

2019-04-23

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Non-Engineering vs. Engineering

	Non-Engineering (studio / seminar)	Engineering (workshop / tech. product)
Deadline	strictly defined due to dependency on artist's imagination	flexible, in relation with sufficient precision
Price / Cost	determined by market value , every cost	related on cost , only variable
Evaluation and assessment	is only possible subjectively , on the basis of impression	can be conducted using objective criteria , e.g. costs, weight, volume
Humans and technical interaction	are one and the same, cannot be separated	costs are human, products are technical
Uniqueness and liability	are not defined and in practice barely enforceable	are clearly regulated and cannot be declared
Moral obligation	exists, imposition among others	the existing and suitable technical know-how
Author	considers the artwork as part of him-/herself	remains anonymous , often lacks emotional ties to the product

(Ludwing and Lechner, 2019)

Engineering, Software, Software Engineering

Engineering, Software, Software Engineering

Content

- Technology / Engineering, Software, Software Engineering
 - Motivation: Successful Software Development
 - Working definition success
 - Unsuccessful software development exists
 - Common reasons for non-success
 - Course
 - Content
 - Topic areas
 - Structure of topic areas
 - Emphasis formal methods
 - Relation to other courses
 - Literature
 - Organisation
 - Lectures
 - Tutorials
 - Exam

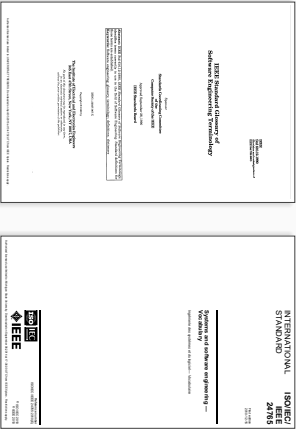
Engineering, Software, Software Engineering

Engineering

Engineering – The **application** of a systematic, disciplined, quantifiable approach to structure, machines, products, systems, or processes. **IEEE 610.12 (1990)**

Engineering – is the **application** of knowledge in the form of science, mathematics, and empirical evidence, to the provision, design, construction, operation and maintenance of the physical, technological, software driven, systems, processes, and organizations. **Wikipedia**

Engineering, Software, Software Engineering



Engineering, Software, Software Engineering

Software Engineering — This Course's Working Definition

Software Engineering –
(1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software;
that is, the application of engineering to software.
(2) The study of approaches such as (1).

IEEE 6012 (1990)

Software Engineering –
1. the systematic application of scientific and technological knowledge, methods, and tools to the development, operation, and maintenance of software;
2. see IEEE 6012 (1)
ISO/IEC JTC1/SC7 (2002)

D. L. Parnas (1971)

Software Engineering –
Multi-person development of multi-version programs.

D. L. Parnas (1971)

Software Engineering – the establishment and use of sound engineering principles to obtain economically software that is reliable and works efficiently on real machines.

F. L. Bauer (1977)

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Content

Terminology

- Engineering: Software, Software Engineering
- Motivation: Successful Software Development
- Working definition: success
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Successful Software Development

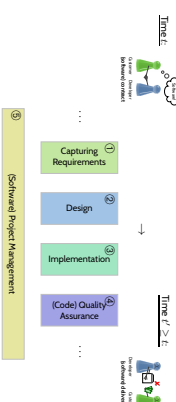
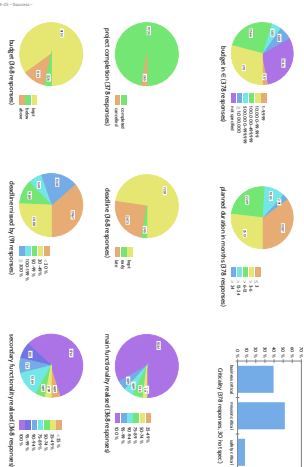
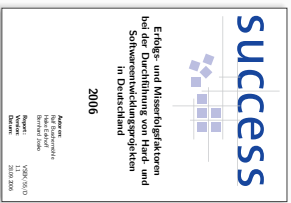
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When is Software Development Successful?

A software development project is successful
if and only if
developer, customer, and user are happy with the result at the end of the project.

Developer Customer User

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Possible causes (by phase)

	①	②	③	④	⑤
①	✓	✓	✓	✓	✓
②	✓	✓	✓	✓	✓
③	✓	✓	✓	✓	✓
④	✓	✓	✓	✓	✓
⑤	✓	✓	✓	✓	✓

And that's this course:

- Discuss **typical Software-Engineering problems**, like **communication, misunderstanding**, etc.
- and (state-of-the-art) **generic mitigation approaches**, like **precise description languages** (e.g. for requirements), like **analysis techniques** (e.g. for program correctness), by **development phase** (Requirements, Design, etc.)

	①	②	③	④	⑤
①	✓	✓	✓	✓	✓
②	✓	✓	✓	✓	✓
③	✓	✓	✓	✓	✓
④	✓	✓	✓	✓	✓
⑤	✓	✓	✓	✓	✓

And that's this course:

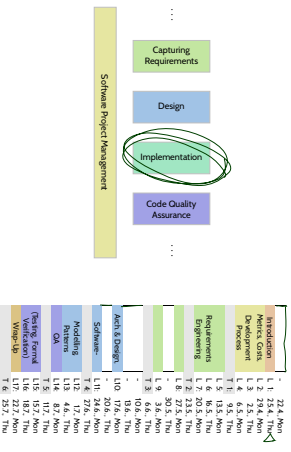
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	①	②	③	④	⑤
①	✓	✓	✓	✓	✓
②	✓	✓	✓	✓	✓
③	✓	✓	✓	✓	✓
④	✓	✓	✓	✓	✓
⑤	✓	✓	✓	✓	✓

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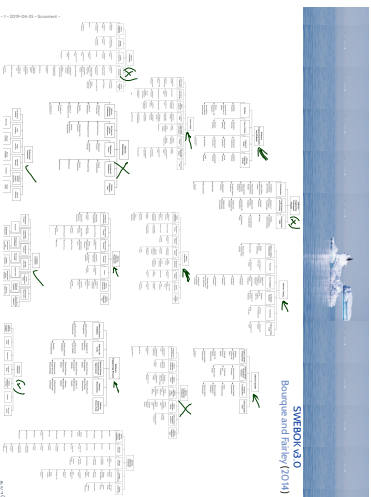
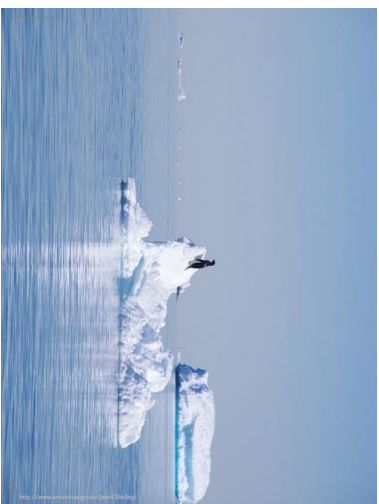
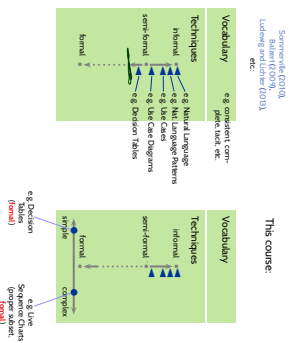
Course Content (Tentative)



Literature (Preview)



Structure of Topic Areas (Example: Requirements Eng.)



Excursion: Informal vs. Formal Techniques

Example: Requirements Engineering. Airbag Controller



Requirement specification, informational

Whenever a crash is detected, the airbag has to be fired within 300 ms ($\pm \epsilon$)



Requirement specification, formal:

- Fix observables: $\text{crashdetected} : \text{Time} \rightarrow \{0, 1\}$ and $\text{firealrtbag} : \text{Time} \rightarrow \{0, 1\}$
- Formalise requirement

$$\forall t, t' \in \text{Time} \bullet \text{crashdetected}(t) \wedge \text{airbagflipped}(t') \implies t' \in [t + 300 - \varepsilon, t + 300 + \varepsilon]$$

→ no more misunderstandings, sometimes **tools** can **objectively** decide: requirement satisfied yes/no



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- Terminology

- Engineering, Software Engineering
- Motivation: Successful Software Development
 - Working definition: success
 - Unsuccessful software development exists
 - Common reasons for non-success
- Course
 - Content
 - Topic areas
 - Structure of topic area
 - Emphasis, formal methods
 - Relation to other courses
 - Literature
- Organization
 - Lectures
 - Tutorials
 - Exam

Course: Organisation

Organisation: Exercises & Tutorials

- Schedule/Submission:**
- exercises online (*from page 8* and *11.4.5*) with first lecture of a block.
 - *early submission* 24h before tutorial (usually Wednesday, 12.00 local time).
 - *regular submission* right before tutorial (usually Thursday, 12.00 local time).
 - please submit *electronically* via *LMS*
- should work in teams of 2-3 people, clearly give names on submission

Production	1	22.4	100
Design	1	13.4	100
Design, Costs	1	2.5	100
Design, Process	1	6.5	100
Requirements	1	9.5	100
Requirements	1	13.5	100
Requirements	1	13.5	100
Requirements	1	20.5	100
Requirements	1	20.5	100
Requirements	1	23.5	100
Requirements	1	27.5	100
Requirements	1	32.5	100
Requirements	1	32.5	100
Requirements	1	66	100
Requirements	1	66	100
Requirements	1	106	100
Requirements	1	18	100
Requirements	1	30.4	100
Requirements	1	30.4	100
Requirements	1	74.6	100
Requirements	1	77.6	100
Requirements	1	77.6	100
Requirements	1	112	100
Requirements	1	112	100
Requirements	1	112	100
Requirements	1	152	100
Requirements	1	152	100
Requirements	1	152	100
Requirements	1	227	100
Requirements	1	227	100
Requirements	1	257	100

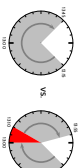
Organisation: Exercises & Tutorials

- Schedule/Admission**
 - examine online ([homepage](#) and [LMS](#)) with link details of 160
 - early admission 2-3 hrs before exam
 - usually Wednesday 12:00 local time
 - exam Thursday 12:00 local time
 - prepare submit electronically via LMS
 - should work in teams of 2-3 people; clearly give names on submission
- Grading system - most complicated grading system ever!**
 - Admission points (good) will allow "open book"
 - ("reasonable" good students know answers) "know yourself"
 - Earn the points and bring home knowledge
 - (rewarded for good student knowledge) *"win interest"*
- IOV bonus for early submission**
- Total: Four groups (central assignment), bonded by rules**
 - group 1: no extra admissions international
 - developing good proposal requires
 - time pressure provided via LMS

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Handwriting	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Maths	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Reading	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Writing	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Spelling	1	2	3	4	5																																																																																															

Organisation: Lectures

- **Homomage** <http://perma.cc/8w6k-ak1x> *anti-fun thing, der. teaching SS2019gwv1*
- **Cursive language** <http://perma.cc/8w6k-ak1x> *one in an odd place*
- **Script Media**
 - *slides without annotations of homomage* with beginning of lecture like list
 - *slides with annotations and homomage* specially word after the lecture
 - *according on US (stream and homomage) we need max 2 days delay (if link on homomage)*
- **Schedule**: open after the first 90 min. lectures, are 90 min. tutorial (with theoretical)
- **Interaction**: always often **more than takes two** so please ask comment immediately
- **Questions/comments**:
 - "conflict" ask immediately or in the break
 - "offline":
 - i) try to solve yourself
 - ii) discuss with colleagues
 - **a) Examples** (LUS group) forum, contact tutor
 - **b) Everything else** contact lecturer, ask of homomage or just drop by, talking 25, lesson 30-40
- **Break**: we have a **5:10 min. break** in the middle of each lecture from now on, unless a majority decides **now**.



Organisation: Exam

- **Exam Admission:**
 - Achieving **50%** of the **regular admission points** to Exercise Sheets 0-3 is sufficient for admission to exam
 - and **50%** of the **regular admission points** of Exercise Sheets 4-6
 - 15 regular admission points to Exercise Sheets 0-3 and 15 regular admission points to Exercise Sheets 4-6
 - → 10 regular admission points for 100%
 - (large plenty of **admission bonus points** in both blocks 0-3 and 4-6)
- **Exam Form:**
 - **written exam**
 - date, time, place, date
 - permitted exam aids: one A4 paper (max. 21 x 29,7 x 1 mm) of notes, max. two sides (unmarked)
 - score from the exercises **do not contribute** to the final grade
 - example exam available on **ILIAS**

One Last Word on The Exercises...

- Every exercise task is a **tiny little scientific work!**
- Basic rule for high quality submissions:
- **rephrase** the task in your own words,
- **state** your solution,
- **convince** yourself and your tutor of the correctness of your solution (at best: prove it).

Example:

Task: What is the length of the longest line inside the square with side length $a = 19.12$?

Submission A:

Submission B:

The length of the longest straight line fully inside the square with side length $a = 19.1$ is 27.01 (rounded).

The longest straight line inside the square is the diagonal. By Pythagoras, its length is $\sqrt{a^2 + a^2}$. Inserting $a = 19.1$ yields 27.01 (rounded).

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One Last Word on The Exercises...

- Every exercise task is a **tiny little scientific work!**
- Basic rule for high quality submissions:
- **rephrase** the task in your own words.
- **state** your solution.
- **convince** yourself and your tutor of the correctness of your solution (at best: prove it).

Example:

Task: What is the length of the longest line inside the square with side length $a = 19.12$?

Submission A:

Submission B:

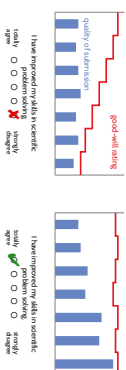
The length of the longest straight line fully inside the square with side length $a = 19.1$ is 27.01 (rounded).

The longest straight line inside the square is the diagonal. As the diagonals of a square are congruent, its length is $\sqrt{a^2 + a^2} = 19.1\sqrt{2} \approx 27.01$ (rounded).

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One Last Word on The Exercises...

- Every exercise task is a **tiny little scientific work!**
- Basic rule for high quality submissions:
 - **rephrase** the task in your own words,
 - **state** your solution,
 - **convince** yourself and your tutor of the correctness of your solution (at best: prove it).



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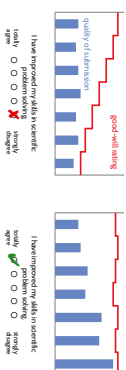
Tell Them What You've Told Them...

- **Bank vocabulary:**
 - software: engineering, software as engineering
 - customer: developer, user
 - successful: software development
- **Notes:** some definitions are neither formal nor universally agreed upon
- **[Final test:]** software development is no longer successful.
- **Bank activities of Software engineering:**
 - specific requirements,
 - implementation,
 - quality assurance,
 - project management
- **Formal vs. Informal methods:**
 - institutes contain the core – by the case of software engineering
 - model-independent, tool-based assessment
 - model-independant
- **Career course and organisation**

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Any (More) Questions?

References



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References

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