MSc “Data Science and AI for competitive manufacturing” programme

Study plans

This document presents the general syllabi of all the MSc double degrees available within the EIT Manufacturing “Data Science and AI for competitive manufacturing” programme. Please note these are the basic versions of the study plans, in order to provide a better understanding of the programme and the differences among the several available combinations within the programme. Considering universities continuously develop their education offer, some of the courses could result to be updated, changed or replaced along the years. Once enrolled, the student will be supported by a local programme coordinator to define the final study plan accordingly to the general structure of the EIT Manufacturing Master programmes.

General structure of the EIT Manufacturing Master Programme

Type of modules	Total credits for EIT-M Master	Total credits 1st year	Total credits 2nd year
Technical courses (TC)	45	40-50	10-20
Specialization courses (SC)	15		
Innovation & entrepreneurship courses (I&E)	30	10-20	10-20
Master thesis (MT)	30	0	30
Tot	120	60	60

Please scroll down this document to find the different syllabi.

Available entry and exit combinations from November 2023 on

ENTRY University (YEAR 1)	EXIT University (YEAR 2)
ECN (France)	UNITN (Italy)
SUPSI (Switzerland)	UNITN (Italy)
UNITN (Italy)	ECN (France)
UCD (Ireland)	UNITN (Italy)
UNITN (Italy)	SUPSI (Switzerland)

Programme Data Science and AI for competitive manufacturing

– Study plan –

ECN-Trento combination

Entry university ECN – exit University of Trento

1st year ECN

Local up-to-date webpages for entry/exit university courses
Please check the details here.

Draft plan:

Type of modules	ECN courses	ECTS	Semes-ter	Total credits
TC	Discrete-Event Simulation	4	1	28
	Introduction to Optimization Methods	4	1	
	Production Management	4	1	
	Statistics and Data Analysis	4	1	
	Entreprise 4.0 processes	4	2	
	Introduction to Information systems	4	2	
	Operation research	4	2	
SC	Basics of Computer Science and Mathematics	3	1	15
	Enterprise Modelling	4	1	
	Strategic management of Sustainable enterprise	4	2	
	Introduction to Research	4	2	
I&E	Project Management	4	1	12
	Financial and Economic Aspects for Ind. Engineering	4	1	
	Innovation Engineering	4	2	
Other	Mandatory language course	2	1	4
	Mandatory language course	2	2	

I&E	Centrally organized summer school	5	2	5

2nd year Trento

Local up-to-date webpages for entry/exit university courses
Please check the details here

Type of modules	Trento courses	ECTS	Semes-ter	Total credits
TC	145062 Machine Learning	6	1	12 (2 courses among 4)
	145453 Data Mining	6	1	
	145635 High-throughput Computing for Data Science	6	1	
	145937 Introduction to Computer and Network security	6	1	
SC	145874 Robot planning and its application	6	1	6 (1 course among 4)
	155020 Multisensory Interactive Systems	6	1	
	146217 Software Development for Collaborative Robotics	6	1	
	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
TC	18	12	12	
SC	2	10	6	
I&E	8	4+5	12	
MT				30
Other	2	2		

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

This study path enables students to focus on industrial engineering, through competencies of modeling and simulation approaches. The technical courses provide a solid foundation in Machine Learning and Data Mining, the specialisation course ranges from robotics to visualization, moreover course on AI and innovation challenges the students with real industrial problem**s.**

Programme Data Science and AI for competitive manufacturing

– 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
Please check the details here

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			

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.

Data Science and AI for competitive manufacturing

– Study plan –

Trento - ECN combination

Entry university Trento – exit university ECN

1st year Trento

Local up-to-date webpages for entry/exit university courses
Please check the details here

Draft plan:

Type of modules	Trento courses	ECTS	Semes-ter	Total credits
TC	145062 Machine learning	6	1	30
	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 Knowledge and Data Integration	6	2	
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	Innovation and Enterpreneruship Basics	6	1	24
	Business Development Laboratory	9	2	
	ICT innovation (the course include the Centrally organized summer school)	9 (4+5)	2	

2nd year ECN:

Local up-to-date webpages for entry/exit university courses
Please check the details here.

Type of modules	ECN courses	ECTS	Semes-ter	Total credits
TC	Multicriteria decision making and decision support	4	1	12
	Model-based system engineering for product service systems	4	1	
	Artificial Intelligence for decision-making in industrial engineering (AI4IE)	4	1	
SC	Advanced IS within PLM approach	4	1	8
	Integrated Design and Implementation of CPPS	4	1	
I&E	Knowledge-based systems	5	1	10
	Project	5	1	
MT	Master thesis: focus on Platforms for digitalized value network	30	2	30
Other	Mandatory language course	2	1	2

Recap

Type of modules	ECTS in S1	ECTS in S2	ECTS in S3	ECTS in S4	Total credits
TC	18	12	12		**42**
SC	6		8		**14**
I&E	6	18	10		**34**
MT	0	0		30	**30**
Other	0	0	2		**2**

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 technical courses provide students a solid foundation in Machine Learning and Data Mining as well as some fundamentals about digital industrial production and digital manufacturing, the specialization courses range from robotics to data visualization, finally a set of well-established courses on innovation, integrated with the summer school completes the offer. Students will also develop skills for enterprise management based on process performance assessment and information systems design and management for smart and connected enterprises.

- Data Science and AI for competitive manufacturing

- Study plan –

UCD-UNITN collaboration

Entry university UCD – exit university UNITN

1st year UCD

Local up-to-date webpages for entry/exit university courses
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	Computational Continuum Mechanics II	5	1	30 (20 sem 1 10 sem 2)
	Computational Continuum Mechanics I	5	1	
	Systems Analysis & Improvement (EITM)	5	1	
	Advanced Polymer Engineering	5	2	
	Advanced Metals Processing	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

Local up-to-date webpages for entry/exit university courses
Please check the details here

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**

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

With this study path, the 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.

Data Science and AI for competitive manufacturing

– Study plan –

Trento-SUPSI collaboration

Entry university SUPSI – exit University of Trento

1st year Trento

Local up-to-date webpages for entry/exit university courses
Please check the details here

Draft plan:

Type of modules	Trento courses	ECTS	Semes-ter	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	

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 technical courses provide students a solid foundation in Machine Learning and Data Mining as well as some fundamentals about digital industrial production and digital manufacturing, the specialisation courses range from robotics to data visualization, finally a set of well-established courses on innovation, integrated with the summer school completes the offer. 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.