E4FT - FASHION-TECH DESIGN

Education For FashionTECH
Education4Fashion-Tech
Interdisciplinary Curriculum for Fashion in the Digital Era
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FOREWORD

The project “Education4Fashion-Tech: Interdisciplinary Curriculum for Fashion in the Digital Era” was initiated through a strategic partnership for higher education within the field of fashion-tech design by The University of Borås – Swedish School of Textiles, Politecnico di Milano – Dipartimento di Design and University of the Arts London – London College of Fashion. The project started in September 2017 and lasts until the end of August 2020. The project is financed by the European Union through the Erasmus+ action KA203 – Strategic Partnerships for Higher Education.

As the aim of the project is to bridge the fashion field with the innovative area of technology, the current Tuning Document forms a basis for the novel field of fashion-tech design. Furthermore, by responding to a market and industry need for hybrid professionals, the document will establish the interdisciplinary education within the field. The Fashion-Tech Design Tuning Document is available and free to use for all higher education institutions to (re-)design, develop, implement, evaluate and enhance quality of their study programmes focusing on educating and preparing professionals for the fashion-tech market.
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INTRODUCTION

Historically, throughout the development of both, fashion and technology, the two fields have found points of convergence, while having significant impacts on each other. By joining the two fields, the areas of fashion, design, science and technology are interconnected, creating the field of fashionable technology, or fashion-tech. Furthermore, for the purposes of this document, fashion-tech is defined as ‘technology that enables a fashion experience for the user wearing it or interacting with it’. The field of fashion-tech is thus characterised with the convergence of the areas of design, natural sciences/engineering, and economics and management. While design includes aspects related to the product, user experience and communication, the area of natural sciences/technology relate to the purely technical knowledge and skills at the intersection of wearables, smart textiles and digital manufacturing. The third area, economics and management, includes topics related to business management, supply chain management and market intelligence.

In order to further explain the relation of fashion to technology, it is important to establish the areas of wearables, smart textiles, and digital manufacturing, as defined by the benchmarking report:

- wearables are on-body products such as clothing, footwear, accessories and jewellery designed to create a communication/interaction enabled by technologies (such as digital and virtual) to amplify and extend natural ability and performance of the human body, or add new functions to the user connecting him with his body, with other persons or objects and with the environment;
- smart textiles are knitted, woven, non-woven fabric systems designed to sense and response to external stimuli (mechanical, thermal, chemical, biological, magnetic and electrical) enabled by advanced, physical and digital technologies;
- digital manufacturing is an integrated approach to manufacturing that is centred around a computational system using tools such as 3D technologies, robotics, AI and AR and the integration between digital technologies for manufacturing processes and embedded digital technologies in products-services (IoT) to enable open and distributed manufacturing that can reshaped design, production, distribution and retail processes.

As emphasised by the benchmarking report, the reality of the fashion-tech design field is currently fragmented and disjointed in aspects related to professionals, trends, disciplines, products, competences, methodologies and applications. Although the field stands at the intersection of different disciplines, and many players in the area have been active for more than five years, there is a need for new types of talents that are capable of planning, managing and leading research and development process at the intersection of fashion.

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1 Fashion-Tech – Education and research benchmarking report
and technology, while being aware the area’s impact on the society, culture and environment. On one hand, as research centres and companies are mostly staffed with scientists, such as textile, electronics or software engineers, they may overlook aspects related to aesthetics of the offering, or fail to investigate scenarios or market opportunities. Higher education institutes on the other hand, are describing a majority of educators of fashion-tech to have a background in only design (at 61% according to the benchmarking report). Furthermore, an increase in collaboration and interdisciplinary skills are needed, as higher education institutes, research centres and companies are all outsourcing knowledge, regardless of the size of the organisation. This further proves the clear need for a balance between creative and technical skills, especially as offerings of fashion-tech are seen as both design- and technology-driven.

**Current state of education in fashion-tech**

From the interviews conducted with 28 universities globally, an unfocused approach to technology was revealed, relying on an excessive heterogeneity and lack of unified vision for what concerns course topics, themes and trends. With the area of fashion-tech focusing 39% on wearables, 39% on smart textiles and 22% on digital manufacturing, universities seem to be missing a shared academic vision on priorities when it comes to smart technologies. This lack of vision also affects times and modalities. Regardless of the level, courses mainly consist of groups of 10-20 students (70% of courses), while smaller and larger groups consist of 0-10 students (15%) and over 30 students (15%). Thus it can be concluded, that fashion and technology courses are delivered to students mainly in their formative academic years, instead of addressing those already working. Significant results about the student’s hiring rate after such courses could not be collected, mostly due to the difficulties in effectively measuring the data specifically related to fashion-tech companies.

Specifically related to education of fashion-tech design, typical offerings of higher education institutes relate to the first cycle and second cycle courses, that is BA and MA level, while there is less focus on the third cycle of PhD programmes. Notable is that there are only courses available within different programmes, and no degree programme is offered specifically focused on the fashion-tech field. At the BA level, or the first cycle in the European Higher Education Area Qualifications Framework (EHEA-QF), most students have a background in the art/design fields (more than 50%), while others are educated in areas such as physics or computer graphics and mathematics. Only 1% of students have an education in engineering. Courses related to fashion-tech have very different durations – from one week workshops to biannual courses. Almost all of those courses have between 10-20 students, while there is one case of more than 40 students. Regarding the competences acquired they are both theoretical and practical, more specifically: transferring knowledge (technical) to develop prototypes; emphasising teamwork and research skills; programming, split between technology and fashion pattern cutting; 3D modelling; basic soft circuits; physical computing; and Arduino and Processing.

When describing the courses at the MA and PhD/post-graduate levels, or the second and third cycle respectively, typical backgrounds of the students are split 50-50, with one part coming from design and the other from engineering. At the second cycle courses, the
number of students is around 10-20, with just one course with less than 10 students. In terms of the competences acquired, both theoretical and practical knowledge and skills are focused on. For example, the courses relate to practical knowledge and experimentation on electric-textiles; giving new meanings to existing technologies; carrying out market research; working in teams; research skills; and programming. At the third cycle, competences acquired are similarly to the second cycle theoretical as well as practical, although more specific. For example, knowledge of fashion and technology that are behind the most emerging developments; knowledge on electronics and chemistry needed to work with fashion-tech and to be able to manage and work in interdisciplinary teams for product development; the ability to translate gained knowledge into basic prototyping.

As emphasised by the benchmarking report, higher education institutes currently offering education related to fashion-tech are facing challenges related to lack of time, relating to the learners to be able to achieve sufficient progress. Furthermore, the importance of balancing theory and hands-on practice has been stressed, while an understanding of planning and managing costs of such interdisciplinary R&D is crucial due to differences in managing projects related to the disciplines separately. Furthermore, by involving aspects related to design-driven innovation, co-creation, and trends and practices within socio-cultural and economic contexts, the learners should be enabled to explore a diverse variety of solutions for concepts, along with market opportunities and scenarios. As the field is at the intersection of the creative and technological disciplines of fashion design and engineering, it relates to programmes at different cycles, focusing on subject areas such as fashion design, textile engineering, and programming among others. This connection is expected to facilitate the application of the field of fashion-tech and its education in higher education institutions across the European Higher Education Area (EHEA) due to the disciplines already being established separately.

**Best practices of teaching, learning and assessment**

In terms of best practice of teaching, learning and assessment methods, cases of best practice have not been identified as the courses given in the area are very recent, and thus difficult to evaluate the results of chosen methods. On the other hand, the shared objective of all the courses examined is to follow a specific methodology to enable the development of theoretical and practical knowledge of the learners. As no universal methodology is followed, the benchmarking report combined the results gathered from higher education institutions, research centres and companies into a distinct set of steps to complement the basic methodology of design.

As established by the benchmarking report, the first step defines the needs of the target and the objectives to be achieved. The second aspect relates to both theoretical and practical knowledge and research, which translates into the acquisition of knowledge related to technology from theoretical courses or applications dedicated to practical work. This phase focuses on technology, the development of actual and new technologies, and the right way to manage them including design. Following is the important step of formulating the scenario, where design finds its maximum expression. This is the phase
where new gestures, behaviours, societies, and cultures are planned. Once the scenario is defined, which act as a sort of storyboard, it will host forms, materials and technologies that will be defined in a coordinated way by the engineers and designers to arrive at the development of the concept. This is all about connecting the world of technology with the one of creativity, in order to develop all the technical components of the project.

Now the components will not only concern the form the choice of materials but will also encompass the integration of technologies, in other words the idea of performance is defined. It is necessary that the latter is functional and that it can be evaluated. This does not only mean choosing the working technology, but it must also be considered if it is industrially reproducible, if it is currently on the market and if it is, of course, fully functional. Subsequently the technology is prototyped and tested. A double path opens up in the test phase. On one hand there is quantitative analysis, while on the other the qualitative one. While the first one examines the object’s correct functioning, the second examines the object’s relationship with the user, like for example the usability, the relationship with the material, and the understanding of how the object was made.

The Tuning Document

Due to the fast pace and variability of the field, and in order to tackle the issues related to fragmentation of the industry, the project and the current document aim to define and establish the education and research of the field, in order to facilitate higher education institutions across the EHEA to find points of convergence and common understanding. Furthermore, the document will form a basis for the institutions to (re-)design, develop, implement, evaluate and enhance quality of their current and planned degree programmes, that will educate and prepare professionals with interdisciplinary knowledge and skills of the area.

The document follows an approach developed by the project Tuning Educational Structures in Europe, aiming to implement the Bologna Process at the institutional and subject area levels of higher education. It emphasises that universities should aim to find points of convergence and common understanding, rather than coordinating their programmes into a pre-defined set of European programmes. Thus, the current Tuning Document aims to form a basis for education and research at the subject area level for a MA programme in Fashion-Tech Design, that can be utilised for designing curricula in the field. Furthermore, the TUNING Guide is utilised for guidance for formulating the Degree Profile (available in the Annex), in order to specify and summarise the subject area in terms of its level, distinctive features, key learning outcomes and competences.

The following section defines the programme objectives, followed by the characteristics of the programme. Thereafter, the learning outcomes are defined, which are followed by generic and subject-specific competences. The next section describes how the basis can be utilised to design, re-design, evaluate or implement new or already existing programmes for education in fashion-tech design. Thereafter, the assessment criteria are defined, in which the learning outcomes are connected to the assessment criteria. Lastly, an evaluation system for quality enhancement is presented.
OBJECTIVES

The following section describes general objectives of the programme as a second cycle education, followed by programme objectives specific to a MA programme in Fashion-Tech Design.

General Objectives

Second cycle education shall essentially build on the knowledge that students acquire in first cycle education, or corresponding knowledge. Second cycle education shall involve a deepening of knowledge, skills and abilities relative to first cycle education and, in addition to what applies to first cycle education, shall:

- further develop the students' ability to independently integrate and use knowledge;
- develop the students' ability to deal with complex phenomena, issues and situations;
- develop the students' potential for professional activities that demand considerable independence or for research and development work.

Programme objectives

The two-year Fashion-Tech Design MA programme aims to develop and deepen interdisciplinary skills in the areas of wearables, smart textiles and digital manufacturing for fashion. The programme is intended to create interdisciplinary figures at the intersection of fashion and technology. The new generation of professionals will be underpinned by a robust set of collaborative and transferable skills, with an emphasis on 21st-century skills, for design driven innovation, co-creation and entrepreneurship, while being aware of the area’s impact on the society, culture and environment.

More specifically, the programme objectives are:

1. to research and transfer innovation with particular reference to the innovation of materials, meanings and processes with the aim of integrating new aesthetic and functional qualities into sustainable fashion-tech products;
2. to codify and interpret the social and cultural practices of interaction and consumption of fashion-tech products to inform their design, and critically evaluate the effects of design practices on the social, cultural, environmental and economic context;
3. to interpret the product in a systemic way or as an overall offer - composed of product lines, merchandise, different brands - and in its relations with the dimensions of communication and distribution on the market;
4. to understand the evolutionary dynamics and business models of the supply chains and organizational systems of fashion companies;
5. to plan and manage the project by integrating design processes to inform strategies for product design, distribution and communication;
6. to understand, manage and coordinate a value chain of the complex project (which operates on components, semi-finished products, aggregated processing processes, services, etc.);
7. to understand and implement business logic and strategies to evaluate market scenarios opportunities for fashion-tech.

PROGRAMME CHARACTERISTICS

The purpose of the two-year MA Fashion-Tech Design programme is to provide learners with interdisciplinary knowledge and skills in the areas of wearables, smart textiles and digital manufacturing, enabled by a design-driven methodology, and informed the area’s impact on the society, culture and environment. The programme is designed with a specialist focus, where the learners will develop a broad overview as well as a deep knowledge in fashion-tech design, aimed ‘to build up knowledge and experience in a special field or discipline’\(^2\). Successful graduates are expected to demonstrate collaborative and transferable knowledge and skills, supported by the development of competences required for sustainable design-driven innovation, co-creation and entrepreneurship. Furthermore, as a blend of art, business, science and technology, the learners will learn to apply the design-driven methodology next to STEM\(^3\) skills.

A further aim of the MA programme is to create hybrid professionals, with the ability to combine and manage design skills with scientific knowledge, who can be easily integrated into the professional market of fashion-tech. As successful graduates will be equipped for working in fashion-tech enterprises combining cutting-edge technologies with ‘intangible’ factors, they will enter the industries as agile, proactive employees, ‘intrapreneurs’, or entrepreneurs initiating start-ups and generating new businesses and jobs. In terms of education, the programme will allow students to obtain competences for pursuing PhD programmes in the fashion-tech field focusing on design, technology and management at the intersection of wearables, smart textiles and digital manufacturing.

The degree programme presents distinctive features, relating to its approach, structure and orientation. First, with an interdisciplinary approach, where fashion design and digital technologies are integrated, the programme responds to market and industry demand by training future professionals in interpreting trends and creating fashion-tech concepts, that can be further developed into aesthetic and functional products. Furthermore, blended learning, that utilises conventional and virtual teaching methods, is implemented to promote simultaneous independent and collaborative ways of working. The utilisation of Problem Based Learning (PBL) enables the facilitation of knowledge development and generation, while enhancing group collaboration and communication to transfer knowledge into practical applications. The learners will capitalise on opportunities and address constraints of the field of fashion-tech design through theoretical and applied research to concept and product development and innovation management.

\(^2\) Universities’ contribution to the Bologna process – an introduction (p. 73)
\(^3\) i.e. science, technology, engineering and mathematics
With a modular and flexible structure, the MA programme is designed to offer levelled education for learners with a wide range of previous education and experience, such as designers, scientists, compu-engineers and biologists. Expected learners can be from a variety of backgrounds with an ambition to develop and innovate fashion-tech concepts, supported by an open mind-set, along with creativity and curiosity. Furthermore, the structure enables the integration of learning mobility experience in the programme, promoting internationalisation, recognition and mobility in line with Bologna Process principles, that aim to facilitate mobility within the EHEA for further studies or work, increase attractiveness of the programme for students outside the EHEA, and to provide high quality knowledge base leading to further development of Europe as a community.

In terms of academic content, the programme is intended to be divided into the following educational units, or modules: (1) design and multimedia communication; (2) technology and engineering; (3) human, social, psychological and economic context; (4) electives; (5) individual work. The courses within the modules are to be assessed based on the achievement of the programme learning outcomes, while also integrating generic and subject-specific competences, linked to approaches to teaching and learning and student workload.

**LEARNING OUTCOMES**

The intended learning outcomes have been defined based on the Swedish Higher Education Ordinance (Högskoleförordningen), as they form a generic basis that can be easily transferable to the universities in EHEA, supplemented by more specific generic and subject-specific competences.

**Knowledge and understanding**

For a master’s degree, a student shall independently be able to:

1. demonstrate knowledge and understanding of the field of fashion-tech, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current relevant research and development work;
2. demonstrate specialised methodological knowledge in fashion-tech design enabled by a design-driven methodology, and technological insights informed by social, cultural and environmental approaches.

**Skills and abilities**

For a master’s degree, a student shall independently:

1. demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations in a variety of fields even with limited information;
2. demonstrate the ability to identify and formulate issues or problems critically, autonomously and creatively, to contribute to the formation of knowledge and solutions;
3. demonstrate the ability to plan, manage and, using appropriate methods, undertake advanced tasks within predetermined time frames, as well as the ability to evaluate this work;
4. demonstrate the ability in speech and writing, both nationally and internationally, to clearly report and discuss conclusions and the knowledge and arguments on which they are based in dialogue with different audiences;
5. demonstrate the skills required for participation in interdisciplinary research and development work or autonomous employment in some other qualified capacity.

**Judgement and approach**

For a master’s degree, a student shall independently:

1. demonstrate the ability to reflect on and make assessments in fashion-tech design informed by relevant disciplinary, social, ethical and environmental issues, and also to demonstrate awareness of ethical and sustainability related aspects of research and development work;
2. demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used;
3. demonstrate the ability to identify the personal need for further knowledge and take responsibility for lifelong learning.

**COMPETENCES**

Competences are regarded as a combination of attributes related to knowledge and its application, attitudes, skills, responsibilities and values, that describe the level or degree to which a person is capable of performing them. Those that are generic are transferable to any degree programme, and must be acquired (and build upon previously obtained competences) in the first phases of the studies to prepare the learners for lifelong learning. As transferable competences are of rising importance, the generic competences described in the next section have been defined as most relevant for fashion-tech design and are adapted from the transferable skills identified by the first phase of the Tuning Project and its guide to formulating degree programme profiles. The generic competences must prepare the students for making complex judgements about their own and others’ work, while emphasis is on their understanding of the importance of their meta-cognitive skills. The competences specific to the area of fashion-tech design are described as subject-specific competences. The achievement of those generic and subject-specific competences are to be accomplished within the completion of the educational units, which are described further below. The following section defines generic and subject-specific competences for the MA programme of Fashion-Tech Design.
Generic competences

1. **Problem formulation and solving**: capacity to identify, formulate and solve questions and problems by applying knowledge in research and practical situations, and/or in a new context.
2. **Creativity and innovation**: capacity to be creative in developing ideas and in pursuing research goals.
3. **Planning and management**: capacity to plan and manage projects taking into account time, budgetary and personnel constraints.
4. **Communication skills**: ability to communicate effectively by being sensitive to the needs of diverse audiences.
5. **Communication of information**: ability to present complex information in a concise manner orally, visually and in writing by utilising a variety of appropriate channels.
6. **Teamwork**: capacity for collaboration in interdisciplinary teams and for assuming responsibility for tasks.
7. **Independent work**: ability to work autonomously conducting original interdisciplinary research and development work in parallel to communicating concepts and critical values.
8. **Critical thinking**: ability to think critically in contexts of creativity, innovation, problem-solving, communication and collaboration (21-st century skills).
9. **Research ability**: capacity to contribute to the advancement of knowledge through scientific research.
10. **Interpersonal abilities**: capacity to express, reflect and demonstrate one’s awareness, determination, promotion and self-critical abilities for lifelong learning.
11. **Information literacy**: capacity to find, analyse, use and understand facts and concepts.

Subject-specific competences

**Design and multimedia communication**

1. capacity to acquire and develop knowledge and understanding of fashion design in relation to natural science, engineering, economics and management with regard to professional and/or experimental work;
2. capacity to acquire and develop knowledge and understanding of design methodology and design theory with respect to both experimental and professional work in relation to fashion-tech design;
3. capacity to use and reflect on the methods of composition, form principles and design expression as the basis for human-centred design;
4. capacity to develop original ideas and apply them in a systematic way, transforming concepts into design solutions, to develop them into fashion-tech products/services;
5. capacity to function as a catalyst that enables designers to plan, manage and lead design led interdisciplinary research and development process, and to work with scientists, compu-engineers and biologists to develop and innovate for material, products for manufacturing processes.
Technology and engineering

1. capacity to acquire and develop knowledge and understanding of textile and smart materials and their applications;
2. capacity to acquire and develop knowledge and understanding of wearable technologies, smart textiles and digital manufacturing and their processes;
3. capacity to acquire and develop knowledge and understanding of collaborative design and innovation methods to deliver more effective ways of developing user-driven innovations, disruptive products and products/services;
4. ability to research and transfer innovation with particular reference to materials, meanings and processes in various fields;
5. ability to integrate capabilities and knowledge in the engineering area and the design area (e.g. 3D virtual design and prototyping, AR/VR, HMI, coding embedded in the design process) to develop innovative products and applications;
6. capacity to evaluate diverse and disruptive forms of innovation that contribute value to a fashion enterprise and shape the future of the fashion industry;
7. capacity to creatively and critically envision future possibilities of emerging technologies and propose both new and well explored concepts for opportunities and/or solutions in socio-cultural and economic context;
8. capacity to transfer knowledge from disciplinary fields to new sectors and applications, favouring the creative solutions of problems.

Human, social, psychological and economic contexts

1. capacity to acquire and develop knowledge and understanding of the social and economic context of fashion-tech design and products;
2. capacity to acquire and develop knowledge and understanding of socio-cultural and technological trends and practices to evaluate market scenarios and opportunities for fashion-tech products;
3. capacity to acquire and develop knowledge and understanding of new and emerging business models of the fashion industry;
4. ability to demonstrate entrepreneurial thinking that optimises opportunities, products and markets emerging from the fashion-tech space;
5. ability to develop communication and distribution strategies relevant to the fashion-tech space.

TRANSLATION INTO CURRICULUM

The allocation of credits within the programme is to be carried out with the top-down approach, where the whole programme consists of 120 ECTS, with 60 ECTS per year and 30 ECTS to be achieved per semester. The programme has an emphasis on a modular and flexible structure, thus the proposed credits allocated to a course unit vary from 7.5, 15 to 30 ECTS, as presented in Table 1 below. Furthermore, the semesters are to be divided into four terms or study periods, with possibilities of allocating ECTS per course depending on the specific purpose, learning outcomes, and teaching and learning methods.
of the educational unit (i.e. module). In terms of the actual length of the teaching period, one term must be allocated ten weeks, with a total of 40 weeks and 80 weeks per one and two years respectively. The proposed structure aims to ensure that each learner will achieve the intended learning outcomes during the nominal duration of the programme, while their knowledge and skills are expected to progress gradually throughout the studies, and be supported by the development of competences achieved through co-curricular activities.

Table 1. Proposed structure.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>Term 1</td>
<td>7,5</td>
<td>7,5</td>
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<tr>
<td>Term 2</td>
<td>7,5</td>
<td>7,5</td>
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<tr>
<td>Term 3</td>
<td>7,5</td>
<td>7,5</td>
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<tr>
<td>Term 4</td>
<td>15</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 3</td>
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<td>Term 5</td>
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<td>Semester 4</td>
</tr>
<tr>
<td>Term 6</td>
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<tr>
<td>Term 7</td>
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</tbody>
</table>

With a total of 120 ECTS, the distribution of credits between modules is defined in a range (as shown in Table 2 below) in order to enable the learner to meet their needs based on their previous educational and vocational background and experience, and individual interests and abilities. If a different modular or non-modular structure is utilised based on the country or higher education institution requirements, it is recommended to follow the guidelines in the table regarding the percentage of ECTS that must be offered within each unit.

As the programme focus is on interdisciplinary fashion-tech design, the learners are expected to choose 37.5 – 52.5 ECTS within the ‘Design and multimedia communication’ module, and 15 – 37.5 ECTS within the ‘Technology and engineering’ module in order to enable levelled education in both design and engineering for learners with different backgrounds and experience. Furthermore, 7.5 – 15 ECTS will be acquired from the ‘Human, social, psychological and economic contexts’ with a focus on entrepreneurship to enable successful graduates to comprehend changes in economic, market and socio-cultural trends and develop capacity for entrepreneurial thinking. Additional 7.5 – 15 ECTS will be acquired through the ‘Electives’ module in order to enable the learners to take additional courses based on their individual interests and abilities with the goal of developing the capacity for explaining and applying knowledge and skills in a critical and constructive manner. Lastly, 22.5 – 30 ECTS will be chosen from the ‘Individual work’ unit consisting of an internship for a training opportunity and/or final thesis work.
Table 2. Proposed educational units.

<table>
<thead>
<tr>
<th>Name of educational unit</th>
<th>Number of ECTS</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Design and multimedia communication</td>
<td>37.5</td>
<td>52.5</td>
</tr>
<tr>
<td>Technology and engineering</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Human, social, psychological and economic contexts</td>
<td>7.5</td>
<td>15</td>
</tr>
<tr>
<td>Electives</td>
<td>7.5</td>
<td>15</td>
</tr>
<tr>
<td>Individual work</td>
<td>22.5</td>
<td>30</td>
</tr>
</tbody>
</table>

In relation to estimating student workload, one credit represents approximately 25 to 30 hours of student work time, which in total for the programme stands for 3000 to 3600 hours. As the actual learning time depends on a variety of factors, including time employed by the student and their background, the amount of student workload within modules is calculated based on the 30-hour maximum per one ECTS. Thus, the workload for one semester is intended to consist of a maximum of 900 student working hours, with 1800 hours per year. In the following sections, the educational units are described based on their purpose, subject-specific competences, educational activities and assessment methods.

EDUCATIONAL UNITS

The following section describes the educational units in terms of their academic content, allocation of ECTS, teaching and learning approaches, along with assessment methods.

Design and multimedia communication

The purpose of the module is to provide learners with the knowledge, skills and approach within design and multimedia communication, supported by competences developed within technology and engineering. Thus, the successful graduate will have the capacity to function as a catalyst enabling designers to work with professionals from a variety of disciplines, such as scientists, compu-engineers and biologists. Furthermore, the aim is to equip the learners with knowledge and understanding of design methodology and theory as a basis to developing original ideas and transforming them into fashion-tech concepts, products and services.

The module must offer a theoretical introduction and foundation to fashion design to learners with no or limited competence in the area, while also providing more advanced courses, such as ones focusing on the design-driven methodology and utilisation of 3D virtual design and prototyping. The utilisation of co-creation and peer-learning is recommended in order to increase learning and development of collaborative design and innovation methods. The estimated student work time must stay within the limits of 1125 and 1575 hours for 37.5 and 52.5 ECTS respectively, based on a maximum of 30 hours of
work time per one ECTS. In terms of assessment, it is recommended to employ methods such as written and visual documentation of the carried out design projects through developing concepts and prototypes, which are expected to stimulate active learning to develop the subject-specific competences within the educational unit.

Within the module, the learner is expected to develop the following competences:

1. capacity to acquire and develop knowledge and understanding of fashion design in relation to natural science, engineering, economics and management with regard to professional and/or experimental work;
2. capacity to acquire and develop knowledge and understanding of design methodology and design theory with respect to both experimental and professional work in relation to fashion-tech design;
3. capacity to use and reflect on the methods of composition, form principles and design expression as the basis for human-centred design;
4. capacity to develop original ideas and apply them in a systematic way, transforming concepts into design solutions, to develop them into fashion-tech products/services;
5. capacity to function as a catalyst that enables designers to plan, manage and lead design led interdisciplinary research and development process, and to work with scientists, compu-engineers and biologists to develop and innovate for material, products for manufacturing processes.

Technology and engineering

The purpose of the module is to develop knowledge, skills and approach within technology and engineering next to design skills. In order for the successful graduate to work in the interdisciplinary field of fashion-tech design, it is important to understand and be able to apply the acquired systemic knowledge regarding materials and their application, the nature of product development and its phases and processes along with the generic and subject-specific competences. Furthermore, specific learning outcomes must relate to the areas of wearable technologies, smart textiles and digital manufacturing and their processes.

Courses related to wearables must emphasise the role of technology and how it can be utilised to enhance the natural ability and performance of the human body or add new functions to the body to create interaction with other people, objects or the environment. Regarding wearables, the focus is on all types of fabric systems that respond to external stimuli, such as mechanical, thermal, chemical, biological, magnetic and electrical. Digital manufacturing knowledge and skills relate to an integrated approach to manufacturing where tools such as 3D virtual design and prototyping, AR, VR can be utilised, while reshaping design, production, distribution and retail processes.

The module must offer a theoretical introduction and foundation to the previously described areas, followed by applying the acquired knowledge and understanding through participatory and hands-on learning approaches in the form of developing concepts and prototypes (i.e. laboratory practice, workshops, etc.). Similar to the ‘Design and
multimedia’ module, the utilisation of co-creation and peer-learning is recommended to further develop the capacity of working in interdisciplinary teams. The estimated student work time must stay within the limits of 450 and 1125 hours for 15 and 37.5 ECTS respectively, based on a maximum of 30 hours of work time per one ECTS. In terms of assessment, it is recommended to employ methods such as written exams to test theoretical knowledge, along with written and visual documentation of the carried out design projects for developing concepts and prototypes, or of specific exercises, such as programming or developing samples.

Within the module, the learner is expected to develop the following competences:

1. capacity to acquire and develop knowledge and understanding of textile and smart materials and their applications;
2. capacity to acquire and develop knowledge and understanding of wearable technologies, smart textiles and digital manufacturing and their processes;
3. capacity to acquire and develop knowledge and understanding of collaborative design and innovation methods to deliver more effective ways of developing user-driven innovations, disruptive products and products/services;
4. ability to research and transfer innovation with particular reference to materials, meanings and processes in various fields;
5. ability to integrate capabilities and knowledge in the engineering area and the design area (e.g. 3D virtual design and prototyping, AR/VR, HMI, coding embedded in the design process) to develop innovative products and applications;
6. capacity to evaluate diverse and disruptive forms of innovation that contribute value to a fashion enterprise and shape the future of the fashion industry;
7. capacity to creatively and critically envision future possibilities of emerging technologies and propose both new and well explored concepts for opportunities and/or solutions in socio-cultural and economic context;
8. capacity to transfer knowledge from disciplinary fields to new sectors and applications, favouring the creative solutions of problems.

Human, social, psychological and economic contexts

The purpose of the module is to develop knowledge, skills and approaches within human, social, psychological and economic contexts with a focus on entrepreneurship. Furthermore, as the work of the future fashion-tech designer must be informed by social, cultural and environmental awareness, the educational unit will explore changes in consumer behaviour and interactions with fashion-tech, entrepreneurship and emerging business models, whilst critically evaluating ethical and sustainability issues related to fashion-tech products. The estimated student work time must stay within the limits of 225 and 450 hours for 7.5 and 15 ECTS respectively, based on a maximum of 30 hours of work time per one ECTS. In terms of assessment, it is recommended to employ methods such as reports, oral presentations and written exams.

Within the module, the learner is expected to develop the following competences:
1. capacity to acquire and develop knowledge and understanding of the social and economic context of fashion-tech design and products;
2. capacity to acquire and develop knowledge and understanding of socio-cultural and technological trends and practices to evaluate market scenarios and opportunities for fashion-tech products;
3. capacity to acquire and develop knowledge and understanding of new and emerging business models of the fashion industry;
4. ability to demonstrate entrepreneurial thinking that optimises opportunities, products and markets emerging from the fashion-tech space;
5. ability to develop communication and distribution strategies relevant to the fashion-tech space.

Electives
The purpose of the module is to further provide learners with the ability to explain and apply knowledge and skills in a constructive way for their professional and social needs. Furthermore, the aim is to offer the learners additional courses in design, technology and/or entrepreneurship to meet their needs based on their previous background and experience, and individual interests and abilities as previously described. While the expected learning outcomes and educational activities are dependent on the chosen course(s), it is recommended that the offered courses’ learning outcomes match the ones of the programme along with the activities aiming to support the interdisciplinary context of the curriculum. The estimated student work time must stay within the limits of 225 and 450 hours for 7.5 and 15 ECTS respectively, based on a maximum of 30 hours of work time per one ECTS. The acquisition of the course-specific learning outcomes is recommended to be assessed through the previously described assessment methods suitable for the particular course(s).

Individual work
The purpose of the module is to provide learners with the ability to conduct independent interdisciplinary development or research work that has scientific relevance and is informed by social, cultural and environmental approaches. Furthermore, the aim is to combine knowledge of fashion design and digital technologies with collaborative and transferable skills through theoretical, experimental or experiential approaches for materials, design and function. The individual work must be carried out within an internship and/or (project based) thesis work. Regardless of the required course(s) within the unit, the work must demonstrate the maturity and critical skills of the graduate in the areas of fashion-tech design in relation to:

- deeper knowledge related to an underdeveloped topic and its potential applications, or a major contribution to the advancement of knowledge with respect to a specific research area;
- critical analysis of collected research material according to scientific principles and international standards of scientific knowledge (i.e. databases, scientific articles, conference proceedings, etc.).
- co-operation with companies or other organisations to practice the previously acquired skills in a professional setting, while additionally enabling learners to create contact with future employers or clients;
- synthesis of the outcomes to generate original, innovative and well-argued concepts, products or product-service systems combining wearables, smart textiles and digital manufacturing;
- assessment and evaluation of the effects of the development work, which will be of direct value to the industry or education, along with self-reflection on the need for further knowledge.

The estimated student work time must stay within 675 and 900 hours for 22.5 and 30 ECTS respectively, based on a maximum of 30 hours of work time per one ECTS. The work carried out within an internship is to be presented and assessed through a written report and/or oral/visual presentation. The individual thesis work is to be supported by seminars and supervision throughout the length of the course with the aim of developing and presenting a final exam collection for display and/or exhibition. The seminars are aimed to act as a setting for discussion between the learners and the supervisor(s) initiating critical analysis of the ongoing work. The assessment is based on the evaluation of the interdisciplinary design work, and oral and visual presentations, and self-reflection.

ASSESSMENT METHODS AND CRITERIA

Assessment as a continuous process should facilitate student achievement of learning outcomes, and/or provide a means for students to demonstrate their achievement of intended learning outcomes. For this to occur, chosen assessment methods and assessment criteria for programmes or courses ought to match the knowledge, skills, and attributes that the programmes/courses are aiming to develop, and thus link directly to the intended learning outcomes of that programme. Furthermore, the intended learning outcomes should be clear, transparent, and measurable so that students understand what is expected of them, and how their work will be judged. Making assessment criteria for assessments explicit, that is, specifying what the students must do in order to demonstrate that they have achieved the learning outcomes at specific levels, is also important in this regard.

As the programme is interdisciplinary, it is important that the programme learning outcomes are evident in the courses throughout the curriculum, in order to ensure that the graduates have achieved the learning goals and are able to connect the knowledge and skills from the different disciplines appropriately and effectively. While assessment methods and criteria may vary according to academic tradition and institution- and setting-specific requirements and arrangements, the following key principles for assessment of student work are recommended as a guide:

- assessment is an integral part of the learning process and should stimulate active learning;
- assessment is a matter of academic judgement with reference to the marking criteria specified for a course or an educational unit;
- assessment methods should be transparent and ensure fair treatment of all students, for example through anonymous grading for written exams;
- assessment should fit their purpose, whether diagnostic, formative or summative;
- students should be provided with full and accurate information on all aspects of their assessment;
- all assessment methods and their operation should be monitored and reviewed regularly;
- academic staff should be supported in the implementation of the assessment methods and policy, through the provision of information, staff development, and the sharing of good practice.

Assessment methods that involve interdisciplinary projects, co-operation with relevant companies or other organisations, and exhibitions and/or shows are recommended due to the interdisciplinary nature of the subject area of fashion-tech design. Such methods can be easily linked to programme and course learning outcomes, while enabling the learners to practise their skills and experience the development and implementation of project work in professional situations, and introducing them to interdisciplinary networks of clients and employers. As this Tuning Document provides a basis only for a MA programme, and specific courses are not described in detail, further recommended assessment methods are described with respect to each of the educational units defined above.

In terms of assessment criteria, criterion-referenced marking criteria in the form of a matrix or rubric that follows explicit assessment standards is recommended. The following general criteria that are proposed, have been derived from the learning outcomes, thus need to be contextualised, if relevant, in relation to the specific context, content and demands of the assessment and courses concerned.

The learner should be able to:

- **Subject knowledge**
  - Understand and explain subject knowledge, its background, relevance and applications, and apply this knowledge in a range of contexts.

- **Research**
  - Define a research issue and its possibilities and delimitation(s) taking into account potential practical applications.
  - Identify, effectively use, and justify the use of suitable theory-based frameworks, models and/or methodology and relevant resources (e.g. literature, prior research etc.).
  - Contribute to existing knowledge and identify potential areas for future research.

- **Experimentation/technical competence/innovation**
  - Adopt or develop a systematic, logical and sustainability-driven approach to problem formulation and problem solving, risk taking, and testing of ideas.
and materials in the process of developing new concepts, design solutions and products.

- Communication and presentation
  - Communicate clearly, concisely, and coherently in written, oral and visual forms.
  - Discern and confidently use appropriate means and/or channels for communicating complex ideas and information (e.g. research results).
  - Show sensitivity to the needs of diverse audiences when communicating information and ideas.

- Personal and professional development
  - Critically reflect on planning, engagement and commitment of research and development work to contribute to lifelong learning.
  - Plan and manage research and development work independently, as well as collaborate effectively in interdisciplinary teams, for example in the context of co-creation and peer-learning.

- Ethics, society and sustainability
  - Critically reflect on the ethical, social and environmental impact of research and development work.

Fundamental to achieving the learning outcomes linked to the criteria is constructive and focused feedback from the teacher throughout the course and programme. While summative assessment is a mandatory part of a course and/or educational unit, formative assessment and feedback are also important for supporting student development and progress. An example of such feedback is in the form of seminars, that as previously described foster discussion between the teachers and learners based on critical analysis of the work in progress.

EVALUATION SYSTEM FOR QUALITY ENHANCEMENT

The starting point for developing and implementing an evaluation system should be systematic quality assurance processes in all operations aimed to support continuous enhancement of quality of research and education, along with developing a culture of quality among faculty and staff. In order to assure and enhance the quality of the programme, a continuous process should be implemented, where systematic collection and analysis of key indicators, such as progression of students to employment or higher degrees, responses to evaluation surveys, and feedback from partner institutions, is carried out. In general, the following points should be considered: (1) the educational process, (2) the educational outcomes, and (3) the means and facilities required to deliver the programme. As the current degree programme is based on the European Higher Education Area’s (EHEA) qualifications framework, the suggested points of convergence for an evaluation system are established based on the European Guidelines for Quality Assurance of Education, European Standards and Guidelines (ESG). While the principles underpinning quality in European higher education are (1) relevance, (2), comparability and
compatibility, (3) transparency, (4) mobility, and (5) attractiveness, the following notions should be additionally emphasised:

- Integration – for example, through involving faculty and staff, students, the industry and society in the process of quality enhancement;
- Transparency – for example, through regularly informing staff and students of the goals, priorities and conditions that apply to their work, along with the routines leading the achievement of those goals;
- Uniformity – for example, through quality assurance and enhancement procedures being implemented equally for programme, courses and research, to create clarity, certainty, and efficiency;
- Coordination – for example, by assigning a member of staff involved with the programme to develop, coordinate and support evaluation processes ensuring quality and effectiveness of the programme.

As programme and course evaluation are essential for continuous improvement, the current document proposes an evaluation system for quality enhancement, that is adapted from the dynamic quality development circle by Tuning Educational Structures in Europe. As presented in Figure 1 below, the steps proposed for evaluating and enhancing education and research are (1) systematic review and evaluation, (2) implementation, and (3) continuous follow-up and analysis.

![Figure 1. Evaluation system for quality enhancement.](image)

In line with the Tuning project’s dynamic quality development circle, programme and course evaluation should begin with addressing learning outcomes and competences, which must be in focus throughout the process. Within the first step of systematic review
and evaluation, analysis of the content and structure of the programme, resources and student involvement in the evaluation processes is recommended to. The second step of implementation should include the selection and implementation of teaching, learning and assessment processes; while the third step of follow-up and analysis acts as a basis for further evaluation and improvement, on the basis of feedback from faculty and staff, the students and industry.

Active involvement of faculty, staff and students is crucial for creating, developing and maintaining quality throughout the programme, and within all courses. To ensure that responsibility for quality enhancement is assumed by all parties, it should be clear how the work on quality enhancement is constantly present in both programme and course evaluation. Furthermore, as the programme should be reviewed annually due to the novelty of the subject area, it is important that the results are shared with students, to give them every possibility to influence, and take responsibility for, their education.

**Consultation process with stakeholders**

In order to further enhance the quality of the proposed MA programme, it is recommended that each educational institute which plans to offer education in Fashion-Tech Design initiate a consultation process with industrial and retail stakeholders. Such a process should take place in the form of briefings and meetings for strategic discussions relating to market and societal drivers that have a transformative impact on curricular development and quality enhancement of the degree programme. Furthermore, the process should aim to promote cooperation between academia and industry, while enhancing the competitiveness and sustainability of the education and research. Due to the novelty of the subject area, the consultation process would ideally aim to connect staff, students and the industry in a way that allows the offered education and research to remain innovative and of relevance for society and the environment.
GLOSSARY

Artificial intelligence (AI, also machine intelligence, MI)
Intelligence demonstrated by machines, in contrast to the natural intelligence (NI) displayed by humans and other animals. In computer science AI research is defined as the study of “intelligent agents”: any device that perceives its environment and takes actions that maximize its chance of successfully achieving its goals.

Assessment criteria
Descriptions of what the learner is expected to do and to what level, in order to demonstrate that a learning outcome has been achieved and to what extent. The criteria are usually related to the cycle and/or level descriptors for the module being studied in the discipline concerned. They are normally presented to the students in course catalogues or similar documentation along with the intended learning outcomes, syllabus, etc., at the beginning of the course unit.

Assessment methods
The total range of methods used to evaluate the learner’s achievement in a course unit or module. Typically, these methods include written, oral, laboratory, practical tests/examinations, projects, performances and portfolios. The evaluations may be used to enable the learners to evaluate their own progress and improve on previous performance (formative assessment) or by the institution to judge whether the learner has achieved the learning outcomes of the course unit or module (summative assessment).

Augmented reality (AR)
A live direct or indirect view of a physical, real world environment whose elements are “augmented” by computer generated perceptual information, ideally across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory. The overlaid sensory information can be constructive (i.e. additive to the natural environment) or destructive (i.e. masking of the natural environment) and is spatial registered with the physical world such that it is perceived as an immersive aspect of the real environment.

Bologna process/principles
The Bologna Process is an intergovernmental cooperation of 48 European countries in the field of higher education. It guides the collective effort of public authorities, universities, teachers, and students, together with stakeholder associations, employers, quality assurance agencies, international organisations, and institutions, including the European Commission, on how to improve the internationalisation of higher education. The main focus is (1) the introduction of the three cycle system (bachelor/master/doctorate); (2) strengthened quality assurance; (3) easier recognition of qualifications and periods of study.

Competences
Competences represent a dynamic combination of cognitive and metacognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values. Fostering these competences is the object of all educational programmes. Competences are developed in all course units and assessed at different stages of a programme. Some competences are subject-area related (specific to a field of study),
others are generic (common to any degree course). It is normally the case that competence development proceeds in an integrated and cyclical manner throughout a programme.

**Criterion-referenced assessment**
In this form of assessment particular outcomes, i.e. knowledge, understanding, skills, abilities and/or attitudes are specified as criteria for ‘passing’ the assessment. Criterion-referenced assessment can be associated with the desired and/or ‘threshold minimum’ of the learning outcome to be achieved. In norm-referenced assessment learners are evaluated in relation to one another, usually within their cohort. The latter system of assessment, alone, is not compatible with competence based curricula.

**Degree profile**
A Degree Profile describes the specific characteristics of an educational programme or qualification in terms of learning outcomes and competences, following an agreed format.

**Design driven innovation**
An approach to innovation based on the observation that people do not just purchase products, or services, they buy ‘meaning’ – where users’ needs are not only satisfied by form and function, but also through experience.

**Digital manufacturing**
An integrated approach to manufacturing that is centred around a computational system using tools such as 3D technologies, robotics, AI and AR and the integration between digital technologies for manufacturing processes and embedded digital technologies in products-services (IoT) to enable open and distributed manufacturing that can reshaped design, production, distribution and retail processes. The extent of applications ranges from large scale industrial systems, industry 4.0 and DIY/mini and micro factory up to digital service platforms and bottom up innovation processes, on-demand manufacturing, collaborative and on-site manufacturing (fab-lab and maker space), and repairing and remanufacturing systems.

**ECTS**
ECTS is a learner-centred system for credit accumulation and transfer based on the transparency of learning outcomes and learning processes. It aims to facilitate planning, delivery, evaluation, recognition and validation of qualifications and units of learning as well as student mobility. ECTS is widely used in formal higher education and can be applied to other lifelong learning activities.

**Elective**
A course unit that may be taken as part of a study programme but is not compulsory for all students.

**Fashion-tech**
Technology that enables a fashion experience for the user wearing it or interacting with it.
Generic competences
Also known as transferable skills or general academic skills. They are general to any degree programme and can be transferred from one context to another.

IoT (Internet of Things)
The Internet of things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure.

Learning outcome
A Learning Outcome may be described as a statement of what a learner is expected to know, understand and be able to demonstrate after completion of a process of learning. Learning outcomes are expressed in terms of the level of competence to be obtained by the learner. They relate to level descriptors in national and European qualifications frameworks.

Mixed reality (MR)
The merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time. Mixed reality takes place not only in the physical world or the virtual world, but is a mix of reality and virtual reality, encompassing both augmented reality and augmented virtuality via immersive technology.

Qualifications Framework for the European Higher Education Area
An overarching framework that makes transparent the relationship between European national higher education frameworks of qualifications and the qualifications they contain. It is an articulation mechanism between national frameworks.

Quality assurance
The process or set of processes adopted nationally and institutionally to ensure the quality of educational programmes and qualifications awarded.

Rubric
A written guide for assessing student work. At a minimum, it lists the things you’re looking for when you assess student work.

Skills
A skill is the learned capacity to achieve pre-determined results often with the minimum outlay of time, energy, or both. Skills are often divided into general/generic and subject specific skills.

Smart textiles
Knitted, woven, non-woven fabric systems designed to sense and response to external stimuli (mechanical, thermal, chemical, biological, magnetic and electrical) enabled by advanced, physical and digital technologies.
Subject-specific competences
Competences related to a specific subject area.

Technology driven innovation
Management philosophy that pushes for development of new goods or services based on a firm’s technical abilities instead of proven demand: to make keys first and then look for locks to open.

Tuning
Tuning Educational Structures in Europe is a university driven project which aims to offer an approach to implement the Bologna Process at higher education institutional and subject area level. The Tuning approach contains a methodology to (re-)design, develop, implement and evaluate study programmes for each of the Bologna cycles. The term “Tuning” emphasizes the notion that universities are not aiming to unify or harmonize their degree programs into a prescribed set of European curricula, but rather are looking for points of convergence and common understanding based on diversity and autonomy.

Virtual reality (VR)
A computer-generated scenario that simulates a realistic experience. The immersive environment can be similar to the real world in order to create a lifelike experience grounded in reality or sci-fi. Augmented reality systems may also be considered a form of VR that layers virtual information over a live camera feed into a headset, or through a smartphone or tablet device.

Wearables
Body products such as clothing, footwear, accessories and jewellery designed to create a communication/interaction enabled by technologies such as digital and virtual to amplify and extend natural ability and performance of the human body or add new functions to the user connecting him with his body, with other persons or objects and with the environment.
BIBLIOGRAPHY


Fashion-Tech – Education and research benchmarking report (available at www.e4ft.eu)


Högskoleförordningen (available at http://www.uhr.se/sv/_Studier-och-antagning/Antagning-till-hogskolan/Hogskoleforordningen/)


ANNEX

Degree profile

Fashion-Tech Design
MA Fashion-Tech Design at the intersection of
Wearables, Smart Textiles and Digital Manufacturing

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Master’s level:</td>
<td>The purpose of the MA degree programme is to provide learners in Fashion-Tech Design with interdisciplinary knowledge and skills in the areas of wearables, smart textiles and digital manufacturing, enabled by a design driven methodology, and informed by the area’s impact on the society, culture and environment. The successful graduates will demonstrate collaborative and transferable skills combining knowledge of fashion design and digital technologies, supported by the development of the competences necessary for design-driven innovation, co-creation, and entrepreneurship.</td>
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<table>
<thead>
<tr>
<th>A</th>
<th>CHARACTERISTICS</th>
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<tbody>
<tr>
<td>DISCIPLINE (S)</td>
<td>Fashion-tech design, interdisciplinary; focus on wearables, smart textiles and digital manufacturing.</td>
</tr>
<tr>
<td>Name of educational unit</td>
<td>Number of ECTS</td>
</tr>
<tr>
<td>Design and multimedia communication</td>
<td>37.5</td>
</tr>
<tr>
<td>Technology and engineering</td>
<td>15</td>
</tr>
<tr>
<td>Human, social, psychological and economic contexts</td>
<td>7.5</td>
</tr>
<tr>
<td>Electives</td>
<td>7.5</td>
</tr>
<tr>
<td>Individual work</td>
<td>22.5</td>
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</table>
2 FOCUS
Specialist: with emphasis on developing a broad overview as well as a deep knowledge in the areas of fashion-tech design, including wearables, smart textiles and digital manufacturing.

3 ORIENTATION
The degree programme has a focus on problem-based learning, in order to transfer knowledge into practical applications. This will be applied through research, experimental and experiential approaches to concept and product development and innovation management. This will enable the learner to capitalise on opportunities and address constraints of the fashion-tech field.

4 DISTINCTIVE FEATURES
− interdisciplinary approach to fashion-tech design with a focus on wearables, smart textiles and digital manufacturing;
− blended learning to promote concurrent independent and collaborative ways of working;
− Problem Based Learning (PBL) to facilitate knowledge development and generation, and enhance group collaboration and communication;
− modular and flexible structure;
− learning mobility experience to promote internationalisation, recognition and mobility in line with Bologna principles;
− the programme responds to market and industry demands through the education of future professionals in interpreting trends and creating fashion-tech concepts.

C KEY COMPETENCES ACHIEVED ON PROGRAMME COMPLETION

1 MAIN GENERIC COMPETENCES
− **Problem formulation and solving**: capacity to identify, formulate and solve questions and problems by applying knowledge in research and practical situations, and/or in a new context.
− **Creativity and innovation**: capacity to be creative in developing ideas and in pursuing research goals.
− **Planning and management**: capacity to plan and manage projects taking into account time, budgetary and personnel constraints.
− **Communication skills**: ability to communicate effectively by being sensitive to the needs of diverse
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<tr>
<td>1</td>
<td><strong>Communication of information</strong>: ability to present complex information in a concise manner orally, visually and in writing by utilising a variety of appropriate channels.</td>
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<td>1</td>
<td><strong>Teamwork</strong>: capacity for collaboration in interdisciplinary teams and for assuming responsibility for tasks.</td>
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<td>1</td>
<td><strong>Independent work</strong>: ability to work autonomously conducting original interdisciplinary research and development work in parallel to communicating concepts and critical values.</td>
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<td>1</td>
<td><strong>Critical thinking</strong>: ability to think critically in contexts of creativity, innovation, problem-solving, communication and collaboration (21-st century skills).</td>
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<tr>
<td>1</td>
<td><strong>Research ability</strong>: capacity to contribute to the advancement of knowledge through scientific research.</td>
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<tr>
<td>1</td>
<td><strong>Interpersonal abilities</strong>: capacity to express, reflect and demonstrate one’s awareness, determination, promotion and self-critical abilities for lifelong learning.</td>
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<tr>
<td>1</td>
<td><strong>Information literacy</strong>: capacity to find, analyse, use and understand facts and concepts.</td>
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<tr>
<th>2</th>
<th><strong>MAIN SUBJECT SPECIFIC COMPETENCES</strong></th>
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<tbody>
<tr>
<td>2</td>
<td>Design and multimedia communication</td>
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<tr>
<td>2</td>
<td>capacity to acquire and develop knowledge and understanding of fashion design in relation to natural science, engineering, economics and management with regard to professional and/or experimental work;</td>
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interdisciplinary research and development process, and to work with scientists, compu-engineers and biologists to develop and innovate for material, products for manufacturing processes.

Technology and engineering

- capacity to acquire and develop knowledge and understanding of textile and smart materials and their applications;
- capacity to acquire and develop knowledge and understanding of wearable technologies, smart textiles and digital manufacturing and their processes;
- capacity to acquire and develop knowledge and understanding of collaborative design and innovation methods to deliver more effective ways of developing user-driven innovations, disruptive products and products/services;
- ability to research and transfer innovation with particular reference to materials, meanings and processes in various fields;
- ability to integrate capabilities and knowledge in the engineering area and the design area (e.g. 3D virtual design and prototyping, AR/VR, HMI, coding embedded in the design process) to develop innovative products and applications;
- capacity to evaluate diverse and disruptive forms of innovation that contribute value to a fashion enterprise and shape the future of the fashion industry;
- capacity to creatively and critically envision future possibilities of emerging technologies and propose both new and well explored concepts for opportunities and/or solutions in socio-cultural and economic context;
- capacity to transfer knowledge from disciplinary fields to new sectors and applications, favouring the creative solutions of problems.

Human, social, psychological and economic contexts

- capacity to acquire and develop knowledge and understanding of the social and economic context of fashion-tech design and products;
- capacity to acquire and develop knowledge and understanding of socio-cultural and technological
trends and practices to evaluate market scenarios and opportunities for fashion-tech products;
− capacity to acquire and develop knowledge and understanding of new and emerging business models of the fashion industry;
− ability to demonstrate entrepreneurial thinking that optimises opportunities, products and markets emerging from the fashion-tech space;
− ability to develop communication and distribution strategies relevant to the fashion-tech space.

EMPLOYABILITY & FURTHER EDUCATION

1 EMPLOYABILITY

The programme aims to create hybrid professionals who can easily be integrated into the professional market at the intersection of fashion and technology. Graduates will be equipped for working in fashion-tech enterprises combining cutting-edge technologies with ‘intangible’ factors to add value to fashion-tech products. As a result, they will enter the fashion-tech industries as more agile, proactive employees, “intrapreneurs”, and perhaps more importantly, as entrepreneurs themselves, initiating their own start-up fashion-tech studios with their peers and generating new businesses and jobs.

2 FURTHER EDUCATION

The degree program will allow students to obtain competences to pursue PhD programs in the fashion-tech field focusing on design, technology and management at the intersection of wearables, smart textiles and digital manufacturing.

EDUCATION STYLE

1 LEARNING & TEACHING APPROACHES

The general learning style is problem-based learning that focuses on participatory and hands-on training approaches that are open to co-creation and peer-learning, in which blended learning through conventional and virtual teaching methods will be utilised.
Main assessment strategies and methods are practice, case studies, presentations, reports, examinations and project work, final thesis, self-reflection.

**F** COMPLETE LIST OF PROGRAMME LEARNING OUTCOMES

**Knowledge and understanding:**
For a master’s degree, a student shall independently be able to:
1. demonstrate knowledge and understanding of the field of fashion-tech, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current relevant research and development work;
2. demonstrate specialised methodological knowledge in fashion-tech design enabled by a design-driven methodology, and technological insights informed by social, cultural and environmental approaches.

**Skills and abilities:**
For a master’s degree, a student shall independently:
1. demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations in a variety of fields even with limited information;
2. demonstrate the ability to identify and formulate issues or problems critically, autonomously and creatively, to contribute to the formation of knowledge and solutions;
3. demonstrate the ability to plan, manage and, using appropriate methods, undertake advanced tasks within predetermined time frames, as well as the ability to evaluate this work;
4. demonstrate the ability in speech and writing, both nationally and internationally, to clearly report and discuss conclusions and the knowledge and arguments on which they are based in dialogue with different audiences;
5. demonstrate the skills required for participation in interdisciplinary research and development work or autonomous employment in some other qualified capacity.

**Judgement and approach:**
For a master’s degree, a student shall independently:
1. demonstrate the ability to reflect on and make assessments in fashion-tech design informed by relevant disciplinary, social, ethical and environmental issues, and also to demonstrate awareness of ethical and sustainability related aspects of research and development work;
2. demonstrate insight into the possibilities and limitations of research, its role
| 3. demonstrate the ability to identify the personal need for further knowledge and take responsibility for lifelong learning. |

- in society and the responsibility of the individual for how it is used;
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