

Space education proposals under PECS

Three pillars

Why finance space education?

- **Prepare and encourage** students to pursue a career in the space industry
- Provide a suitable and ready **workforce** for Cypriot entities
- Leads to **stronger European expertise**
- Help initiate **collaboration** between ESA member states

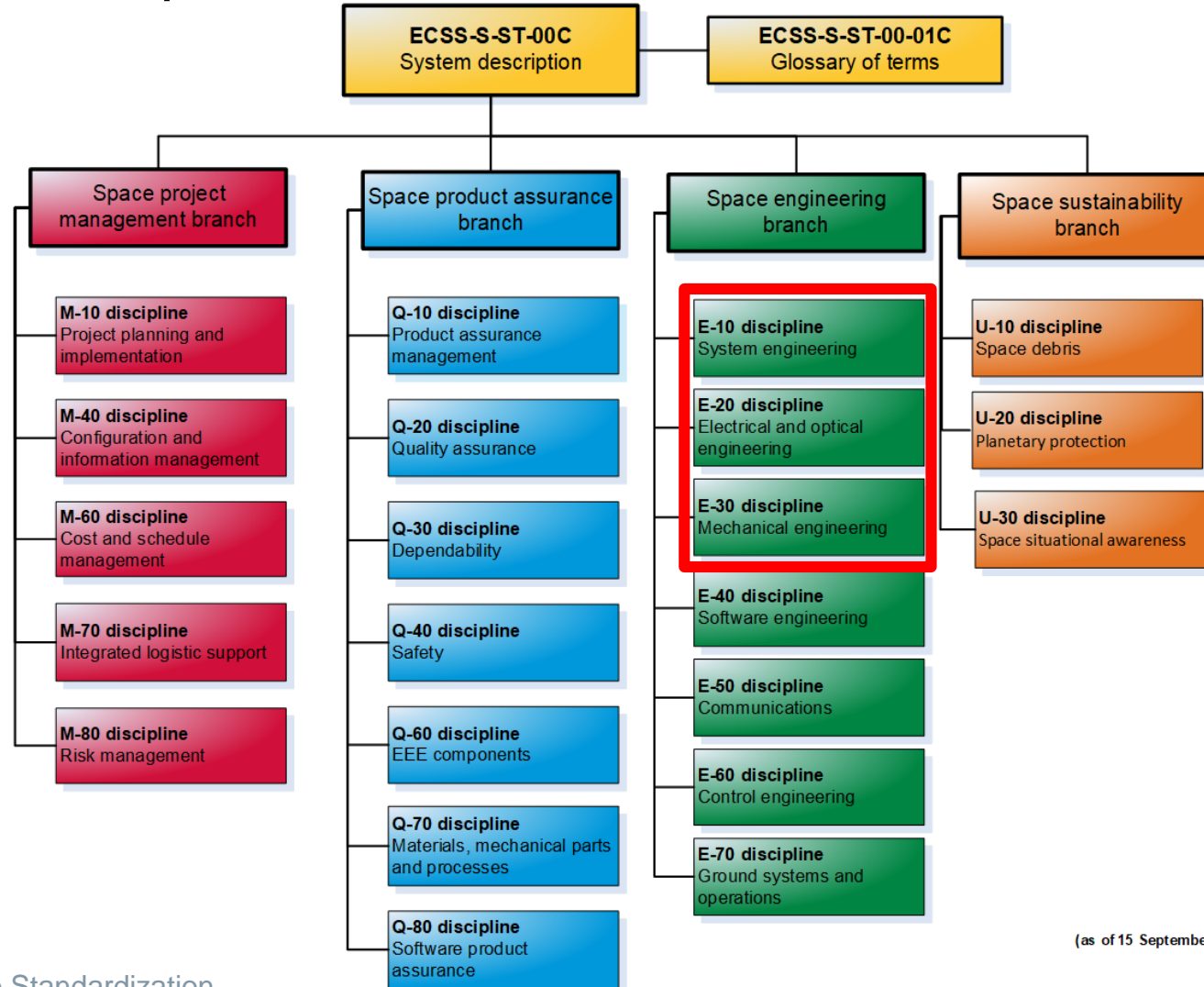
Development of a space degree

- **Prerequisites**
 - Needs to **build on existing degrees**
 - Cannot be done in one step
 - Responds to **needs of local industry**
 - Modules have test criteria (exam/thesis) AND give credits (ECTS)
- **Very strongly encouraged**
 - Use of ECSS

International links

- **Increases efficiency** of the course development
- Space business is international
- **Increases visibility** of space education
- Improves **chances for collaborations** with other entities of ESA member states
- **Very strongly encouraged**
 - Use of English

ECSS Disciplines



(as of 15 September 2021)

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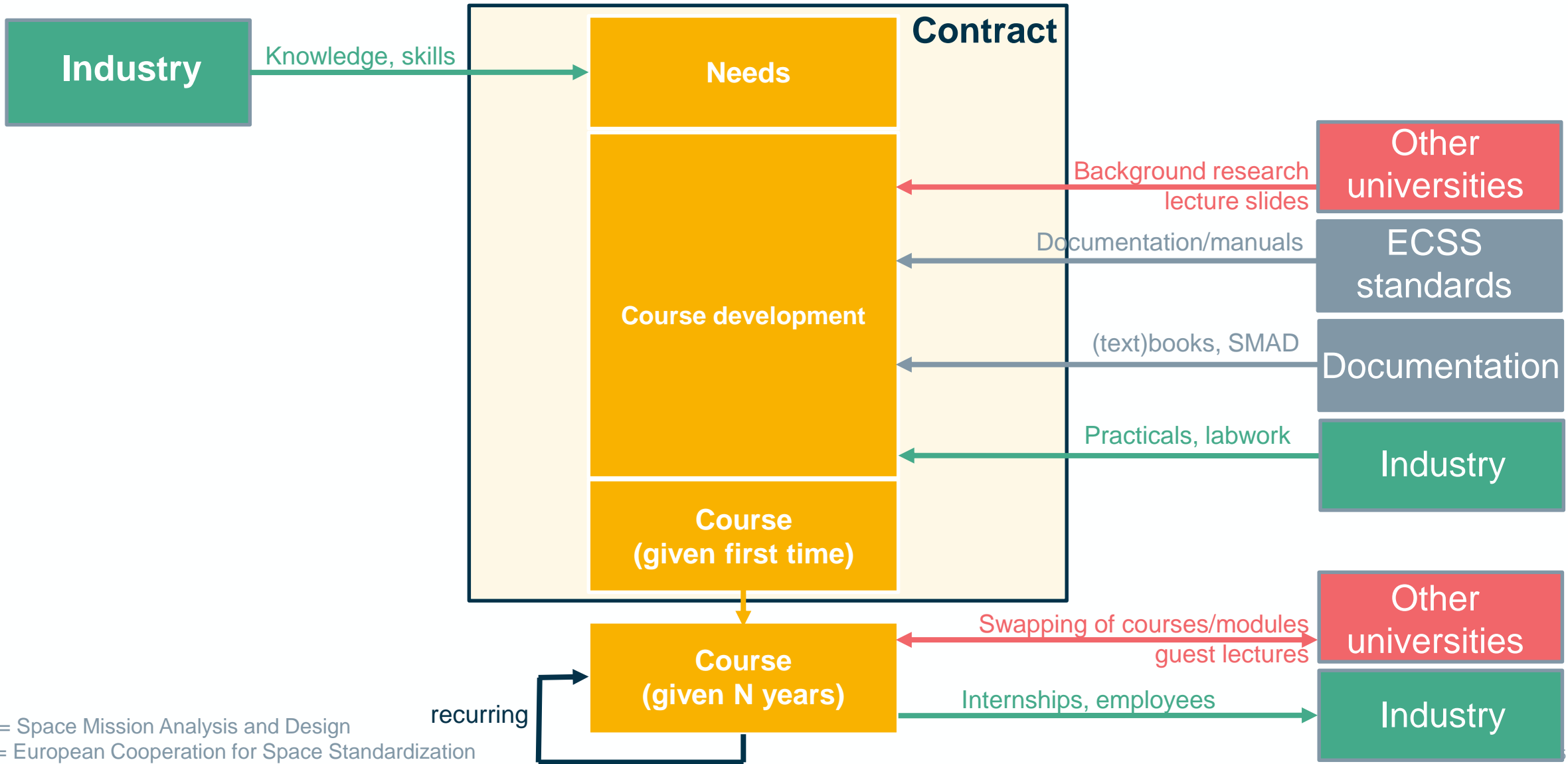
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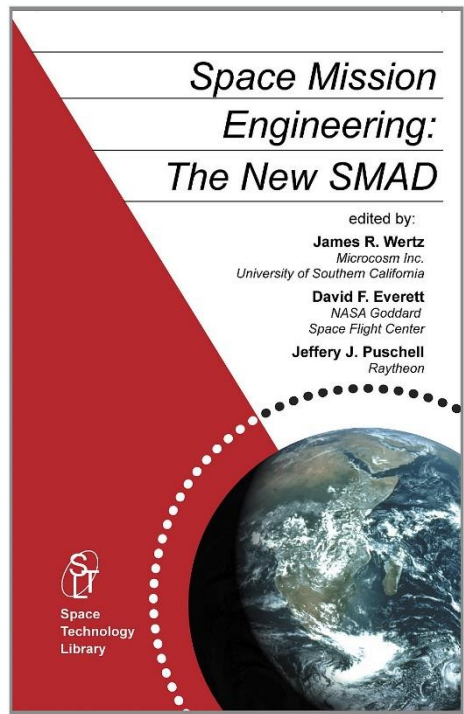
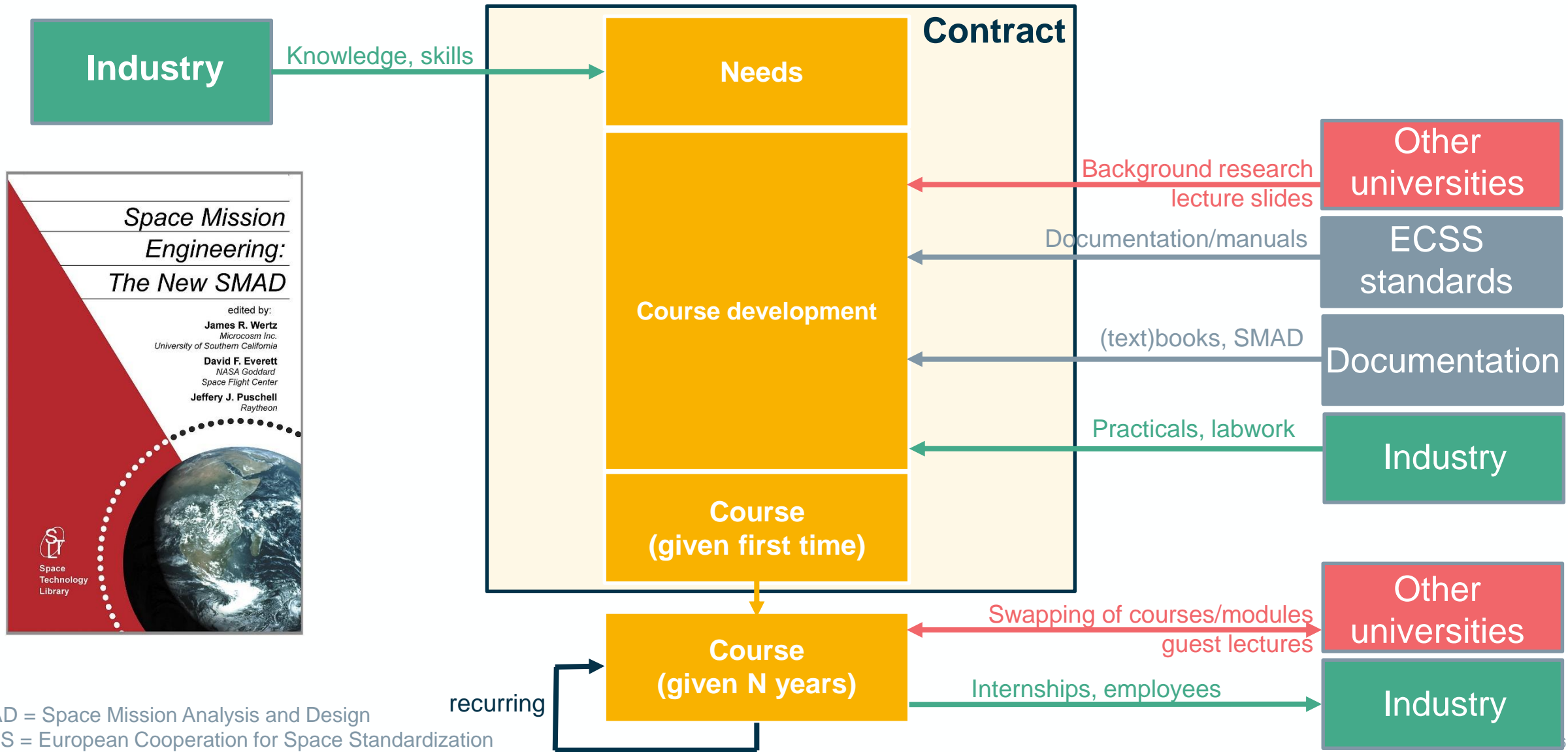
Space Education Development Model



SMAD = Space Mission Analysis and Design
 ECSS = European Cooperation for Space Standardization



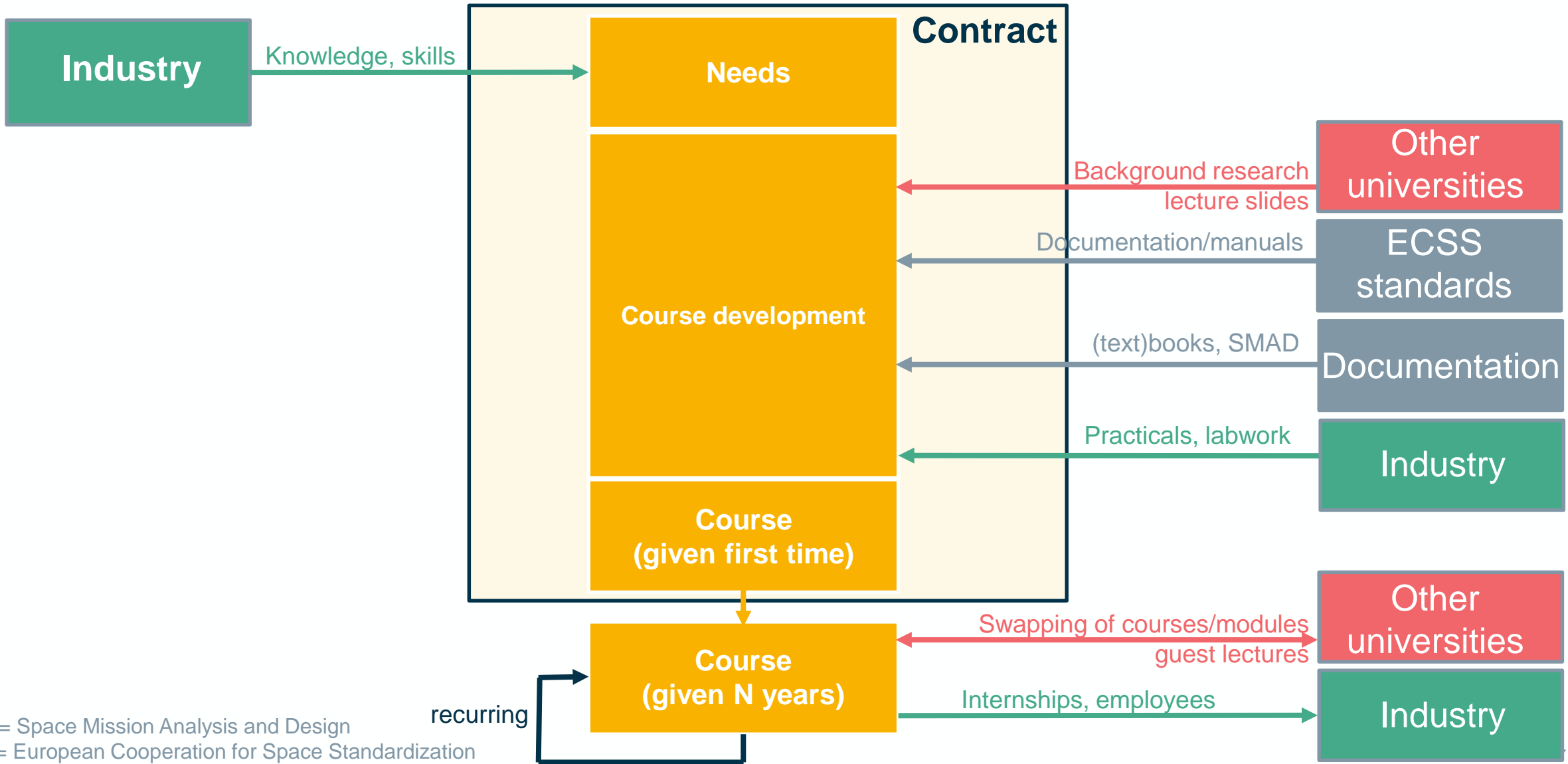
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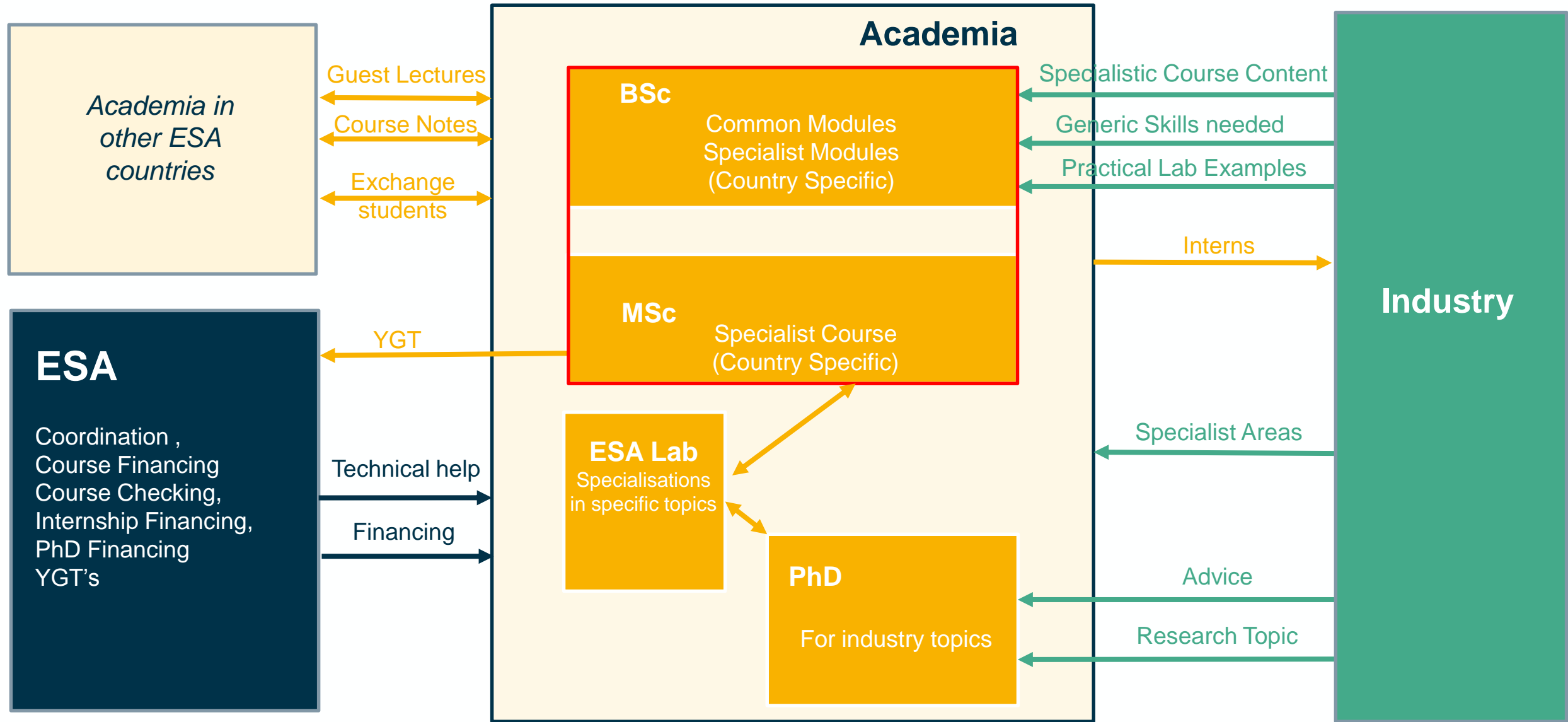
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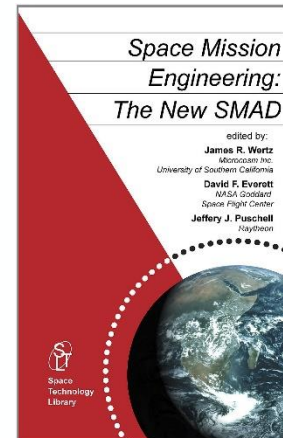
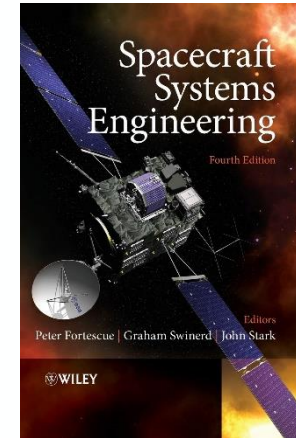


Idealized model for long term Space Education and cooperation with industry



Common mistakes in Education Proposals

- Not showing outline course contents
- Not showing the input information sources (SMAD, universities, etc.)
- Not having the course in English (at least partially)
- Not including industry
- Not taking advantage of ECSS
- Not being accredited OR discussing accreditation process
- Not including independent reviews of course material (correct and complete information)
- Not giving assurances of recurring nature of the course (i.e., it is a single shot/one off)
- Not showing how it fits into the current BSc/MSc programme OR discussing end goals



Overview of funded space education activities

	Activity	Country	Entity
1	Space Education for Bulgaria (SpaceEdu4BG)	Bulgaria	Faculty of Physics, Sofia University St. Kliment Ohridski
2	TRACOFUNAT: Training courses “Fundamentals of aerospace technologies”	Lithuania	Vilnius University
3	Space Image Processing	Lithuania	Vilnius Gediminas Technical University
4	University Course and Public Lectures on Earth Observations (UniEO)	Lithuania	Faculty of Chemistry and Geosciences, Vilnius University
5	Aquatic Remote Sensing in Higher Education (QREDO)	Lithuania	Klaipeda University
6	VENTSPILS UNIVERSITY COLLEGE SATELLITE TECHNOLOGY EDUCATION PROGRAMME	Latvia	Ventspils University College
7	Development of study course “Thermal Management and Power Electronic Packaging in Spacecraft Applications”	Latvia	Riga Technical University
8	Introduction to Wavelets for Space Applications	Latvia	University of Latvia
9	Development of university course – satellite communications systems	Latvia	Ventspils University College
10	Space for Education, Education for Space (SEES)	Slovakia	Slovak University of Technology - FEI-STU
11	TUKE Space Forum	Slovakia	Faculty of Electrical Engineering and Informatics, Technical University of Kosice
12	University course Earth Observation with ESA missions	Slovakia	Faculty of Mining, Ecology, Process Control and Geotechnologies, Technical University of Kosice
13	SIREN Space Ionizing Radiation Experts Nursery	Slovakia	Slovak Academy of Sciences - Institute of Experimental Physics

Other key universities in Member States



	University	Country
1	Technical University of Denmark	Denmark
2	ISAE Superaero	France
3	Technical University of Berlin	Germany
4	Technical University of Munich	Germany
5	Polytechnic University of Milan	Italy
6	Sapienza University of Rome	Italy
7	University of Pisa	Italy
8	Delft University of Technology	Netherlands
9	KTH Royal Institute of Technology	Sweden
10	Swiss Federal Institute of Technology Zurich	Switzerland
11	Cranfield University	UK
12	University of Glasgow	UK
13	University of Southampton	UK
14	University of Surrey	UK

- Note: this list is far from comprehensive



Annex – Course information (for reference)



LT1_10		TRACOFUNAT: Training courses “Fundamentals of aerospace technologies”			
Contract no.	4000115692	Contract status	Completed	Country	Lithuania
Prime Supplier	Vilnius University	Contact details		Mr. Liudas Tumonis	
Sub Supplier	N/A			liudas.tumonis@ff.vu.lt	
Language	Lithuanian				
Essence	Course development "Fundamentals of aerospace technologies"				
Course material	Kosmoso technologiju pagrindai (vu.lt)				
Target program	BSc (TBC)				
Lecture topics					
1	Orbital Mechanics Covers: problems and laws of two body orbital mechanics, Kepler's laws, Orbital velocities, orbital manoeuvres, interplanetary space flight principles				
2	Launchers Covers: rocket working principles, Tsiolkovsky's rocket equation, staging, velocity losses, rocket engine working principles, properties of De Laval nozzle, classification, properties and applications of rocket engines				
3	Spacecraft Covers: objectives of remote sensing, environmental conditions in space and main spacecraft's systems and sensors.				
4	Policy of the aerospace activities, legal regulations and management Covers: introduction to ESA and its activities, status of the Lithuanian steps to be ESA member state and main international space law agreements.				

LT3_03		Space Image Processing			
Contract no.	4000126592	Contract status	Completed	Country	Lithuania
Prime Supplier	Vilnius Gediminas Technical University	Contact details		Ms. Jūratė Sužiedelytė Visockienė jurate.visockiene@vgtu.lt jurate.suziedelyte-visockiene@vilniustech.lt	
Sub Supplier	National Paying Agency				
Language	Syllabus in Lithuanian and English, course language in English				
Essence	N/A				
Course material	N/A				
Target program	MSc				
Lecture topics					
1	Remote sensing systems – electromagnetic radiation theories; platforms and sensor characteristics				
2	Remote Sensing Data – MultiSpectral Instrument (MSI) and Operational Land Imager (OLI) Radiometric Performance; Cross Calibration; Sources of Free Remote Sensing Data				
3	Space image processing methods and approaches (1)				
4	Space image processing methods and approaches (2)				
5	Remote sensing technology for engineering studies – evolution and advances in remote sensing satellites and sensors for the study of different types of environment; remote sensing technology for environmental protection				
Practicals					
1	Downloads the Sentinel data (images)				
2	Flood plain mapping and simulation with ESA SNAP Toolbox (open source software)				
3	Remote sensing for desertification mapping (SNAP software)				
4	Land cover classification and accuracy assessment (QGIS open source software)				
Self-study					
1	Getting started using Trimble eCognition for various remote sensing applications (commercial software)				
2	Threshold Classification Method on Forest Height Mapping example with Trimble eCognition Essentials				
3	Building extraction example with Trimble eCognition Developer, with 2 hours of teacher consultation				

LT3_08		University Course and Public Lectures on Earth Observations (UniEO)			
Contract no.	4000126335	Contract status	Completed	Country	Lithuania
Prime Supplier	Faculty of Chemistry and Geosciences, Vilnius University		Contact details	Ms. Justinas Kilpys	
Sub Supplier	N/A			justinas.kilpys@gf.vu.lt	
Language	Syllabus in Lithuanian and English, lecture material in Lithuanian				
Essence	A course about 'remote sensing applications for Earth observations'. Until course approval, topics will be incorporated in existing courses at the Institute of Geosciences (i.e. Applications of GIS, Remote sensing in hydrometeorology, Applications of satellite Earth observations).				
Textbook	Zemes stebejimas is kosmoso – Vilniaus universiteto Hidrologijos ir klimatologijos katedra (vu.lt)				
Target program	Unclear				
Lecture topics					
	1 History of remote sensing				
	2 Satellites and orbits				
	3 Electromagnetic radiation				
	4 Earth observations with optical sensors				
	5 Earth observations with infrared sensors				
	6 Earth observations with passive microwave				
	7 Earth observations with radars				
	8 Satellite remote sensing in agriculture				
	9 Monitoring land-use change				
	10 Remote sensing of forests				
	11 Disaster risk management				
	12 Monitoring of water bodies				
	13 Snow and ice observations				
Practicals					
	1 EO data search and download. Introduction to SNAP				
	2 Agriculture – crop classification				
	3 Determination of land-use types				
	4 Forestry and vegetation health				
	5 Classification of urban areas				
	6 Water detection and mapping of floods				
	7 Determination of the burned forest areas				
	8 Sea ice detection				

SK1_06	Space for Education, Education for Space (SEES)				
Contract no.	4000117400	Contract status	Completed	Country	Slovakia
Prime Supplier	Slovak University of Technology - FEI-STU		Contact details	Ms. Jana Jurkovičová	
Sub Supplier	N/A			jana.jurkovicova@stuba.sk	
Language	Slovak (TBC)				
Essence	Part of the activity includes a series of 10 specialized lectures, as well as group project work.				
Textbook	N/A				
Target program	BSc (TBC)				
Lecture topics					
	1	Orbital mechanics			
	2	Chemical and electrical propulsion systems			
	3	Basics of Earth (land) observation techniques			
	4	Fundamentals of space scientific instruments			
	5	Sensors for orientation and stabilization of satellites and space probes			
	6	Robotic technologies and autonomous systems in space applications			
	7	Principles of space communication systems			
	8	On board computers and software standards			
	9	Power sources of satellites and deep space probes			
	10	Electric and alternative propulsion of satellites and space probes			

SK4_06	TUKE Space Forum				
Contract no.	4000128931	Contract status	Completed	Country	Slovakia
Prime Supplier	Technical University of Kosice, Faculty of Electrical Engineering and Informatics	Contact details		Mr. Ján Genči	
Sub Supplier	N/A			genci@tuke.sk	
Language	Lecture slides in English				
Essence	Development of "Space Data Analysis" course.				
Textbook	Space Data Analysis Course – TUKE Space Forum				
Target program	MSc				
Lecture topics					
	1	Introduction			
	2	AMONnet			
	3	Copernicus programme I.			
	4	Copernicus programme II.			
	5	Copernicus programme III.			
	6	Copernicus programme - time allocated for catching-up in case of missed or problematic topics			
	7	Astrometry - Gaia			
	8	Astronomy - Herschel, Hubble space telescope, TESS			
	9	Astrometry/Astronomy - time allocated for catching-up in case of missed or problematic topics, discussion about semester projects			
	10	Magnetosphere - Swarm, magnetospheric models			
	11	Heliophysics - Parker Solar Probe			
	12	Cosmic ray physics - PAMELA, Voyager			
	13	Presentation of student projects and time allocated for catching-up in case of missed or problematic topics			