

## Subject Description Form

<b>Subject Code</b>	<b>ITC1D04</b>
<b>Subject Title</b>	<b>Smart Wearables and Smart Living</b>
<b>Credit Value</b>	<b>3 credits</b>
<b>Level</b>	<b>1</b>
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	ITC students will also be allowed to take this subject as ITC has no such subject at the introduction level. The existing ones focused on textile technology for devices rather than smart systems and smart living.
<b>Objectives</b>	<p>Smart wearable systems have high levels of intelligence, with many new functions enhancing our everyday life. They can effectively see, feel, listen, talk, learn new things, memorize information, repair themselves, change their color, shape or pattern, communicate with others via electronic media, mobile phones and the Internet, lift weight and even provide their own power. Foreseeable applications in smart living include but not limited to healthcare, the Internet of things, smart cities, robotics, sports, fashion, housing, and protection of environment and animals. They will enhance the quality of life of human being, help monitoring and protecting natural environment and animals, contributing to the communication, safety and security of society. The subject is open to all PolyU undergraduates.</p> <p>The subject aims to provide an introduction of smart wearable technology, an emerging multi-disciplinary field. It covers foundation knowledge on flexible functional materials, technologies and products as well as key applications in arts, communication, healthcare, sports, well-being and protection of natural environment. The subject is designed to enable students to identify the features and requirements of smart wearable systems for smart living. The subject also provides an opportunity for students to apply the knowledge and skills learnt in this subject to analyze the latest developments critically and to explore futuristic wearables in laboratory-based projects.</p>
<b>Intended Learning Outcomes</b> <i>(Note 1)</i>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>a) Acquire basic knowledge of smart functional materials, technologies, design, integration strategies, safety and sustainability related to this topic;</li> <li>b) Assess technologies in smart wearables and smart living, their advantages and disadvantages;</li> <li>c) Describe the development trends in technologies for smart wearable products and their potentials in smart living applications such as location tracking, communication, monitoring environmental conditions, monitoring health conditions and activities of human;</li> </ol>

- d) Demonstrate the ability to adapt new technologies and update her/his knowledge; develop the self-learning ability for sourcing, selecting, analyzing, integrating and communicating information
- e) Demonstrate creativity, inter-personal skill and teamwork ability by conceiving and developing innovative ideas.
- f) Exhibit fluent reading and writing ability through required reference reading and essay writing.

Please explain how the Intended Learning Outcomes relate to the following three essential features of GUR subjects: Literacy, Higher order thinking, and Skills for life-long learning:

**Literacy:**

Students will study a range of textbooks, scholarly articles and video materials. At least 200 pages or 10 chapters should be read in the required reference books. Guidelines and questions for reading will be given, facilitating the students to understand and think about the content. They will write an essay of no less than 2500 words to show their learning results of the subject and exercising their critical thinking, and can conceive related mini-project for in- class presentation concerning the subject of future wearable technology. [Intended Learning Outcomes (a), (b), (c), (d) and (f)]

**Higher order thinking:**

“Smart Wearables and Smart Living” is a subject that looks at the emerging wearable technology and its applications in arts, communication, healthcare, entertainments, sports, transportation, protection of environment and animals etc. The subject introduces innovative concepts, functional materials, interactive devices, fabrication and integration technologies, current and emergent smart wearable systems and their applications. Emphasis will be placed upon innovative explorations of futuristic scenarios for the design, development and application of smart wearables and smart living. Students are required to conceive and produce two mini-projects utilizing the materials, components and tools. A presentation and a demonstration prototype will summarize the leaning results in the form of exhibition.

[Intended Learning Outcomes (c) and (d)]

**Life-long learning:**

Through the introduction of future technology, the subject will equip the students with theoretical and practical knowledge of the design and function of wearables and its applications in smart living, and inspire students’ creativities and interests in innovative explorations of

	<p>futuristic scenarios for the design, development and application of smart wearables and smart living. Students will be developed with motivation of self-centered learning and ability in reading books and technology reports, as well as essay writing and oral communication. With the instilled innovative consciousness and thinking, the students will be able to apply their self-reflective awareness and personal identity development plan to improve their professional advancement and employment opportunities. [Intended Learning Outcomes (a), (b), (c), (d), (e) and (f)]</p>
<p><b>Subject Synopsis/ Indicative Syllabus</b> <i>(Note 2)</i></p>	<p>This subject will be delivered via interactive lectures, individual and group projects conducted. Subject topics will be arranged in terms of smart wearable technology and smart living applications. The smart living part will weight around 30% in the subject.</p> <ol style="list-style-type: none"> <li>1. Introduction to smart wearable systems, including course overview, and project assignment formats</li> <li>2. Definition and classification of smart wearable systems Wearable computer, wearable electronics, smart cloths, virtual reality, augmented reality. implantable, skin mountable</li> <li>3. Functional materials The applications of nano and smart technologies to impart functional properties to soft and flexible materials like fibers and fabrics. Functions of electronic, photonic and interactive materials.</li> <li>4. Flexible interactive devices Structures and functions of electronic textiles; light-emitting and chromic fabrics; embedded microelectronic fabrics.</li> <li>5. Design and integration of wearable systems Wearable products for monitoring environmental conditions, human and animal activities and health; for active microclimate control; for communications</li> <li>6. Case studies of smart wearable systems Healthcare; education and training; sports, industrial uniforms, location tracking; development trends</li> <li>7. Related issues Policy, ethics, market, safety, sustainability and regulations</li> </ol>
<p><b>Teaching/Learning Methodology</b> <i>(Note 3)</i></p>	<p>Dissemination of basic knowledge through lectures, and tutorials in studio environment will be employed. Students are required to read at least 200 pages from the mandatory reading list. This interactive approach will offer better opportunities for students to deepen their understanding of the concepts taught as well as gain hands-on experience in problem solving, as well as cultivate the self-learning</p>

motivation and reading ability. The subject matters will be reinforced by group discussions, small projects and critics. Students will be encouraged to interact with the lecturer, and present their own investigation of the new developments and new products in the essay and class presentation. Individual essay, studio work and group projects will be the major parts of continuous assessment components.

**Assessment Methods in Alignment with Intended Learning Outcomes**

(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
Continuous assessment	100%						
Presentation	20%	✓	✓	✓	✓	✓	
Essay	40%	✓	✓	✓	✓		✓
Group project	40%	✓	✓	✓	✓	✓	
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

**Group Presentation (20%)**

Students will be evaluated based on their collaborative performance in presentation contents, communication and analytical skills of the case studies related to wearable and assigned topics covered from the subject reading list for English Reading (ER) requirement. Presentations by groups will be carried out in three parallel sessions. Each presentation and critics will be conducted within 15 minutes. Each group has 5-6 students.

[Intended Learning Outcomes (a), (b), (c), (d) and (e)]

**Individual Essay (40%):**

Students are required to submit a research essay of 2500 words in English to fulfill the “English Writing” requirement, one week after the last lecture. This is the most important piece of coursework for this subject. A reading of an extensive text (100,000 words or 200 pages) is required. It examines and develops student’s written presentation skills. 10% of this writing assessment will be conducted by ELC.

[Intended Learning Outcomes (a), (b) (c), (d) and (f)]

**Group Project (40%)**

Groups of 5-6 students each will work on a selected topic. Interaction among group members will enhance their communication skills, practice their team work spirit, leadership as well as entrepreneurship. In order to gain systematic technical knowledge/skills, students are also given opportunity to conceive

	<p>and produce mini-project utilizing the materials, components and tools. A presentation of a demonstration prototype will summarize the leaning results in the form of exhibition. [Intended Learning Outcomes (a), (b), (c), (d) and (e)]</p>	
<p><b>Student Study Effort Expected</b></p>	<p>Class contact:</p>	
	<ul style="list-style-type: none"> <li>▪ Lecture/ Seminar</li> </ul>	<p>26 Hrs.</p>
	<ul style="list-style-type: none"> <li>▪ Studio/Laboratory</li> </ul>	<p>12 Hrs.</p>
	<p>Other student study effort:</p>	
	<ul style="list-style-type: none"> <li>▪ Preparation for presentations/projects</li> </ul>	<p>35 Hrs.</p>
	<ul style="list-style-type: none"> <li>▪ Reading and writing</li> </ul>	<p>35 Hrs.</p>
	<p>Total student study effort</p>	<p>108 Hrs.</p>
<p><b>Reading List and References</b></p>	<p>Students are required to read at least 10 selected chapters, each has approximately 20 pages, from the following 3 required reading books.</p> <p><b>Required readings</b></p> <ol style="list-style-type: none"> <li>1. Xiaoming Tao, Handbook of smart textiles, Springer, 2015. (e-version available)</li> <li>2. Toshiyo Tamura, Wenxi Chen, Seamless Health Monitoring, Springer. 2018. (e-version available)</li> <li>3. Daren Guler, Madeline Gannon and Kate Sicchio, Crafting wearables: blending technology with fashion, Springer, 2016.(e-version available)</li> </ol> <p><b>Supplementary</b></p> <ol style="list-style-type: none"> <li>4. Gwilt, A. (Ed.), Fashion design for living. Routledge, New York, 2015.</li> <li>5. Genova, A., Fashion and Technology: a guide to materials and applications. NY Fairchild books, Bloomsbury Publishing, New York, 2018.</li> <li>6. Spilsbury, R., Hi-tech Fashion. Capstone Global Library, Oxford, 2014.</li> <li>7. Abdelsalam (Sumi) Helal, Mounir Mokhtari, Bessam Abdulrazak, The Engineering Handbook of Smart Technology for Aging, Disability, and Independence, John Wiley &amp; Sons, Inc. 2008. (e-version available)</li> <li>8. D Tilak, Electronic textiles: smart fabrics and wearable technology, Woodhead, 2015.</li> </ol> <p><b>Periodicals and Websites</b></p>	

	Advanced Materials Smart Materials Bulletin Smart Materials and Structures Textile Research Journal  High Performance Textiles Textile Outlook International
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Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon subject completion. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time, overcrowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method is intended to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

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