

Addendum B
to the
2020 1+1 Dual Degree Graduate Program Agreement
between Western Michigan University and Instituto Superior Técnico

Double Degree
Master in Aerospace Engineering (IST)/Master of Science Aerospace Engineering (WMU)
(to start in 2021/2022)

Program proposal – November 25th, 2020

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Note:

- (1) In this document 1 WMU credit is considered equivalent to 2 ECTS (European Credit Transfer and Accumulation System).
- (2) For a student to enroll in the DD MSAE program, a plan of study should be developed by the graduate program advisor of the student's home institution and approved by the graduate program advisors at WMU and at IST. The plan of study should include courses to be taken by the student and the student's thesis research plan with the consents of the thesis co-advisors at IST and at WMU. Any changes to the DD MSAE plan of study must be submitted in writing and approved by the graduate program advisors at WMU and at IST.

1 – Application and entrance admission criteria

At WMU:

- **Applications**
Prospective WMU undergraduate students in aerospace engineering (AE) who meet the eligibility requirements (see Admission Requirements) must set up a meeting with the AE undergraduate advisor and the AE graduate advisor. Before admission to the DD MSAE program can be finalized, students must submit the standard application for admission to the Office of Admissions/Graduate Admissions.
- **Admission Requirements**
 1. Meet Graduate College admission requirements.
 2. Students must have completed a minimum of 80 and a maximum of 96 credit hours in their undergraduate programs, including credits earned from advanced placement.
 3. Transfer students must have completed a minimum of 30 credit hours as a full-time student at WMU.
 4. Students must have a minimum accumulated grade point average (GPA) of 3.5/4.0 at WMU.
- **Participation and Graduation Requirements**
 1. It is the responsibility of the student to recognize his/her eligibility status.

2. Students must complete the bachelor's degree in aerospace engineering in the 1st year. Students in the DD MSAE program may not elect to by-pass the bachelor's degree.
3. A student completing the bachelor's degree requirements with an accumulated GPA of less than 3.25/4.0 is no longer eligible to count the 5000-level credit hours specified in the plan of study toward the master's degree and is automatically terminated from the DD MSAE program.
4. Students will only be allowed to count a maximum of nine 5000-level credits taken during their undergraduate studies toward their master's degree.
5. Students must receive a grade of "B" (3.0/4.0) or better in the 5000-level courses taken during their undergraduate studies. Courses with a grade of "CB" or below cannot be counted toward their master's degree.
6. A minimum of six hours must be mathematics oriented.
7. Students are required to complete a minimum of 30 credits hours.
8. Students must complete the master's degree within 24 months from the completion of the bachelor's degree. If the DD MSAE program is not completed within these time limits, none of the 5000-level courses specified in the plan of study and used to meet the requirements of the undergraduate degree can be counted toward the master's degree.
9. A student who does not follow the approved plan of study may become ineligible to participate in the DD MSAE.
10. A student who becomes ineligible to participate in the DD MSAE, must be informed by the graduate advisor in writing of his/her ineligibility. A copy of this letter to the student must be sent to the Graduate College.
11. A student who is ineligible to participate in (or withdraws from) the DD MSAE cannot count any of the courses specified in the plan of study for both bachelor's and master's degrees. These courses, however, may be counted toward the student's bachelor's degree upon the discretion of the undergraduate advisor.
12. A student may withdraw from the DD MSAE program at any time by informing the advisor of undergraduate programs and the graduate advisor in writing. A copy of this request to withdraw must be sent to the Graduate College for approval.

At IST:

- Application requirements

Students should hold or be enrolled in a BSc degree/1st cycle degree in Aerospace Engineering, or other BSc degree/1st cycle degree which fulfills the admission requirements to the Master degree/2nd cycle in Aerospace Engineering at IST (MEAer). The student's overall grade should be greater than or equal to 15 out of 20. A list with the ranking of the students that meet the requirements will be published following the order of the possible admission.

- Admission requirements

The students are subject to an eliminatory interview, by IST and WMU representatives. The double degree is only formalized if the students are accepted in MEAer and approved in the interview. The candidates must demonstrate an excellent command of spoken and written English.

2 – Nominations and applications

For students from WMU to IST the nomination and complete application documents must be sent to IST by April 15th of the previous academic year.

For students from IST to WMU the nomination and complete application documents must be sent to WMU by March 15th of the previous academic year.

3 – Academic year start

At WMU: Early September

At IST: September – October

4 – Curricular plan

There are two curricular options:

(1) 1st year at IST and 2nd year at WMU;

(2) 1st year at WMU and 2nd year at IST.

The detailed curricular options are presented in the following tables.

(1) 1st year at IST and 2nd year at WMU

	1 st Semester						2 nd Semester						Summer I or II			
	1 st Quarter			2 nd Quarter			3 rd Quarter			4 th Quarter						
	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred				
1st year @ IST	One of the four program required courses (1 st)	6	3	Sustainable Design and Manufacturing	6	3	One of the four program required courses (2 nd)	6	3	Optional	6	3				
	Aerodynamics Optional	6	3	Structures Optional	6	3	Aerodynamics Optional	6	3	Structures Optional	6	3				
	Aerospace Optional				6	3	Aerospace Optional				6	3				
	Course			ECTS	WMU Cred	Course			ECTS	WMU Cred	Course		ECTS	WMU Cred	Course	ECTS
2nd year @ WMU	One of the four program required courses (3 rd)				6	3	One of the four program required courses (4 th)				6	3	AE 7000 Master's Thesis	15	3	
	WMU MSAE Recommended or Approved Elective or Math oriented				6	3	WMU MSAE Recommended or Approved Elective or Math oriented				6	3				
	WMU MSAE Recommended or Approved Elective or Math oriented				6	3	AE 7000 Master's Thesis				15	3				



(2) 1st year at WMU and 2nd year at IST

	1 st Semester						2 nd Semester		
	1 st Quarter			2 nd Quarter					
	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred
1st year @ WMU (WMU BSE/MSE)	One of the four program required courses (1 st)			6	3		One of the four program required courses (2 nd)		
	Aerospace Elective (from among WMU MSAE elective courses)			6	3		AE 4690 Aircraft Design		
	AE 3710 Aerodynamics II			6	3		AE 4700 Orbital Mechanics		
	AE 4600 Aircraft Stability and Control			6	3		AE 4760 Aerospace Propulsion II		
	AE 4630 Aerospace Structural Design			6	3		AE 4800 Aerospace Engineering Project		
2nd year @ IST	Course	ECTS	WMU Cred	Course	ECTS	WMU Cred	Master's Dissertation	ECTS	WMU Cred
	One of the four program required courses (3 rd)	6	3	One of the four program required courses (4 th)	6	3		30	6
	IST Optional	6	3	Structures Optional	6	3			
	Aerospace Optional			6	3				

5 – Dissertation

The master's dissertation will be supervised by IST and WMU and evaluated by both parties after an oral defence.

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6 – Auxiliary data

DD MSAE Program Required Courses		
Courses @WMU	equivalence	Courses @IST
AE 5100 – Foundations of Structural Mechanics	==	Structural Mechanics
AE 5200 - Advanced Aerodynamics	==	Aerodynamics II
AE 5400 – Aerospace Vehicle Dynamics	==	Dynamics of Mechanical Systems
AE 6410 – Space Flight Dynamics and Control	==	Guidance, Navigation, and Control

7 – Auxiliary data (IST)

Aerospace Optional courses @IST	Aerodynamics Optional courses @IST	Recommended Optional courses @IST
Air Traffic Management	Thermodynamics II	Heat Transfer
Aircraft Emissions	Aerodynamics III	Propulsion
Aeroacoustics	Computational Fluid Mechanics	Maintenance, Quality and Safety
Helicopters	Turbulence in Fluids	Micro and Nano Mechanics
Aerospace Structures		Linear and Nonlinear State-Space Control Theory
Aeroelasticity	Structures Optional courses @IST	Control of Cyber-Physical Systems
Radar Systems	Computational Mechanics	Air Traffic Control Systems
Space Environment	Laminated Composite Materials	
New Configurations for Air Systems	Machine Components Design	
Aircraft Hybrid Propulsion Systems	Thin Structures	
Aircraft and Spacecraft Optimal Design		
Multivariable, Nonlinear and Optimal Control		
Guidance, Navigation and Control		
Space Launchers		
Unmanned Aerial Vehicles		

IST “Integrated” Masters Degree in Aerospace Engineering (MEAr)*

<https://fenix.tecnico.ulisboa.pt/cursos/meaer/curriculo>

*From the academic year of 2021/2022 on IST Integrated Masters will be split in 2 cycles.

8 – Auxiliary data (WMU)

Approved Elective courses @WMU (cont.)
ME 5450 - Computational Fluid Dynamics I
ME 6450 - Computational Fluid Dynamics II
ME 6300 - Advanced Fluid Dynamics
ME 6350 - Turbulence
ME 6090 - Combustion
ME 5410 - Continuous System Modeling and Simulation
ME 6330- Advanced Control Systems
ME 5600 - Engineering Analysis
ME 5620 - Application of Numerical Methods in Engineering

Recommended elective courses @WMU
AE 5760 - Advanced and Electric Propulsion Systems
AE 6710 - Molecular Gas Dynamics
AE 6200 – Biofluid Mechanics – From Earth to Space
AE 6400 - Atmospheric Flight Dynamics and Control
AE 6410 - Space Flight Dynamics and Control
ME 5610 - Finite Element Method
ME 6370 - Design Optimization
ME 6520 - Mechanics of Composite Materials
ME 6610 - Advanced Finite Elements

Mathematics oriented courses @WMU
ME 5600 – Engineering Analysis
ME5610 – Finite Element Method
ME5620 – Application of Numerical Methods in Engineering
ME 6370 - Design Optimization
ME 6610 – Advanced Finite Elements
ME 6330 – Advanced Control Systems

WMU undergraduate Aerospace Engineering

http://catalog.wmich.edu/preview_program.php?catoid=36&poid=11065&hl=%22aerospace+engineering%22&returnto=search

WMU “Traditional” Masters Degree in Aerospace Engineering (MSAE)

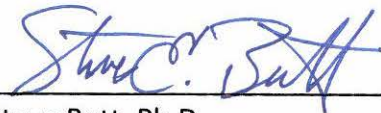
http://catalog.wmich.edu/preview_program.php?catoid=37&poid=11705&hl=aerospace+engineering&returnto=search

9 – Academic and administrative representatives

Academic responsible for the program at WMU Professor William Liou william.liou@wmich.edu	Academic responsible for the program at IST Professor Fernando Lau lau@tecnico.ulisboa.pt
Contact person: Cristine Thomas cristine.thomas@wmich.edu	Contact person: Luís Moreira, International Office luis.moreira@tecnico.ulisboa.pt

Authorized by:

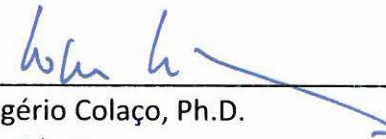
Western Michigan University



Steve Butt, Ph.D.
Dean, College of Engineering and Applied Sciences

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Rogério Colaço, Ph.D.
President

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