

**SCIENTIFIC AND METHOD MODULES**

<b>Module name</b>	<b>Chemical Biology and Biophysics of Cancer: Physics of Cancer</b>
<b>Number</b>	2015-A2
<b>Aims</b>	This module discusses how molecular and materials science can provide a new perspective in oncology. Molecular biology shows the complexity and ambiguity that arises from the variability of tumours. Nevertheless, some biochemical and biophysical changes are universal to solid tumour progression and may provide both, novel diagnostic as well as therapeutic concepts. The state of the art in diagnostics and therapeutics will be discussed to identify the current needs.
<b>Contents</b>	Tumour progression (tumour growth and homeostasis, uncontrolled proliferation, invasion and metastasis, tumour induced alterations of the stroma, vascular system and immune system, role of chemical cues as well as active and passive forces in triggering cell division and apoptosis), Diagnostics and screening (cytobrushes, imaging [CT, MRI], tumour markers, histology, tumour staging), Therapy (surgery, radiation, chemotherapy [antineoplastic drugs, cytostatic molecules, protein kinase inhibitors]), Targeted tumour therapy (specific and unspecific shuttles, specific expression of cell surface proteins, internalization of biomolecules into tumour cells, linkers for controlled release, etc.), Personalised medicine and better tumour staging (single cell analysis, high throughput and content, genetic networks, tumour specific tracers and their application by PET-imaging or fMRI-scanning, tumour cell biomechanics and adhesion), Models of tumour growth (finite element-based models, differential adhesion hypothesis, glass-like behaviour), Relapse (selective pressure and resistant tumour cells, dormant cancer cells, cancer stem cells).
<b>Methods</b>	Hybrid molecules as novel or optimised drugs (advanced synthetic methods, combining organic, inorganic and biochemical approaches), Imaging (CT, MRI, PET, fMRI), Active and passive cell mechanics and adhesion (AFM-based cell rheology, cellhesion, magnetic bead rheology, optical stretcher), Tumour cell migration (wound healing, migration through collagen gels, traction force microscopy), Vital imaging of tumour cells.
<b>Type</b>	Two-day block course/ yearly recurrence with modification
<b>Date (month/year)</b>	7–9 September 2015
<b>Time</b>	See program: <a href="http://conference.uni-leipzig.de/poc/2015/">http://conference.uni-leipzig.de/poc/2015/</a>
<b>Work load</b>	15 hours presence/ 45 hours self-study
<b>Examination</b>	2-page report about the conference, submission until 16 September 2015 to Prof. Käs
<b>Credit points</b>	2
<b>Responsible scientists</b>	Käs
<b>International guest lecturers</b>	
<b>Industrial partners</b>	
<b>Recommendations for literature</b>	