INFORMATION ABOUT COMPLEX ENGINEERING PROBLEMS (WP), COMPLEX ENGINEERING ACTIVITIES (EA), KNOWLEDGE PROFILES (WK)

GENERAL INFORMATION

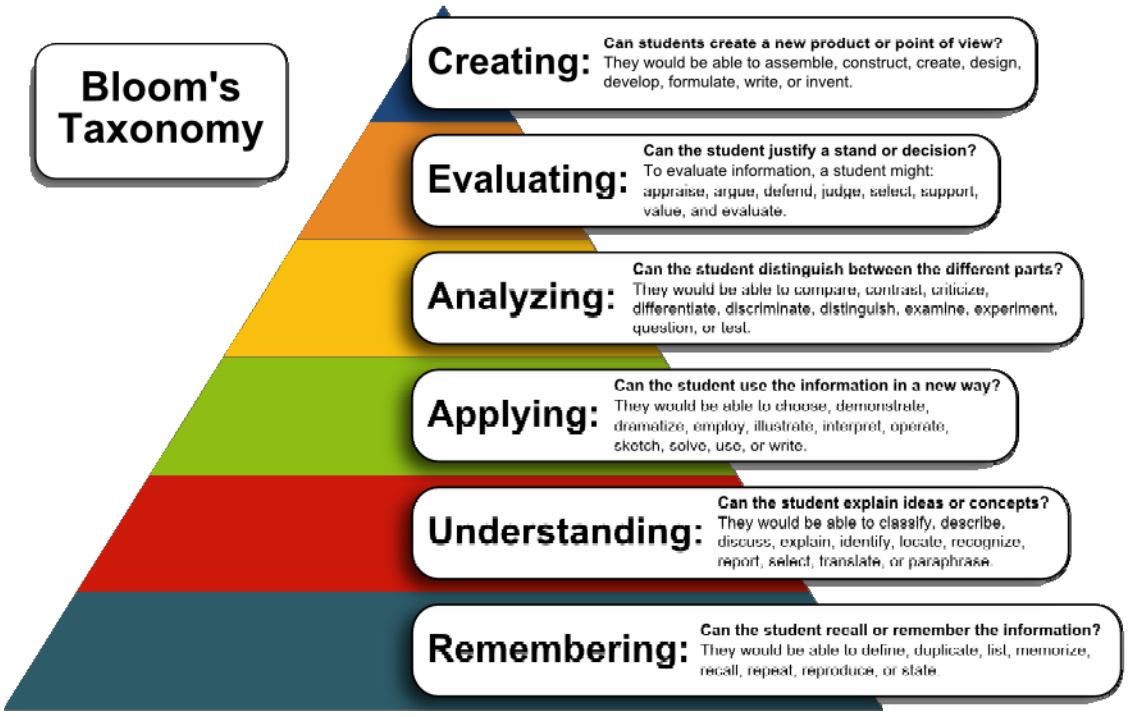
Engineering Applications

Emphasis on engineering applications in degree programmes aims to ensure that all engineering graduates have a sound understanding of up-to-date industrial practice, in particular:

Electrical and Electronic Engineering:

1. To appreciate the characteristic behaviour of materials in electrical and electronic systems.
2. To be able to analyse and design electrical and electronic systems from devices/components made of various materials.
3. To understand the concepts of generation, transmission and distribution of low and high voltage power.
4. To appreciate cost effectiveness and energy consumption of component/device equipment selection, manufacturing process and integration process.
5. To appreciate the range of manufacturing methods currently available and the skills which they require in people for their use.
6. To understand the whole process of industrial decision making in design, manufacturing and use and how it is influenced not only by technical ideas but also by the practical constraints of financial and human resources and by the business and social environment of engineering.

BLOOM'S TAXONOMY



https://www.google.com/url?sa=i&url=https%3A%2F%2Fcourses.dcs.wisc.edu%2Fdesign-teaching%2FPlanDesign_Fall2016%2F2-Online-Course-Design%2F2_Learning-Objectives-Alignment%2F6_objectives_blooms-taxonomy.html&psig=AOvVaw2lsbJzWKS1btjvEwem9zWn&ust=1611803806524000&source=images&cd=vfe&ved=0CAMQjB1qFwoTCPj0z5yTu-4CFQAAAAAdAAAAABAJ

COMPLEX ENGINEERING PROBLEMS (WP)

The range of Complex Engineering Problems is defined as follows:

No.	Attribute	**Complex Engineering Problems** have characteristic WP1 and some or all of WP2 to WP7:
WP1	Depth of Knowledge Required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5, WK6 or WK8 which allows a fundamental-based, first principles analytical approach.
WP2	Range of conflicting requirements	Involve wide-ranging and/or conflicting technical, non-technical issues (such as ethical, sustainability, legal, political, economic, societal) and consideration of future requirements
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, creativity and originality in analysis to formulate suitable models
WP4	Familiarity of issues	Involve infrequently encountered issues or novel problems
WP5	Extent of applicable codes	Address problems not encompassed by standards and codes of practice for professional engineering
WP6	Extent of stakeholder involvement and conflicting requirements	Involve collaboration across engineering disciplines, other fields, and/or diverse groups of stakeholders with widely varying needs
WP7	Interdependence	Address high level problems with many components or sub-problems that may require a systems approach

COMPLEX ENGINEERING ACTIVITIES (EA)

The range of Complex Engineering Activities is defined as follows:

No.	Attribute	**Complex activities** mean (engineering) activities or projects that have some or all of the following characteristics:
EA1	Range of resources	Involve the use of diverse resources including people, data and information, natural, financial and physical resources and appropriate technologies including analytical and/or design software
EA2	Level of interactions	Require optimal resolution of interactions between wide-ranging and/or conflicting technical, non-technical, and engineering issues
EA3	Innovation	Involve creative use of engineering principles, innovative solutions for a conscious purpose, and research-based knowledge
EA4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterised by difficulty of prediction and mitigation.
EA5	Familiarity	Can extend beyond previous experiences by applying principle- based approaches.

KNOWLEDGE PROFILE (WK)

No.	Knowledge and Attitude Profile
WK1	A systematic, theory-based understanding of the **natural sciences** applicable to the discipline and awareness of relevant **social sciences**
WK2	Conceptually-based **mathematics**, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline
WK3	A systematic, theory-based formulation of **engineering fundamentals** required in the engineering discipline.
WK4	Engineering **specialist knowledge** that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports **engineering design and operations** in a practice area
WK6	Knowledge of **engineering practice** (technology) in the practice areas in the engineering discipline.
WK7	**Knowledge of** the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development[2]
WK8	Engagement with selected knowledge in the current **research literature** of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues
WK9	**Ethics, inclusive behavior and conduct.** Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

SUSTAINABLE DEVELOPMENT GOALS (SDG)

No	Description
1	No poverty
2	Zero hunger
3	Good health and well-being
4	Quality education
5	Gender equality
6	Clean water and sanitation
7	Affordable and clean energy
8	Decent work and economic growth
9	industry, innovation and infrastructure
10	Reduced inequalities
11	Sustainable cities and communities
12	Responsible consumption and production
13	Climate action
14	Life below water
15	Life on land
16	Peace, justice and strong institutions
17	Partnership for the goals