Data Science and AI for Competitive Manufacturing

Master Science programme

General. Basic information

Name & type	MSc Data Science and AI for Competitive Manufacturing
Mode & duration	full-time, 2 years Credits: 120 ECTS
Accreditation	EIT Label accreditation - November 2020
Annual Tuition fee	EU/EFTA students tuition fee: EUR 8000.00 per year NON EU/EFTA students tuition fee: EUR 15000.00 per year Students financial support is provided to a sub-set of enrolled students. No specific request is needed. Available financial support is: * based on merit

EIT Manufacturing Master School

'Join the force of Innovation in Manufacturing'

The **EIT Manufacturing Master School** offers two-year programmes that encompasses a year of intensive study at two different universities, where students acquire comprehensive knowledge and expertise in their chosen field.

Additionally, the **programme includes a three-week summer school** emphasizing a minor track in **Innovation & Entrepreneurship** held at a third university, enriching the learning experience further.

This initiative is a collaborative effort led by EIT Manufacturing, in association with **seven university partners**. Together, we have designed and implemented five diverse programmes that merge technical and technological coursework with specialized training in innovation and entrepreneurship. These programmes provide students with a multifaceted education that not only equips them with a strong academic foundation but also **fosters the development of practical skills** necessary for success in the dynamic and evolving landscape of manufacturing. The education at EITM Manufacturing Master School combines technical competencies with skills in Innovation and Entrepreneurship. EIT Manufacturing Master School students will be an elite group of forthcoming engineers, operators, innovators, and other relevant professionals.

Programme Overview

The **Data Science and AI for Competitive Manufacturing programme (DS)** is a **Master of Science level programme** within the EIT Manufacturing (EITM) Master School. The EITM Master School is a highly prestigious Manufacturing Engineering and Science education provider on advanced level with a focus on Innovation and Entrepreneurship (I&E). The education at EIT Manufacturing Master School combines technical competence with skills in Innovation and Entrepreneurship. EIT Manufacturing Master School students will be an elite group of forthcoming engineers, ICT experts, operators, innovators, and other relevant professionals.

The EIT Manufacturing Master School students will:

- improve their knowledge on up to date manufacturing innovation and learn how to turn this knowledge into successful business;
- take part in events such as Summer Schools and Kick-offs;
- exchange ideas with business partners and researchers at Co-Locations Centres (CLC) and during internships;
- have access to renowned European research facilities;
- earn double degree and the EIT Manufacturing Certificate.

Data Science and AI for Competitive Manufacturing is a combination of studying manufacturing science and Information and communication technology including the usage and adoption of advanced digital solutions and platforms. During the programme, students will gain new skills in these areas.

- Relevant fields of studies include modelling and simulation, virtual prototyping, service and system engineering, machine learning and data mining.
- Students learn the latest theoretical knowledge and know how to apply their skills in practical real-life problems. Typical application areas of Data Science and AI for competitive manufacturing: Cyber-physical systems (CPS), Information system management, digital monitoring, digital security.

Students will have a solid background with well-founded scientific knowledge with a significant technical and application content, favouring immediate entrance to job market. Typical functions of a DS engineer and ICT expert include quality management, design and management of manufacturing processes, industrial installations as well as machine learning techniques, High-performance computing for data science.

Programme structure

The first year is spent at one university (entry) and second year at another (exit) university in two different European countries. The combination of entry and exit university are called student study path.

The following universities provide an **entry year (first year)**:

- University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Switzerland
- University College Dublin (UCD), Ireland
- University of Trento (UNITN), Italy

The following parties provide an **exit year (second year)**:

- University of Trento (UNITN), Italy
- University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Switzerland

Possible combinations:

Combination	ENTRY University (YEAR 1)	EXIT University (YEAR 2)
Combination 1	(SUPSI), Switzerland	University of Trento (UNITN), Italy
Combination 2	University of Trento (UNITN), Italy	(SUPSI), Switzerland
Combination 3	University College Dublin (UCD), Ireland	University of Trento (UNITN), Italy

EIT Manufacturing reserves the right to change the exit universities of this programme

Curricula structure:

The two years programme (120 ECTS) includes an Innovation and Entrepreneurship (I&E) Module (30 ECTS), and a Technical Major Module (90 ECTS) structured as follows:

- 45 ECTS for Host Programme technical courses
- 15 ECTS for Host Programme AM specialization courses
- 30 ECTS for the I&E Module courses
- 30 ECTS for the Master thesis

Students are committed to collect a total of 40-50 ECTS related to the Technical Major and of 10-20 ECTS related to the I&E Module in the first year (60 ECTS total) whereas in the second year they are committed to collect 10-20 ECTS for the Technical Major, 10-20 ECTS for the I&E Module and 30 ECTS for the Master Thesis Project (60 ECTS total). The total of technical courses and specialization

courses must be 60 ECTS, within the boundaries above. All Master School education will be held in English and all partner universities are assumed to use ECTS units.

NOTE: Each university can have, in addition to the general programme above, compulsory requirements for the student study plan, such us mandatory local language courses. You will be informed by your university about this.

DEGREES and EIT Label Certificate:

At the end of the EIT Manufacturing Data Science and AI for Competitive Manufacturing programme (DS) of 120 ECTS, students will get two degrees from each entry and exit university. **One degree** will be **in Engineering** and a **second degree** will be **in Information Technology (ICT)**, according to the following list:

- **SUPSI:** Master of Science (MS) in Engineering, University of Applied Sciences and Arts of southern Switzerland (SUPSI). Higher Education Act of Switzerland (414.20/2011). => 90 ECTS degree
- **UCD:** Master of Engineering (ME) in Manufacturing Engineering
- **UNITN:** Master of Science in Computer Science (Laurea Magistrale, Ordinamento 270/04, Classe di Laurea LM-18 – Informatica) – 120 ECTS degree

In addition to the National Accredited degrees, the students receive the **EIT Label Certificate**, documenting the EIT accreditation and high quality of the programme.

Career opportunities:

Manufacturing is struggling to find digital experts able to understand engineering production systems and to manage data to address technological and business challenges. With this programme you can boost your career becoming one of the few experts on the market. Moreover, the EIT Manufacturing Master School will prepare you for high level technical positions, Innovation roles and business profiles, including the capability to create your own start-up. It will allow you to create a professional network at national and international level through the several initiatives and the EIT alumni communities.
The degrees also grant you the eligibility (120 ECTS degrees only) for post graduate doctoral studies, eventually to be done at EIT Manufacturing Doctoral School

A student who graduates from the Data Science and AI for Competitive Manufacturing programme (DS) shall:

- have broad knowledge of theories and concepts in Cyber-physical systems (CPS), Information system management, digital monitoring, digital security.
- be able to critically, independently and creatively participate in strategic work to meet manufacturing-related problems and to be able to relate these measures to sustainable social development,
- be able to implement the gained engineering expertise to create new or improved methods, techniques, products, and services in the field;
- be able to think beyond traditional disciplinary boundaries to find innovative solutions to real-world problems and to come up with new ideas;
- be able to draw up plans and to make decisions foreseeing future consequences from a scientific, ethical, and societal perspective;
- be able to turn innovations in the area into feasible and successful business solutions;

- be able to profitably work in small size teams and contexts by taking into account all relevant elements and showing effective decision-making and leadership abilities.

Admission process:

➢ First application window deadline is 8th December!

Please note we recommend this deadline to NON EU/EFTA students requiring to apply for a VISA to study in Europe.

If you apply BY 8th December:

- you will be evaluated along December 2024.
- you will receive the offer from the EIT Manufacturing in January 2024.
- local enrolment will start in February*
- 9th December your application will be frozen and we don't consider any further modification and resubmission

*as a preliminary date, depending on the individual conditions of the university

➢ Second application window deadline is 15th January!

Please note we recommend this deadline to NON EU/EFTA students requiring to apply for a VISA to study in Europe.

If you apply BY 15th January:

- you will be evaluated along January 2025.
- you will receive the offer in February 2025.
- local enrolment will start in February*
- 16th January your application will be frozen and we don't consider any further modification and resubmission.

*as a preliminary date, depending on the individual conditions of the university

➢ Third application window deadline is 31st March 2025!

If you apply BY 31st March:

- you will be evaluated along April 2025.
- you will receive the offer in April 2025.
- local enrolment will start in April*
- 1st April March your application will be frozen and we don't consider any further modification and resubmission.

*as a preliminary date, depending on the individual conditions of the university

other IMPORTANT information:

- Please check special university requirements, before applying!
- Applicants must have completed a bachelor's degree encompassing a minimum of 180 ECTS credits.
- Students should have basic competence in engineering analysis, production operations, and mathematics including calculus, algebra, and mathematical statistics.
- Students must have basic competences in programming (python)
- Conditional acceptance:
    - Students in their final year of undergraduate education may also apply and if qualified, receive a conditional acceptance. If you have not completed your studies, please include a written statement from the degree administration office (or equivalent department), confirming that you are enrolled in the final year of your education and giving your expected completion date – which should be before the start of the Master's programme.
    - If you receive a conditional offer, you should present your degree certificate to your entry university before enrollment at the latest.
- The specific required admission diplomas are:

B.Sc. degree in Mechanical Engineering, Electrical Engineering, Computer Engineering, Business Engineering, Management Engineering, Computer Science, Information Technology or Industrial Engineering or equivalent degrees.

Documentation languages:

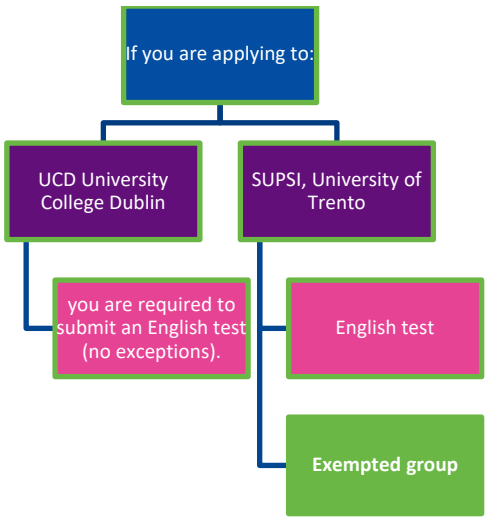
The entry qualification documents are accepted in the following languages: English (issued in or officially translated along with verified copies))

You have to provide a duly certified copy of transcript of records in original language and translated into English. All courses must be included. Please scan the front and back of every document- all stamps and signatures must be fully visible.

Language requirements:

- ## Language proficiency requirements for EIT Manufacturing Master School

The language of instruction in all EIT Manufacturing Master School programmes is English. All applicants must provide proof of sufficient proficiency in English. Generally, the proficiency must be proved with sufficient results in a language test. Certain groups of applicants may be exempted from the language test but required to provide other documentation on their language proficiency. Only the tests and exemptions listed below will be accepted. Applications without acceptable proof of English proficiency will be discarded and not evaluated further. All language test results must be electronically verifiable.



- ## Accepted English language tests and minimum scores

Please note that the English test must be taken on or after 30 September 2023. Older results will not be accepted.

- IELTS >= 6.5, with no section lower than 6 A photocopy of your test IELTS test result together with your application documents is sufficient.
- TOEFL IBT>= 93 (minimum 21 for writing, 19 in the other sections) English test results from TOEFL should be uploaded to your application form and sent

directly from the ETS test centre to the EIT Manufacturing Master School Office. (EIT Manufacturing Master School code number: C898 , you can choose industrial engineering if you apply to “Platform for Digitalized Value Networks” and “Data Science and AI for Competitive Manufacturing”, otherwise choose mechanical engineering for the other programmes))

- CAE: grades A – C are accepted. Attach the document to your application on the DreamApply portal.
- CPE: grades A – C are accepted. Attach the document to your application on the DreamApply portal.

Exempted group

If you apply for: **SUPSI, University of Trento** you may be exempted from the English test if you meet one of the conditions presented below in the table:

Exempted group	Required proof
Applicants who have completed a bachelor’s degree (180 ECTS or equivalent) instructed in English at a university in an EU/EFTA country.	Degree certificate, diploma supplement, transcript of records or other official document issued by the institution clearly stating the language of instruction.
Applicants who have completed a bachelor’s degree instructed in English at a university that is physically located in one of the following countries: Antigua and Barbuda, the Bahamas, Barbados, Belize, Botswana, Cameroon, Canada, Dominica, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Grenada, Guyana, Hong Kong, India, Jamaica, Kenya, Lesotho, Liberia, Malawi, Namibia, Nigeria, the Philippines, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sierra Leone, Singapore,	Degree certificate or proof of estimated graduation granted by a university in this country.

South Africa, Switzerland, Tanzania, Trinidad and Tobago, Uganda, Zambia, or Zimbabwe.	
Applicants who have completed a bachelor's degree instructed in English at a university that is physically located in one of the following countries: Australia, Canada, New Zealand, the United Kingdom, or the United States.	Degree certificate or proof of estimated graduation granted by a university in this country.
Applicants who have completed **secondary education** degree instructed in English in: an EU/EEA country, Australia, Canada, New Zealand, South Africa, Switzerland, the United Kingdom or the United States while residing in that country.	Secondary-school final certificate in PDF format. If the degree is completed in an EU/EEA country, Switzerland or South Africa, English as the language of instruction must be stated unambiguously on the certificate. For those countries, if the language of instruction is not indicated on the certificate, upload an official document issued by the institution clearly stating the language of instruction.

Documents to submit:

To apply to the Master School, you are required to upload the following documents/elements.

IMPORTANT: you need to **submit a complete application package** consisting of the following documents, in pdf and portrait format, **before the application deadline.**

It is every prospective student´s responsibility to make sure their application is correct and complete.

- Degree Certificate/Diploma in its original language AND translated into English (If your university does not provide this service, the translation has to be done by an authorized translator and his/her credentials, signature and stamps must be visible in the translated document). In case of on-going studies, a statement certifying that you are in the final year of your studies. The statement must be written by the degree administration office (or equivalent department), confirming that you are enrolled on the final year of your education and giving your expected completion date.

- Official and stamped transcript of records in original language and translated into English. All courses taken must be included. Please scan the front and back of every document- all stamps and signatures must be fully visible.

- Proof of English proficiency. Please refer to the 'Language requirements' section for more information.

- Curriculum Vitae including details on your academic and professional career, based on EuroPass template CV. Please note that no other CV formats than EuroPass will be accepted and your application will be automatically rejected if you do not meet this condition.

EuroPass CV editor you can find here: europa.eu/europass/eportfolio/screen/cv-editor?lang=en

- Records of evidence Please attach an additional, single PDF file, which will be a record and supporting document of your CV. This means that if you have references, letters of recommendation, employment certificates, volunteer work certificates, contacts to people etc. who can attest to your educational and professional activity. All these evidence files must be one PDF, which you can create using a simple online creator.

- Motivation short movie A short motivational movie (max 2 minutes). In the movie, please answer two questions:

    1) Why are you fit for this program?

2) where do you see yourself five years after graduation?

- A coloured copy of your either National ID (only for EU/EFTA students) or passport

Please notice that, from the moment you are admitted, your university will contact you to complete the formalities for enrolment and might request additional documents from you.

IMPORTANT:

- Please upload the **original version of your degree certificate and transcript of records.** If this is not possible, photocopies of your degree certificate, transcript of records and statements should be **stamped and signed by the degree administrations office (or equivalent department) of the issuing institution, or by a Notary Public.** Please note that we do not accept documents after the deadline. All documents must be uploaded/come in before the deadline in order for us to process your application.
- **Applications that are not supported by official documents will not be processed.**
- **Applications with fraudulent documents will invariably be rejected.**
- **All admitted students must present the original Transcript of records and Degree Certificate/Diploma before enrolment.**

VISA:

Applicants are responsible for their own VISA.

SPECIAL UNIVERSITIES REQUIREMENTS

This applies only if the below universities are a possible choice for the programme you want to apply

- **For NON EU/EFTA** students choosing **SUPSI (University of Applied Sciences and Arts of Southern Switzerland – Switzerland)** as entry/exit university, before applying, please note you need to: **submit 2 applications**:

1. one application into DreamApply portal

2. second application into SUPSI local portal by 30th April, to be eligible to enrol locally: www.supsi.ch/home_en/bachelor-diploma-master/informazioni-generali/iscrizioni.html .

Please keep in mind this in case you request a VISA to study in EU.

- check the Switzerland entry requirements at: www.sem.admin.ch/sem/it/home/publiservice/weisungen-kreisschreiben/auslaenderbereich/verfahren_und_zustaendigkeiten.html

- check NOT ELIGIBLE Countries for VISA in Switzerland at: www.sem.admin.ch/dam/sem/it/data/rechtsgrundlagen/weisungen/auslaender/verfahren/zustimmungspfl-studierende-i.pdf.download.pdf/zustimmungspfl-studierende-i.pdf.

SYLLABI:

Study plan

Generic objectives of the program

Data Science and AI for competitive manufacturing is a combination of manufacturing science and Information and communication technology including the usage and adoption of advanced digital solutions and platforms.

Specificities of this combination

The theoretical modules provide the students with a sound understanding of Data Science methods. Moreover, students learn practical skills of data engineering and how to engineer machine learning pipelines in the technical modules and in the practical projects. The technical and specialisation course provides bases on HCP, distributed systems and services moreover a course on AI and innovation challenges the students with real industrial problems.

General structure of the EIT-M Master Programme

Type of modules	Total credits for EIT-M Master	Total credits 1st year	Total credits 2nd year
Technical courses (TC)	40-48	40-50	10-20
Specialization courses (SC)	12-20		
Innovation & entrepreneurship courses (I&E)	30	10-20	10-20
Master thesis (MT)	30	0	30
Tot	120	60	60

Study plan –
SUPSI- Trento collaboration

Entry university SUPSI – exit University of Trento

1st year SUPSI

Local up-to-date webpages for entry/exit university courses:

Master of Science in Engineering - Data Science - SUPSI

Draft plan:

Type of modules	SUPSI courses	ECTS	Semester	Total credits
TC	Predictive modelling (FTP_PredMod)	3	1	30 (3 FTP out of 4, 3 TSM out of 4)
	Machine Learning (FTP_MachLe_A)	3	1	
	Multi-Agent Systems (FTP_MultiASys)	3	2	
	Applied Statistics and Data Analysis (FTP_AppStat)	3	2	
	Data Analysis and Classification (TSM_DataAnaCla)	3	1	
	Advanced Data Management – non standard database systems (TSM_AdvDataMgmt)	3	1	
	Causal AI (TSM_causality)	3	1	
	Analysis of Sequential Data (TSM_AnSeqDa)	3	1	
	Virtual environments (MP_DCAPVE)	9	2	
	Quality and Risk Management (CM_QRM)	3	2	
SC	Deep Learning Lab	3	1	12
	Advanced Probabilistic Modelling (MC_APM)	6	1	

	Machine Learning in Computer Vision (TSM_CompVis)	3	1	
I&E	Project in data science applied to manufact.	10	1-2	18
	Innovation and Lean (CM_InnoLEAN)	3	1	
	Centrally organized summer school	5	2	

2nd year Trento

Local up-to-date webpages for entry/exit university courses

Type of modules	Trento courses	ECTS	Semes-ter	Total credits
TC	145763 Bio-Inspired Artificial Intelligence	6	1	12 (2 courses among 4)
	146114 Knowledge Graph Engineering	6	1	
	145635 High-throughput Computing for Data Science	6	1	
	145301 Project Course	6	1	
SC	140472 Distributed Systems for measurement and automation	6	1	6 (1 course among 2)
	145810 Service Design and Engineering	6	1	
I&E	145623 Innovation and Entrepreneurship Studies in ICT (core)	6	1	12
	145881 AI and Innovation	6	1	
MT	Thesis, including internship (core)	30	2	30

Recap

Type of modules	ECTS in S1	ECTS in S2	ECTS in S3	ECTS in S4	Total credits
TC	12	18	Max 18		**48**
SC	12	0	Max 8		**16**

I&E	6	12	12		**30**
MT	0	0	0	30	**30**
Other					
Total	30	30			

– Study plan –
Trento-SUPSI collaboration

General structure of the EIT-M Master Programme

Type of modules	Total credits for EIT-M Master	Total credits 1st year	Total credits 2nd year
Technical courses (TC)	40-48	40-50	10-20
Specialization courses (SC)	12-20		
Innovation & entrepreneurship courses (I&E)	30	10-20	10-20
Master thesis (MT)	30	0	30
Tot	120	60	60

Entry university SUPSI – exit University of Trento

1st year Trento

Local up-to-date webpages for entry/exit university courses

Draft plan:

Type of modules	Trento courses	ECTS	Semester	Total credits
TC	145062 Machine learning	6	1	30 (5 among 7)
	145453 Data Mining	6	1	
	145764 Deep learning	6	2	
	146105 Design of digital production and assembly system	6	1	

	146106 Precision engineering: digital manufacturing	6	2	
	146114 Knowledge Graph Engineering	6	1	
	145763 Bio-Inspired Artificial Intelligence	6	1	
SC	145874 Robot Planning and its application	6	1	6 (1 among 6)
	145810 Service Design and Engineering	6	1	
	145811 Low power wireless networking for the Internet of Things	6	1	
	142117 Software development for collaborative robotics	6	1	
	145683 Data Visualization Lab	6	2	
	155301 Project Course	6	1-2	
I&E	145936 Innovation and Entrepreneurship Basics	6	1	24
	145288 Business Development Laboratory	9	2	
	145455 ICT innovation (the course includes the Centrally organized summer school)	9 (4+5)	2	

2nd year SUPSI

Local up-to-date webpages for entry/exit university courses

Master of Science in Engineering - Data Science - SUPSI

Type of modules	SUPSI courses	ECTS	Semester	Total credits
TC	Multi-Agent Systems (FTP_MultiASys)	3	2	15 (5 among 8)
	Causal AI (TSM_causality)	3	1	
	Applied Statistics and Data Analysis (FTP_AppStat)	3	1	
	Data Analysis and Classification (TSM_DataAnaCla)	3	1	

	Bayesian Machine Learning (TSM_BayMaLe)	3	1	
	Predictive modelling (FTP_PredMod)	3	1	
	Advanced Data Management – non standard database systems (TSM_AdvDataMgmt)	3	1	
	Quality and Risk Management (CM_QRM)	3	2	
SC	Virtual environments (MP_DCAPVE)	9	2	9
I&E	Machine Learning in Operations (TSM_MLDaOps)	3	2	6
	Innovation and Lean (CM_InnoLEAN)	3	1	
MT	Thesis, including internship (core)	30	1-2	30

Recap

Type of modules	ECTS in S1	ECTS in S2	ECTS in S3	ECTS in S4	Total credits
TC	18	12	12	3	**45**
SC	6	0	0	9	**15**
I&E	6	18	3	3	**30**
MT	0	0	15	15	**30**
Other					
Total	30	30	30	30	

- Study plan –
UCD - UNITN collaboration

General structure of the EIT-M Master Programme

Type of modules	Total credits for EIT-M Master	Total credits 1st year	Total credits 2nd year
Technical courses (TC)	42	40-50	10-20
Specialization courses (SC)	16		
Innovation & entrepreneurship courses (I&E)	32	10-20	10-20
Master thesis (MT)	30	0	30
Tot	120	60	60

Entry university UCD – exit university UNITN

1st year UCD

ME Manufacturing Eng withData Sci & AI for CompetitiveManufacturing - Programme Details (ucd.ie)

Draft plan:

Type of modules	UCD courses	ECTS	Semes-ter	Total credits
TC	Supply Chain Design & Analysis	5	1	30 (20 sem 1 10 sem 2)
	Energy Systems and Climate Change	5	1	
	Systems Analysis & Improvement (EITM)	5	1	
	Advanced Polymer Engineering	5	2	
	Operations Management	5	2	
	MEEN41330 Data Analytics for Engineers	5	1	

SC	Manufacturing Engineering II	5	1	10 (5 sem 1 5 sem 2)
	Engineering Decision Support Systems	5	2	
I&E	Centrally organized summer school	5	2	20 (5 sem 1 15 sem 2)
	MEEN40820 Technical Comms (Online) (option)	5	1	
	MEEN40560 Research Skills and Techniques (option)	5	1	
	Professional Eng. (Finance)	5	2	
	Professional Engineering (Management)	5	2	

2nd year UNITN

Type of modules	UNITN courses	ECTS	Semes-ter	Total credits
TC	145062 Machine Learning	6	1	12
	145453 Data Mining	6	1	
SC	146217 Software Development for Collaborative Robotics	6	1	6
I&E	145623 Innovation and Entrepreneurship Studies in ICT (core)	6	1	12
	145881 AI and Innovation	6	1	
MT	Master thesis (including internship)	30	2	30 (30 sem2)

Recap

Type of modules	ECTS in S1	ECTS in S2	ECTS in S3	ECTS in S4	Total credits
TC	20	10	12		**42**
SC	5	5	6		**16**
I&E	5	10+5	12		**32**
MT				30	**30**
Tot	30	30			**120**