self instruction hours: 45.0 h

Module examination(s):
- “Humangeographie”
  written | 90 min | 5.0/5.0 CP

Lecturers (in alphabetic order):
- KRAMER, Dr. Caroline, Ord.; IfGG

Individual lecture courses:
- Descriptions + Recommended background knowledge see p. 4.
Module T5a: “Human Geography & Human Ecology” (cont.)

Module topic

This module aims at highlighting definitions and social norms, of intersections/interphases between nature and culture in context of demographic change in rural and urban areas.

Learning outcomes

**Disciplinary knowledge**
- concepts, theories & definitions
  concepts of human geography and human ecology, sustainability.
- subject matter (factual data, examples)
  progress in human geography and human ecology; basis questions in geographical research, geography of population, urban geography, human and social ecology, sustainability.
- methods & procedures
  methods of academic work, bibliographical research.

**Professional skills**
- Analysis of tables and maps, critical reading.

**Personal competence**
- n.a.
Module T5a: “Human Geography & Human Ecology” (cont.)

Literature/ Course material


Module T5a

Course

Humangeographie und Humanökologie
(Human Geography & Human Ecology)

K I T lecture ID 8004/5
Relevance compulsory elective
Prerequisites Bachelor,
German proficiency
(DSH level)
Term(s) 3rd term (winter)
Language German
Training mode Lecture, 2 WCH
Exercise, 2 WCH
Workload 5.0 CP ⇒ 150.0 h

KRAMER, Dr. Caroline, Ord.; IfGG

Definitions and social norms, intersections/ interphases between nature and culture in context of demographic change in rural and urban areas. Environmental problems, theories of development, political ecology.

Recommended background knowledge
Fundamentals of sociological and economic aspects

Disciplinary knowledge
- concepts, theories & definitions
  concepts of human geography and human ecology, sustainable development.
- subject matter (factual data, examples)
  progress in human geography and human ecology; questions in geographical research, geography of population, urban geography, human and social ecology.
- methods & procedures
  methods of academic work, bibliographical research.

Professional skills
Analysis of tables and maps, critical reading.

Personal competence
n.a.

Assessment specification
written 90 min = module exam “Humangeographie”
oral ---
other ---

Contact
carolin.kramer@kit.edu

* WCH = Weekly Contact Hours
# Sozio-ökologischer Komplex (Socio-ecological Complex)

**Relevance for ResEngin curriculum**

<table>
<thead>
<tr>
<th>compulsory elective</th>
<th>Administration</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inst. f. Wasser &amp; Gew.entw.</td>
<td><a href="mailto:charlotte.kaempf@kit.edu">charlotte.kaempf@kit.edu</a></td>
</tr>
</tbody>
</table>

**Term(s) offered**

3rd term (winter)

**Duration | Cycle**

1 term; every year

**Language of instruction**

German

**Prerequisites**

Bachelor, German language proficiency at DSH level

**Module coordinator**

KÄMPF, Dr.rer.nat. Charlotte; IWG-WK

**Learning outcomes**

Description see p. 2.

**Literature / Course materials**

Reference list see p. 3.

**Basis for module(s)**

not applicable

**Intersection with module(s)**

M 7 Integrated Projects

**Lecture courses**

| (training mode) | 19212 Gesellschaft–Technik–Ökologie (lecture, exercises) | 5.0 CP | 2+1 WCH |

**Workload specification**

(30 work hours → 1 CP acc. to ECTS)

| 5 x 30 h | 150 h |

**Lecture Phase:**

Contact hours 21.0 h
Self instruction hours 42.0 h
Exercises 10.5 h
Exam preparation 31.5 h

**Exam Phase:**

Self instruction hours 45.0 h

**Module examination(s)**

(mode | scope | weighting)

“Sozio-ökologischer Komplex” report | 2.500 words | 5.0/5.0 CP

**Lecturers**

- KÄMPF, Dr.rer.nat. Charlotte; IWG-WK

**Individual lecture courses**

Descriptions + Recommended background knowledge see p. 4.
Module T5b: “Socio-ecological Complex” (cont.)

Module topic

This module aims at exemplifying challenges at the intersection of three societal domains: academe, society and government. Students will learn that “Resources Engineering” is a process within the socio-economic complex that is characterized by the cultural frame.

Learning outcomes

Disciplinary knowledge

- concepts, theories & definitions
  interdisciplinary analysis of ecosystems.
- subject matter (factual data, examples)
  utilization of natural resources, policy making.
- methods & procedures
  planning procedure for transdisciplinary projects (e.g., environmental (impact) assessment); participatory decision making; technical communication: proposals, project presentation, reports (e.g., feasibility studies, environmental impact statements, completion reports).

Professional skills

- critical thinking; awareness for meaning of words
  (semantics of various societal domains and cultural groups).

Personal competence

- social competence: inter- and transdisciplinarity.
Module T5b: “Socio-ecological Complex” (cont.)

Literature/ Course material

- Updated course pack for individual sessions
- Students are required to generate an annotated link list in small groups
Module T5b

Course

Sozio-ökologischer Komplex
(Socio-ecological Complex)

Gesellschaft- Technik- Ökologie
(Society-Engineering-Ecology)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19212</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>3rd term (winter)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Seminar, 3 WCH*</td>
</tr>
<tr>
<td>Workload</td>
<td>5.0 CP ⇒ 150.0 h</td>
</tr>
</tbody>
</table>

**Workload specification**

**LECTURE PHASE**
- Contact (based on 2 WCH) 21.0 h
- Self instruction 42.0 h
- Exercise 10.5 h
- Exam preparation 31.5 h

**EXAM PHASE**
- Self-instruction 45.0 h

**Contact**
charlotte.kaempf@kit.edu

**Lecturer(s)**
KÄMPF, Dr. rer. nat. Charlotte (Dipl.-Biol., MA Tech Comm); IWG-WK

**Course topic**
(a) Challenges at the intersection of three societal domains: academe, society and government, (b) “Resources Engineering” as a complex process within the socio-economic complex that is characterized by the cultural frame.

The course emphasizes legislation for environmental protection under democratic rule which may serve as a model for developing countries to prepare graduates for their future workplaces in the public sphere.

Recommended background knowledge
n.a.

**Learning outcomes**

**Disciplinary knowledge**
- concepts, theories & definitions
  interdisciplinary analysis of ecosystems.
- subject matter (factual data, examples)
  utilization of natural resources.
- methods & procedures
  planning procedure for transdisciplinary projects (e.g., environmental (impact) assessment); participatory decision making; technical communication: proposals, project presentation, reports (e.g., feasibility studies, environmental impact statements, completion reports).

**Professional skills**
critical thinking; awareness for meaning of words
(semantics of various societal domains and cultural groups).

**Personal competence**
social competence: inter- and transdisciplinarily as mode of social action

**Assessment specification**
- written ---
- oral ---
- other report = module exam “Sozio-ökologischer Komplex”
  (2.500 words)

* WCH = Weekly Contact Hours
## Projekt- & Personalmanagement

*Project & Personell Management*

### Relevance for ResEngin curriculum
- **compulsory elective**

### Administration
- Inst. f. Wasser & Gew. entw.
- Wasserwirtschaft & Kulturtech.

### Contact
- b.lehmann@kit.edu

### Term(s) offered
- 2nd term (summer)

### Duration | Cycle
- 1 term; every year

### Language of instruction
- German

### Prerequisites
- Bachelor, German language proficiency at DSH level

### Module coordinator
- LEHMANN, Dr.-Ing. Boris; IWG-WK

### Learning outcomes
- Description see p. 2.

### Literature / Course materials
- Reference list see p. 3.

### Basis for module(s)
- not applicable

### Intersection with module(s)
- not applicable
- M 7 Integrated Projects

### Lecture courses
---

<table>
<thead>
<tr>
<th>Lecture courses (training mode)</th>
<th>19204 Schlüsselkompetenzen im Ing.beruf (lecture, exercises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>5.0 CP  2+1 WCH</td>
</tr>
<tr>
<td>Cycle</td>
<td>SUM  5.0 CP  3 WCH</td>
</tr>
</tbody>
</table>

### Workload specification
---

<table>
<thead>
<tr>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>(30 work hours → 1 CP acc. to ECTS)</td>
</tr>
<tr>
<td><strong>5 x 30 h</strong> 150 h</td>
</tr>
</tbody>
</table>

---

### Lecture Phase:
- Contact hours: 21.0 h
- Self instruction hours: 42.0 h
- Exercises: 10.5 h
- Exam preparation: 31.5 h

### Exam Phase:
- Self instruction hours: 45.0 h

### Module examination(s)
---

<table>
<thead>
<tr>
<th>Module examination(s) (mode</th>
<th>scope</th>
<th>weighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Schlüsselkompetenzen&quot; presentation</td>
<td><strong>10 min</strong></td>
<td>5.0/5.0 CP</td>
</tr>
</tbody>
</table>

### Lecturers
---

<table>
<thead>
<tr>
<th>Lecturers (in alphabetic order)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- LEHMANN, Dr.-Ing. Boris; IWG-WK</td>
</tr>
<tr>
<td>- GÖRISCH, Hon.Prof. Dr.-Ing. Uwe; Dr.-Ing. Uwe Görisch GmbH</td>
</tr>
</tbody>
</table>

### Individual lecture courses
---

<table>
<thead>
<tr>
<th>Individual lecture courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptions + Recommended background knowledge see p. 4.</td>
</tr>
</tbody>
</table>
Module T5c: “Project & Personnel Management” (cont.)

Module topic

This module aims at sensitizing students for the complexity of the engineering profession in decision making positions in industry, government, and consulting.

Learning outcomes

Disciplinary Knowledge
- **concepts, theories & definitions**
  team organization, time management, Pareto principle.
- **subject matter (factual data, examples)**
  diplomacy (rhetoric, rules of communication and moderation), correspondence and telecommunication, project management, written communication (scientific methods), corporate policy.
- **methods & procedures**
  cost accounting and tender preparation, sociologic methods and tools.

Professional skills
- Presentation skills.

Personal competence
- Self-management.
Module T5c: “Project & Personell Management” (cont.)

Literature/ Course material

Lecture notes
Module T5c

Project- und Personalmanagement
(Project and Personell Management)

Course

Schlüsselkompetenzen im Ingenieurberuf
(Personal competence for engineers)

<table>
<thead>
<tr>
<th>KIT lecture ID</th>
<th>19204</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td>compulsory elective</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Bachelor, German proficiency (DSH level)</td>
</tr>
<tr>
<td>Term(s)</td>
<td>2nd term (summer)</td>
</tr>
<tr>
<td>Language</td>
<td>German</td>
</tr>
<tr>
<td>Training mode</td>
<td>Lecture, 2 WCH, Exercise, 1 WCH</td>
</tr>
<tr>
<td>Workload</td>
<td>5.0 CP → 150.0 h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Workload specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LECTURE PHASE</strong></td>
</tr>
<tr>
<td>Contact (based on 2 WCH)</td>
</tr>
<tr>
<td>Self instruction</td>
</tr>
<tr>
<td>Exercise</td>
</tr>
<tr>
<td>Exam preparation</td>
</tr>
<tr>
<td><strong>EXAM PHASE</strong></td>
</tr>
<tr>
<td>Self-instruction</td>
</tr>
</tbody>
</table>

Contact
b.lehmann@kit.edu

Lecturer(s)
LEHMANN, Dr.-Ing. Boris; IWG-WK
GÖRISCH, Hon.Prof. Dr.-Ing. Uwe; Dr.-Ing. Uwe Görisch GmbH

Course topic
The complexity of the engineering profession in decision making positions in industry, government, and consulting.

Recommended background knowledge
n.a.

Learning outcomes

Disciplinary knowledge
- concepts, theories & definitions
  team organization, time management, Pareto principle.
- subject matter (factual data, examples)
  diplomacy (rhetoric, rules of communication and moderation), correspondence and telecommunication, project management, written communication (scientific methods), corporate policy.
- methods & procedures
  cost accounting and tender preparation, sociologic methods and tools.

Professional skills
Presentation skills.

Personal competence
Self-management.

Assessment specification
written ---
oral ---
other presentation = module exam “Schlüsselkompetenzen” (10 min)

* WCH = Weekly Contact Hours