What is software engineering?

* Discipline that is concerned with theories, methods and tools to solve a problem, taking financial and organisation constraints into consideration

Distinguish between generic and customised products.

* Generic products are stand-alone applications that are marketed and sold; requirements are decided upon by developers
* Customised products are developed based on the customer’s requirements

4 activities of software process

* Specification
* Development
* Validation
* Evolution

3 Issues that affect most software

* Heterogeneity
* Social/Business change
* Security

3 Factors to consider when deciding on methods and tools

* Application being developed
* Background of development team
* Requirements

4 Software Engineering Fundamentals

* Dependability/Performance
* Requirements
* Development Process
* Reusability

5 attributes of good software

* Efficiency
* Dependability
* Acceptability
* Maintainability
* Safety

How can an undependable system lead to high costs?

* Undependable systems cause information loss

3 causes of failures

* Hardware
* Software
* Operational failure

4 Dependability properties

* Availability
* Reliability
* Security
* Safety

What is reparability?

* Judgement of how easy it is to fix something

How can the disruption of failures be minimised?

* Fix problems ASAP; this requires problem diagnosis, access to faulty component, and change

What is maintainability?

* How easy it is to add new features, change features and fix problems

What is survivability?

* How well the system will serve the users’ needs in case of an error

What two factors does safe system operation rely on?

* Availability, Reliability

Give an example of when a system may be unreliable

* External Attack

How does a *Denial of service* attack affect a software?

* Availability

5 Dependability achievements

* Avoid accidental errors
* Design V&V processes that will effectively detect errors
* Configure system correctly to the operating environment
* Design security mechanisms to prevent external attacks
* Design recovery mechanism

Why are dependability costs high?

* To increase dependability, more expensive hardware is required; extensive testing is also required

5 Factors of a sociotechnical system

* Has a social or organisational purpose
* Has multiple users
* Respects the law
* Have policies and rules
* Not a stand-alone application

7 layers of the sociotechnical stack

* Society
* Organisation
* Business Process
* Application System
* Communication & Data Management
* Operating System
* Equipment

What does “holistic system design” refer to?

* The interactions and dependencies between system layers

What is a complex system?

* A set of inter-related components working together to achieve a common objective

3 Organisational effects of systems

* Process Change
* Job Change
* Organisation Change

3 Characteristics of sociotechnical system

* Emergent Properties
* Non-Deterministic
* Complex Relationships with Organisation’s Objectives

5 Emergent properties

* Reliability
* Reparability
* Volume
* Usability
* Security

Emergent properties can be non-functional or functional – what is the difference?

* Functional: the intended property
* Non-functional: property that was not intended

3 Factors that make systems engineering harder than software engineering

* Communication Difficulties due to several disciplines working together
* Professional Boundaries
* Differing Assumptions

What is sub-system integration?

* Process of putting hardware, software and people to make a system

What are operational processes?

* Processes that are involved in using a system for its intended purpose