**name of the module**: Corrosion Protection  
**semester**: 6  
**credits (28 hours)**: 5  
**workload / hours** | **time of contact** | **privat study** | **preparation for exams**  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>summary 140</td>
<td>60</td>
<td>60</td>
<td>20</td>
</tr>
</tbody>
</table>
**level**: Not yet defined  
**preconditions**: Anorganic and organic chemistry, physical chemistry, binders and pigments, basics of coatings formulation  
**intention of all, coordination in study**: Understanding the mechanisms of corrosion as base for the deduction of effective methods for corrosion protection  

**Part 1: Corrosion**  
Homogeneous corrosion of metals in aqueous electrolytes  
thermodynamics and kinetics of electrochemical reactions, instrumentation,  
corrosion in various aqueous media  
Heterogeneous corrosion of metals in aqueous electrolytes  
galvanic corrosion, selective corrosion, concentration cells, passivity,  
local deterioration of passive layers, intergranular corrosion, pitting corrosion,  
corrosion cracking  
Atmospheric corrosion  
Corrosion of specific materials  

**Part 2: Corrosion protection**  
Design of corrosion resistant components  
Corrosion inhibitors  
Electrochemical corrosion protection  
Surface preparation for passive corrosion protection  
Chemical conversion layers  
Organic coatings for corrosion protection  
Duplex systems  

**literatur**:  
Skript zur Vorlesung  

**offered**: ☑ every semester  
☐ in winter term  
☐ in summer-term  

**useful for other courses of studies**:  
responsible: Prof. Dr. Lobnig  

**Sections and efficiency statements**  

<table>
<thead>
<tr>
<th>form of teaching, form of learning</th>
<th>contingent/ hours</th>
<th>learning targets, targets of qualification</th>
<th>efficiency control</th>
<th>estimated time of students work</th>
</tr>
</thead>
</table>
| lecture with post processing      | 3                 | Evaluation of the corrosion properties of metals  
Ability to choose and evaluate methods for corrosion protection | Written exam  
60 min | 120               |  
<p>| exercises                         | 1                 | Application of the methods to simple examples of use |                       | 20                             |<br />
| summary                           | 4                 |                                          |                     | 140                            |</p>
<table>
<thead>
<tr>
<th>Course name</th>
<th>Laboratory “Corrosion and Corrosion Protection”</th>
</tr>
</thead>
<tbody>
<tr>
<td>In semester number</td>
<td>CIB 6, CIB 7</td>
</tr>
<tr>
<td>ECTS- Credits (30 hours)</td>
<td>6</td>
</tr>
</tbody>
</table>
| Workload / hours | Total 180  
\n\nContact time 90  
\n\nSelf-study 60  
\n\nPreparation for examination 30 |
| Prerequisites | Basic knowledge of corrosion and coatings technology |
| Total target | - Knowledge of methods to evaluate the corrosion behaviour of metals  
\n\n- Knowledge of methods to evaluate the effectiveness of corrosion protective measures  
\n\n- Ability to apply these methods to practical problems |
| Experiments | - Electrode potentials  
\n\n- I-E-curves of Fe, Fe-Cr and Fe-Cr-Ni alloys with varying Cr-concentrations in sulfuric acid, passivity  
\n\n- Atmospheric corrosion of Fe with NaCl-droplet deposition  
\n\n- Pitting corrosion of Fe-Cr-Ni alloys – effect of potential sweep rate, steel composition, and chloride concentration  
\n\n- Measurement of corrosion rates with different methods Tafel method  
\n\n\n- Polarisation resistance method  
\n\n- Volumetric method  
\n\n- Gravimetric method  
\n\n- Effectivity and inhibiting mechanism of corrosion inhibitors  
\n\n- Anodic and cathodic blistering of organic coatings on steel  
\n\n- Phosphating and effect of errors in the phosphating process  
\n\n- Osmotic blistering of organic coatings  
\n\n- Cathodic delamination  
\n\n- Filiform corrosion  
\n\n- Phospatizing  
\n\n- Determination of resistances and capacitances of electronic circuits using impedance spectroscopy  
\n\n- Water uptake of organic coatings  
\n\n- Comparison of corrosion resistance of coatings, e.g. yoghurt lids of aluminum cans  
\n\n- Non-destructive evaluation of steel bars in concrete  
\n\n- Analysis of corrosion failures |
| Content | 

| Reference material | Current publications and patents  
\n\nD.A. Jones, Principles and Prevention of Corrosion, Macmillan Publishing Company, 1992  
\n\nEgon Kunze, Korrosion und Korrosionsschutz, Band 1 bis 6, Wiley-VCH, 2001 |
| Module owner | R. Lobnig |
| Language | English |

**Description**

<table>
<thead>
<tr>
<th>Type of instruction/type of learning</th>
<th>Hours/week</th>
<th>Targets, learning outcomes</th>
<th>Type of assessment</th>
<th>Estimated student workload in hours</th>
</tr>
</thead>
</table>
| Laboratory “Corrosion and Corrosion Protection” | 6 | **Knowledge of electrochemical and classical testing methods**  
\n\n- Measurement of electrode potentials  
\n\n- Potentiostatic and galvanostatic | Short presentation of experimental results, Lab work, Lab journal, Written examination | 200 |
<table>
<thead>
<tr>
<th>Measurements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Electrochemical noise</td>
<td></td>
</tr>
<tr>
<td>- Impedance spectroscopy</td>
<td></td>
</tr>
<tr>
<td>- Scanning Kelvin probe</td>
<td></td>
</tr>
<tr>
<td>- Salt spray testing</td>
<td></td>
</tr>
<tr>
<td>- Tests with temperature-relative humidity-cycling</td>
<td></td>
</tr>
<tr>
<td>- Metallography</td>
<td></td>
</tr>
<tr>
<td>- Electron microscopy</td>
<td></td>
</tr>
</tbody>
</table>

*Ability to apply these techniques to practical problems*