Title of the lecture		**ORGANIC COMPUTING**	
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	Topics	**Content**	**# slides**
A. Introduction: Systems Thinking			
A.01	**OC Introduction**	Examples: Sorting network, Indian junction, Predator - prey, Balinese water temples, Dissipative structures, Candle mover and ants, Tierra und self-modifying code, Small World, Cellular Automata, Lindenmayer Systems; Common characteristics; Technical usage: Organic Computing	48
A.02	**Systems Thinking**	Systems thinking; Definitions of „system“ (Abstractions and aspects, Structure and behaviour, System boundary, Some more system types; Holarchy and hierarchy, complexity	43
B. Methods			
B.01	**MAS**	How to model a concurrent system of multiple independent entities? Examples of agents; system environment; agent types; MAS; agreement in MAS; simulation of MAS	40
B.02	**Optimization**	Problem and term definition, Fitness landscapes, Classification, Traditional approaches, Nature-inspired algorithms	79
B.03	**LCS**	Machine learning in OC Systems. Examples; LCS overview; ZCS: Zeroth-level classifier system; XCS: accuracy-based classifier system: application example Organic Traffic Control	49
B.04	**ACO**	Ant Colony Optimization as an example of biologically inspired algorithms:Understand how the behavior of ants inspired computer algorithms.Real ants; Shortest path; classical path search; ant example network routing; ant example traveling salesman; ACO: optimization metaheuristic; further application examples	40
B.05	**Ant-based Clustering**	Comparison of biologically inspired and traditional data clustering algorithms. Data clustering; traditional approaches; ant-based clustering; comparison.	30
B.06	**Biologically inspred synchronisation**	How the behavior of fireflies inspired synchronization algorithms. physical time synchronisation; fireflies and their behaviour; decentralized synchronization in sensor networks (firefly metaphor)	21
B.07	**Neural Networks**	Alternate approaches to machine learning. Overview, examples; three-layer feed-forward networks; training; conclusion	47
C. OC Systems: A Quantitative Approach			
C.01	**Quantitative emergence**	Examples, order and entropy, observation model, emergence, redundancy, emergence fingerprints, emergence prediction	41
C.02	**Quantitative OC**	Self-organization and autonomy, 5 aspects of adaptive systems; Robustness and flexibility; Configuration space and variability; Control and degree of autonomy; Controlled self-organization	51
C.03	**OC architectures and examples**	MAPE, Observer/Controller, architectural options, examples, Organic Traffic Control, ONC, other examples from SPP, Holonic agent	33
C.04	**Social OC**	Social mechanisms, Trust Communities for Open Grid Computing, Ostrom's Enduring Institutions and norms, Holonic agents	54
D. OC Outlook			
D.01	**Three Dimensions of OC**	Self-Engineering, Self-optimization, Interdependence (Social OC)	58
D.02	**Wrap-up**	OC: The big picture	7
	Total		641