Electronics
EE3C11
(Introduction)

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Marion de Vlieger

Building the “bridge”

Semiconductors

Circuits

Specifications come from the top

Hardware comes from the bottom

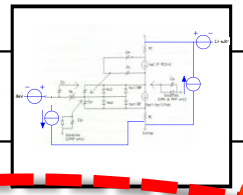
Show-stoppers come from the bottom

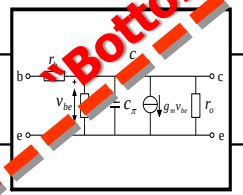
Top-down design

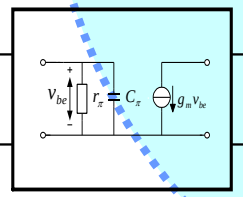
Customer

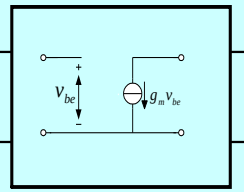
“Bottom-aware top-down design”

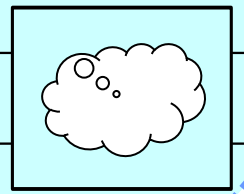
Design Methodology











Bottom-up design

Books

Electronics

Structured Electronic Design
Edition 1.3
Anton Montagne

Download via Brightspace
(or buy a hardcopy at Delft Academic Press)

Semiconductors

Semiconductor Physics and Devices; Basic Principles
Donald A. Neamen
McGraw-Hill International Edition, (4th edition)

This course is about

Technology aware

Structured Design Methodology

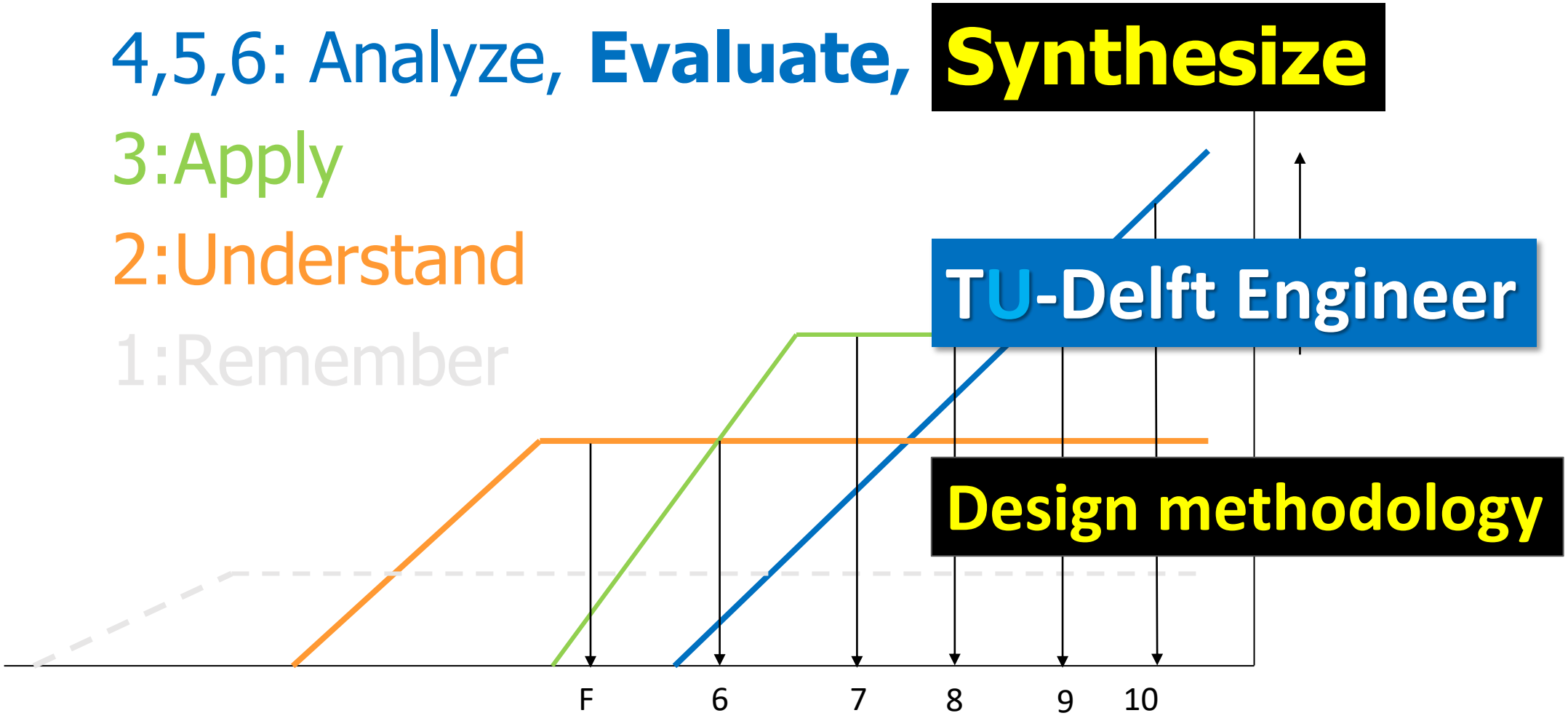
Bloom for engineers

4,5,6: Analyze, **Evaluate,** **Synthesize**

3:Apply

2:Understand

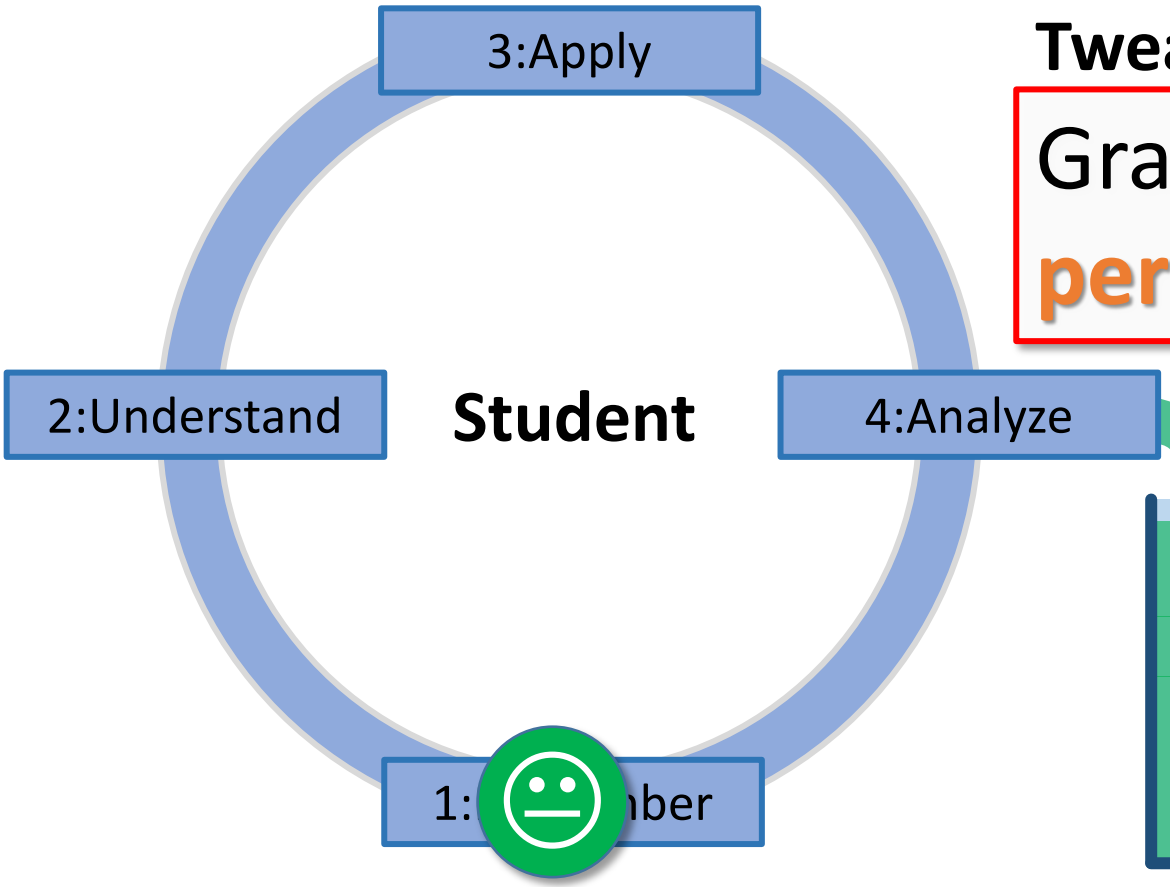
1:Remember

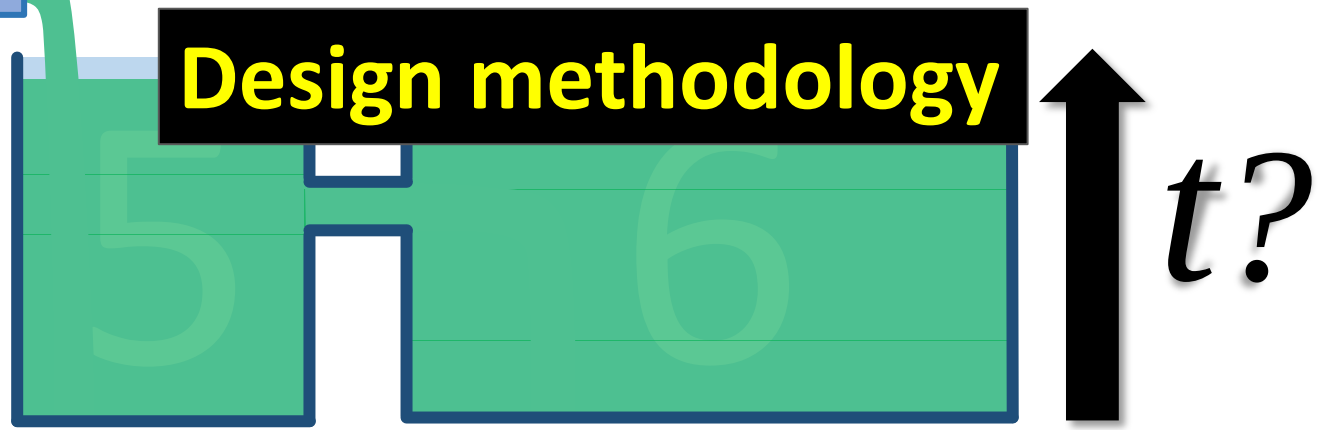


Traditional Bloom Cycle for **Electronic Engineers**

Active education until level 4
Repeat existing designs
Analyze results
Tweak designs to meet specs

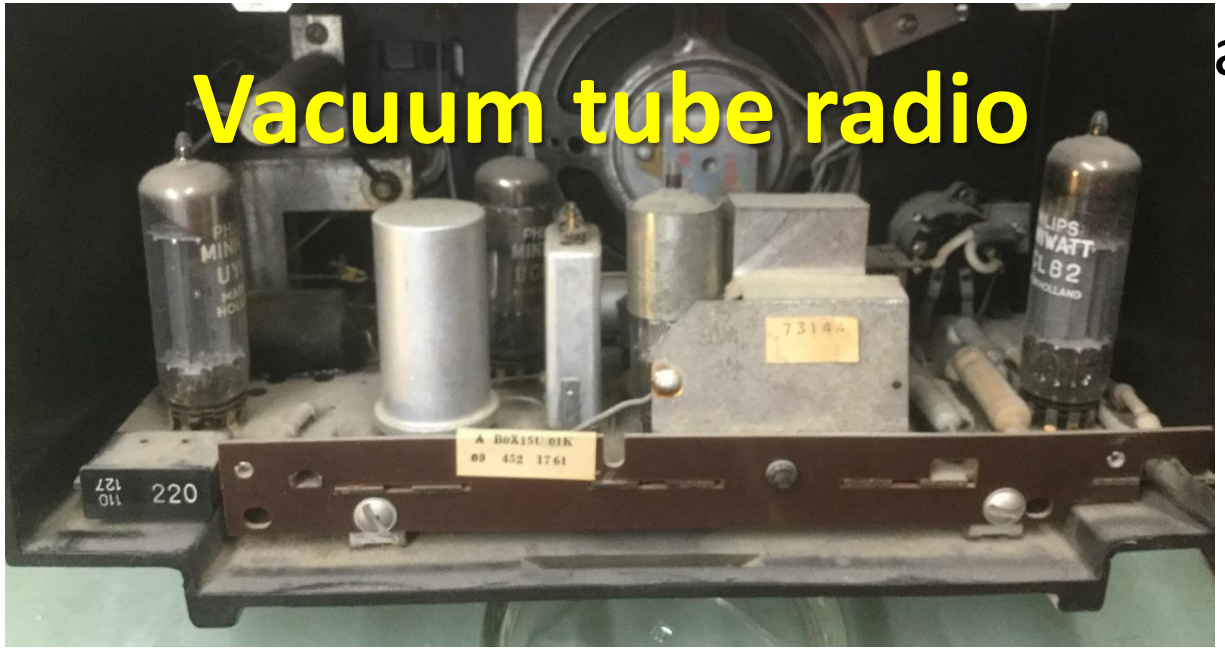
Gradually develop a
personal **design methodology**

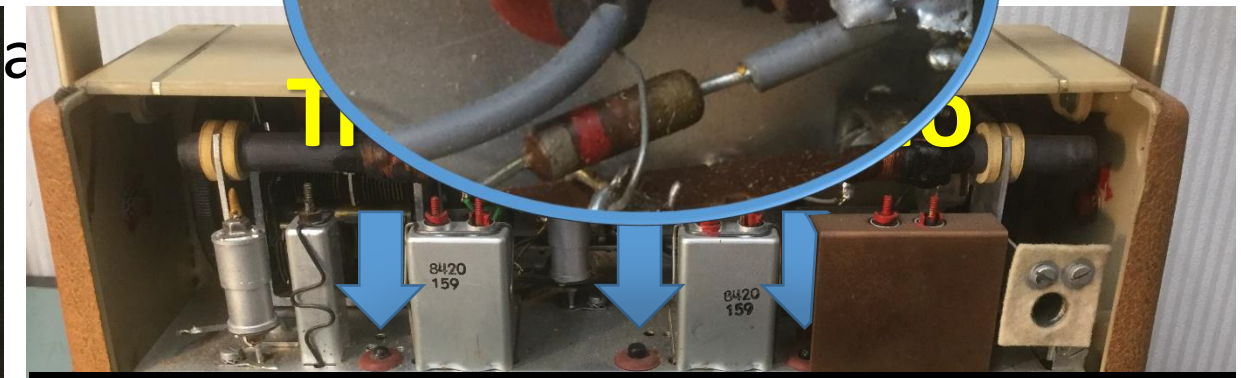




Repeat
Analyze
Tweak

"Experience"



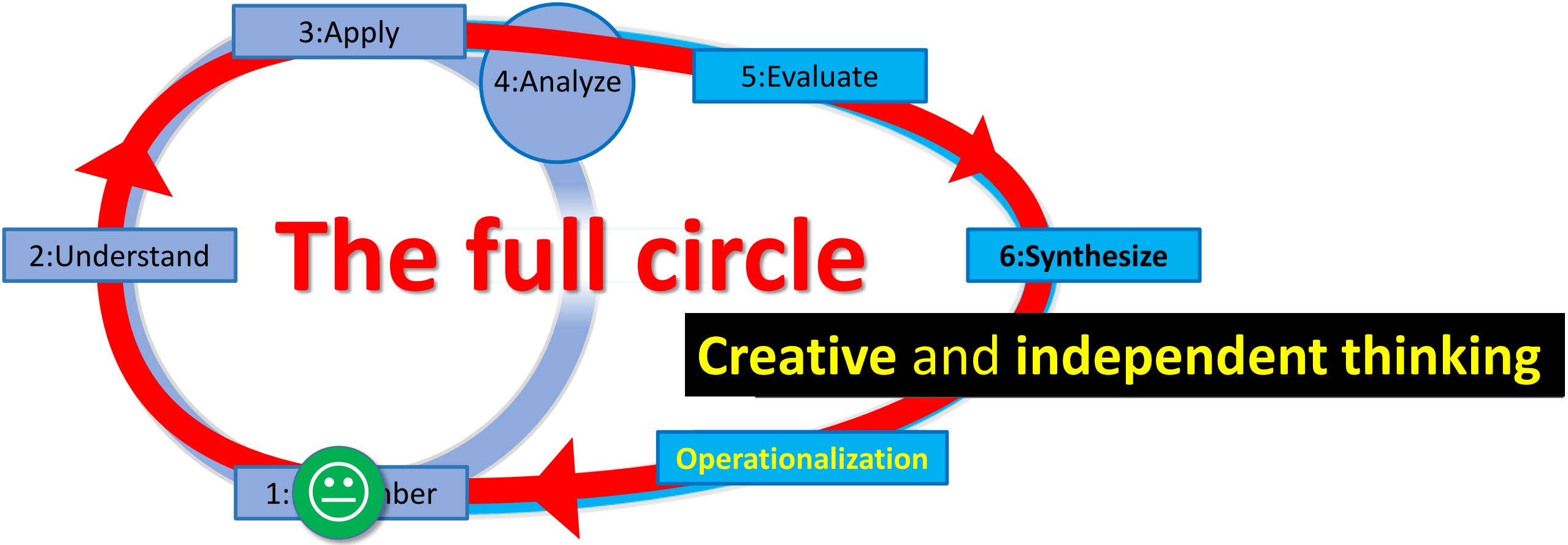


Transistor technology

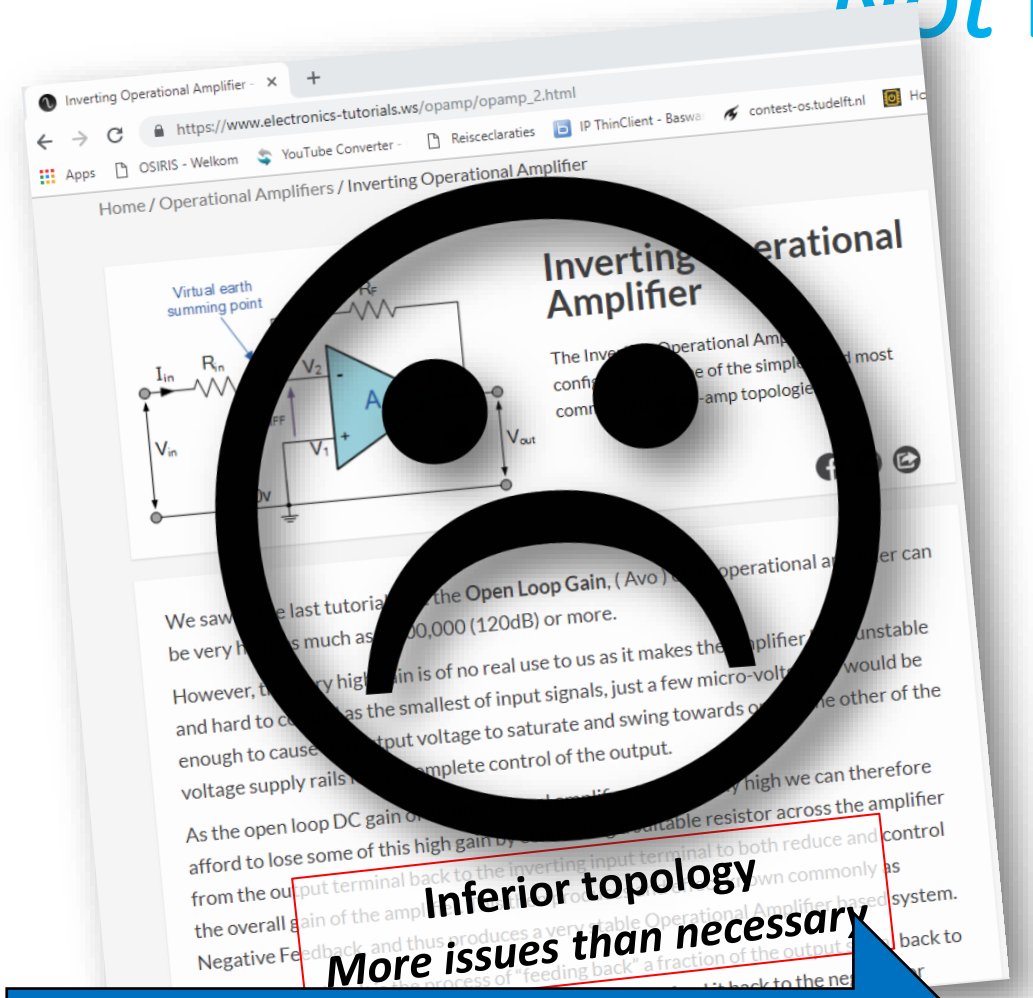
Vacuum tube architecture

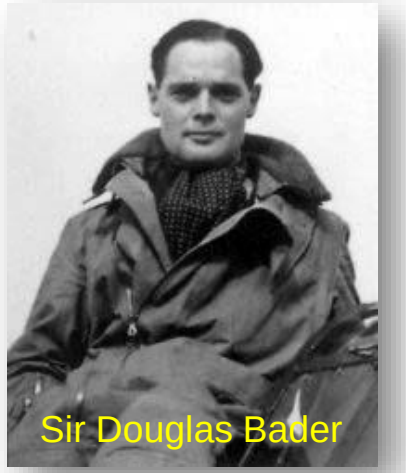
Bloom Cycle for **Innovators**

Active education including level 5 and 6 **and operationalization**



Not in this course





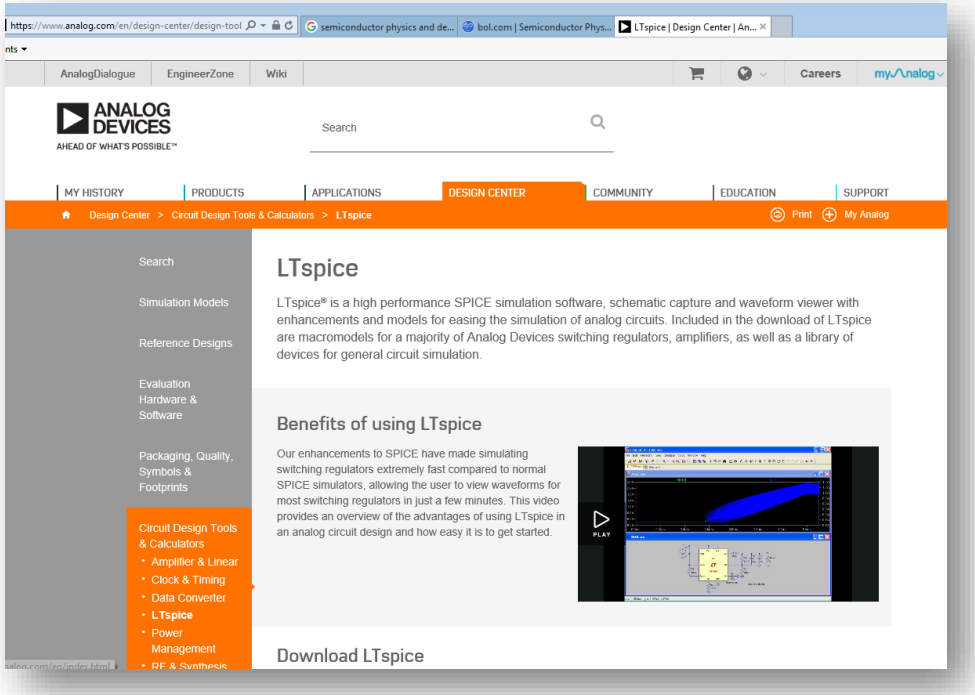
"Rules are for the guidance of the wise men - and for the obedience of fools"

Creative and **independent thinking**

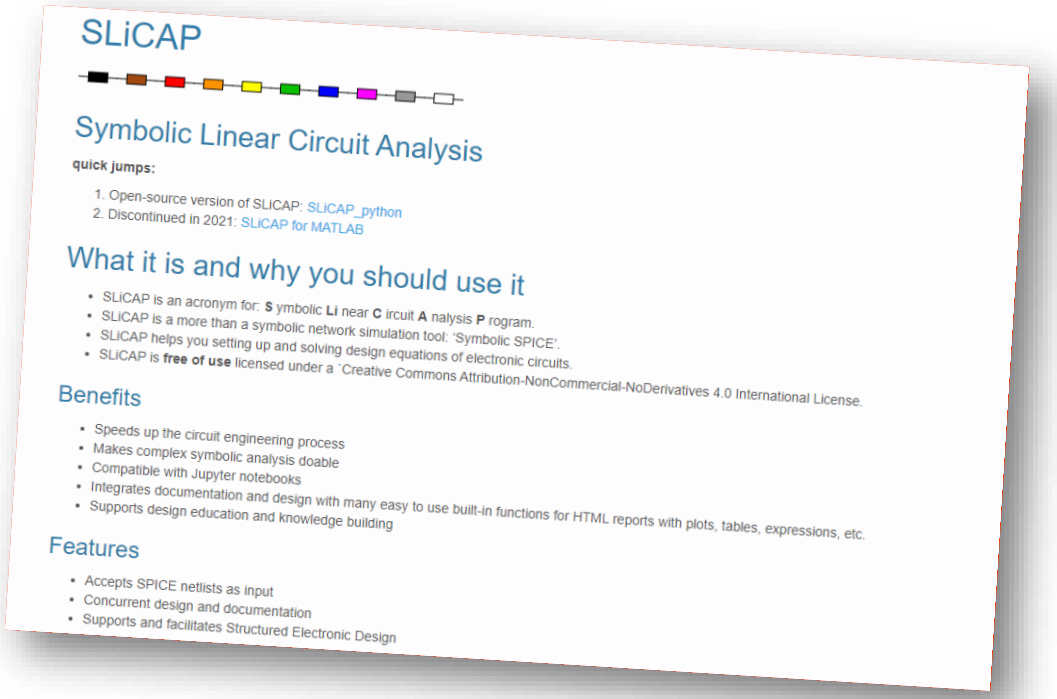
HOW? : Create a design *yourself*

Elective bonus assignments

Software



LTspice®: Simulation, Schematic capture and **Waveform viewer**



SLiCAP : To set up and solve Design Equations of electronic circuits.

To create design documentation

(SLiCAP is a Python application: you need a laptop with e.g. Anaconda)

HOW? : Create a design *yourself*

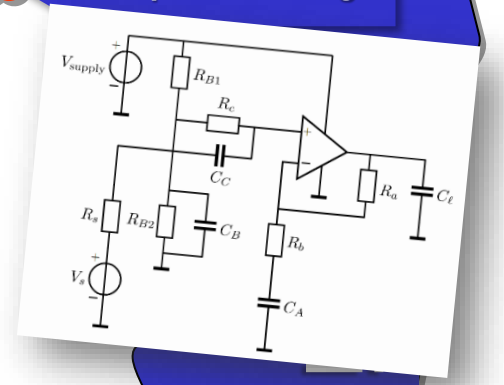
LTspice and **SLiCAP**

This course and related courses

Semiconductors

Circuits

Top-down design

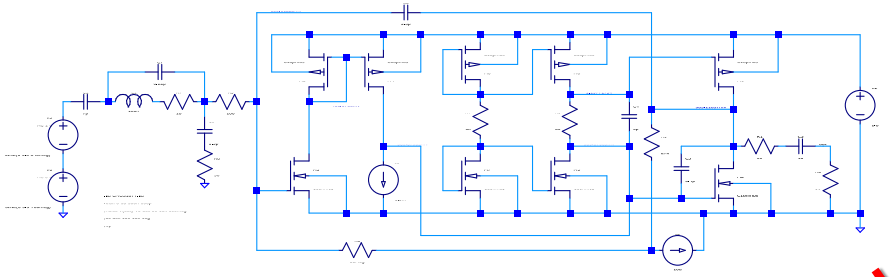


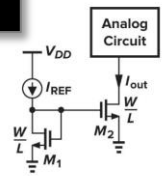
EE3C11

EE4109

EE4C10

ET8011MSC
(masterclass)





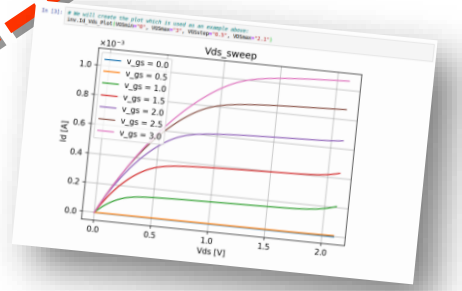
$$I_{REF} = \frac{1}{2}\mu_n C_{ox}\left(\frac{W}{L}\right)_1 (V_{GS} - V_{TH})^2$$

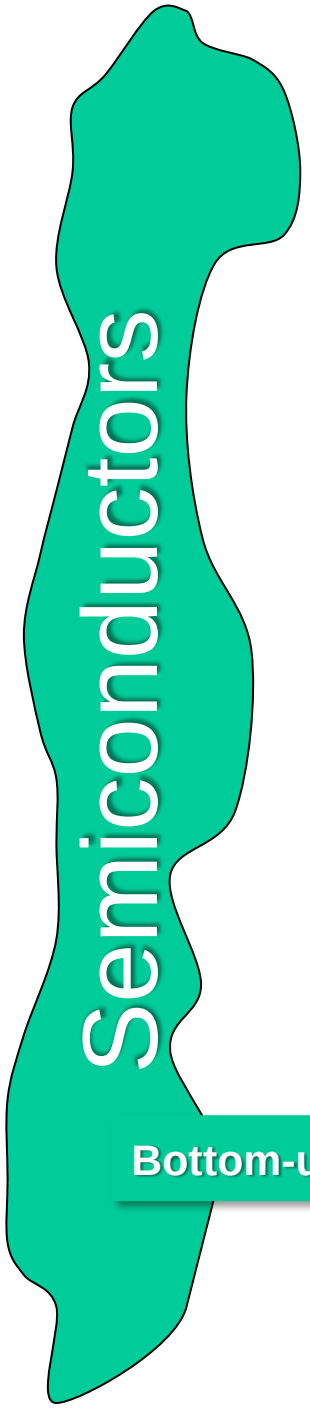
$$I_{out} = \frac{1}{2}\mu_n C_{ox}\left(\frac{W}{L}\right)_2 (V_{GS} - V_{TH})^2$$

$$\Rightarrow I_{out} = \frac{(W/L)_2}{(W/L)_1} I_{REF}$$

EE3C11

Bottom-up design



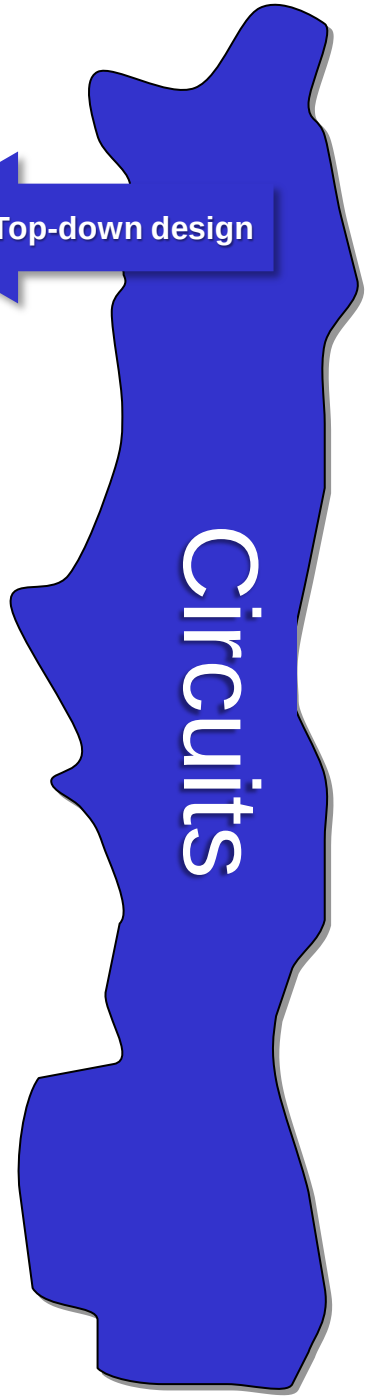


Schedule

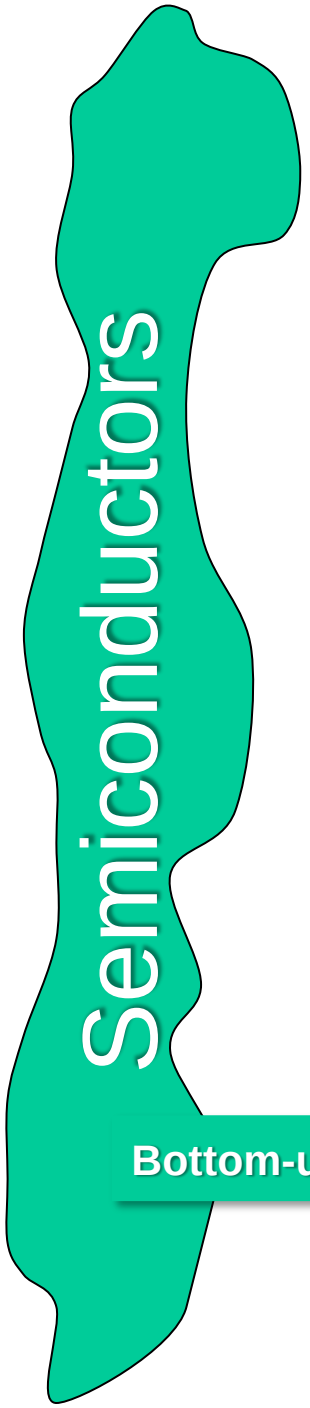
Name	Start week	Day	Date
Electronics Session 1	3.1	Tuesday	9-2-2021
Physics Session 1	3.1	Wednesday	10-2-2021
Electronics Session 2	3.1	Thursday	11-2-2021
Electronics Session 3	3.2	Tuesday	16-2-2021
Physics Session 2	3.2	Wednesday	17-2-2021
Electronics Session 4	3.2	Thursday	18-2-2021
Electronics Session 5	3.3	Tuesday	23-2-2021
Physics Session 3	3.3	Wednesday	24-2-2021
Electronics Session 6	3.3	Thursday	25-2-2021
Electronics Session 7	3.4	Tuesday	2-3-2021
Physics Session 4	3.4	Wednesday	3-3-2021
Electronics Session 8	3.4	Thursday	4-3-2021
Electronics Session 9	3.5	Tuesday	9-3-2021
Physics Session 5	3.5	Wednesday	10-3-2021
Electronics Session 10	3.5	Thursday	11-3-2021
Electronics Session 11	3.6	Tuesday	16-3-2021
Physics Session 6	3.6	Wednesday	17-3-2021
Electronics Session 12	3.6	Thursday	18-3-2021
Physics Session 7	3.7	Tuesday	23-3-2021
Electronics Session 13	3.7	Wednesday	24-3-2021
Physics Session 8	3.7	Thursday	25-3-2021
Electronics Session 14	**3.7**	**Friday**	**26-3-2021**
Electronics Session 15	3.8	Tuesday	30-3-2021
Physics Session 9	3.8	Wednesday	31-3-2021
Electronics Session 16	3.8	Thursday	1-4-2021
Electronics Session 17	3.9	Tuesday	6-4-2021
Physics Session 10	3.9	Wednesday	7-4-2021
Electronics Session 18	3.9	Thursday	8-4-2021

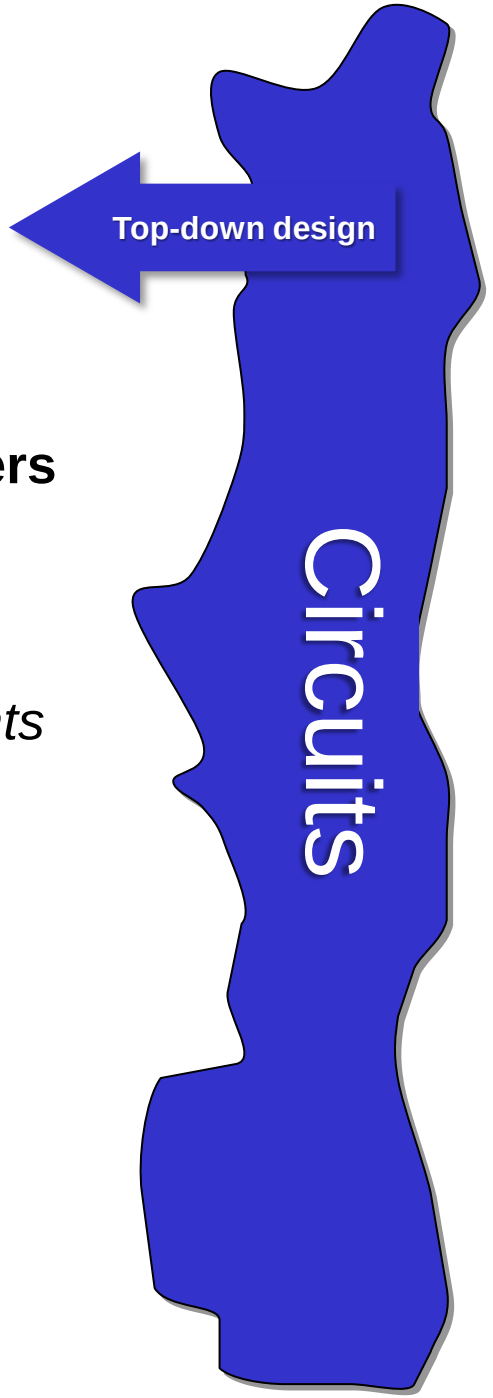
Bottom-up design

Top-down design



Exam





Multiple choice + some open questions that need short answers

Open book (course books, handouts and the slides)

A total of 1 bonus point for the exam can be built up via assignments
The bonus point remains valid for the re-sit.