DES203T:
Designing Intelligent Systems

Session 1

https://sites.google.com/a/iiitdm.ac.in/vsudhir/courses/designing-intelligent-systems

http://172.16.15.126:8080/videos/DES203T/

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, DESIGN AND MANUFACTURING, KANCHEEPURAM

- Dr. Sudhir Varadarajan
- Dean (Design, Innovation & Incubation)

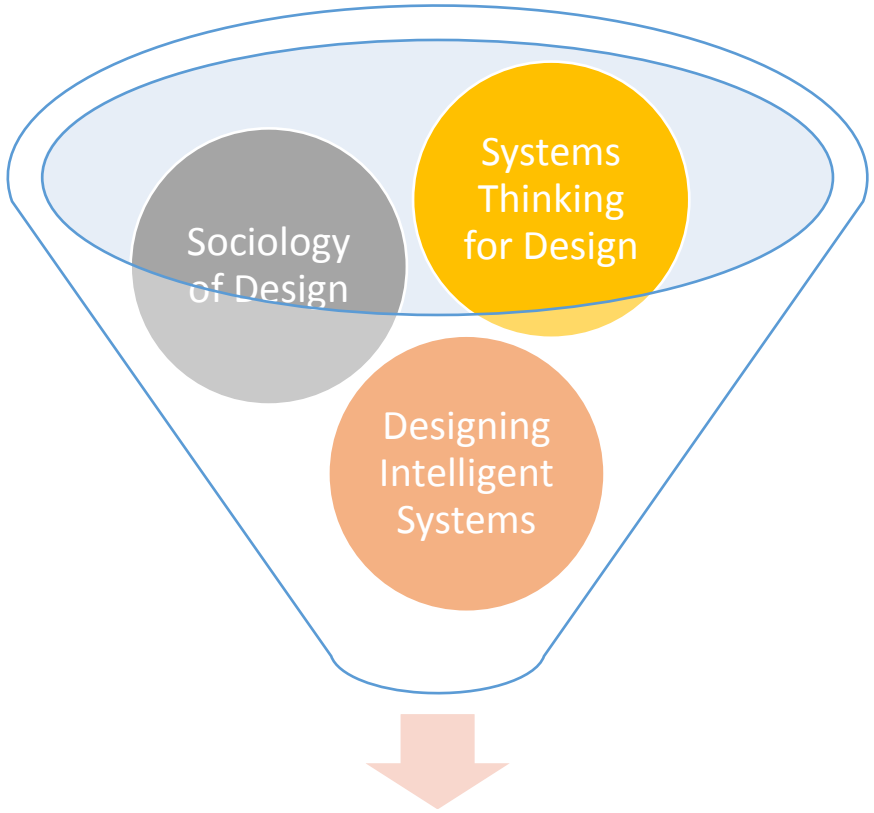
SESSION OUTLINE

- Continuing from where we left in “Systems Thinking for Design”
- Introduction to “Designing Intelligent Systems”
- Learning Outcomes and Course Structure

Open questions that you are likely to have

- Assuming you sense a real opportunity, you may still want to know
- Is my product concept really innovative?
- Does it leverage the trend towards smart/intelligent products?
- Is the product concept designed for intelligent behavior?

A case for more expertise on CONCEPT DESIGN



Intelligent Product/Service

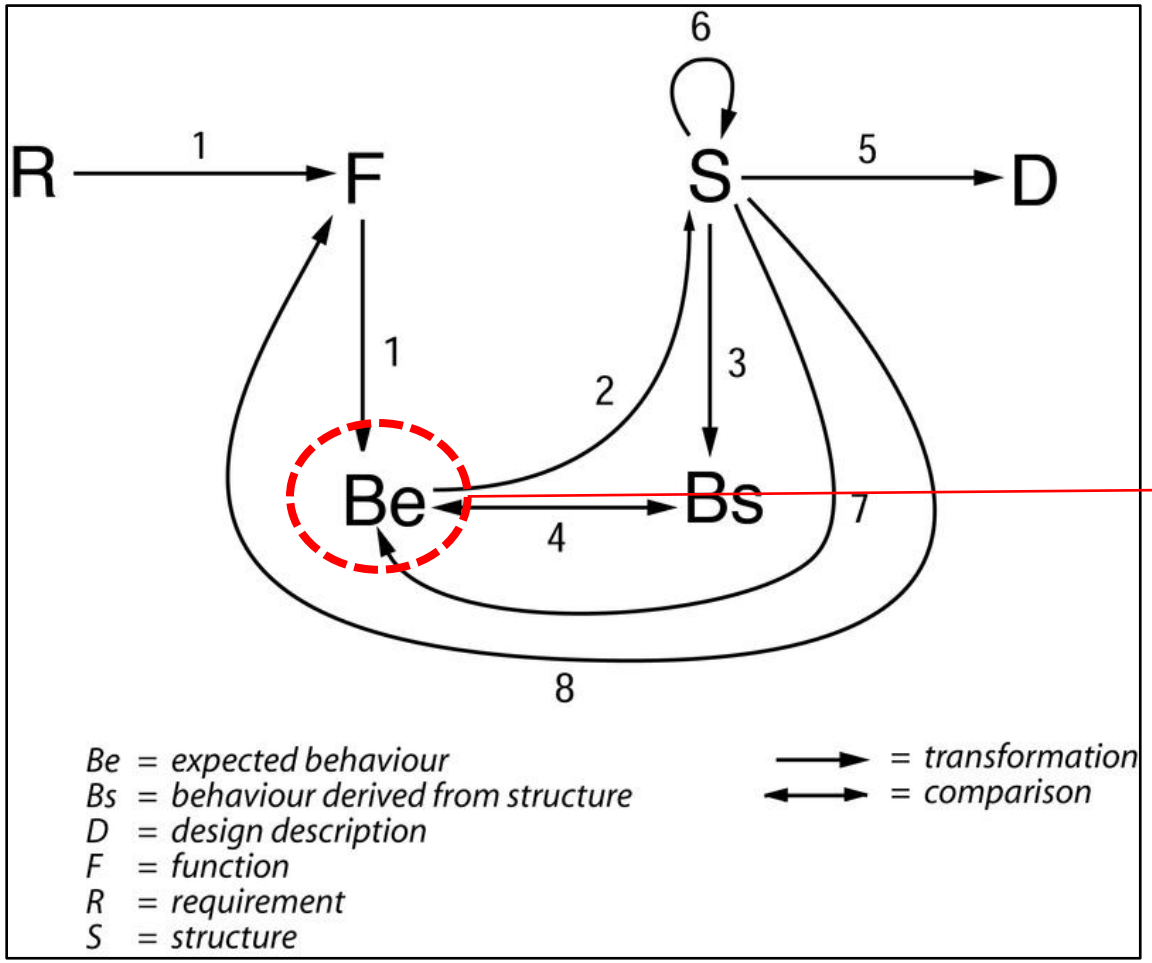
SESSION OUTLINE

- Continuing from where we left in “Systems Thinking for Design”
- Introduction to “Designing Intelligent Systems”
- Learning Outcomes and Course Structure

Exercise 1 (20 min):

- What is intelligent behavior?
- Which principles of complexity can explain intelligent behavior?
- What can we infer about intelligent behavior using the FBS model?
- Is there a role for metaphors in designing intelligent systems?
- What is the difference between robotics & AI?

Designing for Intelligence



Intelligent behavior depends on function and structure

Principles of complexity like feedback and recursion have a key role to play

Mechanical, Biological and Social metaphors are used to shape structures and functions for intelligent behaviors

A Holistic View of Intelligent Systems

Three Perspectives in Designing Intelligent Systems		
A: Intelligence as info processing / brain/digital nervous system – better signal control (focus on information/symbol manipulation) – classic AI	B: Intelligence can come from anywhere - through multiple senses & variety of signals (focus on different types of info & from different parts, ex: glass vibration for buildings) – bio-inspired AI (Robotics)	C: Intelligence that is evolutionary (self-organizing, no predefined structure, guided by local rules, dynamic rules, multi-agent, Artificial life) - inspired by Ecological and Social Systems

SESSION OUTLINE

- Continuing from where we left in “Systems Thinking for Design”
- Introduction to “Designing Intelligent Systems”
- Learning Outcomes and Course Structure

What is your expectation from this course?

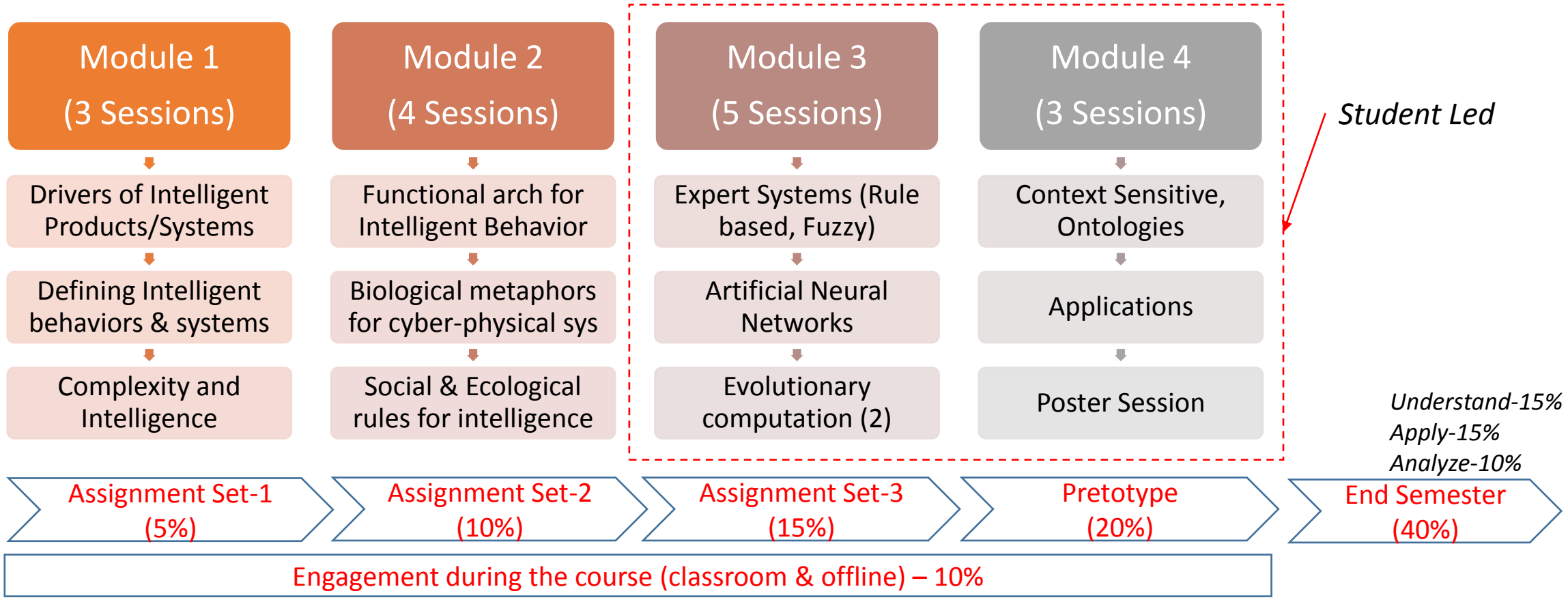
- Write down 2-3 key outcomes you expect

Learning Outcomes

What you will learn to do during & after this course?

- Identify and define the right type of intelligent behaviour for a chosen product concept
- Design high-level functional and component (structural) architecture for intelligent behaviour using appropriate metaphor and analogy
- Evaluate and select the right AI technique for the proposed functional and component architecture and vice versa

Session & Assessment Plan



Key References *(All the content will be on the course website)*

- Donald A Norman (2007), The design of future things, Basic Books, New York
- Serge A. Rijsdijk and Erik Jan Hultink (2013), Developing Intelligent Products, in Kenneth B. Kahn Ed., The PDMA Handbook of New Product Development, Third Edition, Wiley
- Stephen C.-Y. Lu (1) and Ang Liu (2012), Abductive reasoning for design synthesis, CIRP Annals - Manufacturing Technology 61 (2012) 143–146
- Ross Ashby, Brains, Intelligence, Creativity and Genius, In Roger Conant, Mechanisms of Intelligence: Ross Ashby's writings on Cybernetics (digital version)
- James G Miller (1971), The nature of living systems, Academy of Educational Development
- Michael Negnevitsky (2005), Artificial Intelligence: A Guide to Intelligent Systems, Second Edition, Addison Wesley
- Dario Floreano and Claudio Mattiussi (2008), Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, MIT Press

Systems Thinking, Sociology of Design and Intelligent Systems: What is the connection?

	Systems Thinking for Design	Sociology of Design	Intelligent Systems Design
Systems Thinking & Complexity	Core Skills: Abstracting elements, Categorizing, Linking, Seeing Patterns/metaphors, Interpreting… SNAC/Networks/ISM/FBS (function-form)	Qualitative modeling, teasing key elements from ethnographic notes, … thinking about stakeholders … SNA, Small Worlds, Caveman…	Cybernetics and Feedback Systems (CPS), Self-organizing, Autopoetic & Living Systems … multiple intelligences, senses, variety engineering, ecological dimensions … metaphors / analogies
Sociology of Design	Rich pictures, content from ethnography … observation skills … subtle meanings of objects, people… surfacing assumptions / rituals … agent autonomy…	Discovering values attached to objects (technologies/products), people (users and teams), self … interdependency of individual and social, focus on the living present,	Concept of Socially interactive / Decentralized / Autonomous Agents… language-thought? Context-sensitive / knowledge of context … translating user needs and contextual signals into intelligence
Intelligent Systems Design	Reducing over-specification? … decentralized … Agent based as opposed to event based modeling	New forms of intelligence? Beyond the language-thought angle? Brain-to-brain?	Core Information Processing techniques to derive intelligence … Classical AI

Reflect on today's session and plan for the next one