

# Degree Structure - Atmospheric Sciences (2020-2023)

**NOTE!** SEND ALL THE UPDATES OF THE STRUCTURE TO EDUCATION COORDINATOR TIINA HASARI

- Master's programme in atmospheric sciences
  - Advanced studies in atmospheric sciences
    - Compulsory courses for all study tracks
    - Optional courses for all study tracks
    - Study track in Aerosol Physics
    - Study track in Biogeochemical cycles
    - Study track in Geophysics of the hydrosphere
    - Study track in Atmospheric chemistry and analysis
    - Study track in Remote sensing
    - Study track in Meteorology
  - Other studies
  - Study Modules offered to students from other degree programmes

<b>Master's programme in atmospheric sciences</b>		120 cr	Degree		Complete 120 cr	Corresponding course in the old system (studies done before 1.8.2017)
<b>Discipline studies</b>						
<b>Advanced studies in atmospheric sciences</b>		95-120 cr		Compulsory		
<b>Compulsory courses for all study tracks</b>		45-50 cr		Compulsory	Complete all 6 courses. Included in the study module of advanced studies of a study track.	
Atmospheric and Earth Sciences Today	AT M3 01	5 cr	Course	Compulsory		
Atmospheric science seminar for Master's students	AT M3 45	5 cr	Course	Compulsory		53192 Opiskelijaseminaari
Climate.now	AT M3 02	2 / 5 cr	Course	Compulsory	Choose either 2 cr or 5 cr course (5 cr course is recommended)	530379 Ilmastonmuutos nyt ja A530379 Avoin yo: Ilmastonmuutos nyt

Project course in atmospheric sciences	AT M3 03	3 / 5 cr	Course	C o m p u l s o r y	Choose either 3 cr or 5 cr course (5 cr course is recommended) <b>Can be substituted by ATM380 Solutions.now</b>	
Master's thesis	AT M3 50	3 0 cr	Course	C o m p u l s o r y		
Maturity test	AT M3 99	0 cr	Course	C o m p u l s o r y		
<b>Optional courses for all study tracks</b>		0 - 2 5 cr		O p t i o n a l	Included in the study module of advanced studies of a study track.	
Dimension analysis	AT M3 65	5 cr	Course	O p t i o n a l		
Leadership for sustainable change	AT M3 73		Course	O p t i o n a l		
Biosphere-atmosphere process modelling	AT M3 74		Course	O p t i o n a l		
Sustainable.now	AT M3 78		Course	O p t i o n a l		
SystemsChange.now	AT M3 79		Course	O p t i o n a l		
Solutions.now	AT M3 80		Course	O p t i o n a l		
Earth System Modelling	AT M3 77		Course	O p t i o n a l		
Special Course in Atmospheric Sciences	AT M4 10 (1- 99)	5 - 1 0 cr	Course	O p t i o n a l		
<b>Optional Study Tracks</b>				C o m p u l s o r y	Choose 1 study track	

<b>Study track in Aerosol Physics</b>						
Aerosol Physics, Advanced Studies	AT M3 001	9 5 - 1 2 0 cr	Study module	Al te rn a t i v e		
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure	
<b>Compulsory course packages</b>		m i n . 5 0 cr				
<i>Basics of aerosol physics and chemistry</i>		m i n . 5 cr	Course package	C o m p u l s o r y	Complete at least 5 cr	
Aerosol physics II	AT M3 04	5 cr	Course	C o m p u l s o r y		530001 Aerosolifysiikka II
Nanophysics and nanochemistry	M AT R3 05	5 cr	Course	Al te rn a t i v e		
Basics of atmospheric chemistry	AT M3 06	5 cr	Course	Al te rn a t i v e		53611 Ilmakehän kemian perusteet
Atmospheric and aerosol chemistry	AT M3 07	5 cr	Course	Al te rn a t i v e		530007 Ilmakemian jatkokurssi
Atmospheric photochemistry and reaction kinetics	AT M3 58	5 cr	Course	Al te rn a t i v e		
<i>Aerosol physics</i>		m i n . 3 5 cr	Course package	C o m p u l s o r y	Complete at least 35 cr of this course package	
Classical Nucleation Theory	AT M3 05	5 cr	Course	Al te rn a t i v e		530124 Klassinen nukleaatioteoria
Simulations of Formation of Molecular Clusters	AT M3 11	5 cr	Course	Al te rn a t i v e		530060 Molekyylilusterien muodostumissimulaatiot

Aerosol Modelling	AT M3 12	5 cr	Course	Al te rn a t ive		530265 Aerosolimallinnus
Biosphere-atmosphere process modelling I	AT M3 13	5 cr	Course	Al te rn a t ive		53350 Ilmakehämallinnus I
Biosphere-atmosphere process modelling II	AT M3 14	5 cr	Course	Al te rn a t ive		53352 Ilmakehämallinnus II
Laboratory course in Aerosol physics	AT M3 71	5 cr	Course	Al te rn a t ive		
Aerosol measurement techniques	AT M3 18	5 cr	Course	Al te rn a t ive		53174 Aerosolien mittaustekniikka
Atmospheric observations of aerosols, clouds and reactive trace gases	AT M3 19	5 cr	Course	Al te rn a t ive		530080 Ilmakehän aerosolien mittausta: aerosolifysiikka, näytteenotto- ja mittausten menetelmät
Mass Spectrometry in Atmospheric Sciences and Environmental analysis	AT M3 20	5 cr	Course	Al te rn a t ive		530264 Massaspektrometria ilmakehätieteissä ja ympäristöanalytiikassa
Satellite remote sensing methods in aerosol science	AT M3 25	5 cr	Course	Al te rn a t ive		530233 Satelliittikaukokartoitusmenetelmät aerosolitieteessä
Health Effects of Fine Particles	AT M3 26	5 cr	Course	Al te rn a t ive		530068 Pienihiukkasten terveysvaikutukset
Fine particles in occupational environments	AT M3 27	5 cr	Course	Al te rn a t ive		530037 Pienihiukkaset työympäristössä
Aerosol Optics	AT M3 68	5 cr	Course	Al te rn a t ive		
Physical and chemical characterization of charged molecules and clusters at atmospheric pressure	AT M3 81	5 cr	Course	Al te rn a t ive		
Special course in Aerosols Physics	AT M4 11 (1- 99)	5 - 1 0 cr	Course	Al te rn a t ive		
Data Science		m i n - 1 0 cr	Course package	C o m p u l s o r y	Complete at least 10 cr of this course package	

Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive		530189 Kenttämittausten tilastollinen analyysi
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		53328 Ilman epäpuhtauksien fysiikka, kemia ja vaikutukset; kenttämittaukset
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		535006 Aikasarja-analyysi geotieteissä
Introduction to Machine-learning	DA TA 11 002	5 cr	Course	Al te rn at ive		
Advanced course in Machine-learning	DA TA 12 001	5 cr	Course	Al te rn at ive		
Special course in Data Science	AT M4 17 (1-99)		Course	Al te rn at ive		
<b>Study track in Biogeochemical cycles</b>						
Biogeochemical cycles, Advanced Studies	AT M3 002	9 5 - 1 2 0 cr	Study module	Al te rn at ive		
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure	
<b>Optional course packages</b>		m i n . 5 0 cr			Complete at least 50 cr of individual courses from the following course packages	
Biogeochemical cycles			Course package	Al te rn at ive		
Basics of Biometeorology	FO R- 218	5 cr	Course	Al te rn at ive		
Global biogeochemical cycles	AT M3 28	5 cr	Course	Al te rn at ive		53341 Ilmastojärjestelmän biogeokemialliset kierrot
Eddy covariance intensive course	AT M3 59	5 cr	Course	Al te rn at ive		

Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Advanced aquatic biogeochemistry	EC G S- 011	5 cr	Course	Al te rn at ive		
Ecosystems and climate change	EC G S- 601	5 cr	Course	Al te rn at ive		
Forest ecosystem biogeochemistry	FO R- 228	5 cr	Course	Al te rn at ive		
Forest ecosystem hydrology and water balance	FO R- 229	5 cr	Course	Al te rn at ive		
Forest and peatlands as modifiers of atmospheric composition	FO R- 217	5 cr	Course	Al te rn at ive		
Mitigation of Climate Change in Forestry	FO R- 215	5 cr	Course	Al te rn at ive		
Forest production, growth and yield	FO R- 212	5 cr	Course	Al te rn at ive		
Soils and climate change	FO R- 013	4 cr	Course	Al te rn at ive		
Simulations of forest growth with ecological models	FO R- 214	5 cr	Course	Al te rn at ive		
Special course in Biogeochemical cycles	AT M4 12 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive		
Biometeorology			Course package	Al te rn at ive		
Theory of micrometeorological flux measurements	AT M3 31	5 cr	Course	Al te rn at ive		530040 Mikrometeorologisten vuonmittausmenetelmien teoriat
Field course in micrometeorology and hydrology	AT M3 21	5 cr	Course	Al te rn at ive		
Global biogeochemical cycles	AT M3 28	5 cr	Course	Al te rn at ive		

Terrestrial water, carbon and nitrogen cycles	AT M3 32	5 cr	Course	Al te rn at ive		53693 Veden, hiilen ja typen kierto maa-alueilla
Eddy covariance intensive course	AT M3 59	5 cr	Course	Al te rn at ive		
Turbulence Theory	AT M3 33	5 cr	Course	Al te rn at ive		535041 Turbulenssioppi
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Data Science			Course package	Al te rn at ive		
Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive		
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		
Introduction to machine learning	DA TA 11 002	5 cr	Course	Al te rn at ive		
Advanced course in machine learning	D AT A1 20 01	5 cr	Course	Al te rn at ive		
Special course in Data Science	AT M4 17 (1-99)		Course	Al te rn at ive		
<b>Study track in Geophysics of the hydrosphere</b>						
Geophysics of the hydrosphere, Advanced Studies	AT M3 003	9 5 - 1 2 0 cr	Study module	Al te rn at ive		
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure	

<b>Compulsory course package</b>				C o m p u l s o r y		
Theories and Methods in geophysics of the hydrosphere		m i n . 2 0 c r	Course package	C o m p u l s o r y	Complete at least 20 cr of the courses in this course package	
Measurement Methods in Hydrospheric Geophysics	AT M3 34	5 c r	Course	C o m p u l s o r y		53536 Vesivaipan mittausmenetelmät
Geophysics of Snow and Ice	AT M3 35	5 c r	Course	C o m p u l s o r y		53568 Lumen ja jään geofysiikka
Turbulence Theory	AT M3 33	5 c r	Course	C o m p u l s o r y		
Time Series Analysis in Geosciences	AT M3 10	5 c r	Course	C o m p u l s o r y		
Advanced aquatic biogeochemistry	EC G S- 011	5 c r	Course	A l t e r n a t i v e		
Dimension analysis	AT M3 65	5 c r	Course	A l t e r n a t i v e		
Geoinformatics 1	M E- 204	5 c r	Course	A l t e r n a t i v e	Complete either this or ME-203	
Geoinformatiikka 1	M E- 203	5 c r	Course	A l t e r n a t i v e	Complete either this or ME-204	
Spatial Modelling and Bayesian Inference	M A S T3 20 05	5 c r	Course	A l t e r n a t i v e		
<b>Optional course packages</b>		m i n . 3 0 c r			Complete at least 25 cr, including one course package with at least 15 cr	



Physical oceanography			Course package	Al te rn at ive		
Dynamic Oceanography	A T M3 36	5 cr	Course	Al te rn at ive		53545 Dynaaminen oseanografia
Descriptive Oceanography	AT M3 37	5 cr	Course	Al te rn at ive		53528 Deskriptiivinen oseanografia
Surface Water Waves	AT M3 38	5 cr	Course	Al te rn at ive		53548 Veden pinta-aallot
Oceanography of the Baltic Sea	AT M3 39	5 cr	Course	Al te rn at ive		53540 Itämeren oseanografia I
Coastal Oceanography	AT M3 40	5 cr	Course	Al te rn at ive		53505 Rannikko- oseanografia
Polar Oceanography	AT M3 67	5 cr	Course	Al te rn at ive		
Cryology			Course package	Al te rn at ive		
Sea ice geophysics	AT M3 41	5 cr	Course	Al te rn at ive		53500 Merijään geofysiikka
Frozen Ground	AT M3 42	5 cr	Course	Al te rn at ive		535044 Routa
Glaciology	A T M3 43	5 cr	Course	Al te rn at ive		535008 Glasiologia
Continuum theory applications in snow and ice research	AT M3 63	5 cr	Course	Al te rn at ive		535039 Continuum theory applications in snow and ice research
Hydrology			Course package	Al te rn at ive		
Quantitative hydrogeology and flow modeling	G E O M- H2 012	5 cr	Course	Al te rn at ive		54072 Geohydrologia

Global Hydrology	AT M3 44	5 cr	Course	Al te rn at ive		53574 Globaali hydrologia
Physics of lakes and rivers	AT M3 46	5 cr	Course	Al te rn at ive		
Field Course in Micrometeorology and Hydrology	AT M3 21	5 cr	Course	Al te rn at ive		53641 Mikrometeorologian ja hydrologian kenttäkurssi
Special course in Geophysics of the hydrosphere	AT M4 13 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive		
Data analysis			Course package	Al te rn at ive		
Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive		
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		
Special course in Data Science	AT M4 17 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive		
<b>Study track in Atmospheric chemistry and analysis</b>						
Atmospheric chemistry and analysis, Advanced studies	AT M3 004	9 5 - 1 2 0 cr	Study module	Al te rn at ive		
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure	
<b>Compulsory course packages</b>		m i n . 5 0 cr			Complete at least 50 cr	

<i>Atmospheric chemistry and analysis</i>		10 cr	Course package	C o m p u l s o r y	Complete all 10 cr	
Chemicals and legislation	KE M4 11	5 cr	Course	C o m p u l s o r y		
Basics of atmospheric chemistry	AT M3 06	5 cr	Course	C o m p u l s o r y		
<i>Environmental analysis</i>		min - 20 cr	Course package	C o m p u l s o r y	Complete at least 20 cr	
Sampling and sample preparation	KE M3 32	5 cr	Course	A l t e r n a t i v e		
Mass spectrometry in atmospheric sciences and environmental analysis	A T M3 20	5 cr	Course	A l t e r n a t i v e		55244
Separation techniques (GC and LC)	KE M3 31	5 cr	Course	A l t e r n a t i v e		
Portable analytical instruments and sensors	KE M3 35	5 cr	Course	A l t e r n a t i v e		
Analytical chemistry laboratory works	KE M3 33	5 cr	Course	A l t e r n a t i v e		
<i>Chemical reactions in atmosphere</i>		min - 20 cr	Course package	C o m p u l s o r y	Complete at least 20 cr	
Reaction Kinetics	KE M3 44	5 cr	Course	A l t e r n a t i v e		
Spectroscopy	KE M3 43	5 cr	Course	A l t e r n a t i v e		
Atmospheric and aerosol chemistry	AT M3 07	5 cr	Course	A l t e r n a t i v e		

Atmospheric photochemistry and reaction kinetics	AT M3 58	5 cr	Course	Al te rn at ive	
Experimental methods in molecular science 2	KE M3 66	5 cr	Course	Al te rn at ive	
Special courses in Atmospheric Chemistry and Analysis	AT M4 14 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive	
<b>Optional course package</b>					
Data Science			Course package	Al te rn at ive	
Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive	
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive	
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive	
Introduction to machine learning	DA TA 12 002	5 cr	Course	Al te rn at ive	
Advanced course in machine learning	DA TA 12 001	5 cr	Course	Al te rn at ive	
Special course in Data Science	AT M4 17 (1- 99)		Course	Al te rn at ive	
<b>Study track in Remote sensing</b>					
Remote Sensing, Advanced Studies	A T M3 005	9 5 - 1 2 0 cr	Study module	Al te rn at ive	
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure

<b>Compulsory course package</b>				C o m p u l s o r y		
Mathematical and computational methods in remote sensing		m i n . 1 0 c r	Course package	C o m p u l s o r y	Complete at least 10 cr	
Atmospheric Radiation	AT M3 57	5 c r	Course	C o m p u l s o r y		53624 Fysikaalinen meteorologia
Geoinformatics I	M E- 204	5 c r	Course	C o m p u l s o r y		
Spatial Modelling and Bayesian Inference	M AS T3 20 05	5 c r	Course	A l t e r n a t i v e		
<b>Optional course packages</b>					Complete at least 40 cr of individual courses from the following course packages	
<i>Observation systems and methods</i>			Course package	A l t e r n a t i v e		
Meteorological observation systems	AT M3 22	5 c r	Course	A l t e r n a t i v e		
Advanced Course in Radar Meteorology	AT M3 23	5 c r	Course	A l t e r n a t i v e		
Laboratory Course in Radar Meteorology	AT M3 24	5 c r	Course	A l t e r n a t i v e		
<i>Remote sensing of the atmosphere and hydrosphere</i>			Course package	A l t e r n a t i v e		
Satellite Remote Sensing Methods in Aerosols Science	AT M3 25	5 c r	Course	A l t e r n a t i v e		
Time Series Analysis in Geosciences	AT M3 10	5 c r	Course	A l t e r n a t i v e		

Introduction to light scattering	PA P3 14	5 cr	Course	Al te rn at ive		
<i>Remote sensing of the biosphere and land use</i>			Course package	Al te rn at ive		
Remote sensing 1	G E O G- G3 02	5 cr	Course	Al te rn at ive		
Remote sensing 2	G E O G- 322	5 cr	Course	Al te rn at ive		
Imaging spectroscopy	G E O G- 324	5 cr	Course	Al te rn at ive		
Geoinformatiikka 2	M E- 230	5 cr	Course	Al te rn at ive		
Open GIS and spatial data structures	M E- 231	5 cr	Course	Al te rn at ive		
Remote sensing 1	M E- 232	5 cr	Course	Al te rn at ive		
Basic in object-oriented programming in forest sciences	M E- 234	5 cr	Course	Al te rn at ive		
GIS analysis and modelling	FO R- 258	5 cr	Course	Al te rn at ive		
GIS and RS in environmental and land use applications	FO R- 259	5 cr	Course	Al te rn at ive		
Advanced course in remote sensing (Metsien kaukokartoituksen jatkokurssi)	FO R- 260	5 cr	Course	Al te rn at ive		
Special course in Remote sensing	AT M4 15 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive		
Data Science			Course package	Al te rn at ive		

Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive		
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		
Introduction to machine learning	DA TA 12 002	5 cr	Course	Al te rn at ive		
Advanced course in machine learning	DA TA 12 001	5 cr	Course	Al te rn at ive		
Special course in Data Science	AT M4 17 (1-99)		Course	Al te rn at ive		
<b>Study track in Meteorology</b>						
Meteorology, Advanced Studies	AT M3 006	9 5 - 1 2 0 cr	Study module	Al te rn at ive		
Compulsory courses for all study tracks		4 5 - 5 0 cr		C o m p u l s o r y	Courses listed in the beginning of the degree structure	
<b>Compulsory course packages</b>		5 0 cr			Complete 50 cr from the following two course packages	
<i>Dynamic meteorology I</i>		2 5 cr	Course package	C o m p u l s o r y	Complete all 25 cr	
Boundary Layer Physics I	AT M3 47	5 cr	Course	C o m p u l s o r y		53646 Rajakerroksen fysiikka I
Dynamics of Atmospheric Flow Structures I	AT M3 48	5 cr	Course	C o m p u l s o r y		53605 Ilmakehän virtausrakenteiden dynamiikka

Dynamics of Atmospheric Flow Structures II	AT M3 49	5 cr	Course	C o m p u l s o r y		53605 Ilmakehän virtausrakenteiden dynamiikka
Mesometeorology	A T M3 51	5 cr	Course	C o m p u l s o r y		53632 Mesometeorologia
Synoptic meteorology I	AT M3 52	5 cr	Course	C o m p u l s o r y		53606 Synoptinen meteorologia I
<i>Dynamic meteorology II</i>		2 5 cr	<i>Course package</i>	C o m p u l s o r y	<i>Complete all 25 cr</i>	
Atmospheric Radiation	AT M3 57	5 cr	Course	C o m p u l s o r y		
Cloud Physics	AT M3 54	5 cr	Course	C o m p u l s o r y		53634 Pilvifysiikka
Numerical meteorology I	AT M3 15	5 cr	Course	C o m p u l s o r y		
Meteorological observation systems	AT M3 22	5 cr	Course	C o m p u l s o r y		
Atmospheric General Circulation I	AT M3 55	5 cr	Course	C o m p u l s o r y		53648 Ilmakehän yleinen kiertoliike I
<b>Optional course packages</b>						
<i>Dynamic Meteorology III</i>		<i>m i n . 5 cr</i>	<i>Course package</i>	<i>A l t e r n a t i v e</i>		
Numerical Meteorology II	AT M3 16	5 cr	Course	A l t e r n a t i v e		



Laboratory Course in Numerical Meteorology	AT M3 17	5 cr	Course	Al te rn at ive		
Convective Weather Systems and Climate	AT M3 56	5 cr	Course	Al te rn at ive		53672 Konvektiiviset sääjärjestelmät ja ilmasto
Synoptic meteorology II	AT M3 53	5 cr	Course	Al te rn at ive		53607 Synoptinen meteorologia II
Kasvihuoneilmiö, ilmastomuutos ja vaikutukset	FY S2 074	5 cr	Course	Al te rn at ive	can substitute the ATM302 Climate.now	
Basics of atmospheric chemistry	AT M3 06	5 cr	Course	Al te rn at ive		
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		
Stratospheric Dynamics and Chemistry	AT M3 62	5 cr	Course	Al te rn at ive		53673 Stratosfäärin dynamiikka ja kemia
Laboratory Course in Synoptic Meteorology	AT M3 64	5 cr	Course	Al te rn at ive		53656 Synoptiikan laboratorioskursi
<i>Meteorological remote sensing</i>		<i>m in . 5 cr</i>	<i>Course package</i>	<i>Al te rn at ive</i>		
Advanced Course in Radar Meteorology	AT M3 23	5 cr	Course	Al te rn at ive		
Laboratory Course in Radar Meteorology	AT M3 24	5 cr	Course	Al te rn at ive		
Electromagnetic scattering and absorption	PA P3 14	5 cr	Course	Al te rn at ive		
Statistical Inverse Methods	PA P3 03	5 cr	Course	Al te rn at ive		
Satellite Remote Sensing Methods in Aerosols Science	AT M3 25	5 cr	Course	Al te rn at ive		

<i>Biometeorology</i>		<i>m in - 1 0 cr</i>	<i>Course package</i>	<i>Al te rn at ive</i>		
Theory of micrometeorological flux measurements	AT M3 31	5 cr	Course	Al te rn at ive		
Field course in micrometeorology and hydrology	AT M3 21	5 cr	Course	Al te rn at ive		
Global biogeochemical cycles	AT M3 28	5 cr	Course	Al te rn at ive		
Terrestrial water, carbon and nitrogen cycles	AT M3 32	5 cr	Course	Al te rn at ive		
Eddy covariance intensive course	AT M3 59	5 cr	Course	Al te rn at ive		
Turbulence Theory	AT M3 33	5 cr	Course	Al te rn at ive		
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Special course in Meteorology	AT M4 16 (1- 99)	5 - 1 0 cr	Course	Al te rn at ive		
<i>Data Science</i>			<i>Course package</i>	<i>Al te rn at ive</i>		
Statistical tools for climate and atmospheric science	AT M3 08	5 cr	Course	Al te rn at ive		
Analysis of atmosphere-surface interactions and feedbacks	AT M3 09	5 cr	Course	Al te rn at ive		
Time Series Analysis in Geosciences	AT M3 10	5 cr	Course	Al te rn at ive		
Introduction to machine learning	DA TA 12 002	5 cr	Course	Al te rn at ive		

Advanced course in machine learning	DA TA 12 001	5 cr	Course	Al te rn at ive		
Special course in Data Science	AT M4 17 (1- 99)		Course	Al te rn at ive		
<b>Other studies</b>	AT M4 00	0 - 2 5 cr	Study module	O p t i o n al		
<b>Working life skills and expertise</b>				O p t i o n al		
Career planning		0 cr	Integrated to ATM303 Project course in atmospheric sciences	C o m p u l s o r y		
Practical training	AT M4 01	5 cr	Course	O p t i o n al		
Courses supporting scientific knowledge	AT M4 02 (A- E)	0 - 2 5 cr	Course	O p t i o n al		
<b>Internationalization period - Mobility window</b>				O p t i o n al	Studies completed during the international period will be transferred to the advanced studies or to other studies depending on their content. They can be transferred as a study module or individual courses.	
Study module completed in a foreign university	AT M4 50	1 5 - 2 5 cr	Study module	O p t i o n al		
Course completed in another university	AT M4 03	1 - 1 0 cr	Course	O p t i o n al		
<b>(Parts integrated to other courses)</b>						
Personal Study Plan (PSP)		0 cr	Integrated to ATM301 Atmospheric and Earth Sciences Today	C o m p u l s o r y		
University's own student feedback		0 cr		C o m p u l s o r y		

<b>Optional studies</b>		0 - 2 5 cr		Optional		
Freely chosen study modules		0 - 2 5 cr	Study module	Optional		
Climate University	AT M3 91	0 - 2 5 cr	Study module	Optional		
Freely chosen courses		0 - 2 5 cr	Courses	Optional		
Academic Writing for Students in English-Medium Master's Degree Programmes 1	99 37 34	2 cr	Course	Optional		
Academic Writing for Students in English-Medium Master's Degree Programmes 2	99 37 34	2 cr	Course	Optional		
Finnish 1A	FIN N-111	3 cr	Course	Optional		
Finnish 1B	FIN N-112	3 cr	Course	Optional		
Courses supporting scientific knowledge	AT M4 02 (A-E)	0 - 2 5 cr	Course	Optional		
<b>Other studies in Atmospheric sciences</b>					Complete the courses below if needed and if they (or similar contents) aren't included in your Bachelor's degree.	
Basics of thermophysics	FY S2 001	5 cr	Course	Alternative	Must be completed if you choose Aerosols Physics study track and if the course of similar content isn't included in your previous degree	
Thermodynamic potentials	FY S2 002	5 cr	Course	Alternative	Must be completed if you choose Aerosols Physics study track and if the course of similar content isn't included in your previous degree	
Aerosol physics I	FY S2 071	5 cr	Course	Alternative	Must be completed if you choose Aerosols Physics study track and if the course of similar content isn't included in your previous degree	53051 Aerosolfysiikka I
Fluid Phenomena	FY S2 073	5 cr	Course	Alternative	Must be completed if you choose Geophysics of the Hydrosphere study track and if the course of similar content isn't included in your previous degree	53697 Virtausilmiöt
Introduction to Meteorology and Weather Observations	FY S2 031	5 cr	Course	Alternative	Must be completed if you choose Meteorology study track and if the course of similar content isn't included in your previous degree	

Atmospheric Thermodynamics	FY S2 032	5 cr	Course	Al te rn at ive	Must be completed if you choose Meteorology study track and if the course of similar content isn't included in your previous degree	
Introduction to Atmospheric Flow Dynamics	FY S2 033	1 0 cr	Course	Al te rn at ive	Must be completed if you choose Meteorology study track and if the course of similar content isn't included in your previous degree	
Basic Course in Oceanography	FY S2 075	5 cr	Course	Al te rn at ive	Must be completed if you choose Geophysics of the Hydrosphere study track and if the course of similar content isn't included in your previous degree	53541 Meritietaen peruskurssi
Basic Course in Hydrology	FY S2 076	5 cr	Course	Al te rn at ive	Must be completed if you choose Geophysics of the Hydrosphere study track and if the course of similar content isn't included in your previous degree	53531 Hydrologian peruskurssi
Klimatologian perusteet	FY S2 034	2 cr	Course	Al te rn at ive	Must be completed if you choose Meteorology study track and if the course of similar content isn't included in your previous degree	
Fysikaalinen klimatologia	FY S2 035	3 cr	Course	Al te rn at ive	Must be completed if you choose Meteorology study track and if the course of similar content isn't included in your previous degree	
Transport Phenomena	FY S2 072	5 cr	Course	Al te rn at ive		53108 Siirtoilmöt I
Computational Chemistry	KE K2 22	5 cr	Course	Al te rn at ive		
<b>Study Modules offered to students from other degree programmes</b>						
Atmospheric Sciences, Study module, min. 15 cr	AT M3 90	m in . 1 5 cr	Study module		Choose 15, 25 or 35 cr of courses of Master's Programme in Atmospheric Sciences	
Climate University, Study module, min. 15 cr	AT M3 91	m in . 1 5 cr	Study module		Choose 15, 25 or 35 cr of courses of the study module	
Micro-credentials in Sustainability, Study module	AT M3 93	1 0 cr	Study module			
Sustainable.now	AT M3 85	2 cr	Course	C o m p u l s o r y		

Climate.now	AT M3 86	2 cr	Course	C o m p u l s o r y	
Biodiversity.now	xx xx xxx	2 cr	Course	C o m p u l s o r y	
Political Economy of Sustainability	AT M3 87	2 cr	Course	C o m p u l s o r y	Organized by Jagellonian University
Sustainability and the Arts	AT M3 88	2 cr	Course	C o m p u l s o r y	Organized by University of Bologna