SCIENTIFIC AND METHOD MODULES

Module name	Chemical Biology and Biophysics of Cancer
Number	2012-A2
Aims	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.
Basics	***Recommended knowledge:*** thematic modules T2, T5, T6 ***Required knowledge:*** Advanced knowledge in cell biology (cytoskeleton, transcription, translation), chemistry and biochemistry (hybrids of peptides and inorganic molecules) and cell mechanics (polymer physics, rheology)
Contents	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).
Methods	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.
Type	Two-day block course/ yearly recurrence with modification
Date (month/year)	November 13-14, 2012
Time	10:00-15:30, ITP (Brüderstraße 16), Room 113
Work load	15 hours presence/ 45 hours self-study
Examination	Oral/written, Date
Credit points	2
Responsible scientists	Beck-Sickinger, Hey-Hawkins, Käs, Kroy, Pompe, Robitzki
International guest lecturers	Claudia Mierke (Uni Leipzig), Gabriela Aust (Uni Leipzig), Jörg Galle (IZBI Leipzig), Torsten Remmernach (Uni Leipzig), Ben Frabry (Uni Erlangen), Josef Käs (Uni Leipzig)
Industrial partners	
Recommendations for literature, e-learning	

Graduate School BuildMoNa
Universität Leipzig
Johannisallee 29
04103 Leipzig
Germany

Phone: +49 341 97-36016
Fax: +49 341 97-36094

buildmona@uni-leipzig.de
www.buildmona.de

SCHEDULE for Module 2012-A2

Time	Lecturer	Programme	Location
Day 1			
10:00-11:30	Claudia Mierke	The hallmarks of cancer	ITP Brüderstrasse 16 room: 113
	Lunch break		
13:30-14:30	Gabriela Aust	Tumor metastasis	ITP Brüderstrasse 16 room: 113
14:30-15:30	Jörg Galle	Modelling colon cancer growth	ITP Brüderstrasse 16 room: 113
Day 2			
10:00-11:00	Torsten Remmerbach	Oral cancer screening	ITP Brüderstrasse 16 room: 113
	Lunch break		
13:30-14:30	Ben Fabry	Tumor cell migration in a 3-dimentional matrix	ITP Brüderstrasse 16 room: 113
14:30-15:30	Josef Käs	The role of biomechanics in cancer progression	ITP Brüderstrasse 16 room: 113

Didactic elements:
Lecture, discussions, practical training – lab demonstration, etc.

Expected performance:
Active participation in discussions during lab demonstration etc.