

**Modulhandbuch**  
**Studiengang Master of Science Materialwissenschaft**  
**Chalmers Incoming Double Degree**  
Prüfungsordnung: 177ChI2014

Wintersemester 2017/18  
Stand: 19. Oktober 2017

Universität Stuttgart  
Keplerstr. 7  
70174 Stuttgart

## Inhaltsverzeichnis

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| <b>Qualifikationsziele .....</b>                                 | <b>3</b>  |
| <b>111 Options 1 .....</b>                                       | <b>4</b>  |
| 1111 Option A .....                                              | 5         |
| 17700 Synthesis and Properties of Ceramic Materials .....        | 6         |
| 55750 Materials Science - Seminar and Practical/Laboratory ..... | 8         |
| 1112 Option B .....                                              | 9         |
| 17560 Phase Transformations .....                                | 10        |
| 55760 Materials Science - Seminar and Practical/Laboratory ..... | 12        |
| <b>112 Options 2 .....</b>                                       | <b>13</b> |
| 1121 Option A .....                                              | 14        |
| 17710 Nanocomposite Materials .....                              | 15        |
| 37100 Diffraction methods in Materials Science .....             | 17        |
| 50080 Physikalische Chemie von Polymeren .....                   | 19        |
| 1122 Option B .....                                              | 20        |
| 17650 New Materials and Materials Characterization Methods ..... | 21        |
| 37100 Diffraction methods in Materials Science .....             | 23        |
| 50080 Physikalische Chemie von Polymeren .....                   | 25        |
| <b>72050 Module Chalmers University of Technology .....</b>      | <b>26</b> |
| <b>80510 Masterarbeit Materialwissenschaft .....</b>             | <b>27</b> |

## Qualifikationsziele

Die Absolventinnen und Absolventen des Master Studiengangs „Materialwissenschaft“

- verfügen über ein vertieftes mathematisch-, natur- und materialwissenschaftliches Wissen, dass Sie befähigt materialwissenschaftliche Problemstellungen richtig einzustufen, zu verstehen und vor dem Hintergrund der multidisziplinären Ausrichtung des Fachgebietes auf wissenschaftlichem Niveau zu lösen.
- Haben sowohl ein breites als auch grundlegendes Verständnis über die Beziehung zwischen Eigenschaften und dem Aufbau/Mikrostruktur von Materialien erworben, und sind somit in der Lage gezielt Eigenschaften von Materialien durch kontrollierte Prozesse einzustellen.
- Haben Kenntnisse über die wesentlichen und neuesten Materialcharakterisierungsmethoden und sind somit in der Lage ein sehr breites Spektrum materialwissenschaftliche Fragestellungen systematisch zu lösen bzw. neue Verfahren für neue Fragestellungen zu entwickeln.
- Sind in der Lage mit Fachleuten und Spezialisten aus dem materialwissenschaftlichen Kernspektrum und anderen naturwissenschaftlichen und ingenieurwissenschaftlichen Disziplinen zu kommunizieren.
- Sind durch die naturwissenschaftlich grundlegend geprägte Ausbildung in der Lage Ihre Kenntnisse zu vertiefen, sich neue Wissensgebiete im naturwissenschaftlichen Spektrum zu erschließen und wesentlich beizutragen an der wissenschaftlichen Entwicklung des Fachgebiets.
- Sind in der Lage selbständig Projekte aus dem Bereich Forschung und Entwicklung zu Planen und durchzuführen.

## 111 Options 1

---

|                     |      |          |
|---------------------|------|----------|
| Zugeordnete Module: | 1111 | Option A |
|                     | 1112 | Option B |

---

## 1111 Option A

---

Zugeordnete Module:   17700 Synthesis and Properties of Ceramic Materials  
                              55750 Materials Science - Seminar and Practical/Laboratory

---

## Modul: 17700 Synthesis and Properties of Ceramic Materials

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                    |                |                         |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|
| 2. Modulkürzel:                                     | 030500014                                                                                                                                                                                                                                                                                                                                                                          | 5. Moduldauer: | Einsemestrig            |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                                                                                                               | 6. Turnus:     | Jedes 2. Wintersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                                                                                                                  | 7. Sprache:    | Deutsch                 |
| 8. Modulverantwortlicher:                           | apl. Prof. Dr. Joachim Bill                                                                                                                                                                                                                                                                                                                                                        |                |                         |
| 9. Dozenten:                                        | Anke Weidenkaff<br>Joachim Bill                                                                                                                                                                                                                                                                                                                                                    |                |                         |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft, PO 177-2011, 1. Semester<br>→ Vertiefungsmodule<br>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 1. Semester<br>→ Option B --> Options<br>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 3. Semester<br>→ Option A --> Options 1                                                              |                |                         |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                       |                |                         |
| 12. Lernziele:                                      | The students<br>- have knowledge about ceramics produced by powder technology and by molecular precursors<br>- have knowledge about biomineralization processes and biominerals<br>- are able to understand bio-inspired processes and materials                                                                                                                                   |                |                         |
| 13. Inhalt:                                         | Ceramics produced by powder technology,<br>ceramics derived from molecular precursors,<br>biomineralization,<br>bio-inspired processes and materials.                                                                                                                                                                                                                              |                |                         |
| 14. Literatur:                                      | <ul style="list-style-type: none"> <li>• Carter, C. B. und Norton, M. G.: Ceramic Materials - Science and Engineering, Springer, 2007.</li> <li>• Colombo, R. et al. (Eds.): Polymer Derived Ceramics, DEStech Publication, 2010.</li> <li>• Fahlman, B.D.: Materials Chemistry, Springer, 2008.</li> <li>• Mann, S.: Biomineralization, Oxford University Press, 2001.</li> </ul> |                |                         |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 177001 Lecture Synthesis and Properties of Ceramic Materials</li> <li>• 177002 Exercise Synthesis and Properties of Ceramic Materials</li> <li>• 177003 Lecture Synthesis and Properties of Ceramic Materials</li> <li>• 177004 Exercise Synthesis and Properties of Ceramic Materials</li> </ul>                                         |                |                         |
| 16. Abschätzung Arbeitsaufwand:                     | Lecture<br>Presence hours: 28h<br>Self-study: 63 h<br>Exercises<br>Present hours: 28h<br>Self-study: 56h                                                                                                                                                                                                                                                                           |                |                         |
| 17. Prüfungsnummer/n und -name:                     | <ul style="list-style-type: none"> <li>• 17701 Synthesis and Properties of Ceramic Materials (PL), Schriftlich oder Mündlich, Gewichtung: 1</li> <li>• V Vorleistung (USL-V), Sonstige</li> </ul> Accreditation: presence during exercises                                                                                                                                         |                |                         |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                                                                                                                    |                |                         |

19. Medienform:

---

20. Angeboten von: Materialwissenschaft

---

**Modul: 55750 Materials Science - Seminar and Practical/Laboratory**

|                                                     |                                                                                                                                                                                                                                                                                      |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | -                                                                                                                                                                                                                                                                                    | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 9 LP                                                                                                                                                                                                                                                                                 | 6. Turnus:     | Wintersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                    | 7. Sprache:    | Deutsch        |
| 8. Modulverantwortlicher:                           | Dr. Ralf Schacherl                                                                                                                                                                                                                                                                   |                |                |
| 9. Dozenten:                                        |                                                                                                                                                                                                                                                                                      |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 3. Semester<br>→ Option A --> Options 1                                                                                                                                                                   |                |                |
| 11. Empfohlene Voraussetzungen:                     |                                                                                                                                                                                                                                                                                      |                |                |
| 12. Lernziele:                                      |                                                                                                                                                                                                                                                                                      |                |                |
| 13. Inhalt:                                         |                                                                                                                                                                                                                                                                                      |                |                |
| 14. Literatur:                                      |                                                                                                                                                                                                                                                                                      |                |                |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 557501 Materials Science - Seminar</li> <li>• 557502 Materials Science - Practical/Laboratory</li> </ul>                                                                                                                                    |                |                |
| 16. Abschätzung Arbeitsaufwand:                     |                                                                                                                                                                                                                                                                                      |                |                |
| 17. Prüfungsnummer/n und -name:                     | <ul style="list-style-type: none"> <li>• 55751 Materials Science - Seminar and Practical/Laboratory (USL), Schriftlich oder Mündlich, Gewichtung: 1</li> <li>• 55752 Materials Science - Seminar and Practical/Laboratory (USL), Schriftlich oder Mündlich, Gewichtung: 1</li> </ul> |                |                |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                      |                |                |
| 19. Medienform:                                     |                                                                                                                                                                                                                                                                                      |                |                |
| 20. Angeboten von:                                  | Materialdesign                                                                                                                                                                                                                                                                       |                |                |

## 1112 Option B

---

Zugeordnete Module:   17560 Phase Transformations  
                              55760 Materials Science - Seminar and Practical/Laboratory

---

## Modul: 17560 Phase Transformations

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                         |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|
| 2. Modulkürzel:                                     | 031400010                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5. Moduldauer: | Zweisemestrig           |
| 3. Leistungspunkte:                                 | 9 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6. Turnus:     | Jedes 2. Wintersemester |
| 4. SWS:                                             | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7. Sprache:    | Englisch                |
| 8. Modulverantwortlicher:                           | Dr. Ralf Schacherl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                         |
| 9. Dozenten:                                        | Eric Jan Mittemeijer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                         |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 1. Semester<br>→ Option A --> Options<br>M.Sc. Materialwissenschaft, PO 177-2011, 1. Semester<br>→ Vertiefungsmodule<br>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 3. Semester<br>→ Option B --> Options 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                         |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                         |
| 12. Lernziele:                                      | The students <ul style="list-style-type: none"> <li>• are proficient in the field of thermodynamics and solid state kinetics of materials,</li> <li>• know the most important surface-treatment methods of materials and the properties obtained after the treatment,</li> <li>• are able to apply the concepts of thermodynamics, solid state kinetics and surface-treatment methods in the research and development of advanced materials,</li> <li>• have the competence to communicate, on a high level, with experts in the field of science and engineering about the topics of this module (e.g. on symposia).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                         |
| 13. Inhalt:                                         | <p><b>Thermodynamics of Materials</b></p> <p>Thermodynamics of mixed phases (integral mixing functions, partial mixing functions), general definition of partial state variables, solution models (ideal, regular, real), melting equilibria, solid-liquid equilibria, partial vapour pressure, EMF methods, calorimeter, order-transition in mixed crystals, piezoelectricity, thermodynamic properties of alloys, influence of atom-volume differences, Miedema model, analytical description of thermodynamic mixing functions, calculation and description of phase equilibria, potential -partial pressure diagram, Ellingham diagram, electron theoretical first principle calculation of thermodynamic mixing functions.</p> <p><b>Solid state kinetics: diffusion and phase transformation kinetics</b></p> <p>Meaning of diffusion for the microstructure, defects, Fick's laws, thermodynamic factor, examples, Boltzmann-Matano analysis, Substitutional and interstitial diffusion, experiment of Simmons and Balluffi, Kirkendall-effect, Darken-equation, Onsager-relations, Grain-boundary diffusion (Fisher, Suzoka, Whipple), diffusion along dislocations, diffusion-induced grain boundary migration, Schottky- and Frenkel-defects, mass transport in chemical and electrical potential fields, effect of impurities,</p> |                |                         |

Diffusion in ionic semiconductors, diffusion in semiconductors, Electromigration, interstitials in metals , electromigration, homogenous and heterogeneous reactions, Johnson-Mehl-Avrami equation, nucleation, growth and impingement, analysis of transformation kinetics,

**Surface Engineering**

Thermochemical processes: carburizing, nitriding, oxidation, CVD etc. PVD.

Characterisation of surfaces and thin layers: development and measurement of residual stresses, depth- profile analysis.

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14. Literatur:                       | <ul style="list-style-type: none"> <li>• E.J. Mittemeijer, Fundamentals of Materials Science, Springer (2010)</li> <li>• D.R. Gaskell, Introduction to the Thermodynamics of Materials, Taylor und Francis (2009)</li> <li>• C.H.P. Lupis, Chemical Thermodynamics of Materials, North Holland (1983)</li> <li>• M. Hillert, Phase Equilibria, Phase Diagrams and Phase Transformations: Their Thermodynamic Basis, Cambridge University Press (2007)</li> <li>• D.A. Porter, K.E. Easterling, M.Y. Sherif, Phase Transformations in Metals and Alloys, CRC Press (2009)</li> <li>• P. Shewmon, Diffusion in Solids, John Wiley und Sons (1988)</li> <li>• J. Crank, The Mathematics of Diffusion, Oxford University Press (1979)</li> </ul> |
| 15. Lehrveranstaltungen und -formen: | <ul style="list-style-type: none"> <li>• 175601 Lecture Phase Transformations</li> <li>• 175602 Exercise Phase Transformations</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 16. Abschätzung Arbeitsaufwand:      | <p>Presence time: 100 h</p> <p>Self-study: 161 h</p> <p>Total: 261 h</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 17. Prüfungsnummer/n und -name:      | <ul style="list-style-type: none"> <li>• 17561 Phase Transformations (PL), Mündlich, Gewichtung: 1</li> <li>• V Vorleistung (USL-V), Schriftlich</li> </ul> <p>Zulassung: Übungsklausur bestanden</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 18. Grundlage für ... :              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 19. Medienform:                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 20. Angeboten von:                   | Materialdesign                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Modul: 55760 Materials Science - Seminar and Practical/Laboratory**

|                                                     |                                                                                                                                                                                                                                                                                            |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | -                                                                                                                                                                                                                                                                                          | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                       | 6. Turnus:     | Wintersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                          | 7. Sprache:    | Deutsch        |
| 8. Modulverantwortlicher:                           | Dr. Ralf Schacherl                                                                                                                                                                                                                                                                         |                |                |
| 9. Dozenten:                                        |                                                                                                                                                                                                                                                                                            |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 3. Semester<br>→ Option B --> Options 1                                                                                                                                                                         |                |                |
| 11. Empfohlene Voraussetzungen:                     |                                                                                                                                                                                                                                                                                            |                |                |
| 12. Lernziele:                                      |                                                                                                                                                                                                                                                                                            |                |                |
| 13. Inhalt:                                         |                                                                                                                                                                                                                                                                                            |                |                |
| 14. Literatur:                                      |                                                                                                                                                                                                                                                                                            |                |                |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 557602 Materials Science - Practical/Laboratory</li> <li>• 557601 Materials Science - Seminar</li> </ul>                                                                                                                                          |                |                |
| 16. Abschätzung Arbeitsaufwand:                     |                                                                                                                                                                                                                                                                                            |                |                |
| 17. Prüfungsnummer/n und -name:                     | <ul style="list-style-type: none"> <li>• 55761 Materials Science - Seminar and Practical/Laboratory (USL) (USL), Schriftlich oder Mündlich, Gewichtung: 1</li> <li>• 55762 Materials Science - Seminar and Practical/Laboratory (USL), Schriftlich oder Mündlich, Gewichtung: 1</li> </ul> |                |                |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                            |                |                |
| 19. Medienform:                                     |                                                                                                                                                                                                                                                                                            |                |                |
| 20. Angeboten von:                                  | Materialdesign                                                                                                                                                                                                                                                                             |                |                |

## 112 Options 2

---

|                     |      |          |
|---------------------|------|----------|
| Zugeordnete Module: | 1121 | Option A |
|                     | 1122 | Option B |

---

## 1121 Option A

---

Zugeordnete Module:    17710 Nanocomposite Materials  
                              37100 Diffraction methods in Materials Science  
                              50080 Physikalische Chemie von Polymeren

---

## Modul: 17710 Nanocomposite Materials

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                 |                |                         |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|
| 2. Modulkürzel:                                     | 031400061                                                                                                                                                                                                                                                                                                                                                                                       | 5. Moduldauer: | Einsemestrig            |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                                                                                                                            | 6. Turnus:     | Jedes 2. Sommersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                                                                                                                               | 7. Sprache:    | Englisch                |
| 8. Modulverantwortlicher:                           | apl. Prof. Dr. Joachim Bill                                                                                                                                                                                                                                                                                                                                                                     |                |                         |
| 9. Dozenten:                                        | Joachim Bill                                                                                                                                                                                                                                                                                                                                                                                    |                |                         |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br>→ Option A --> Options 2<br>M.Sc. Materialwissenschaft, PO 177-2011, 2. Semester<br>→ Vertiefungsmodule<br>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 2. Semester<br>→ Option B --> Options<br>M.Sc. Materialwissenschaft, PO 177-2016, 2. Semester<br>→ Zusatzmodule |                |                         |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                                    |                |                         |
| 12. Lernziele:                                      | The students:<br>- have knowledge of preparation of nanocomposite materials and organic/inorganic hybrids<br>- are able to identify correlations between the structure and properties of materials<br>- are able to create new application fields based on determined structure/property correlation                                                                                            |                |                         |
| 13. Inhalt:                                         | - bionic principles<br>- biomineralization<br>- bio-inspired materials<br>- nanocomposites derived from molecular precursors                                                                                                                                                                                                                                                                    |                |                         |
| 14. Literatur:                                      | Colombo, R. et al. (eds.): Polymer Derived Ceramics. DEStech Publication, 2010.<br>Fahlman, B. D.: Materials Chemistry, Springer, 2008.<br>Mann, S.: Biomineralization. Oxford University Press, 2001.                                                                                                                                                                                          |                |                         |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 177101 Lecture Nanocomposite Materials</li> <li>• 177102 Exercise Nanocomposite Materials</li> <li>• 177103 Lecture Nanocomposite Materials</li> <li>• 177104 Exercise Nanocomposite Materials</li> </ul>                                                                                                                                              |                |                         |
| 16. Abschätzung Arbeitsaufwand:                     | Lecture<br>Presence hours: 28h<br>Self-study: 63h<br>Exercises<br>Present hours: 28h<br>Self-study: 56h                                                                                                                                                                                                                                                                                         |                |                         |
| 17. Prüfungsnummer/n und -name:                     | <ul style="list-style-type: none"> <li>• 17711 Nanocomposite Materials (PL), Schriftlich oder Mündlich, Gewichtung: 1</li> <li>• V Vorleistung (USL-V), Sonstige</li> </ul> Accreditation: presence during exercises                                                                                                                                                                            |                |                         |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                                                                                                                                 |                |                         |

19. Medienform:

---

20. Angeboten von: Chemische Materialsynthese

---

## Modul: 37100 Diffraction methods in Materials Science

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | 031400025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6. Turnus:     | Sommersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 7. Sprache:    | Englisch       |
| 8. Modulverantwortlicher:                           | PD Dr. Nikolay Zotov                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 9. Dozenten:                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | <p>M.Sc. Materialwissenschaft, PO 177-2016,<br/>→ Optional Modules --&gt; Metals and Structural Materials --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br/>→ Option B --&gt; Options 2</p> <p>M.Sc. Materialwissenschaft, PO 177-2011, 4. Semester<br/>→ Compulsory Optional (related to the subject) --&gt; Schlüsselqualifikationen</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 4. Semester<br/>→ Optional Modules --&gt; Advanced Materials Characterization II --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 4. Semester<br/>→ Metals and Structural Materials --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br/>→ Option A --&gt; Options 2</p> <p>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 4. Semester<br/>→ Compulsory Optional (related to the subject) --&gt; Electives</p> <p>M.Sc. Materialwissenschaft, PO 177-2011, 4. Semester<br/>→ Compulsory Optional (unrelated to the subject) --&gt; Schlüsselqualifikationen</p> |                |                |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |
| 12. Lernziele:                                      | <p>The students will be able to:</p> <p>Perform themselves diffraction experiments</p> <p>Interpret diffraction data</p> <p>Extract relevant microstructural information from the diffraction data</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |
| 13. Inhalt:                                         | <p>The course covers the application of different diffraction methods for the study of basic and advanced materials. Topics covered include:</p> <ul style="list-style-type: none"> <li>• Classification of Materials</li> <li>• Defects in Solids</li> <li>• Basics of X-ray and neutron scattering</li> <li>• Diffraction studies of Polycrystalline Materials</li> <li>• Microstructural Analysis by Diffraction</li> <li>• Diffraction studies of Thin Films</li> <li>• Diffraction studies of Nanomaterials</li> <li>• Diffraction studies of Amorphous and Composite Materials</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| 14. Literatur:                                      | <p>Diffraction Analysis of the Microstructure of Materials, E.J. Mittemeijer, P. Scardi, 2004</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 371001 Vorlesung mit Übungen Diffraction Methods in Material Science</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                |

|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 16. Abschätzung Arbeitsaufwand: | Präsenzzeit 4 SWS<br>Selbststudiumszeit 2 SWS                                                                                      |
| 17. Prüfungsnummer/n und -name: | • 37101 Diffraction methods in Materials Science (PL), Schriftlich, 60 Min., Gewichtung: 1<br>• V Vorleistung (USL-V), Schriftlich |
| 18. Grundlage für ... :         |                                                                                                                                    |
| 19. Medienform:                 |                                                                                                                                    |
| 20. Angeboten von:              | Materialdesign                                                                                                                     |

## Modul: 50080 Physikalische Chemie von Polymeren

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | 031210803                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 3 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6. Turnus:     | Sommersemester |
| 4. SWS:                                             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 7. Sprache:    | Englisch       |
| 8. Modulverantwortlicher:                           | Univ.-Prof. Dr. Sabine Ludwigs                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 9. Dozenten:                                        | Sabine Ludwigs                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree,<br>PO 177ChI2014, 4. Semester<br>→ Option A --> Options 2<br>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree,<br>PO 177ChI2014, 4. Semester<br>→ Option B --> Options 2                                                                                                                                                                                                                     |                |                |
| 11. Empfohlene Voraussetzungen:                     | Fundamentals of Macromolecular Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |
| 12. Lernziele:                                      | The students have knowledge in solution and solid properties of polymers.<br><br>Furthermore the students have competence in polymer engineering and modification of technical important polymers.                                                                                                                                                                                                                                                                 |                |                |
| 13. Inhalt:                                         | <ul style="list-style-type: none"> <li>• Statistical thermodynamics (Flory-Huggins-theory, solubility parameters, phase equilibrium and phase transition)</li> <li>• Morphologies of homo-, block copolymers and polymer blends</li> <li>• Amorphous and crystalline polymer state</li> <li>• Rubber elasticity</li> <li>• Polymer viscoelasticity</li> <li>• Polymer topics (polyelectrolytes, polymer surfaces, conducting polymers, nanolithography)</li> </ul> |                |                |
| 14. Literatur:                                      | L. H. Sperling, Introduction to Physical Polymer Science, Wiley-VCH<br>U. W. Gedde, Polymer Physics, Chapman und Hall<br>H.-G. Elias, Makromolecules, Part 1-4, Wiley-VCH                                                                                                                                                                                                                                                                                          |                |                |
| 15. Lehrveranstaltungen und -formen:                | • 500801 Vorlesung Physikalische Chemie von Polymeren                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
| 16. Abschätzung Arbeitsaufwand:                     | Lecture<br>Presence hours 10 x 3 h = 30 h<br>examination 2 h<br>Self-study 58 h<br>Summe: 90 h                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 17. Prüfungsnummer/n und -name:                     | 50081 Physikalische Chemie von Polymeren (BSL), Schriftlich, 90 Min., Gewichtung: 1                                                                                                                                                                                                                                                                                                                                                                                |                |                |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
| 19. Medienform:                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
| 20. Angeboten von:                                  | Polymerchemie                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |

## 1122 Option B

---

Zugeordnete Module:    17650 New Materials and Materials Characterization Methods  
                                 37100 Diffraction methods in Materials Science  
                                 50080 Physikalische Chemie von Polymeren

---

## Modul: 17650 New Materials and Materials Characterization Methods

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                |                         |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------|
| 2. Modulkürzel:                                     | 031420056                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5. Moduldauer: | Einsemestrig            |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6. Turnus:     | Jedes 2. Sommersemester |
| 4. SWS:                                             | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 7. Sprache:    | Deutsch                 |
| 8. Modulverantwortlicher:                           | Univ.-Prof. Dr. Guido Schmitz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                |                         |
| 9. Dozenten:                                        | Eduard Arzt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                         |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | <p>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 2. Semester<br/> → Option A --&gt; Options</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 2. Semester<br/> → Nanomaterials and Nanostructures --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 2. Semester<br/> → Zusatzmodule</p> <p>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br/> → Option B --&gt; Options 2</p> <p>M.Sc. Materialwissenschaft, PO 177-2011, 2. Semester<br/> → Vertiefungsmodule</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 2. Semester<br/> → Advanced Materials Characterization II --&gt; Specialization subject</p> |                |                         |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                         |
| 12. Lernziele:                                      | <p>The students have knowledge of the structure and function of biological and nano-structured materials</p> <p>have knowledge of the basic principles of testing and characterization techniques</p> <p>are able to select a proper means of testing/analysis for a given problem.</p> <p>are able to communicate with experts in this field about biological and nano-structured materials as well as testing and characterization methods</p>                                                                                                                                                                                                                                                           |                |                         |
| 13. Inhalt:                                         | <p>Biological materials: wood, bone, teeth, silk, resilin</p> <p>Bio-inspired materials: functional surfaces</p> <p>Biological strategies : self-cleaning (lotus effect), reduction of flow resistance (shark skin), adhesion design (insects and reptiles), self-organization (cytoskeleton)</p> <p>nanostructured materials: nano-crystalline metals, nano-particles, nanorods, quantum dots und lines, thin films, structuring, applications</p> <p>characterization methods: high resolution microscopy, synchrotron techniques</p>                                                                                                                                                                    |                |                         |
| 14. Literatur:                                      | Julian Vincent, Structural Biomaterials, revised edition, Princeton University Press, Princeton, 1991                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                         |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 176501 Lecture New Materials and Materials Characterization Methods</li> <li>• 176502 Lecture New Materials and Materials Characterization Methods</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                         |
| 16. Abschätzung Arbeitsaufwand:                     | Presence time: 92h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                         |

Self-Study: 88h

Total: 180h

---

17. Prüfungsnummer/n und -name:

- 17651 New Materials and Materials Characterization Methods (PL),  
Mündlich, 30 Min., Gewichtung: 1
  - V Vorleistung (USL-V), Mündlich, 30 Min.
- Zulassung: Praktikum bestanden

---

18. Grundlage für ... :

---

19. Medienform:

---

20. Angeboten von:

Materialphysik

---

**Modul: 37100 Diffraction methods in Materials Science**

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | 031400025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 6 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6. Turnus:     | Sommersemester |
| 4. SWS:                                             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 7. Sprache:    | Englisch       |
| 8. Modulverantwortlicher:                           | PD Dr. Nikolay Zotov                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 9. Dozenten:                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | <p>M.Sc. Materialwissenschaft, PO 177-2016,<br/>→ Optional Modules --&gt; Metals and Structural Materials --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br/>→ Option B --&gt; Options 2</p> <p>M.Sc. Materialwissenschaft, PO 177-2011, 4. Semester<br/>→ Compulsory Optional (related to the subject) --&gt; Schlüsselqualifikationen</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 4. Semester<br/>→ Optional Modules --&gt; Advanced Materials Characterization II --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft, PO 177-2016, 4. Semester<br/>→ Metals and Structural Materials --&gt; Specialization subject</p> <p>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br/>→ Option A --&gt; Options 2</p> <p>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, 4. Semester<br/>→ Compulsory Optional (related to the subject) --&gt; Electives</p> <p>M.Sc. Materialwissenschaft, PO 177-2011, 4. Semester<br/>→ Compulsory Optional (unrelated to the subject) --&gt; Schlüsselqualifikationen</p> |                |                |
| 11. Empfohlene Voraussetzungen:                     | BSc Materialwissenschaft (Materials Science)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |                |
| 12. Lernziele:                                      | <p>The students will be able to:</p> <p>Perform themselves diffraction experiments</p> <p>Interpret diffraction data</p> <p>Extract relevant microstructural information from the diffraction data</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                |
| 13. Inhalt:                                         | <p>The course covers the application of different diffraction methods for the study of basic and advanced materials. Topics covered include:</p> <ul style="list-style-type: none"> <li>• Classification of Materials</li> <li>• Defects in Solids</li> <li>• Basics of X-ray and neutron scattering</li> <li>• Diffraction studies of Polycrystalline Materials</li> <li>• Microstructural Analysis by Diffraction</li> <li>• Diffraction studies of Thin Films</li> <li>• Diffraction studies of Nanomaterials</li> <li>• Diffraction studies of Amorphous and Composite Materials</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                |
| 14. Literatur:                                      | <p>Diffraction Analysis of the Microstructure of Materials, E.J. Mittemeijer, P. Scardi, 2004</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                |
| 15. Lehrveranstaltungen und -formen:                | <ul style="list-style-type: none"> <li>• 371001 Vorlesung mit Übungen Diffraction Methods in Material Science</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                |                |

|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 16. Abschätzung Arbeitsaufwand: | Präsenzzeit 4 SWS<br>Selbststudiumszeit 2 SWS                                                                                      |
| 17. Prüfungsnummer/n und -name: | • 37101 Diffraction methods in Materials Science (PL), Schriftlich, 60 Min., Gewichtung: 1<br>• V Vorleistung (USL-V), Schriftlich |
| 18. Grundlage für ... :         |                                                                                                                                    |
| 19. Medienform:                 |                                                                                                                                    |
| 20. Angeboten von:              | Materialdesign                                                                                                                     |

**Modul: 50080 Physikalische Chemie von Polymeren**

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| 2. Modulkürzel:                                     | 031210803                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5. Moduldauer: | Einsemestrig   |
| 3. Leistungspunkte:                                 | 3 LP                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6. Turnus:     | Sommersemester |
| 4. SWS:                                             | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 7. Sprache:    | Englisch       |
| 8. Modulverantwortlicher:                           | Univ.-Prof. Dr. Sabine Ludwigs                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 9. Dozenten:                                        | Sabine Ludwigs                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree,<br>PO 177ChI2014, 4. Semester<br>→ Option A --> Options 2<br>M.Sc. Materialwissenschaft Chalmers Incoming Double Degree,<br>PO 177ChI2014, 4. Semester<br>→ Option B --> Options 2                                                                                                                                                                                                                     |                |                |
| 11. Empfohlene Voraussetzungen:                     | Fundamentals of Macromolecular Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                |
| 12. Lernziele:                                      | The students have knowledge in solution and solid properties of polymers.<br><br>Furthermore the students have competence in polymer engineering and modification of technical important polymers.                                                                                                                                                                                                                                                                 |                |                |
| 13. Inhalt:                                         | <ul style="list-style-type: none"> <li>• Statistical thermodynamics (Flory-Huggins-theory, solubility parameters, phase equilibrium and phase transition)</li> <li>• Morphologies of homo-, block copolymers and polymer blends</li> <li>• Amorphous and crystalline polymer state</li> <li>• Rubber elasticity</li> <li>• Polymer viscoelasticity</li> <li>• Polymer topics (polyelectrolytes, polymer surfaces, conducting polymers, nanolithography)</li> </ul> |                |                |
| 14. Literatur:                                      | L. H. Sperling, Introduction to Physical Polymer Science, Wiley-VCH<br>U. W. Gedde, Polymer Physics, Chapman und Hall<br>H.-G. Elias, Makromolecules, Part 1-4, Wiley-VCH                                                                                                                                                                                                                                                                                          |                |                |
| 15. Lehrveranstaltungen und -formen:                | • 500801 Vorlesung Physikalische Chemie von Polymeren                                                                                                                                                                                                                                                                                                                                                                                                              |                |                |
| 16. Abschätzung Arbeitsaufwand:                     | Lecture<br>Presence hours 10 x 3 h = 30 h<br>examination 2 h<br>Self-study 58 h<br>Summe: 90 h                                                                                                                                                                                                                                                                                                                                                                     |                |                |
| 17. Prüfungsnummer/n und -name:                     | 50081 Physikalische Chemie von Polymeren (BSL), Schriftlich, 90 Min., Gewichtung: 1                                                                                                                                                                                                                                                                                                                                                                                |                |                |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
| 19. Medienform:                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                |
| 20. Angeboten von:                                  | Polymerchemie                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                |

## Modul: 72050 Module Chalmers University of Technology

|                                                     |                                                                                                                                                          |                                                                   |   |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---|
| 2. Modulkürzel:                                     | -                                                                                                                                                        | 5. Moduldauer:                                                    | - |
| 3. Leistungspunkte:                                 | 60 LP                                                                                                                                                    | 6. Turnus:                                                        | - |
| 4. SWS:                                             | -                                                                                                                                                        | 7. Sprache:                                                       | - |
| 8. Modulverantwortlicher:                           |                                                                                                                                                          |                                                                   |   |
| 9. Dozenten:                                        |                                                                                                                                                          |                                                                   |   |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014,<br>M.Sc. Materialwissenschaft Chalmers Outgoing Double Degree, PO 177ChO2014, |                                                                   |   |
| 11. Empfohlene Voraussetzungen:                     |                                                                                                                                                          |                                                                   |   |
| 12. Lernziele:                                      |                                                                                                                                                          |                                                                   |   |
| 13. Inhalt:                                         |                                                                                                                                                          |                                                                   |   |
| 14. Literatur:                                      |                                                                                                                                                          |                                                                   |   |
| 15. Lehrveranstaltungen und -formen:                |                                                                                                                                                          |                                                                   |   |
| 16. Abschätzung Arbeitsaufwand:                     |                                                                                                                                                          |                                                                   |   |
| 17. Prüfungsnummer/n und -name:                     | 72051                                                                                                                                                    | Module Chalmers University of Technology (PL), ,<br>Gewichtung: 1 |   |
| 18. Grundlage für ... :                             |                                                                                                                                                          |                                                                   |   |
| 19. Medienform:                                     |                                                                                                                                                          |                                                                   |   |
| 20. Angeboten von:                                  |                                                                                                                                                          |                                                                   |   |

**Modul: 80510 Masterarbeit Materialwissenschaft**

|                                                     |                                                                                                                                                                                                                                                                              |                |                                   |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------|
| 2. Modulkürzel:                                     | 031400016                                                                                                                                                                                                                                                                    | 5. Moduldauer: | Zweisemestrig                     |
| 3. Leistungspunkte:                                 | 30 LP                                                                                                                                                                                                                                                                        | 6. Turnus:     | Wintersemester/<br>Sommersemester |
| 4. SWS:                                             | 0                                                                                                                                                                                                                                                                            | 7. Sprache:    | Englisch                          |
| 8. Modulverantwortlicher:                           | Univ.-Prof. Dr.-Ing. Eric Jan Mittemeijer                                                                                                                                                                                                                                    |                |                                   |
| 9. Dozenten:                                        |                                                                                                                                                                                                                                                                              |                |                                   |
| 10. Zuordnung zum Curriculum in diesem Studiengang: | M.Sc. Materialwissenschaft Chalmers Incoming Double Degree, PO 177ChI2014, 4. Semester<br>M.Sc. Materialwissenschaft, PO 177-2011, 4. Semester<br>M.Sc. Materialwissenschaft, PO 177-2016, 4. Semester                                                                       |                |                                   |
| 11. Empfohlene Voraussetzungen:                     |                                                                                                                                                                                                                                                                              |                |                                   |
| 12. Lernziele:                                      | The students:<br>Can oversee independently a small scientific project and evaluate the results.<br>Are able to summarize the results in a scientific report and present these in a talk                                                                                      |                |                                   |
| 13. Inhalt:                                         | Familiarization in the project by literature research and preparation of a work plan.<br>Performance and evaluation of the own experiments.<br>Discussion of the results.<br>Summarization of the results in a scientific report.<br>Presentation and defence of the results |                |                                   |
| 14. Literatur:                                      |                                                                                                                                                                                                                                                                              |                |                                   |
| 15. Lehrveranstaltungen und -formen:                |                                                                                                                                                                                                                                                                              |                |                                   |
| 16. Abschätzung Arbeitsaufwand:                     |                                                                                                                                                                                                                                                                              |                |                                   |
| 17. Prüfungsnummer/n und -name:                     |                                                                                                                                                                                                                                                                              |                |                                   |
| 18. Grundlage für ... :                             |                                                                                                                                                                                                                                                                              |                |                                   |
| 19. Medienform:                                     |                                                                                                                                                                                                                                                                              |                |                                   |
| 20. Angeboten von:                                  | Materialdesign                                                                                                                                                                                                                                                               |                |                                   |