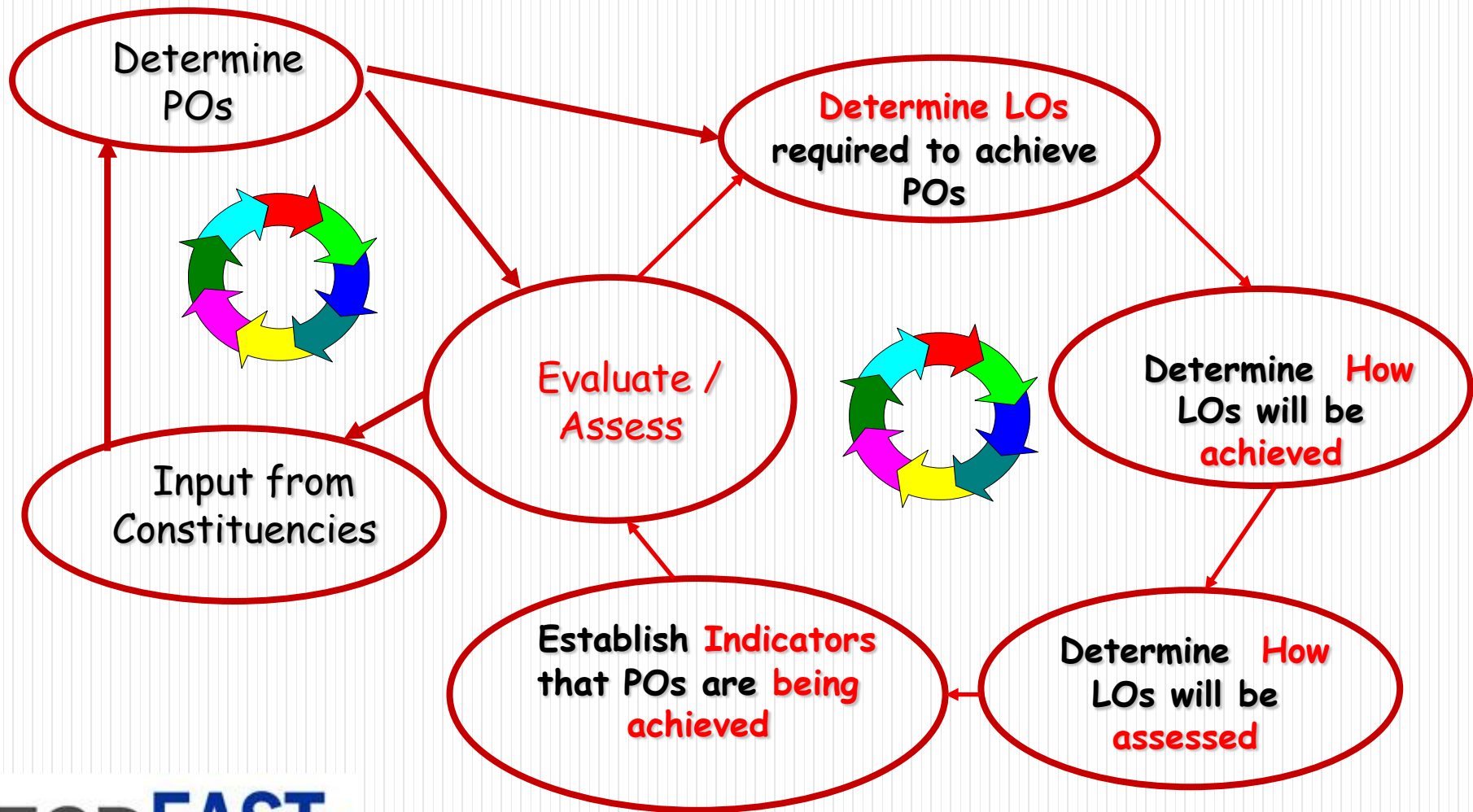


# *Engineering Curricula Design: Methodology and Evaluation*



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# ABET Program Improvement Loops



# Definitions

- **Constituencies (Stakeholders)** are *broad statements* that describe what graduates *are expected to attain* within *a few years of graduation*.

*Program educational objectives are based on the needs of the program's constituencies.*

# Definitions

- **Program Objectives** are *broad statements* that describe what graduates *are expected to attain* within *a few years of graduation*.

*Program educational objectives are based on the needs of the program's constituencies.*

# Definitions

- **Learning Outcomes** are *statements* that describe what students *are expected to know and be able to do* by *the time of graduation*. These relate to *skills, knowledge, and behaviors* that students acquire as they progress through the program.

# Definitions

- **Performance Indicators** are *specific, measurable statements* identifying *the performance(s)* required to meet *the outcome; confirmable through evidence.*

# Definitions

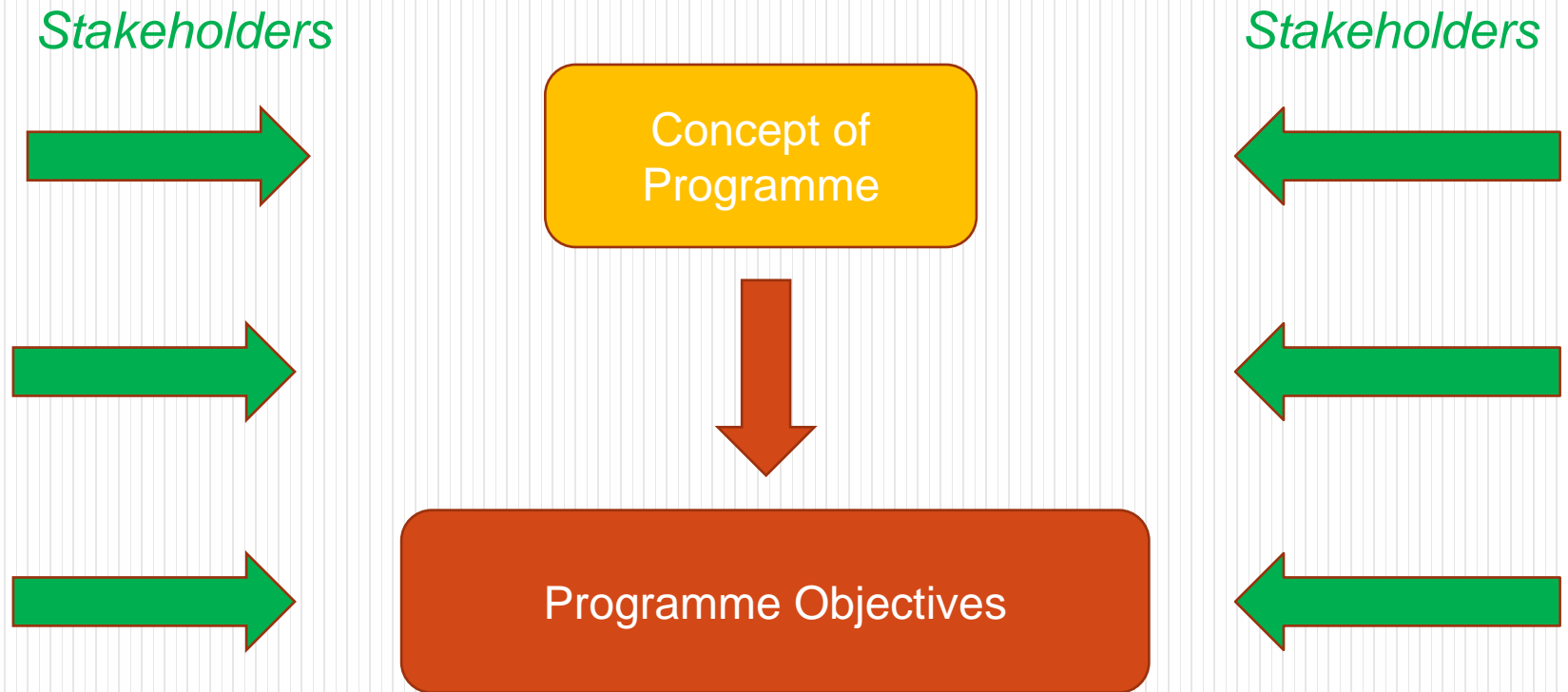
- **Credit** is an award made to a learner in *recognition of the verified achievement* of designated **learning outcomes** at a specified *level*
- **Level** is an indicator of the *relative demand, complexity and depth* of learning and of *learner autonomy*

# Definitions

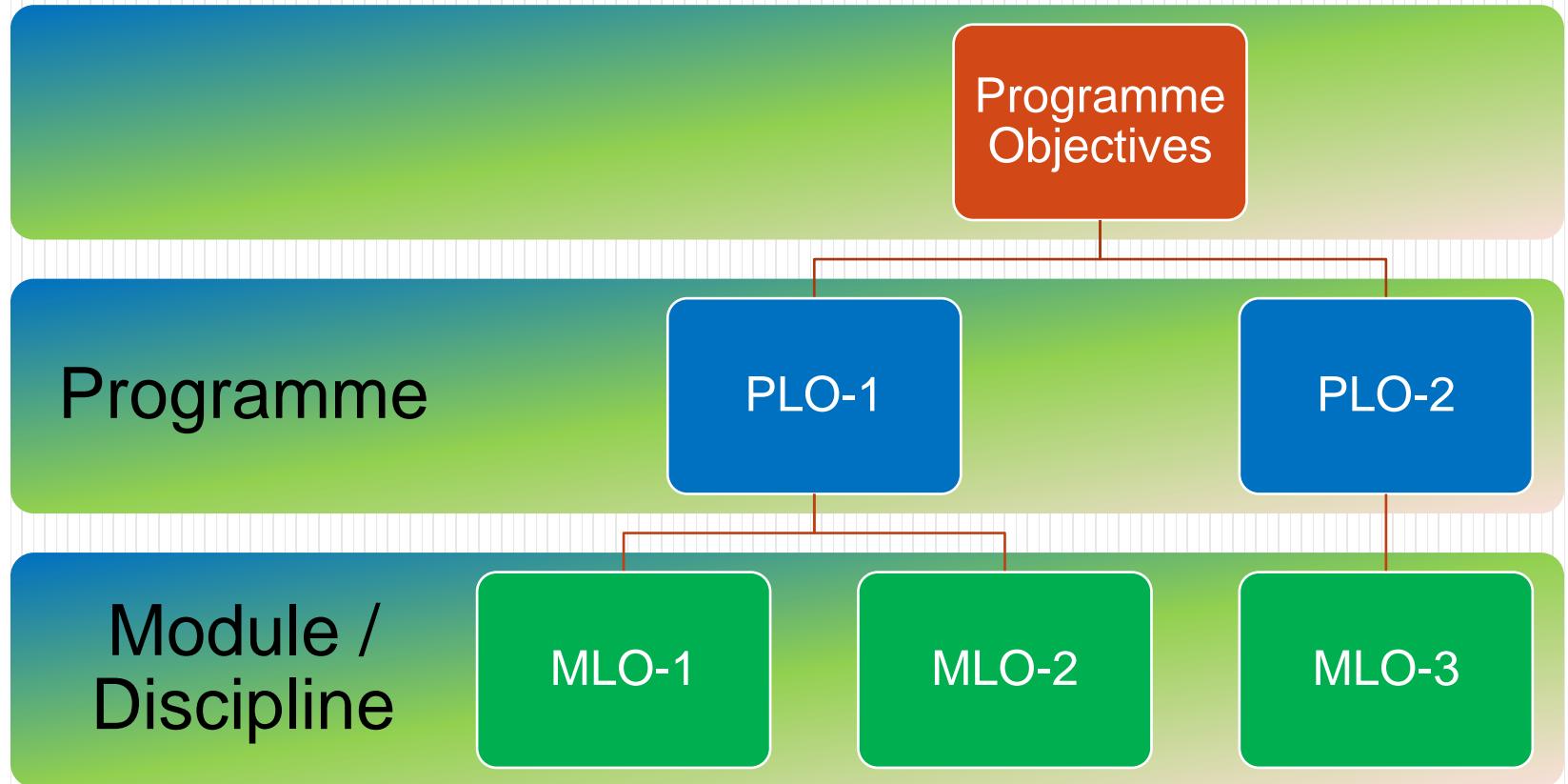
**Notional Learning Time (Workload)** is a number of hours which it *is expected* a learner will spend, on average, in order *to accomplish* the specified *learning outcomes* at a particular level.



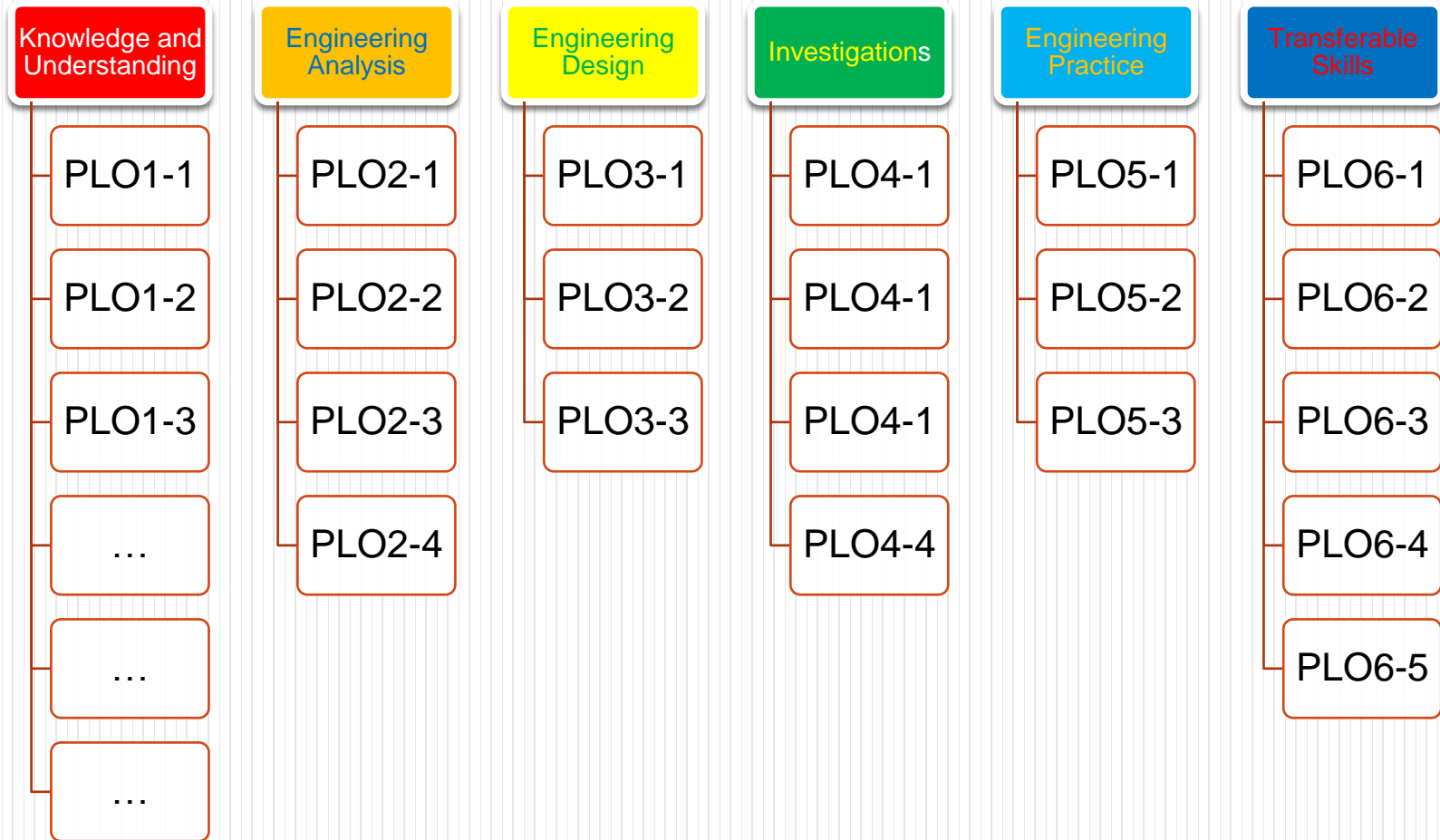
# Curriculum Design



# Curriculum Design



# Curriculum Design



# Curriculum Design

Knowledge  
and  
Understanding

- an in-depth knowledge and understanding of the principles of their branch of engineering;
- a critical awareness of the forefront of their branch.

# Curriculum Design

## Engineering Analysis

- the ability to solve problems that are unfamiliar, incompletely defined, and have competing specifications;
- the ability to formulate and solve problems in new and emerging areas of their specialisation;
- the ability to use their knowledge and understanding to conceptualise engineering models, systems and processes;
- the ability to apply innovative methods in problem solving.

# Curriculum Design

## Engineering Design

- an ability to use their knowledge and understanding to design solutions to unfamiliar problems, possibly involving other disciplines;
- an ability to use creativity to develop new and original ideas and methods;
- an ability to use their engineering judgment to work with complexity, technical uncertainty and incomplete information.

# Curriculum Design

## Investigations

- the ability to identify, locate and obtain required data;
- the ability to design and conduct analytic, modeling and experimental investigations;
- the ability to critically evaluate data and draw conclusions;
- the ability to investigate the application of new and emerging technologies in their branch of engineering.

# Curriculum Design

## Engineering Practice

- the ability to integrate knowledge from different branches, and handle complexity;
- a comprehensive understanding of applicable techniques and methods, and of their limitations;
- a knowledge of the non-technical implications of engineering practice.
- a knowledge of the non-technical implications of engineering practice.



# Curriculum Design

## Transferable Skills

- function effectively as leader of a team that may be composed of different disciplines and levels;
- work and communicate effectively in national and international contexts.
- demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice;
- demonstrate an awareness of project management and business practices, such as risk and change management, and understand their limitations;
- recognise the need for, and have the ability to engage in independent, life-long learning.

# Curriculum Design

Knowledge and Understanding

70 ECTS

Engineering Analysis

8 ECTS

Engineering Design

8 ECTS

Investigations

8 ECTS

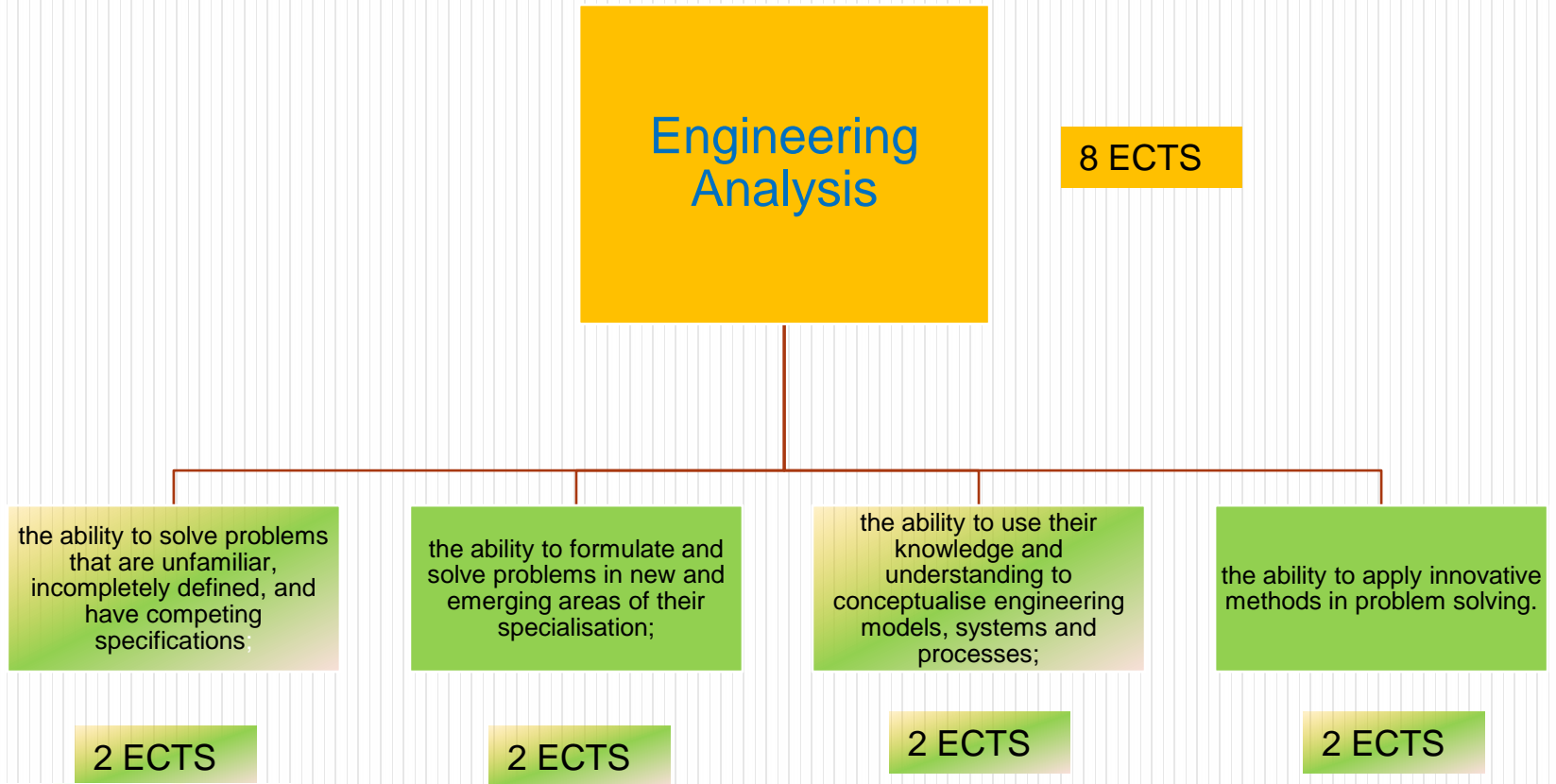
Engineering Practice

6 ECTS

Transferable Skills

20 ECTS

# Curriculum Design



# Curriculum Design

Transferable Skills

20 ECTS

function effectively as leader of a team that may be composed of different disciplines and levels;

4 ECTS

work and communicate effectively in national and international contexts.

4 ECTS

demonstrate awareness of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions in a societal and environmental context, and commit to professional ethics, responsibilities and norms of engineering practice;

4 ECTS

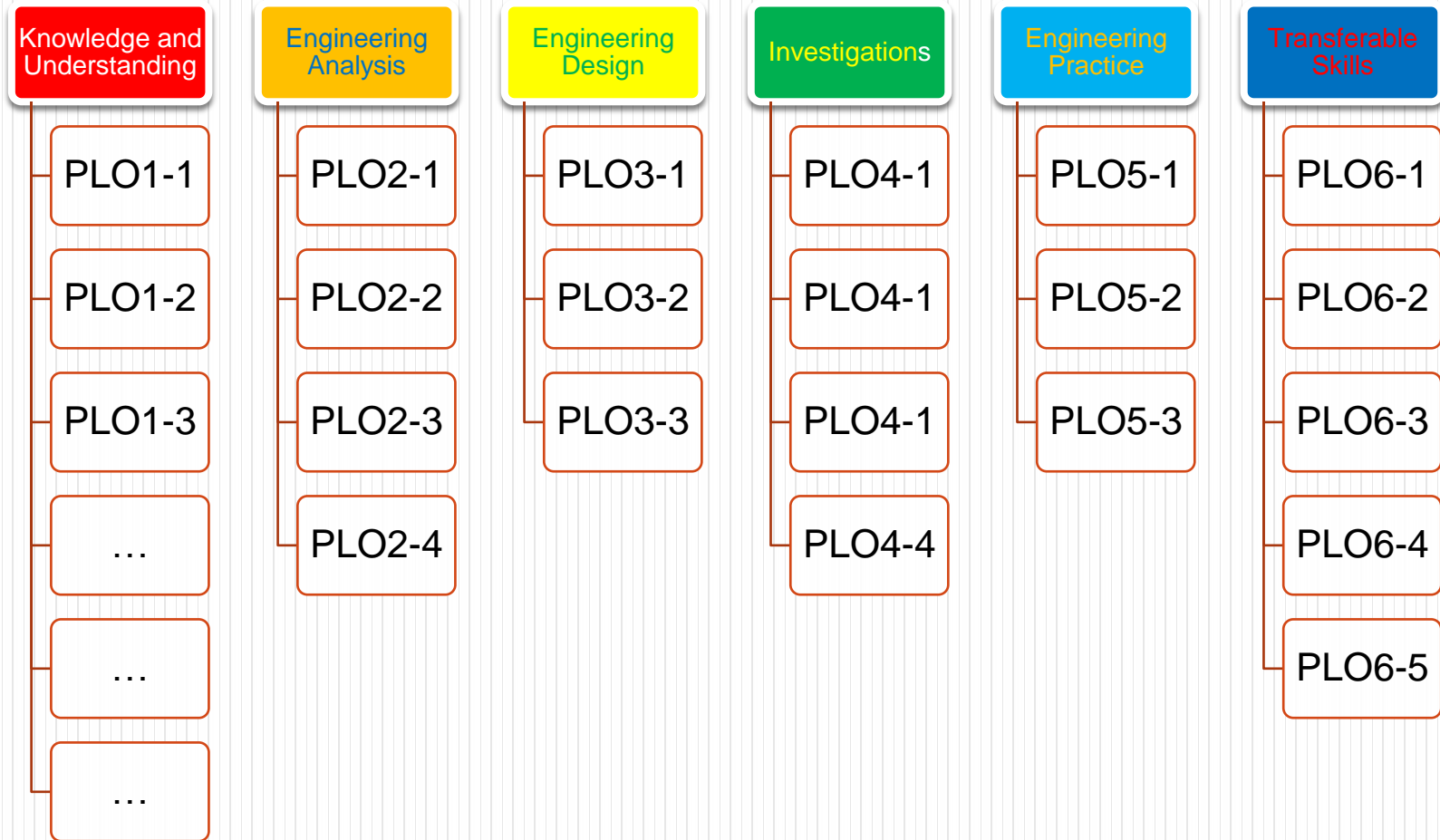
demonstrate an awareness of project management and business practices, such as risk and change management, and understand their limitations;

6 ECTS

recognise the need for, and have the ability to engage in independent, life-long learning.

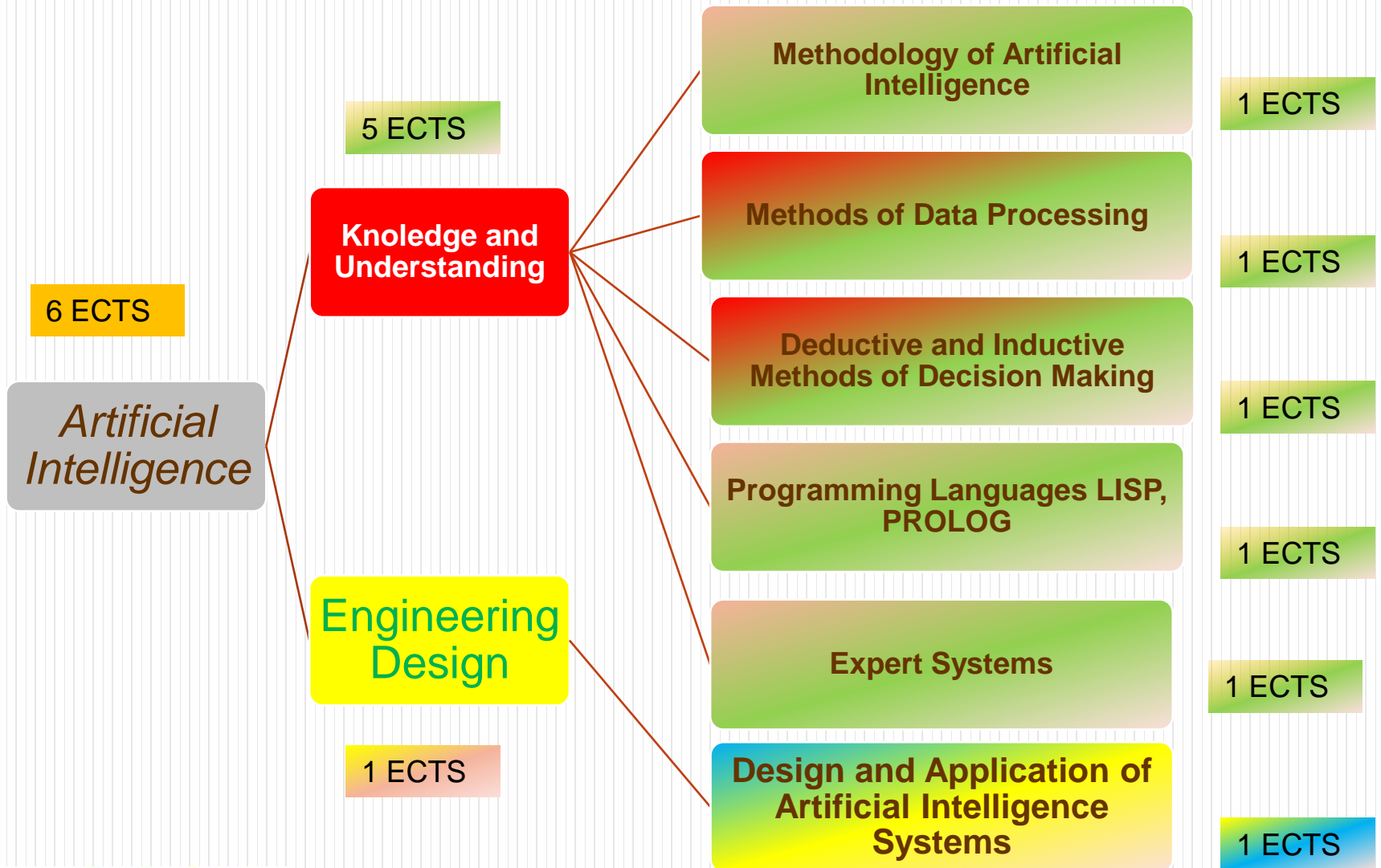
2 ECTS

# Curriculum Design



# Credit Allocation

Module / Discipline	Knowledge and Understanding	Engineering Analysis	Engineering Design	Investigations	Engineering Practice	Transferable Skills
.....						
<i>Artificial Intelligence</i>	5	-	1	-	-	-
.....						
<i>Research Project</i>	2	2	2	2	3	3
<i>Master's Thesis</i>	10	2	2	4	2	4



# Evaluation and Assessment

**Assessment** is one or more *processes that identify, collect, and prepare data to evaluate* the attainment of student outcomes and program educational objectives.

*Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the objective or outcome being measured. Appropriate sampling methods may be used as part of an assessment process.*

**Evaluation** is one or more *processes for interpreting the data and evidence accumulated through assessment* processes.

*Evaluation determines the extent to which student outcomes*

*am educational objectives are being attained. It results in decisions and actions regarding program improvement.*



# Evaluation and Assessment

- Inputs:**
- student background;
  - faculty background;
  - educational resources.

- Processes:**
- programs & services offered;
  - populations served;
  - faculty teaching loads/class size;
  - policies, procedures, governance.

**Assessment** of **inputs and processes** only establishes the *capability* or *capacity* of a program

# Evaluation and Assessment

- Outputs:**
- student grades/graduation rates;
  - employment statistics;
  - publication numbers;
  - faculty development activities;
  - credit hrs delivered;
  - statistics on resource availability;
  - participation rates;

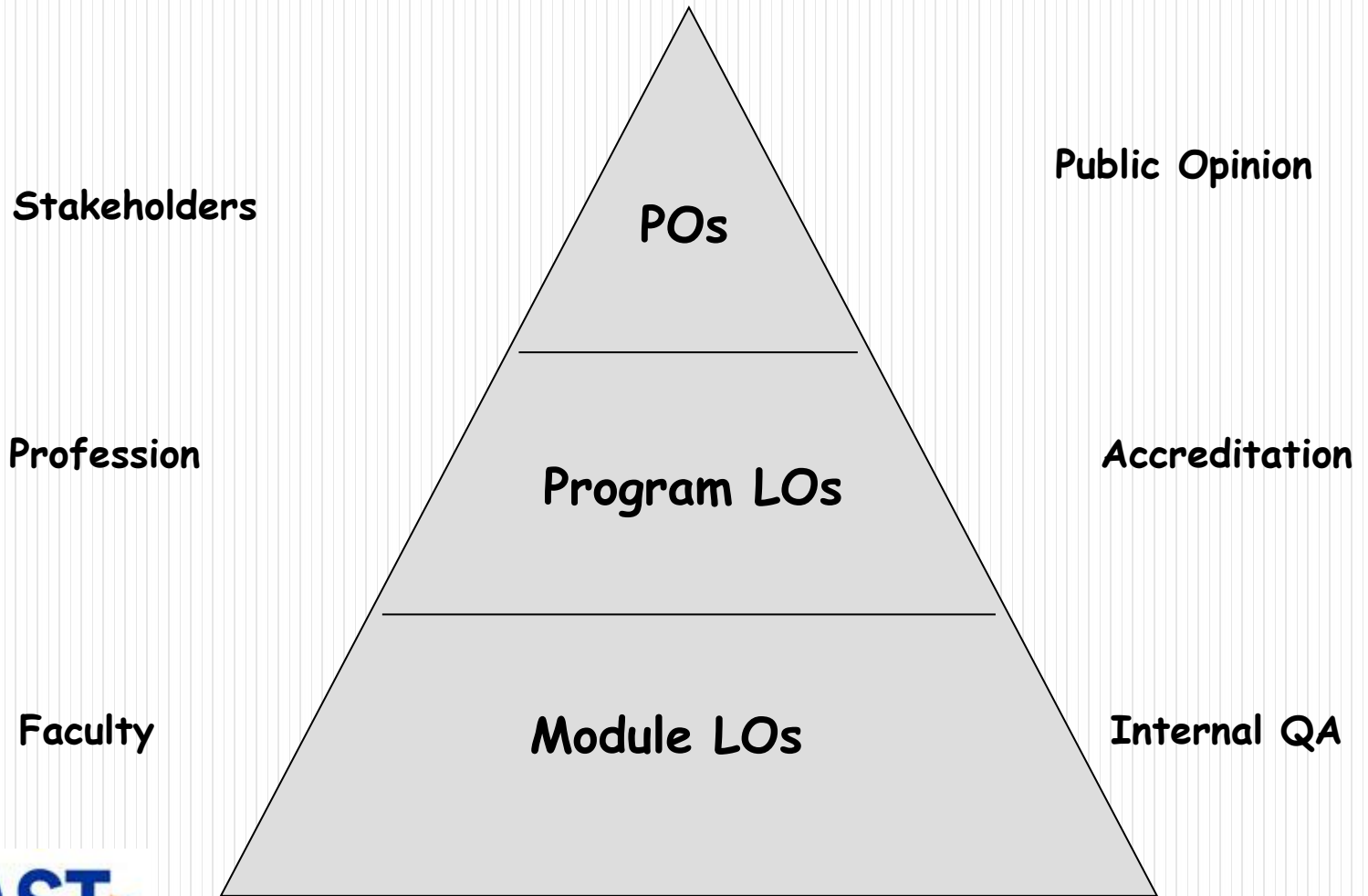
**Assessment** of **outputs** serve as *indirect measures* or proxies for *effectiveness*—they provide general indicators of achievement.

# Evaluation and Assessment

- Outcomes:**
- what have students learned;
  - what skills have they gained;
  - attitudes developed;
  - faculty publication citations data;
  - faculty development;
  - student learning and growth.

**Assessment** of **outcomes** provides for *direct measures* of the *effectiveness* of what has been done with that capability/ capacity related to individual learning and growth

# Evaluation and Assessment



*Thank you for your attention.*