

Appendix: Curriculum for Double Degree Agreement between Wuhan University (WHU) and the Technische Universität München (TUM)

Wuhan University Master's program:

- Schools of Resources and Environmental Science
- School of Geodesy and Geomatics
- School of Remote Sensing and Information Engineering
- State Key Lab of Information Engineering in Surveying, Mapping and Remote Sensing
- GNSS Research Center

Technische Universität München Master's program

- Chair of Astronomical and Physical Geodesy
- Chair of Geodetic Geodynamics
- Chair of Satellite Geodesy
- Chair of Photogrammetry & Remote Sensing
- Chair of Cartography
- Chair of Remote Sensing Technology

As explained in the Agreement on the Double Master's program between the Technische Universität München and Wuhan University, the double degree Master's program is comprised of six semesters over three years. The students should spend the first year at their home university. At least one year of studies should be spent at the host university.

For the double degree Master's program, three different curricula are scheduled. **Two curricula (Curriculum 1a and Curriculum 1b)** are intended for WHU students going to the TUM. **One curriculum (Curriculum 2)** is intended for TUM students going to WHU.

Curriculum 1a		Curriculum 1b		Curriculum 2	
3rd year	Co-supervised Master's Thesis	3rd year	Co-supervised Master's Thesis	3rd year	Co-supervised Master's Thesis
	TUM		WHU		TUM
2nd year	TUM	2nd year	TUM	2nd year	WHU
	WHU		WHU		TUM
1st year	WHU	1st year	WHU	1st year	TUM

Fig. 1) Curricula 1a and 1b: for WHU students going to the TUM
Curriculum 2: for TUM students going to WHU

General information regarding both universities

Study year:

Study year at WHU starts in the summer term:

Summer term: first half of-September- end of January

Winter term: second half of February – end of June

Vacation between the terms starts in July and lasts two months.

Study year at TUM starts in the winter term:

Winter term (lectures and exams): first half of-October – beginning of March

Summer term (lectures and exams): first half of-April – mid-August

Credits:

WHU: To obtain a Master's degree, the students are required to earn 42 credits in the Wuhan University Credit System (of which at least 30 are for degree courses and 2 are for professional practice, 10 are for Master's Thesis). Further, an academic paper must be publicly released, a written thesis must be submitted and be defended in a colloquium. At WHU, there is no fixed amount of credits that needs to be obtained for each semester. If the students select more courses, they can earn more credits. One credit in the Wuhan University Credits System corresponds to 18 hours of classes.

Participation in scientific research tasks or an engineering program is a characteristic feature of graduate education at WHU. Practical and teamwork skills are built and developed through hands-on experiences. Students are required to apply classroom knowledge and theories through literature reviews, system design, coding, testing, documentation and technical report writing, even in the management of technology and people. That is an important part of graduate student life at WHU, enrichment beyond classroom credits

TUM: Full-time study at the TUM is equivalent to 30 credits in the European Credits Transfer System (ECTS) per semester (one year equals 60 credits). To obtain a Master's degree, students are required to earn 120 ECTS credits. Of this, 90 credits have to be obtained from courses. Further, students are awarded 30 credits for submitting a written thesis and defending it in a colloquium. The amount of ECTS credits awarded for a single course corresponds to the workload of the students. Thereby 1 credit means a workload of 15 hours. Workload time consists of the time spent in lectures, self-study time during the term and before the exams, and time spent working on a project or a lab. The total workload of a student is 40 hours per week. One semester is equivalent to 22.5 weeks.

The scaling factor is 0.5 for the conversion of Wuhan University Credits System into the ECTS, that is:

1 WHU credit	=	2 ECTS credits
1 ECTS credit	=	0.5 WHU credits

Grading scale:

TUM grades are awarded on a scale from 1.0 (best) to 5.0 (worst). Grades for individual exams are given in the increments 1.0, 1.3, 1.7, 2.0... 4.7, 5.0.

WHU has two grading systems. Most courses are graded A, B, ..., F. A few courses are graded P(Pass) or F(Failure).

The grading scale is expressed as follows:

WHU	TUM	Definition
A (90-100)	1.0, 1.3	Very Good
B (80-89)	1.7, 2.0, 2.3	Good
C (70-79)	2.7, 3.0, 3.3	Satisfactory
D (60-69)	3.7, 4.0	Sufficient
F (0-59)	4.3, 4.7, 5.0	Fail

Study fees:

As stated in the “Agreement concerning the extension of the Agreement on double Master’s program in ESPACE between Technische Universität München and Wuhan University, P.R. China”, no study fees will be charged by the host university. Tuition fees at the home university are to be paid according to the regulations of the home university.

However, TUM charges obligatory administrative fees (“semester contribution”) from every student, also exchange students. From winter term 2015/16, the “semester contribution” will be 113,-€ per semester (52,-€ student union and 61,-€ “Semesterticket”). This amount is not a university fee, but is paid to a national student organization (http://www.studentenwerk-muenchen.de/en/?no_cache=1). This fee includes i.a.:

- an extendable ticket for public transportation in evening and at the weekend (<http://www.tum.de/en/studies/semester-ticket/>)
- access to meals
- housing discounts

Curriculum 1a and Curriculum 1b for WHU students going to the TUM

	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
1st Semester (Wuhan University)		
Theory and Practice of Socialism with Chinese Characteristics	2	
Dialectics of Nature	1	
First Foreign Language	2	
Research Methodology and Scientific Writing	3	
Principles of GNSS	2	
Practice in Research Project I	6	
Total:	16	
2nd Semester (Wuhan University)		
German as Second Language	2	
Spatial Statistics & Analysis	2	
Generalized Adjustment	2	
Signal Processing and Analysis	2	
Practice in Research Project II	6	
Total:	14	
3rd Semester (Technische Universität München)		
Introduction to Earth System Science		6
Numerical Modeling Coursework Numerical Modeling		6
Introduction to Photogrammetry, Remote Sensing and Image Processing		6
Signal Processing and Microwave Remote Sensing		5
Applied Computer Science		3
Orbit Mechanics Coursework Orbit Mechanics		4
Total amount of ECTS – 3rd semester:		30
4th Semester (Technische Universität München)		
Projects in Earth Oriented Space Science and Technology		8
Applied Earth Observation and Mission Engineering		6
Satellite Navigation and Advanced Orbit Mechanics		6
Estimation Theory		3
On-Orbit Dynamics and Robotics		3
Introduction to Spacecraft Technology (<i>only for students spending the 5th semester at Wuhan University</i>)		4
Spacecraft Technology (<i>only for students spending the 5th semester at Technische Universität München</i>)		8 (4 th semester: 4 ECTS 5 th Semester: 4 ECTS)
Total amount of ECTS – 4th semester:		30

5th semester – optionally at TUM (Curriculum 1a) or at WHU (Curriculum 1b)

Curriculum 1a: WHU students studying 5th semester at TUM	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
<p>The third semester consists of required and elective modules. Required: Each student has to choose one of the three specializations <i>Earth System Science from Space</i>, <i>Remote Sensing</i>, or <i>Navigation</i> (18 credits). Electives: 8 credits worth of electives should be taken. A subject catalog will be announced at the beginning of the semester at the latest.</p>		
Specialization (Earth System Science from Space)		
Atmosphere and Ocean		6
Earth System Dynamics		6
Earth Observation Satellites		6
Specialization (Remote Sensing)		
Photogrammetry		6
Remote Sensing		6
Geo-Information		6
Specialization (Navigation)		
Precise GNSS		6
Advanced Aspects of Navigation Technology		6
Navigation Labs		6
Total amount of ECTS – 5th semester:		30

Curriculum 1b: WHU students studying 5th semester at WHU	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
<p>Students do need not to do any specific course, but are required to finish thesis proposal, to attend seminars and to do project R&D in one of the three specializations of Remote Sensing, Geospatial Information System and Geodesy</p>		
Specialization offered by Wuhan University:		
Thesis proposal (literature review and plan)	-	8
Attending at least 10 academic seminars or workshops	-	5
Project algorithm design and coding , experimental analysis	-	17
Total:		30

6th semester: Master's Thesis at one of the Universities according to the student's choice.	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
Master's Thesis	-	24
Master's Colloquium	-	6
Total	-	30

Curriculum 2 for TUM students going to WHU

	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
1st Semester (TUM)		
Introduction to Earth System Science		6
Numerical Modeling Coursework Numerical Modeling		6
Introduction to Photogrammetry, Remote Sensing and Image Processing		6
Signal Processing and Microwave Remote Sensing		5
Applied Computer Science		3
Orbit Mechanics Coursework Orbit Mechanics		4
Total amount of ECTS – 1st semester:		30
2nd Semester (TUM)		
Projects in Earth Oriented Space Science and Technology		8
Applied Earth Observation and Mission Engineering		6
Satellite Navigation and Advanced Orbit Mechanics		6
Estimation Theory		3
On-Orbit Dynamics and Robotics		3
Spacecraft Technology		8 (2 nd semester: 4 ECTS 5 th Semester: 4 ECTS)
Total amount of ECTS – 2nd semester:		30
3rd Semester (WHU)		
Comprehensive Chinese	2	4
Outline of China	3	6
Research Methodology and Scientific Writing	3	6
Principles of GIS	2	4
Practice in Research Project I	6	12
Total:		32
4th Semester (WHU)		
Generalized Adjustment	2	4
Digital Terrain Surface Simulation & its Methods	2	4
Hyperspectral Remote Sensing	2	4
Spatial Statistics & Analysis	2	4
Practice in Research Project II	6	12
Total:		28

5th semester (TUM) Students need to do 6 credits of required courses and 24 credits of elective courses.	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
<p>The third semester consists of required and elective modules. Required: Each student has to choose one of the three specializations <i>Earth System Science from Space</i>, <i>Remote Sensing</i>, or <i>Navigation</i> (18 credits). Electives: 8 credits worth of electives should be taken. A subject catalog will be announced at the beginning of the semester at the latest.</p>		
Specialization (Earth System Science from Space)		

Atmosphere and Ocean		6
Earth System Dynamics		6
Earth Observation Satellites		6
Specialization (Navigation)		
Precise GNSS		6
Advanced Aspects of Navigation Technology		6
Navigation Labs		6
Specialization (Remote Sensing)		
Photogrammetry		6
Remote Sensing		6
Geo-Information		6
Total amount of ECTS – 5th semester:		30

6th semester:	Wuhan University Credits System	ECTS Credits (European Credits Transfer System)
Master's Thesis at one of the Universities according to the student's choice.		
Master's Thesis	-	24
Master's Colloquium	-	6
Total	-	30

Master's Thesis

- (1) The Master's Thesis is co-supervised by one teacher from WHU and one teacher from the TUM.
- (2) Both supervisors, at TUM and at WHU, are experts in the field of the thesis. The supervisors are selected at the beginning of the thesis work.
- (3) A status report written in English must be submitted to both co-supervisors after three months. The status report must provide a summary of the work that has already been done and give an outlook on the anticipated outcome together with a schedule for the time until submission.
- (4) The Master's Thesis must be written in English.
- (5) The final grade is averaged from the individual grades of both supervisors.
- (6) The Master's Thesis must be defended in a Master's Colloquium at one of the universities.