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EELISA European University

Learning outcomes of the future European Engineer

Deliverable 2.7

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EELISA Partners

Number	Role	Name in original language	Name in English	Short name	Country
1	COO	Universidad Politécnica de Madrid	Technical University of Madrid	UPM	Spain
2	BEN	Budapesti Műszaki és Gazdaságtudományi Egyetem	Budapest University of Technology and Economics	BME	Hungary
3	BEN	École Nationale des Ponts et Chaussées	National School of Civil Engineering	PONTS ParisTech	France
4	BEN	Friedrich-Alexander-Universität Erlangen-Nürnberg	Friedrich-Alexander University Erlangen-Nürnberg	FAU	Germany
5	BEN	İstanbul Teknik Üniversitesi	Istanbul Technical University	ITU	Turkey
6	BEN	Scuola Normale Superiore	Higher Normal School	SNS	Italy
7	BEN	Scuola Superiore di Studi Universitari e di Perfezionamento Sant'Anna	Sant'Anna School of Advanced Studies	SSSA	Italy
8	BEN	Universitatea Politehnica din Bucuresti	Politehnica University of Bucharest	UPB	Romania
9	BEN	Université Paris Sciences et Lettres	Université PSL	PSL	France
10	LTP	École Nationale Supérieure de Chimie de Paris	Paris National School of Chemical Engineering	CHIMIE ParisTech	France
11	LTP	École Nationale Supérieure des Mines de Paris	Paris National School of Mining Engineering	MINES ParisTech	France

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EXECUTIVE SUMMARY

The table of learning outcomes is based on the Eur-Ace guidelines. But taking the European Engineer Profile that was developed in the joint deliverable (D2.6) it opens a very important and explicit place to new competences that will be required for the engineers of the future. These include ethics and empathy, leadership, communication skills both to experts and to the general public. Of course, they include the skills demanded by employers as well as by the students themselves, the priority consideration of sustainable development, the ability to move beyond the national space, in the European multicultural context.

"I'd like to emphasize that engineers have to be not only expert of technical knowledge, but of economics/management, of environmental issues and somehow of social and political sciences. I fully agree that they have to find the ways how to communicate with other type of engineers, with experts of other professions, with politicians / decision makers, and with citizens. Engineers are supermen."

Anonymous contributor, online survey on the EELISA European engineer 2022

1. REMINDER OF CONTEXT AND OBJECTIVES

EELISA brings together complementary strengths and profiles in Europe to add value to engineering, transform engineering higher education in Europe, building new bridges between the applied sciences and education in order to train a new generation of engineers who will be engaged citizens able to face the challenges of tomorrow.

The universities of EELISA aim to give students the opportunity to earn a European degree in engineering and increase their competencies and employability so that they can work anywhere in Europe in either the world of academic research the private sector or public administration

A fundamental aim of EELISA is to take on board the engineering education needs of stakeholders, include joint research and transfer activities so that their outcomes serve society and humanity, and help build smart and sustainable solutions in Europe.

In this sense, the ambition of the EELISA is to define and implement a common model of European engineer rooted in society, with an increased inclusiveness, cross-disciplinarity and commitment.

As stated in the Eelisa proposition, "workshops were organised to lead to the definition of the learning outcomes for EELISA degree. Each of them will include different type of external speakers (agencies, businesses, associations). This feed into the work of WP3 about the requirements and accreditation for the EELISA degree.

The outcome-oriented approach will become the common ground for partners. Deans will be able to define the learning outcomes for EELISA Degree (D2.6.1) and then thanks to two additional meetings, Deans will define the common template for all EELISA degrees (degree objectives, specific outcomes, teaching units description, assessment methods) that will be common to all degrees (D2.6.2)."

2. SUMMARY OF THE ENGINEER PROFILE (EXTRACTED FROM D2.6)

The EELISA Alliance aims to develop a European engineer profile (EEP) that includes a set of skills that encompasses scientific, technical and more relational outcomes, within the European context of diversity and mobility. The EELISA-EEP can help to provide a scaffolding for the Learning Outcomes for a future joint degree, as well as ideas for the EELISA Supplement and Credentials. The EELISAEELISA-EEP should be based on pre-existing frameworks such as the EUR-ACE® Framework Standards and Guidelines (November 2021) and the Washington Accord Graduate Attribute Profile (Nov 2021), but with some additions to emphasize the importance of mobility and the European dimension it provides. In that light, most international standards for engineer profiles underline the importance of key concepts such as understanding, practice, design, research, knowledge, methods and complexity, although not always in that order. Most frameworks can also be divided into hard skills and softer ones, with some emphasis on practical knowledge, but few point out the utility of mobility/diversity during the degree to help promote learning. We propose that the EELISA-EEP include four conceptual fields within its framework.

2.1. Scientific and theoretical knowledge

This part of the profile involves core skills or theory-based understanding of the basic sciences in each field of engineering, for example mathematics, computing, and their use to develop products, processes and systems. Students are exposed to theoretical problems and the formulation of possible solutions based on engineering fundamentals, in a design framework. Here access to research methodologies and relevant literature is key to help evaluate the data or processes using state of art methods. Excellent scientific knowledge is the backbone of the European engineer profile.

2.2. Addressing sustainability

European engineers will need to understand how the techniques they develop are compatible with the depletion of natural resources and not generate irreversible situations. Especially they will need to take into account the entire life cycle of products and services they design and produce. This implies a critical and thorough analysis of the socio-environmental risks that pertain to the development of new technologies.

2.3. Interculturalism: an engineer embracing the European project

Just as practical learning may help to understand engineering fundamentals, adding mobility in a degree program can help facilitate understanding and incorporating soft skills on a personal level. By being exposed to different professors, university environments and cultures, students will become more aware of different societal issues, ethical problems and cultural dispositions. Mobility also provides a means to being exposed to a working environment in a different country via internships. The ambition with mobility in EELISA is to go beyond an exposure to different cultures and different ways of thinking. The core of this project is to nurture an atmosphere of cooperation and common values around cohorts of students that will embrace the European engineer vision of EELISA and develop across geographies and over time a shared vision of Europe and its values.

2.4. Business and communication skills: Practical and applied knowledge

Engineers should be able to work with materials, equipment and tools outside the classroom in order to apply problem solving techniques. This will also expose them to economic, organisational and managerial issues, and enhance a critical sense and judgment about the application of different solutions. They need to adopt a user-centric approach that enables to gather societal expectations with technological ambitions. There are many ways to ensure that students engage in work to ensure they acquire the expected expertise of engineering analysis, design and practice, including problem-based learning.

Given the uncertainty and complexity of real world situations, while applying the theoretical and practical knowledge they obtained, engineers will need to take into consideration social objectives, and ethical responsibilities in addition to sustainability issues mentioned above. Because they are at the interface between science, techniques and society, they will also require training related to communication skills, decision-making and independent learning (learning on the job) to better integrate the views of multiple stakeholders into their decision and creative processes. These skills are best learnt in real contexts, in which students, having acquired its basic principles, put them into practice in actual multi-lingual, multi-cultural and inter-disciplinary contexts. The complexity of decisions they will need to tackle involves a reflexive thinking posture on their own practice. This analytical thinking can feed back into their professional actions and further improve common knowledge. Given the fast evolving technological and societal environment, the European engineer needs to adopt a position of continuous learning that will maintain its ability to address societal challenges over time and to manage younger collaborators within its firms.

3. D2.7 PROPOSITION EUROPEAN ENGINEER PROFILE / LEARNING OUTCOMES

We started from the profile of the European engineer that we have developed. The novelty of this profile is to insist on important competences which go beyond technical and professional specialisation and which respond to a societal demand in the European area, which correspond to strong aspirations of students and which are also demands of employers. In particular, the following can be explained

- the objectives of sustainable development
- increased communication skills beyond the restricted circle of competence
- management skills
- ethical skills
- belonging to a European space

We have therefore based ourselves primarily on the Eur-Ace guidelines. We also analyzed other competence tables and in particular the IEA learning attributes table defined at the engineering level by the Washington Agreement (see annex). All the aspects we have just listed are certainly already described in these tables through the competences linked to the practice of engineering. But it is probably important to specify the attributes and to keep specific paragraphs for these topics in order to make them more explicit and more precise.

In this deliverable to the commission, it is also important to say that we have given here a table of competences as we think they correspond to a master engineer level. This table could be adapted for bachelor levels. In particular, it will be important not only to define the competences as here, but also to quantify them according to scales ranging from (knowledge, understanding, expert use, strategic planning ...). This work is a first version, which will evolve with the concrete development of training courses in the coming years.

In addition, there is a philosophy based on lifelong learning. As the IEA points out, there are the attributes given by graduation but they imply skills that will be more strongly developed during the first years of a career in the first jobs. In addition there is the problem of rapidly changing technological issues: Because knowledge develops very fast, engineers have to keep on learning new things. Engineering represents a continual process of replacement; therefore, one has to keep up with the steps of technological development; this is very important.So how are we going to inculcate in an engineer's mind this necessity to reprogram himself or herself? It must be a philosophy of life. It is more a matter of interaction between the academic world and the business. Physicians write this phrase in the Hippocratic Oath: "I will maintain the necessary independence and will not undertake anything beyond my competence. I will maintain and improve my skills in order to ensure the best of my mission." The same could be proposed for engineers as both a technical and human value.

4. TABLE OF LEARNING OUTCOMES

NB: We only addressed the Master level (engineering grade) with professional competencies

The International Engineering alliance discusses three different grades and also two sets of professional competencies and Graduate Attributes.

Washington Accord	International Professional Engineers Agreement
Sydney Accord	International Engineering Technologists Agreement
Dublin Accord	APEC Engineer Agreement

The eur-ace discusses two grades (master- bachelor level) and sets guidelines .

In blue we directly re- used guidelines from Eur-ace.

When no comments are involved, we put The Washington Accord text instead if it brings a more accurate concept as compared to the Eur-Ace. WA_n means Washington accord (see annex)

	Comments	European Engineer profile	Eur-Ace guidelines
Knowledge and Understanding	A sound training in the basic sciences is required and must be common to all engineers, whatever their specialization will be. This strong scientific knowledge beyond the scope	• in-depth knowledge and understanding of mathematics, natural sciences and computing sciences underlying the engineering fundamentals, at a level necessary to achieve their application in their engineering specialization as well as	• in-depth knowledge and understanding of mathematics, computing and sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes;

	of the specialization is necessary to allow connection with other disciplines and multidisciplinary collaboration. Mathematics and physics in particular bring rigor in reasoning that allows to go beyond empirical observations by introducing the scientific method. Chemistry, biology, earth science bring multidisciplinary knowledge.	collaboration at the interface between different fields. • in-depth knowledge and understanding of engineering disciplines underlying their specialization, at a level necessary to achieve their professional use; • critical awareness of the forefront of their specialization; • ability to address complex multidisciplinary engineering problems.	• in-depth knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes; • critical awareness of the forefront of their specialisation; • critical awareness of the wider multidisciplinary context of engineering and of knowledge issues at the interface between different fields.
Engineering analysis	**The WA agreement insists on the global holistic approach:** **WA2:** Identify, formulate, research literature and analyze *complex* engineering	• ability to identify and analyse new and complex engineering problems; • ability to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods; to critically	• ability to analyse new and complex engineering products, processes and systems within broader or multidisciplinary contexts; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental

	problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (WK1 to WK4)	interpret the outcomes of such analyses ; • ability to conceptualise engineering products, processes and systems; • ability to formulate judgements with incomplete or limited information, *that include multidisciplinary approach as well as reflecting on social and ethical responsibilities.* • integrate knowledge and handle complexity. • ability to identify, formulate and solve unfamiliar complex engineering problems that are incompletely defined.	methods or new and innovative methods; to critically interpret the outcomes of such analyses ; • ability to conceptualise engineering products, processes and systems; • ability to identify, formulate and solve unfamiliar complex engineering problems that are incompletely defined, have competing specifications, may involve considerations from outside their field of study and non-technical – societal, health and safety, environmental, economic and industrial – constraints; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods in problem solving; • ability to identify, formulate and solve complex problems in new and emerging areas of their specialisation.

Engineering design	**WA3:** Design creative solutions for *complex* engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5) Experiential approach Practical knowledge in real situations Aware of and familiar with late equipment and measurements Digital engineer	• ability to innovate, to develop, to design new and complex products (devices, artefacts, etc.), processes and systems, with specifications incompletely defined and/or competing, that require integration of knowledge from different fields and non-technical – societal, health and safety, environmental, economic and industrial commercial – considerations; to select and apply the most appropriate and relevant design methodologies or to use creativity to develop new and original design methodologies. • ability to design using knowledge and understanding at the forefront of their engineering specialization and at the state of the art of digital technology.	• ability to develop, to design new and complex products (devices, artefacts, etc.), processes and systems, with specifications incompletely defined and/or competing, that require integration of knowledge from different fields and non-technical - societal, health and safety, environmental, economic and industrial commercial – constraints; to select and apply the most appropriate and relevant design methodologies or to use creativity to develop new and original design methodologies. • ability to design using knowledge and understanding at the forefront of their engineering specialisation.

Investigation and Engineering practice	Investigation should not be mixed with research only. Can be achieved with research of course (research-based learning) but also of with innovation -oriented learning. o Business oriented o Creativity The complexity of modern systems, the consideration of multiple uses and the increasing number of data require the mastery of new methods of data analysis and the consideration of automated mechanisms of adaptation. This must necessarily go beyond the simple ability to program in computer science to	• ability to use research methods to identify, locate and obtain required data; • ability to conduct searches of literature, • advanced laboratory/workshop skills and ability to design and conduct experimental investigations, critically evaluate data and draw conclusions; • ability to investigate in a creative way the application of modern engineering and IT tools to carry out simulation in order to pursue detailed investigations and research of complex technical issues; Ability to develop critical thinking gather information from the context and analyze and interprete the data	• ability to identify, locate and obtain required data; • ability to conduct searches of literature, to consult and critically use databases and other sources of information, to carry out simulation in order to pursue detailed investigations and research of complex technical issues; • ability to consult and apply codes of practice and safety regulations; • advanced laboratory/workshop skills and ability to design and conduct experimental investigations, critically evaluate data and draw conclusions; • ability to investigate in a creative way the application of new and emerging technologies at the forefront of their engineering specialisation.

	systematically use new tools (data analysis, machine learning, artificial intelligence)		
Society and sustainable development	Focus oriented: • Sustainability, climate change, circular economy • Solidarity Social dimensions Equitable, aimed at ‘‘engineering education for all” The Eur-ace only has one set of attributes for these competencies that we splitted to emphasize. For these topics we are more in phase with the Washington accord.	• ability to analyze and evaluate the societal impacts to deliver sustainable solutions for society, the economy and environment. • Ability to design solutions with sustainable methodology.	**Making Judgements** **Communication and Team-working** • ability to integrate knowledge and handle complexity, to formulate judgements with incomplete or limited information, that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgement to deliver sustainable solutions for society, the economy and environment; • ability to manage complex technical or professional activities or projects that can require new strategic approaches, taking responsibility for decision making.

Ethics: Understanding and level of practice	2. Humanistic and human literacy - Guided by ethics - Multi-cultural - Gender sensitive Socio-emotional strong and mindful Ethical leadership: Setting an example and inspiring esteem and respect are among the qualities of an engineer with good leadership.	• ability to consult and apply codes of practice and safety regulations;Respect of Safety and healths and environment protection Honesty transparency, respect of intellectual property rules. Respect of societal, gender equality and diversity and environmental considerations as required	
Being a European Understanding the benefits of	Mindful of history, geography and political aspects Teamwork in multicultural, multilingual and inter-disciplinary environments	Knowledge of the European union, its organization, its common values and its main strategic orientation.	

diversity and interculturality	Involving international experiences Trained to work in international and interdisciplinary projects Democratic challenges are econ,omic, geopolitical and technology (digitalization …)	Knowledge the challenges Europe is facing and the relation and positioning of Europe within the world. Ability to use and favor networking opportunities all across Europe industries Developing a global and inclusive vision with a strong curiosity and pragmatism recognizing the value of other systems and approaches.	
Leadership and communication: Role as a team-member and project enabler	Mindsets • Global mindset • Cultural agility Valuing learning over knowing	• ability to manage complex technical or professional activities or projects that can require new strategic approaches, taking responsibility for decision making. Ability to communicate with peers but also with the rest of the engineering community and also with a public of non-specialists taking into account cultural, language, and different levels of knowledge.	

		•Ability to lead a project : identify needs, establish requirements, propose solutions, set goals, share teamwork, follow up an idea from its birth to its realization and adoption by the organization or the company • interpersonal communication	
Project Management Finance and intellectual property:	Awareness of Legal Aspects Knowledgeable of innovation processes, patents and proprietary aspects	• knowledge and understanding of management and economy principles of a business company, financial concepts and economic decision making, • Knowledge of entrepreneurship (regulation, business models, funding…) • ability to manage the budget of a project. • awareness of intellectual property, and patent regulations	

Lifelong Learning	Attitude and self-aware: • Personalized for joint personal and professional development • Dynamic and continuously evolving • Modular and flexible: open to the engineer's own discovery • Oriented to lifelong learning • Agility to learn and relearn • Ability and agility to change perspectives	• ability to recognise the need and commitment for and to engage in independent life-long learning; • ability to undertake further study autonomously. • adaptability to new and emerging technologies Commitment to continuous professional	• ability to engage in independent life-long learning; • ability to undertake further study autonomously.

5. TEMPLATE FOR COURSE DESCRIPTION

SNS	Digital communications IA			
Master course	**Introduction to Machine Learning**			
Duration/days of the week	***Start date***	***End date***	***Validation mode***	***ECTS***
40h	4/20/2022	6/30/2022	Oral Examination	6.0
Teaching mode : Hybrid				
URL : https://www.sns.it/en/corsoinsegnamento/introduction-machine-learning				
Contact person : xxx.yyy@sns.it				

Course description

Module 1 (20 hours) Foundation of Data Mining and machine Learning (Prof. Giannotti) - 1) Introduction: the Knowledge Discovery process. All steps in a nutshell- 2) Data understanding and Data exploration- 3) Unsupervised learning: Clustering: intro clustering: K-Means clustering- 4) Unsupervised learning: Clustering: DBSCAN e Hierarchical clustering- 5) practicals: case study on simple data sets iris e titanic (python or Knime)- 6) Supervised Learning: Classification introduction, performance evaluation, a first simple classifier: KNN - 7) Supervised Learning: classification with Decision tree- 8) practical: case study on simple data sets iris e titanic- 9) Supervised Learning:Classification advanced: RF, SVM, NN - 10) Unsupervised learning: Pattern mining: a-priori pattern mining: case study Module 2 (20hrs) Application of Machine Learning algorithms in Bioinformatics and Life Sciences (Dr. Raimondi)- 1) protein structure/function prediction using machine learning- 2) protein structure prediction using deep learning and co-evolution- 3) protein language models- 4) application of graph neural network for the prediction of protein interaction networks- 5) deep learning applications to genomics :DNA motif discovery- 6) deep learning applications to genomics: variant intepretation- 7) deep learning applications to genomics: single cell RNAseq analysis and interpretation- 8) practicals: protein model languages- 9) practicals: deep learning for genomics- 10) practicals: multiomics data integration

Learning objectives

Aim of the course is to provide students with basic knowledge of both theoretical foundations and practical aspects of machine learning, with a particular focus on applications to bioinformatics and biology.

Prerequisite:

at least a Bachelor

Related Communities : Tools, technologies and digital solutions for health and care, including personalised medicine

Partner : Scuola Normale Superiore

Department, School or Faculty : Scuola Normale Superiore

ANNEXES

Work progress towards preparing the delivery includes:

- Key literature already identified and reviewed
- University own findings and studies, already collected and discussed
- Internal Workshop The profile of the European engineer, held March 15 (see conclusions in the Annex 1)
- EELISA web-based consultation launched and opened until the end of April (Annex 2)
- International Consultancy work already in progress, with delivery date of April 21 (Annex 3)
- List of traits to be considered in EEP

Annex. Comparison of Washington accord with EUR-ACE® guidelines.

Sources:

Graduate attributes and professional competencies, International engineering alliance version 2021-1

EUR-ACE® Framework Standards and Guidelines 4/11/2021

This comparison concerns the engineer (master level).

Since the Washington accord contains more items than the EUR-ACE® guidelines, the guidelines of Eurace-have been divided to fit in the same attributes. This applies especially to the attribute that correspond to "Making judgements and teamworking" (Eur-ace) that are developed in the Washington accord along these attributes "The Engineer and the World", Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance:

	Washington attributes	**EUR-ACE guidelines**
Engineering Knowledge: Breadth, depth and type of knowledge, both theoretical and practical / **Knowledge and Understanding**	**WA1:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop solutions to complex engineering problems	• in-depth knowledge and understanding of mathematics, computing and sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes; • in-depth knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes; • critical awareness of the forefront of their specialisation; • critical awareness of the wider multidisciplinary context of engineering and of knowledge issues at the interface between different fields.

Problem Analysis Complexity of analysis / **Engineering analysis**	**WA2:** Identify, formulate, research literature and analyze *complex* engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (WK1 to WK4)	• ability to analyse new and complex engineering products, processes and systems within broader or multidisciplinary contexts; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods; to critically interpret the outcomes of such analyses ; • ability to conceptualise engineering products, processes and systems; • ability to identify, formulate and solve unfamiliar complex engineering problems that are incompletely defined, have competing specifications, may involve considerations from outside their field of study and non-technical – societal, health and safety, environmental, economic and industrial – constraints; to select and apply the most appropriate and relevant methods from established analytical, computational and experimental methods or new and innovative methods in problem solving; • ability to identify, formulate and solve complex problems in new and emerging areas of their specialisation.
Design/development of solutions: Breadth and uniqueness of engineering	**WA3:** Design creative solutions for *complex* engineering problems and design systems, components or processes to meet identified	• ability to develop, to design new and complex products (devices, artefacts, etc.), processes and systems, with specifications incompletely defined and/or competing, that

problems i.e., the extent to which problems are original and to which solutions have not previously been identified or codified **/Engineering design**	needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5)	require integration of knowledge from different fields and non-technical - societal, health and safety, environmental, economic and industrial commercial – constraints; to select and apply the most appropriate and relevant design methodologies or to use creativity to develop new and original design methodologies. • ability to design using knowledge and understanding at the forefront of their engineering specialisation.
Investigation: Breadth and depth of investigation and experimentation **/Engineering practice**	**WA4:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (WK8)	• ability to identify, locate and obtain required data; • ability to conduct searches of literature, to consult and critically use databases and other sources of information, to carry out simulation in order to pursue detailed investigations and research of complex technical issues; • ability to consult and apply codes of practice and safety regulations; • advanced laboratory/workshop skills and ability to design and conduct experimental investigations, critically evaluate data and draw conclusions;

		• ability to investigate in a creative way the application of new and emerging technologies at the forefront of their engineering specialisation.
Tool Usage: Level of understanding of the appropriateness of technologies and tools	**WA5:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems (WK2 and WK6)	/seen in Engineering design
Making judgements and teamworking	Here is a marked difference. While Eur-ace only gives a single learning outcome (Making judgements and team working), the Washington accord splits it into WA6-7-8-9-10	Eur-ace has a single cell for making judgements, team working ethics and communication. • ability to integrate knowledge and handle complexity, to formulate judgements with incomplete or limited information, that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgement to deliver sustainable solutions for society, the economy and environment; • ability to manage complex technical or professional activities or projects that can require new strategic approaches, taking responsibility for decision making.

The Engineer and the World: Level of knowledge and responsibility for sustainable development / Part of **Making judgements and teamworking**	**WA6:** When solving complex engineering problems, analyze and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (WK1, WK5, and WK7)	Repeated from "**Making judgements and teamworking** • ability to integrate knowledge and handle complexity, to formulate judgements with incomplete or limited information, *that include reflecting on social and ethical responsibilities* linked to the application of their knowledge and judgement to deliver sustainable solutions for society, the economy and environment;
Ethics: Understanding and level of practice / Part of **Making judgements and teamworking**	**WA7:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (WK9)	**Repeated from Making judgements and teamworking** "that include reflecting on social and ethical responsibilities"
Individual and Collaborative Team work: Role in and diversity of team / Part of **Making judgements and teamworking**	**WA8:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings (WK9)	**Repeated from Making judgements and teamworking** • ability to manage complex technical or professional activities or projects that can require new strategic approaches, taking responsibility for decision making.

Communication: Level of communication according to type of activities performed	**WA9:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, taking into account cultural, language, and learning differences.	
Project Management and Finance: Level of management required for differing types of activity	**WA10:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.	
Lifelong learning: Duration and manner / **Lifelong Learning**	**WA11:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8)	• ability to engage in independent life-long learning; • ability to undertake further study autonomously.