



Modernization of the curriculum of Textile Engineering and Textile Technology in Indonesia, Malaysia and Pakistan



WP 2 - Deliverable 2.3

Updated modules in Asian Universities



New curricula for Asian Universities – Del 2.1 – WP 2

Project acronym:	SMARTEX
Project full title:	Modernisation of curriculum of Textile Engineering and Textile Technology in Indonesia, Malaysia and Pakistan
Grant agreement no.:	2019-2154/0001-001
Responsible partner for deliverable:	P2-UGent
Contributing partners:	All
Author(s):	Benny Malengier, Carla Hertleer
Distribution level:	National
Total number of pages:	16
Version:	V0.4
Language	English
Reviewed by:	
Status:	
Delivery date:	31/01/2021

Version control

Number	Date	Description
V0.1	28/12/2020	First draw up of the document
V0.2	16/03/2021	Adding of the Modules
V0.3	7/04/2021	Adaptation of the classification
V0.4	19/04/2021	Finalisation of the document



Content

Table of Contents

Abbreviations and Acronyms	4
1. Introduction.....	5
2. Overview of new and to-be-updated courses.....	5
3. Defined Modules	6
4. Updated courses	13
4.1 P7 – Smart Textiles and Fashionable Technology (STFT).....	13
4.2 P6 – P7 – Technical Textiles.....	13
4.3 P7 – Advanced Garment and Smart Clothing (AGSC).....	14
4.4 P8 – Advanced Textiles II: Biodegradable Textiles	15
4.5 P9 – Technical Textile Manufacturing	16
5. Conclusion	16



Abbreviations and Acronyms

Abbreviation	Full name
Credits	Crs
EACEA	Education, Audiovisual and Culture Executive Agency
EC	European Commission
EU	European Union
HEI	Higher Education Institution
ICT	Information and Communication Technologies
P5-UiTM	Universiti Teknologi MARA
P6-UTHM	Universiti Tun Hussein Onn Malaysia
P7-STTT	Politeknik STTT Bandung
P8-ITB	Institut Teknologi Bandung
P9-BZU	Bahauddin Zakariya University
P10-NED	NED University of Engineering and Technology
WP	Work Package

New curricula for Asian Universities – Del 2.1 – WP 2

1. Introduction

The goal of the SMARTEX project is to modernise the curricula of Textile Engineering and Textile Technology studies on a Bachelor level in six Asian Universities: two in Malaysia, two in Indonesia and two in Pakistan. In order to do so the current situation in these six universities was documented in deliverable 2.1. All partners gave input on their existing courses and desired new courses. From this content, a module list was distilled with common content, in order to build up the new and to update courses. After long deliberation, updated course content lists have been created for the courses to be updated.

2. Overview of new and to-be-updated courses

We repeat first the list of all courses

	Bachelor in	Duration	To-be-updated courses	New courses
P5	Textile Science & Fashion Technology	3yrs/121crs	Technical Textiles (Sem 5; 3crs)	Smart Textiles (Sem 3,4,5; 3crs, elective course)
P6	Mechanical Engineering Technology	4yrs/142crs		Smart Textiles (Sem 6,7; 3crs, elective course) Technical Textiles (Sem 6,7; 3crs, elective course)
P7	Textile Chemistry	4yrs/146crs	Smart Textiles & Fashionable Technology (Sem 5; 2crs)	
	Textile Engineering	4yrs/146crs	Technical Textiles (Sem 5; 2crs)	
	Garment Production	4yrs/146crs	Advanced Garment and smart garment (Sem 5; 2crs)	
P8	Arts in Design	4yrs/144crs		Advanced Textiles I (Sem 5; 2crs, theory, elective course) Advanced Textiles II (Sem 6; 3crs, theory with basic practical work, elective course) Electronic Textiles (Sem 6; 3crs, theory with basic practical work, elective course)
P9	Textile Engineering	4yrs/139crs	Technical Textile Manufacturing (Sem 7; 3crs)	Smart Textile (Sem 6; 2crs)
P10	Textile Science	4yrs/134crs		Protective Textiles (Sem 7 or 8; 3crs, 3 theory 50 min and 1 practical 100 min; elective course)
	Textile Engineering	4yrs/136crs		Geotextiles (Sem 7 or 8; 3crs, 3 theory 50 min and 1 practical 100 min; elective course) Technical Textiles (3crs) Smart Textiles (3crs) Textile Composites (3crs)

3. Defined Modules

In order to define the courses, a full module list was first constructed with content that will be developed in D2.4. All partners then composed their courses by combining modules to form a full course.

The module list contains **87 modules** to be created within the Smartex project, and is as follows:

Module Nr	Module	Module Nr	Module
M01	Introduction to Technical Textiles * Definition * Classification: Buildtech, Agrotech, Clothtech, Geotech, Homotech, Indutech, Medtech, Oekotech, Packtech, Protech and Sportech + examples * Technical vs non-technical	M47	Optical Fiber Definition Types Use in garments
M02	Fibres for Technical Textiles Man made; CF; UHMWPE; Aramid; Microfiber; Nanofiber	M48 (double module)	Smart and Adaptive Polymers Photo-sensitive materials Thermo-sensitive materials Chemically sensitive materials Mechanically sensitive materials
M03	Yarn manufacturing for Technical Textile *Types *Manufacture	M49	Displays *emissive textile *reflective devices *Embedding LED (def, types, use in garments) *Soft circuit (use of Adafruit flora, circuit through sewing, and fixed components) *Chromic materials
M96 M02- 03-07	Fibres and Yarns for Technical Textiles *Definition *Aramid; Carbon; Glass fibre *Electrospinning *Properties *Applications	M51	Textile Based Electronic Sensors *Types *Design *Manufacture



New curricula for Asian Universities – Del 2.1 – WP 2

<p>M04 Fabric Manufacturing for Technical Textiles Types; machines 2-D and 3-D fabrics woven; knitted ; non-woven biaxial and multi-axial braiding 3D preforms (knit/woven)</p>	<p>M52 Heating Textiles Types (fibre, strip, fabric) Design Manufacture</p>
<p>M97 Woven Fabric for Technical Textiles M04A Extended from part M04 for 1 meeting/class *net shape *3D-fabric</p>	<p>M53 Integrating electronic smart textile *yarn to component connection *solder/glue/epoxy/sew joining *connection to micro-controller *Design *Manufacture</p>
<p>M98 Knitted Fabric for Technical Textiles M04B Extended from part M04 for 1 meeting/class *net shape *3D-fabric *Biaxial *Multiaxial</p>	<p>M54 Energy harvesting *Thermo-electric *Tribo-electric *Photovoltaic *piezo electric</p>
<p>M05 Braiding *Intro *Classification *manufacturing techniques *Applications</p>	<p>M55 Smart Protection 01: General *Smart materials *Smart surface treatments *Sensors, actuators, CPU *Personal protective</p>
<p>M06 Narrow Width Fabrics *Intro *Classification *manufacturing techniques *Applications</p>	<p>M56 Smart Protection (double module) *Protective clothing for firefighter and rescue worker *Protective textile for older people *See module firefighters Technical textiles for smart material *Add Intelligent material as needed</p>
<p>M07 Electrospinning *The technique *Types *Examples</p>	<p>M58 Smart Material Application 01: Geotechnical and civil engineering * Building reinforcement * geotextile and geogrid * embedded textiles *solar textiles * application and future trends</p>
<p>M08 Automotive textiles * Tires, Airbag, belt, hoses and filter upholstery, carpet * Testing for automotive Fabric</p>	<p>M59 Smart Material Application 02: Automotive * overview * textile for interior * textile for upholstery *safety and quality</p>

New curricula for Asian Universities – Del 2.1 – WP 2

M09	Composite 1: Textile for Composite *textile composites *textile reinforcement structures *Textile preforms	M60	Smart Material Application 03: Health * wound care * drug release material * electronics: sensors, actuators, ... * wearable systems rehabilitation and monitoring
M10	Composite 2: Composite manufacturing. *Machines *software simulation *practical (resin, vacuum, ... hands on) *Composite manufacturing.	M61	Textile ergonomy *Definition *Factors *Safety and health consideration
M11	Composite 3: Applications of Composites *General applications *Aircraft - space modules	M62	Smart Textile System in medical, protective and sport clothing *Characteristics *Medical *protective clothing *Sports
M12	Composite 4: Testing of Composites *standards *Testing methods	M63	Product Design *product design and development *smart system design and development
M99 M09- M10- M11	Textile Composite Combined M09-M10-M11 fitting for 1 meeting *Definition *Textile Reinforcement structure *Performance textiles *Testing	M64	Modern Smart textile development *Smart textile today *Smart textile recent developments
M14 M13-14	Industrial Textiles 01: General overview (half module) *Packaging *Filters Industrial Textiles 02: Filtration *Dry and Liquid *filtration design *filtration testing	M103 M61- M63- M64	Product Design and Development of Smart Textiles *smart system design and product development *Modern smart textile development *Textile ergonomy (definition, factors, safety and health consideration) *Creative textile and fashion
M15	Geotextiles 1: Overview Materials Manufacturing Functions Applications	M65	Mini Project on Group Work *Create prototype of smart product *Design, material, Integration, measurement, presentation Some 1 week, some 2 weeks, some 7 weeks!
M16	Medical Textiles *Materials *Textiles for implantation *Non-Implantable Textiles *Healthcare and Hygiene *Mouth Masks	M66	Advanced Textiles *Combination of intro Technical and intro smart textiles with focus on advanced textiles in general *Definition *History

New curricula for Asian Universities – Del 2.1 – WP 2

<p>M18 Protective Textiles and Clothing *Body Armour *Principles of ballistic impact protection *bullet protection *Stab-resistant protection *Military textiles *chemical protection *biological protection *selected applications</p>	<p>M67 Advanced Textiles: Fibres *Natural *Regenerated *Synthetic</p>
<p>M19 Protective Clothing 02: Fire Protection *requirements *Applications</p>	<p>M68 Advanced Textiles: Yarn - Fabric *Reuse part Technical and Smart ! Yarn construction *Fabric structure Overview Textile Production processes</p>
<p>M21 Sports and Recreation *Specialty fibres *yarn and fabric structure *special finishes *High performance applications</p>	<p>M104 Finishing & Care M69 - *Basic Introduction: finishing for aesthetic, M72 durability, comfort, *safety, care, environment resistance</p>
<p>M22 Architectural and Construction (half module) *Fabrics *Construction *coatings *Applications</p>	<p>M71 Textile Colouration *Dyeing *Printing *Industrial scale processes</p>
<p>M23 Textile and Clothing Comfort *concept, definition, principles *Man, climate and textiles *principle (pyramid: heat isolation, air permeability, moisture transfer) *process involved in perception of comfort (physical, neuophysiological, physiological) *Mechanism of heat transfer through textiles and clothing (conduction, convection and radiation)</p>	<p>M73 Advanced Textile Industry *overview *Materials *Processes *Applications</p>
<p>M26 Coating: General Overview *Materials and chemistry *Methods of coating *Testing standards</p>	<p>M74 Bio-Textiles *Bio lace *Bio cotoure *Natural Dyes</p>
<p>M27 Laminating: General Overview *Materials and chemistry *Methods of laminating *fusible interlinings *Testing standards</p>	<p>M75 Advanced Textiles Biodegradable *Definition *History</p>

New curricula for Asian Universities – Del 2.1 – WP 2

<p>M28 Nano Technology *Intro *History *Classification *Synthesis *Application</p>	<p>M76 Fibres (Bio) *Overview standard fibres *Protein-based *Alternatives: non-wood pulp, ...</p>
<p>M29 Plasma Technology *Intro *Chemistry *Biomedical application</p>	<p>M77 Alternative Fabric Construction *Reuse content non-woven tech textiles *non-woven and woven *Functionality: Filters protection, ...</p>
<p>M30 Non-Woven 01: Intro *Def *manufacturing processes *Properties *Applications *The industry and trade</p>	<p>M78 Alternative colouring (Bio) *Natural dyes *Bio-dyes</p>
<p>M31 Non-Woven 02: Raw Materials and Process Technology *Fibre types *Fibre waste as source *Quality *adhesive and binder *using granules *Stages *Dry-Lay process *Wet-lay *Web bonding *Micro and nano non-woven (melt blow, dry-spinning, centrifugal, electro-spinning)</p>	<p>M79 Functional Coatings - 2 (Bio) *Nano-coatings *enzyme finishes *Natural binders</p>
<p>M32 Non-Woven 03: Characteristics and applications *Medical sector *Upholstery *cleaning *Apparel *Technical use</p>	<p>M80 Sport Applications *Reuse content sport tech textiles *Tracking *Monitoring</p>
<p>M100 Non-Woven M30- *Combined info fitting for 1 meeting M31- *Definition M32 *Manufacturing processes *Properties *Applications</p>	<p>M81 Protective Applications *Reuse content protective tech textiles *Military *Chemical</p>

New curricula for Asian Universities – Del 2.1 – WP 2

<p>M33 Smart Textile 01: Introduction *Definition smart material and smart textile *Scope *Applications *Products *Classification *Smart textile systems and characteristics</p>	<p>M82 Medical Applications *Reuse content medical tech textiles *Nano-sized textiles *Digested material *Bone replacement</p>
<p>M34 Smart Textile: Practical *Fibres, yarns, fabrics, clothing *Integration techniques *Example applications</p>	<p>M83 E-Textiles and Wearable Electronics *Reuse content smart textiles intro (M33) and add practical *examples *Definition *History</p>
<p>M35 Intelligent Textile: Key Functions *Sensor *Actuator *External communication *Functions *Materials</p>	<p>M84 Electronics Basics *Breadboard *Wires *Tools *LED *Battery *Soldering *Multi-meter</p>
<p>M36 Introduction to Advanced Garment and smart clothing M36- M37 Definition and scope History Life cycle wearable electronics (definition, manufacturing, uses)</p>	<p>M86 Wearable microcontrollers History Flora Gemma Hands on</p>
<p>M38 Electro-conductive textile material Theory conduction Intrinsic conductive materials Composite conductive materials Coatings and inks</p>	<p>M87 Sensor Components Fixed PCB sensors to integrate: distance sensor; colour sensor; touch sensor Textile sensors</p>
<p>M40 Conductive Polymers</p>	<p>M88 Arduino Programming your electronic textile</p>
<p>M42 Shape Memory Material temp sensitive SM polymers SM alloy for composites SM polymer films Shape change material for aesthetics and engineering</p>	<p>M89 Group project Create from design to finish an electronic textile</p>



New curricula for Asian Universities – Del 2.1 – WP 2

M44	Smart dyes	M90	Functions of Geo Textile 1) Separation 2) Drainage 3) Filtration 4) Reinforcement 5) Protection
M45	Chromic Materials	M91	Types of Geo Textile 1) Woven Geo Textile 2) Non-Woven Geo Textile 3) Speciality Geo Textile
M101 M34 - M46	Smart Textile: Practical Fibres, yarns, fabrics, clothing integration techniques Example applications Introduction of PCM; Application of PCM	M92	Properties & Test Methods related to Geo Textile
M102 M43- M46	Microcapsules Technology and its applications Introduction on microcapsule technology PCM-based self-thermo-regulating Smart clothing Other smart uses in advanced garment (cosmeto textiles, health, insect repellent)	M93	Wearable Technology and E-Textiles Definition Classification Wearable devices Applications
		M94	Integration of Conductive Material Weaving; Embroidery Flat knitting; circular knitting; warp knitting Measurement: Resistance, Force, Temp, testing

4. Updated courses

With these modules, the updated courses are defined as follows per partner

4.1 P5 – Technical Textiles

This course has every week **120 min of contacts**. The order of the modules in the course will be:

Week	Module
1	M01
2	M02
3	M04
4	M07
5	M08
6	M99 & M12
7	M99 & M12
8	M14 & M22
9	M15
10	M16
11	M18
12	M21
13	M23
14	M26 & M27
15	FINAL EXAM

4.2 P7 – Smart Textiles and Fashionable Technology (STFT)

This course has every week **100 min of contacts**. The order of the modules in the course will be:

Week	Module
1	M33
2	M35
3	M38
4	M48

New curricula for Asian Universities – Del 2.1 – WP 2

5	M48
6	M40
7	M42
8	MID TERM EXAM
9	M102
10	M44
11	M103
12	M103
13	M62
14	M65
15	M64
16	FINAL EXAM

4.3 P7 – Technical Textiles

This course has every week **100 min of contacts**. The order of the modules in the course will be:

Week	Module
1	M01
2	M96
3	M04A
4	M04B
5	M100
6	M99
7	M23
8	MID TERM EXAM
9	M17
10	M33
11	M93
12	M39
13	M94

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

New curricula for Asian Universities – Del 2.1 – WP 2

14	M94
15	M65
16	FINAL EXAM

4.4 P7 – Advanced Garment and Smart Clothing (AGSC)

This course has every week **100 min of contacts**. The order of the modules in the course will be:

Week	Module
1	M36
2	M33
3	M35
4	M38
5	M48
6	M42
7	M102
8	MID TERM EXAM
9	M47
10	M49
11	M23
12	M17 & M56
13	M21
14	M103
15	M65
16	FINAL EXAM



4.5 P9 – Technical Textile Manufacturing

This course has every week **180 min of contacts**. The order of the modules in the course will be:

Week	Module
1	M01
2	M04
3	M05
4	M06
5	M07
6	M08
7	M09
8	M10
9	MID TERM EXAM
10	M11
11	M26
12	M27
13	M28
14	M29
15	M30
16	M31
17	M32
18	FINAL EXAM

5. Conclusion

All 5 to-be-updated courses have been defined, and obtained an updated content fitting within the curriculum they are offered in, in the six Asian universities.