# WiNSt onderwijsdag

## Workgroup core curriculum

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# WORKGROUP

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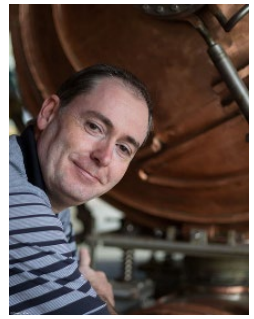

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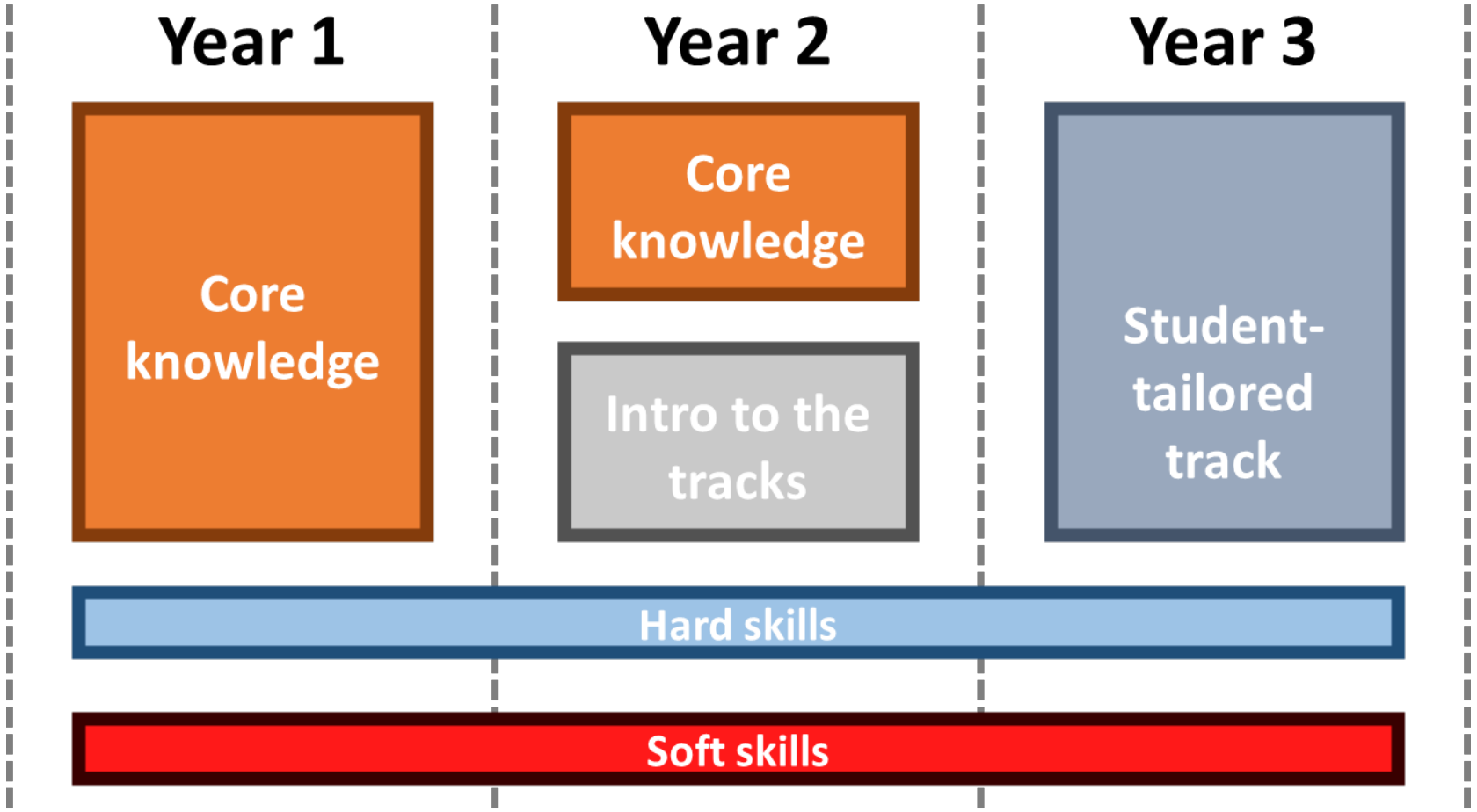
# GOAL OF WORKGROUP – CORE CURRICULUM

- Compulsory courses
  - Which courses would be core knowledge?
  - How do we organize them? Year 1, Serway?

- Required core knowledge
  - content & topics: electromagnetism, quantum mechanics, classical mechanics, thermodynamics & statistical mechanics, (math)
  - Goal is a ‘cookbook’ – content & literature
  - knowledge courses are clustered

- Define eindtermen (level) Bachelor Physics & Astronomy

# GENERAL OUTLINE OF THE BACHELOR



# OPEN QUESTIONS

- **Distribution of topics – organization knowledge/skills**
  - What topics are taught too much (repetition – ‘keten’, e.g., electromagnetism, QM)?
    -> Is there a way of freeing up time, based on being more efficient?
  - What topics are not taught enough? What is missing?
  - How to organize the courses into clusters for synergy?

- **What about compulsory courses?**
  - Astronomy: Kaleidoscope and other course(s)?
  - Other topics (sustainability, AI, …)

- **How do we handle electives?**
  - Do we want to restrict electives until the start of the flex track?
  - If we allow electives, how do we distribute them?

# DISTRIBUTION OF TOPICS (YEAR 1) - ORGANIZATION KNOWLEDGE/SKILLS

- What topics are taught too much (repetition – 'keten', e.g., electromagnetism, QM)?

  -> Is there a way of freeing up time, based on being more efficient?
- What topics are not taught enough? What is missing?
- How to organize the courses into clusters for synergy?

-> Natuurkunde in year 1 with appropriate distribution of topics (based on an introductory book)

Transition school – university: start on an easy level; Think of a compulsory introductory week

-> Missing courses year 1:

Numerical techniques, statistics for beginners, data analysis, (AI?) (as 1 course in year 1 Q1), replace kansrekening

-> As electives: special relativity (3 EC) (only a small part is taught in Mechanics

# DISTRIBUTION OF TOPICS (YEAR 1) - ORGANIZATION KNOWLEDGE/SKILLS

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  -> Is there a way of freeing up time, based on being more efficient?
- What topics are not taught enough? What is missing?
- How to organize the courses into clusters for synergy?

- E&M (6EC), Electromagnetism (6EC) & Electrodynamics (Master) (3EC)
  -> move ED to Bachelor and merge with one part with electromagnetism and offer one 3 EC Electrodynamics as Elective
- Connect thermodynamics and Statistical Physics (6EC)
- Quantum mechanics – QMI compulsory for everyone, QM2 already as elective?
- Experimental techniques – now 3 EC, set as 3+3 EC, and connect a Research lab (more practicum)

# WHAT ABOUT COMPULSORY COURSES?

- Astronomy: Kaleidoscope and other course(s)?
- Other topics (sustainability, AI, …)

-> Compulsory courses in Astronomy

Observational astronomy (3 EC) that includes geometrical optics*

Astrophysics or Cosmology as a compulsory course (3 EC)

-> Introduce one course as a sustainability

-> ‘Sustainability stamp’ on chosen courses Sustainability course (climate change, physics of the atmosphere etc.) (3EC)

*replaces ‘Golven & Optica’

# HOW DO WE HANDLE ELECTIVES?

- Do we want to restrict electives until the start of the flex track?
- If we allow electives, how do we distribute them?

-> Yes, students should focus on core knowledge first

-> No, we should motivate students with specific research topics at an early stage

# Additional slides

# PRACTICUM (6EC)

Voor deel 1 - Mechanica:

- De student kan mechanica-experimenten uitvoeren.
- De student kan het verband aangeven tussen de experimenten en de bijbehorende mechanica-concepten.
- De student kan bij het uitvoeren van de experimenten met medestudenten samenwerken.
- De student kan een korte mondelinge presentatie geven over een zelfgekozen wetenschapper en beroemd experiment.

Voor deel 2 - Practicum:

- De student kan natuurkunde-experimenten voorbereiden en uitvoeren.
- De student kan het verband aangeven tussen de experimenten en de bijbehorende theorie.
- De student kan van elk experiment een adequaat verslag schrijven, rekening houdend met de richtlijnen van wetenschappelijke integriteit.
- De student kan bij de gegeven experimenten een adequate foutenanalyse uitvoeren.
- De student kan bij het voorbereiden, uitvoeren en verslag doen van experimenten met medestudenten samenwerken
- De student kan overweg met de computerapparatuur die op de FNWI gebruikt wordt.

Voor deel 3 - Optica: De student kan optica-experimenten uitvoeren.

- De student kan de resultaten uitwerken met de theorie (parallel met het vak Golven & Optica).
- De student kan bij het uitvoeren van de experimenten met medestudenten samenwerken

# HOW TO TEACH THE ESSENTIAL SKILLS
# WHAT COURSES WILL THE SKILLS BE TAUGHT IN?

- **Hard skills** will have dedicated courses:
  - Such as programming, mathematics for physicists, etc

- **Soft skills:** there will be approved courses throughout the program and in the tracks that teach soft skills:
  - Partly in the core knowledge, partly in the stories
  - The soft skills have to be taught in a standardized way, should be story-independent
  - There will be proper lecture hours to “teach” the soft skills
  - Flex students have to make sure they also follow the right amount of soft skill courses (from any of the stories)