A-WEAR PROJECT

A network for dynamic WEarable Applications with pRivacy constraints

Project no. 813278

H2020-MSCA-ITN-2018 - Marie Skłodowska-Curie Innovative Training Networks

D7.1 Plan for training activities

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RE	Restricted to a group specified by the consortium (including the Commission Services)	
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1. Executive Summary

This document comprises deliverable D7.1 Plan of training activities of WP7 Training working package within A-WEAR project. It reports the plan for the A-WEAR training activities.

2. Overview and structure

The training is based on double and joint PhD programs training, as illustrated in Figure 1.

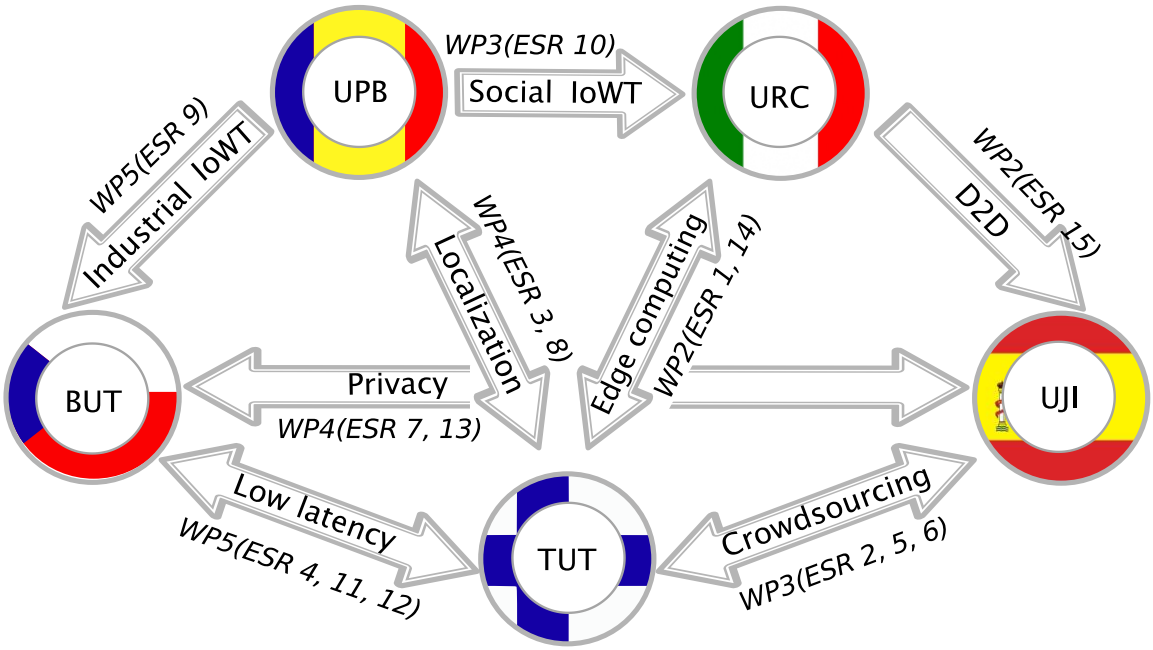

Figure 1 Double and joint degree parings between countries

Our methodology is based on a combination of learning-by-doing, multi-disciplinary and cross-country supervision, proactive ESR involvement in dissemination and outreach tasks, and on-the-job-training skill acquisition. The fellows will be exposed to both academic and industrial environments by performing at least six months of academic secondments and 2-3-month cross-sector secondments. They will also be exposed to intercultural experience by enhancing their adaptability and flexibility skills, not only through the network events, but also by working and learning in two countries and by having both academic and non-academic supervisors. Each fellow will register as a PhD student in two universities of A-WEAR network in order to pursue a joint or double PhD degree. The fellows collect the required course credits through courses taken locally at their universities (Table 3) through A-WEAR seasonal events (Table 2), and also through remote e-learning and book exams. A book exam is an accepted ECTS credit-collection method at TAU, where students are self-studying a certain technical book and then complete assignments based on it, as required by a professor in charge.

Figure 1 shows the double/joint degree pairings along research axes relevant to WPs: each 2 universities are paired along one of the 8 main topics illustrated in the arrows with 1-3 fellows per topic and two topics per research WP: 1) Edge computing (ESRs 1, 14; WP2), 2) D2D (ESR15; WP2), 3) Crowdsourcing (ESRs 2, 5, 6; WP3), 4) Social IoWT (ESR 10; WP3), 5) Localization (ESRs3,8; WP4), 6) Privacy (ESRs 7, 13; WP4), 7) Low latency (ESRs 4, 11, 12; WP5), and 8) Industrial IoWT (ESRs 9; WP5). The arrows pointing towards a unit

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show an incoming visitor to that unit. Double arrows mean that both incoming and outgoing PhD students are registered to the both ends of the arrow, while single arrow means that a incoming student from another unit is registered as a PhD student also at the unit to which the arrow points towards.

2.1. Main training objectives

The training objectives (TO) of A-WEAR are listed below:

TO1. Educate, supervise, and train 15 young ambitious and creative researchers to face the future challenges in smart wearables and wireless computing and enhance their career prospects by training them in a multi-sector cross-country environment and teaching them to think globally

TO2. Create and manage efficiently joint and double European PhD programmes (see Figure 1 for PhD pairings) and build a solid foundation for long-term structured joint PhD education in Europe in the Internet of Wearable Things (IoWT) field with joint selection, supervision, and PhD Dissertation procedures for effective graduation process for PhD's degrees.

TO3. Create open-source training material for educational purpose and to publish and exploit research results and best practices in cooperation with the scientific community, industry, and general public

TO4. Have an interactive participation in social media such as webpage (including the videos of the researchers) and blogs, ResearchGate, Twitter, LinkedIn, YouTube, etc., in the form of literate, illustrative, and video presentations on the training and scientific outcome in order to disseminate efficiently our results; promote career prospects of the young researchers and expand the collaboration and the knowledge transfer also beyond our network

TO5. Foster multi-national collaboration through regular network training events and cross-country secondments as well as establish and maintain long-term academic and industrial partnerships, beyond the project's timeframe, in order to ensure the continuity of high quality training and research of inter-sectorial nature.

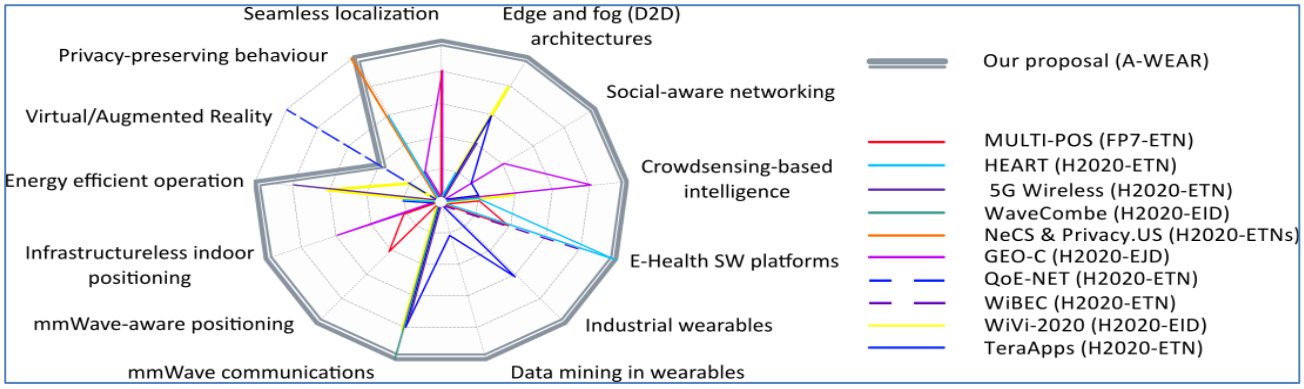

Figure 2 How A-WEAR differs from other on-going or past ITNs

Figure 2 illustrates how A-WEAR differentiates from existing ITNs: on a scale from 0 to 5, we show how A-WEAR plans to address the wearables architectures, challenges and vulnerabilities with respect to different fields and angles. The labels of the axes in Figure 2, with the exception of Virtual Reality (VR)/Augmented Reality (AR), highlight key aspects of our training programme and how it is different from the existing networks. The VR/AR factors are thoroughly addressed in QoE-NET on-going ITN, which we plan to collaborate with (see Section 7) for a more comprehensive training of our fellows.

A total of 15 ESRs will be hired in A-WEAR for 36 months each as shown in Table 1.

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Table 1 Recruitment Deliverables per Beneficiary

Researcher No.	Recruiting Participant (short name)	Planned Start Month 0-45	Duration (months) 3-36	WP involvement	Researcher No.	Recruiting Participant (short name)	Planned Start Month 0-45	Duration (months) 3-36	WP involvement
1.	TAU	M8	36	2	9.	UPB	M9	36	5
2.	TAU	M9	36	3	10.	UPB	M8	36	3
3.	TAU	M9	36	4	11.	BUT	M9	36	5
4.	TAU	M8	36	5	12.	BUT	M9	36	5
5.	UJI	M9	36	3	13.	BUT	M9	36	4
6.	UJI	M9	36	3	14.	URC	M9	36	2
7.	UJI	M9	36	4	15.	URC	M9	36	2
8.	UPB	M8	36	4	Total	-	-	540	

Training will be structured through the following means:

1) training on the job at host organisation and through secondments,
2) network-wide training at seasonal events,
3) local scientific and transferable skills training through courses and e-learning.

In A-WEAR, there is a good balance between network-wide training (mandatory for all fellows) and tailored, individual training (to be determined by ESR and supervisors, based on specific profile). This will enable all fellows to gain the same basis of multidisciplinary knowledge, but it will also enable them to fine-tune their training to their specific needs.

2.2. Network-wide events

Table 2 shows the planned main network-wide training events: an orientation camp/Winter school at the beginning of the programme (M12), to be combined with the mid-term check, three more seasonal schools between M18 and M29, two workshops of 2.5 days each for team works and complementary skills in the last 2 years of A-WEAR, and 4 conference special sessions of half-days. The seasonal schools will have half day dedicated to Advisory & Management Board meetings and fellows' team work; they also will focus on offering technical and non-technical training, based on invited lecturers from industry, local senior researchers, etc.

In addition, we plan to include inspirational success stories by female researchers and entrepreneurs in a number of the seasonal schools, based on the experience of A-WEAR female supervisors and invited industrial female in order to provide role models for female ESRs. Complementary skill courses will include courses such as IPR, negotiation, selling, doctoral studies practices and orientation, scientific paper writing, presentation skills, technology management, ethical training, business practices, marketing, procedures for patenting as well as creating university spin-offs and start-up companies, etc. (some already scheduled in the network events of Table 2, some other to be offered locally by one or several units). All events are scheduled during the period when all fellows are in the network, meaning between M9 (scheduled month of last hiring) and M42 (month of possible contract ending of first fellow to be hired). With 11 scheduled networking events within this interval we aim at ensuring a maximum level of cooperation and networking within A-WEAR units. In the conference special sessions to be organized within A-WEAR we will particularly invite the teams of other networks which expressed interest in our research topics and with whom we have detected potential complementarities. This will benefit our training program also in terms of lessons learnt from other MSCA fellows and in order to exchange technical and complementary skills knowledge. The network-wide events in addition will facilitate social activities, site-visits at the premises of A-WEAR partners, face-to-face meetings of ESRs with their supervisory team and knowledge exchange amongst the ESRs.

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Table 2 Main Network-Wide Training Events, Conferences, and Contribution of Beneficiaries

Event	Main Training Events & Conferences	ECTS	Training outcomes	Lead Unit	Month
E1	*2-5 December 2019*: orientation camp/winter school on "Localization and communication enablers for wearables", including half-day fellow presentations and team building activities collocated with midterm check. It will include introductions, logistics and team building for the A-WEAR team, technical training on seamless localization and low-energy communications in IoWT, and complementary skills on ethics in research, strategy&business planning and MyData. Planned lecturers from TAU and industry: Lohan (TAU) Nurmi (TAU), Kucheryavy (TAU), Andreev (TAU), Ometov (TAU), Ahtensuu (TAU), Hosek (BUT), Niculescu (UPB), Cramariuc (CITST), Torsner (ERI), Suomi (DLI), etc. This event is to be collocated with the mid-term check and will be held in Tampere, Finland.	3-4	Overview of the training and research; IoWT communication and positioning challenges; harmonization of training methodologies; orientation to PhD studies and ethical behaviour	TAU	M12
E2	Half-day A-WEAR workshop at AGILE 2020 conference on wearables in smart cities	1	Presentation, networking and communication skills	UJI	M17
E3	4-day summer school on "Machine Learning, Spatial analysis, and cybersecurity in wearables", including half-day fellow presentations and team building. Topics: machine learning, AI, cryptography and cybersecurity, web and context-aware systems, public safety; complementary skills on multi-cultural business communication and leadership. Planned lecturers from UJI and industry: Huerta (UJI), Gould (UJI), Torres (UJI), Juan (S2G), Carque (CPD), etc.	4	Machine learning and AI techniques; cybersecurity and cryptography methods; public safety; business and leadership	UJI	M18
E4	4 days, Winter school on "Consumer and healthcare applications of wearables", including half-day fellow presentations and team building activities. Topics: Ambient Assisted Living (AAL) challenges, eHealth platforms, mesh sensor networks, localization via miniaturized devices; complementary success stories of female leaders and from research idea to start-ups. Planned lecturers from UPB and industry: Marghescu (UPB), Niculescu (UPB), Popescu (UPB), Cramariuc (CIT), Suciu (BEIA), Pavel (NXP), etc.	3	Wearables usage in AAL and eHealth; platforms requirements for consumer and eHealth applications; how to build a successful start-up	UPB	M22[1]
E5	Half-day A-WEAR workshop at ICUMT 2020 conference on green communication and networking with wearables		Presentation, networking and communication skills		M22
E6	Joint virtual research seminar via Moodle2 and Echo tools covering edge and fog computing, physical layer parameter optimization and MAC protocols in wearables, and wearable applications and services. Lectures: all academic scientists-in-charge of A-WEAR.	3	7-layer OSI model of wearables: from physical layer to application layer – challenges and solutions	TAU	M24
E7	4-day summer school on "Critical Industrial Applications in 5G-Internet of Things (IoT) Ecosystem", including half-day fellow presentations and team building activities. Technical topics: privacy, precise indoor positioning for industrial applications, low-latency communication architectures. Complementary skills: legal aspects of security and privacy protection and from idea to commercial product. Planned lecturers from academy and industry: Hosek (BUT), Misurec (BUT), Simek (SWO), Sedlacek (Greycortex), Polcak (Masaryk university), Uhlir (South-Moravian Innovation Centre), Pus (NET), etc.	3	5G and mmWave architectures; privacy laws and digital privacy solutions; IPR protection.	BUT	M29

[1] Changed from M21 from GA according to the best current estimate.

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E8	Half-day A-WEAR workshop at ICL-GNSS 2021 conference on Location Based Services through wearables	1	Presentation, networking and communication skills	TAU	M30
E9	Half-day A-WEAR workshop 2 at IPIN 2021 conference on indoor location privacy of wearables	1	Presentation, networking and communication skills	UJI	M33
E10	2.5-day workshop, including one-day fellow presentations and team building activities and complementary skills training on languages, communications, business, fundraising, entrepreneurship skills & success stories. Planned lecturers: Iera (URC), Molinaro (URC), Lener (T6E), Himanen (DLI), etc.	1	Fundraising and entrepreneurship skills for a successful career	URC	M35
E11	2.5-day workshop, including one-day fellow presentations and team building activities and complementary skills training on multi-cultural environments, R&D project management & legal aspects and IPR. Planned lecturers: Langwaldt (TAU), Kiviniemi (TAU), Bhuiyan (FGI), Burian (uBlox), etc.	1	Project management cycle	TAU	M41
Total # of ECTS from A-WEAR network-wide events		21 - 22			

2.3. Local training

In addition to the network-wide events, in which topics related to both "scientific and transferable skills" will be taught, each fellow will locally follow additional "scientific and transferable skills" related courses (minimum 5 ECTS from complementary skills courses and minimum 9 ECTS from technical courses). Each fellow will, together with his/her supervisors, select additional courses which fit the fellow's specific profile. Table 3 provides some examples of relevant technical courses provided by the A-WEAR Beneficiaries. In addition, each Beneficiary has an extensive portfolio of transferable skills courses.

Table 3 Few examples of local training through technical courses in English

Unit	Technical course title	ECTS	Training outcomes and relevance to A-WEAR research WPs	Relevant for ESRs:
TAU	TST-90006 Orientation to doctoral studies	3	Lectures diary, literature reviews and research plan writing in order to acquire technical writing clarity and fluency and to be able to present results in a coherent and compact manner. Risk assessment procedures and assessment of ethical issues (WP2-5)	1-6, 8,11,12,14
	ELT-43356 IoT wireless communications; it can be taken also remotely through Moodle2 TAU	5	Technologies, use cases and applications of the different wireless communications mechanisms for IoT, IoWT, and Internet of Everything (WP2-5)	1-6, 8,11,12,14, 15
	KIE-39006 Research Presentation	3	Training of skills necessary for perfecting the research outcome presentation	1-15
	KIE-39106 Research Writing	5	Improving skills related to scientific writing and preparing scientific manuscripts	1-15
	YHTTAY-40066 Methods in Human-Centered Design	5	Methods for developing user-friendly prototypes	2, 4, 8, 14

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	ELT-43406 5G Mobile Communications; it can be taken also remotely through Moodle2 TAU	5	Requirements, enabling technologies, use cases and applications of future fifth generation (5G) mobile communication networks.	1-15
	ELT-43307 Advanced Course in Digital Communication	5	Advanced waveforms and transmission scheme; deep understanding of detection and estimation theory and MIMO systems;	3, 4, 9, 11, 12, 14, 15
	SGN-43006 Knowledge Mining and Big Data	5	Mining Association Rules; Cluster Analysis Describing Data by Probability Distributions and Densities; Regression models Stochastic models Predictive models for classification Models for structured data	1-9, 11-15
	SGN-34006 3D and Virtual Reality	5	New and emerging technologies for 3D visual scene modelling, capture, processing and visualization as well as their use in applications such as 3D video and virtual reality	2, 4, 8, 14
	BMT-47626 Wireless Solutions in Intelligent Environments	5	Project-based student-centered learning focusing on building intelligent platforms for wireless environments in eHealth and industrial domains (WP2-5)	1-6, 8,11,12,14
UPB	Security of Mobile Devices	5	Main cryptographic algorithms and protocols to enable the students to analyse the security of existing solutions and correctly use the cryptographic primitives in the development of new systems (WP3-5)	3, 8, 9,10
	Technologies for Data Privacy Protection	5	Fundamentals of data privacy; privacy for EU GDPR compliance; privacy attacks & protection methods (WP3-5)	3, 8, 9,10
	Software Defined Radio and Programmable Circuits Design	5	Analysis of general architectures of software defined radio systems; problems in designing functional blocks, such as: A/D and D/A converters, demodulators, analog section etc. Specific languages used for design and verification of the digital circuits for FPGA; The lectures are available in electronic format on a MOODLE page.	3, 4, 9, 11, 12, 14, 15
	Security Protocols	5	A selection of core security concepts and technologies, with focus on standard architectures and protocols used in telecommunications networks, enterprise networks, and the Internet. Topics covered: access control; authentication and authorization infrastructures; design principles and security analysis of entity authentication and key exchange protocols; network layer security protocols: IPsec, IKE; secure virtual private networks using IPsec etc.	3, 7, 8, 9, 10, 13
	Data Mining	5	Data preprocessing. Association Rules & Sequential Patterns. Supervised learning. Unsupervised learning – Clustering. Partially supervised learning. Information integration. Link analysis. Data warehousing. Dimensional modeling. Building a data warehouse.	3, 8-10
	Symbolic and statistical learning	5	Introductive elements of machine learning, statistics, information theory and decision theory. Linear models for regressions. Linear models for classifications. Kernel methods and Gaussian processes. Sparse kernel methods (Support vector machines and Relevance vector machines). Bayesian methods and graphical methods. Expectation maximization. Principal components analysis and Independent component analysis. Hidden Markov models.	3, 8-10
	Knowledge representation and reasoning	5	First order and higher order models. Non-monotonic models. Temporal models. Logical models of higher order. Frame systems. Representing structured knowledge. Description logics and ontologies. Constraint-based representation and associated languages. Systems for maintaining data consistency. Bayesian networks. Plan representation and advanced techniques for automatic planning. Real life applications and usage of knowledge representation and automatic reasoning techniques.	8-10
	Scientific writing	2	Increasing the ability of writing technical documents and scientific papers as well as the ability to make technical presentations; Presentation of the general structure of technical and scientific documents; Developing the knowledge of writing techniques and methods; Becoming aware of typical errors in the writing of technical documents at all levels (language, coherence, following a storyline, attractiveness, presentation mode); Refining the techniques for oral presentation	1-15

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UJI	Reproducible research	2	Hands-on guidance on how to increase the degree of reproducibility of own work; creation of reproducible documents from text, code, and data of a scholarly publication and publishing them in an open-source data repository (WP2-4)	2, 5-7, 13, 15
	Test and evaluation of positioning, localization and tracking systems ensuring data diversity	2	Best practices to test the developed positioning, localization, navigation or tracking systems within the Doctorate Program scope; Enable the ESRs to collaborate in databases generation and create a public repository for evaluation purposes (WP4-5).	4,9, 11-13
	14100.05 - English for Research: Articles and Presentations of Research Results	2	Doctoral Students should achieve a series of cross-disciplinary competences related to the communication, diffusion and dissemination of research activities.	1-15
BUT	Modern Electronic Circuit Design	4	The course is focused on advanced methods for modelling, analysis, design, and optimization of discrete and integrated electronic circuits.	11-13
	Applied cryptography	4	Knowledge needed for the solution of cryptographic protection of communication, information and other electronic systems (WP 4-5)	4,9, 11-13
	Optimization Methods and Queuing Theory	4	The first part of this course deals with various currently used optimization methods. Students are first introduced to general Optimization theory. Then various forms of Mathematical Programming are dealt with. After the introduction into Linear and Integer Programming, the attention is given to Nonlinear Programming from its backgrounds like Convexity Theory and optimization conditions to overview and practical use of various optimization algorithms. A practically oriented introduction into Dynamic Programming with finite horizon follows. Students are also introduced into backgrounds of Stochastic Programming and Dynamic programming with infinite horizon, in particular to methods of solving Bellman's equations. The first part is closed by introduction to heuristic optimization algorithms. The second part of the course deals with the Queuing Theory. Various models of single queue systems and queuing networks are derived. The theory is then used by solving practical problems. Students are also introduced into simulation methods that are the only feasible solution method when a theoretical model is not available.	1-4, 9, 11-13
	Information Representation and Machine Learning	4	Objective of this course is to provide information about the complexity theory, graph theory and their comparison, queuing theory, Petri nets, and evolution algorithms.	2, 3,4, 7-9, 11-13
	Next-generation of Wireless Networks	4	This course is dedicated to the introduction of current types of data transmission that utilizes the wireless communication networks and protocols within the concept of next-generation wireless networks. Students will be introduced to the main differences of wireless communication within the frequency spectrum ranging from 450 MHz to 72 GHz. The focus will be directed to: (i) modulation, (ii) security, (iii) communication range, (iv) reliability, (v) packet loss, and (vi) transmission delay. The practical part of the course (laboratories) will be dedicated to principles of the Network Simulator 3, with accent given to a scenario focused on a data transmission utilizing emerging wireless communication technologies from the 5G NR group: LTE/LTE-A, IEEE 802.11ac, IEEE 802.11ad, Sigfox, LoRa, NB-IoT.	3,4, 7-9, 11-13
URC	Multicast in 5G	1.5	Potential, requirements, protocols, use cases and core enabling technologies of future 5G mobile communication networks (WP2-3)	1,10,14,15
	Vehicle-to-X networks	1.5	Understanding of Vehicle-to-Vehicle, Vehicle-to-Infrastructure and Vehicle-to-Everything communications and networking protocols (WP2-3)	1,10,14,15

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	Network programmability and softwarization in 5G systems	1.5	The course will present the main technologies proposed as key enablers for the programmability and softwarization of IoT and 5G systems. (i.e., software-defined networking, network function virtualization, mobile edge computing and information-centric networking).	1,10,14,15
	Fundamentals of Internet of Things	1.5	The course aims to give the fundamental knowledge about the Internet of Things: main enabling technologies at layer-2; IPv6 internetworking solution at layer-3 and above; major architectural solutions; applications and use case scenarios, "Cloud of Things" and "Social Internet of Things" paradigms	1,10,14,15

Regarding the training expected outcomes, at the end of A-WEAR training program the fellows will:

- Have obtained an excellent background in the fields of communication and navigation architectures in wearables, Internet of Things and 5G technologies, privacy and security in wireless networks, eHealth and wearables platforms, edge/fog and cloud computing and oriented-platforms, D2D communications and protocols, and commercial applications of wearables
- Have acquired entrepreneurial, critical thinking, social & creative skills, following their participation in A-WEAR R, D, and T activities, proactive involvement in social media communication, multi-target work and team building activities
- Have acquired a large professional network from the A-WEAR units, the additional networking partners of each A-WEAR unit, the collaborative networks of A-WEAR, plus as a result of A-WEAR high visibility through various publication channels
- Be fully prepared to work in multi-cultural and multi-sector environments with a global mindset and to tackle any challenge regarding inter-personal communication and negotiation as well as have acquired the needed skills to open new start-ups and to create new business models in wearable-based markets and future dynamic wireless communications
- Be able to come up with innovative solutions to counter-act the vulnerabilities in wearables and to reach ground-breaking results in research and development in their future career.

3. Innovative aspects of A-WEAR training programme

A-WEAR training is based on a deep and thorough interaction of 5 top-level EU universities and 12 non-academic units from 5 EU countries, encompassing the R&D areas of wireless dynamic computing, applications and platforms involving wearables. A training network-level event will occur on average every 4 months after the last ESR starts in A-WEAR (Table 2), showing a very intensive collaboration between A-WEAR units. Fellows will be exposed to multi-cultural inter-sector environments also through their academic and industrial secondments. Critical thinking and entrepreneurship skills, which are fundamental in future markets, will be further developed through complementary skill lectures and non-academic secondments. By interacting with at least 4 supervisors, minimum two academic and one industrial, the fellows will broaden their horizon and learn to tackle a problem at hand from various angles. In addition, having a supervisory team well-balanced with both young enthusiastic members and highly-knowledgeable experienced supervisors will ensure the right note towards a comprehensive supervision. Each fellow will prepare a Personal Career Development Plan (PCDP) in close consultation with his/her supervisors. The PCDP will serve as the core document for monitoring and evaluation of progress by the Advisory Board. The main criteria used to assess each fellow's progress are: coursework requirements, participation in network-wide training, individual research performance, publications plan and output, research impact, dissemination and outreach activities, thesis writing and Dissertation. 53% of A-WEAR fellows (2,4,5,6,7,11,12,13) will get a **joint PhD degree** from 2 universities and the rest (1,3,8,9,10,14,15) will get **a double PhD degree**, in those countries where **legislation** does not support yet a joint degree. The double/joint PhD degree pairings between universities were illustrated in Figure 1 based on common topics.

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Table 4 Skill matrix (V= Strong Expertise)

		Academia					Industry and public council											
		TAU	UJI	BUT	UPB	URC	NET	CIT	NXP	WPS	DLI	BEIA	S2G	ERI	CPD	IDOM	SWO	T6E
Technology	Artificial intelligence		V	V					V					V		V		
	Cloud/edge/fog computing	V		V		V			V					V		V		
	Computer vision		V		V			V				V		V		V		
	Cryptography			V									V	V		V		
	Cybersecurity			V					V	V			V	V				
	D2D communications	V				V								V			V	
	Data Fusion		V	V	V			V	V	V		V		V		V		
	eHealth solutions				V			V	V	V				V		V		
	Internet of things (IoT)	V			V	V			V	V	V			V		V	V	V
	Machine learning		V	V				V						V		V		
	Mesh sensor networks	V			V				V	V		V						
	Mobile computing		V			V	V					V		V			V	
	Software design		V			V	V	V	V	V	V	V		V		V	V	
	Systems on Chip (SoC)	V					V		V							V		
	Wireless indoor localization	V	V		V					V							V	
Applications	Ambient assisted living				V			V										
	Automated vehicles					V			V					V		V		
	End-user privacy										V		V					V
	Geographical Information Systems (GIS)		V													V		
	ICT	V				V	V		V	V		V		V		V	V	V
	Location Based Services (LBS)							V		V				V				
	Network security			V		V			V				V	V				
	Public safety														V			
	Robotics				V			V	V							V		
	Smart cities/Urban computing		V						V		V	V				V		
	Sports and wellbeing																V	
	Supply chain/ logistics								V			V						
Education	Knowledge transfer	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
	e-learning/MOOC	V	V	V	V	V			V			V						
	Hands-on training	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
	Student-centred learning	V	V	V	V	V												
	Laboratory work	V	V	V	V	V												

4. Role of non-academic sector in the training programme

A-WEAR network has 12 non-academic partners (7 SMEs, 4 large enterprises, 1 local council). Industrial partners' core businesses encompass all parts of the value chain in wearables (Table 5), thus A-WEAR will ensure career opportunities in academia, industry and government. Being involved in the intense dialog with industry early on in their careers, the ESRs will be able to grasp the essence of focused applied research with a strong emphasis on market-driven requirements.

Each academic unit collaborates through secondments with one company. Each non-academic partner organization will receive at least one ESR in secondments of 1-3 months. A-WEAR industrial partners are fully committed to offer hands-on training through explicit technology-oriented research project work, as well as site-specific training (Table 5). The industrial partners will participate in supervision of all fellows as industrial mentors. All industrial partners will bring to A-WEAR fellows and academic partners new visions that can make their research more easily applicable to the market. All A-WEAR partner organizations, including the industrial ones, are committed to be a part of the Advisory Board and to provide active

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feedback on the A-WEAR research output and timely market insights. The commitment letters have already been signed by all partner organizations.

Table 5 Contribution of non-academic sector to the fellows' training

Non-academic unit	Value chain in wearables	Contribution to A-WEAR fellows' training in addition to other afore-mentioned tasks and to the Education contribution mentioned in Table 4
NET	Smart modules & infrastructure	Training in the design of FPGA hardware-optimized applications for high-speed networks, with particular focus on fast encryption and privacy protection algorithms. Hosting secondment of ESRs 12,13; contribution to seasonal school E7 (training on privacy and commercial product development)
ERI		Training on 5G standardization and development and on wireless channel models for wearables. Hosting secondment of ESRs 4,14; contribution to school E1 (training on low-energy communications)
NXP	Smart connectivity	NXP manages an extensive network of online and classroom training workshops such as Mobile Wearable Introduction, Secure Element in Mobile Wearable. Hosting secondment of ESR 9; contribution to school E4 (training on localization via miniaturized devices)
WPS		Training on smart connectivity via massive mesh sensor networks. Hosting secondment of ESR6; contribution to school E1 (training on localization)
DLI	Smart platform	Training on DLI cloud based data platform (LifeEngine) and on semantic intelligence. Hosting secondment of ESR3. Training in social innovation and project management at schools E1 and E10.
BEIA		Providing a testbed for research on wearable technologies such as client devices (including remote telemetry station, GSM modem, sensors, actuators, solar panel, batteries) and server components. Hosting secondment of ESR 9. Contribution to school E4 (training on entrepreneurship)
SWO		Training on highly precise indoor tracking and data analytics for Industry 4.0, retail and sport applications, and platform optimization in real-time location platforms. Hosting secondment of ESR11.
S2G	SW	Training on cybersecurity both locally and at school E3. Hosting secondments of ESRs 5,7.
CIT	Apps	Training in all aspects of production software development chain; robotic platforms design and testing. Success story of female leader at school E4. Hosting secondment of ESR 10.
T6E	End-user	Training on socio-economic and environmental impact assessment and related data analysis. Hosting secondment of ESR 2 and training on fundraising at seasonal school E10.
CPD		Training on public safety aspects both locally and at school E3. Hosting secondment of ESR 1.

5. International and inter-sectorial secondments for profound synergy

A-WEAR partners' core businesses cover essential markets related to ICT, industrial and healthcare: ambient assisted living (CIT), urban safety (CPD), urban planning (IDOM, T6E), wireless connectivity and ICT solutions, (ERI, SWO), mesh sensor networks (WPS), digitalization of society (BEIA, DLI, SWO), cybersecurity (S2G, NXP), network components manufacturing (NET, ERI), research and project management (DLI, S2G, T6E), end-user organizations (T6E, CPD), etc.

Each non-academic partner organization will receive at least one ESR in a secondment of 2-3 months. A-WEAR industrial partners are fully committed to offer hands-on training through explicit technology-oriented research project work, as well as site-specific training. A-WEAR fellows and units will also enhance collaboration and improve team-work through carefully planned cross-sector and cross-country secondments, as shown in Table 3.1d. Each fellow will go to an academic long secondment (6-12 months) to the university where he/she does his joint or double degree (together with the host university, see Figure 1 pairings) and in a short industrial secondment (2-3 months) to deepen their theoretical findings through proof-of-concept and on-the-field research work.

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