

AI&ES MASTER CURRICULUM OVERVIEW 2024-2025

Core courses

Core topic	Course	Code	Quarter(s)	Timeslot(s)	ECTS
Data science	1. Data acquisition and analysis	5ARB0	GS1	C	5
Human interaction and ethics	2. Human and ethical aspects of AI	5ARC0	GS1	E	5
Programming	3. Software engineering for artificial intelligence	5ARA0	GS1	D2	5
Engineering systems	4a. Physical and data-driven modelling	4CM40	GS3	D	5
	4b. Control principles for linear systems	5ARD0	GS2	A	5
Learning in AI	5a. Bayesian machine learning and information processing	5SSD0	GS2	D2&D3	5
	5b. Decision making with artificial and computational intelligence	1BM120	GS4	C	5
Mathematics	6a. Statistical signal processing	5CTA0	GS1/GS3	A/B	5
	6b. Engineering optimization	4DM20	GS3	B	5

*New course. ** Schedule change. ***Last year offered. ****Last examination year.

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Track 1: High-tech systems and Robotics

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	Human-robot interaction	0HM280	1	GS4	C	5
2	Partial differential equations	2MMA20	1	GS3	D	5
3	System theory for control	4CM10	1	GS1	B	5
4	*Extremum seeking control for data-based performance optimization	4CM120	1&4	GS3	E	5
5	Applications of design principles	4CM50	1	GS4	D	5
6	Multibody and non-linear dynamics	4DM10	1	GS2	A	5
7	Heat and flow in microsystems	4EM40	1	GS2	C	5
8	Composite and light-weight materials: design and analysis	4MM00	1	GS1	A	5
9	Optimal control and reinforcement learning	4SC000	1	GS2	D	5
10	Mobile robot control	4SC020	1	GS4	D2&D3	5
11	Modeling dynamics	5CSA0	1	GS1	D	5
12	Embedded visual control	5LIA0	1	GS4	A1	5
13	Intelligent architectures	5LIL0	1	GS3	C2	5
14	Model reduction	5LMA0	1	GS2	C	5
15	Robust control	5LMC0	1	GS3	E	5
16	Control engineering	4CM00	2	GS1/GS3	C/E	5
17	Model predictive control	5LMB0	2	GS3	A1	5
18	Computer Vision AI and 3D Data Analysis	5LSH0	2&3	GS2	E	5
19	Advanced actuator design	5LWC0	2	GS4	A1	5
20	Responsible data science	2IX30	3	BC3	C	5
21	System identification	5SMB0	3	GS3	C	5
22	Machine learning for multi-physics modeling and design	4AI000	4	GS4	E	5
23	Machine learning for signal processing	5LSL0	4	GS4	A2&A3	5
24	Machine learning for systems and control	5SC28	4	GS4	B	5

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Track 2: Mobility

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	Decision making in transport and mobility	1CM110	1&2	GS2	A	5
2	Advanced full-electric and hybrid powertrain design	4AT030	1&2	GS4	C	5
3	*Advanced control for future heavy-duty powertrains	4AT070	1	GS4	D	5
4	Vehicle control	4AT080	1&2	GS4	B	5
5	Control engineering	4CM00	1	GS1/GS3	C/E	5
6	System theory for control	4CM10	1	GS1	B	5
7	*Extremum seeking control for data-based performance optimization	4CM120	1&4	GS3	E	5
8	Multibody and non-linear dynamics	4DM10	1	GS2	A	5
9	Analysis and design of networked dynamical systems	4DM70	1&2	GS4	B	5
10	Optimal control and reinforcement learning	4SC000	1	GS2	D	5
11	Model predictive control	5LMB0	1	GS3	A1	5
12	Computer Vision AI and 3D Data Analysis	5LSH0	2&3	GS2	E	5
13	Responsible data science	2IX30	3	BC3	C	5
14	System identification	5SMB0	3	GS3	C	5
15	Automotive human factors	0HM310	4	GS1	C	5
16	Behavioral operations management	1JM40	4	GS3	A	5
17	Machine learning for multi-physics modeling and design	4AI000	4	GS4	E	5
18	Machine learning for systems and control	5SC28	4	GS4	B	5

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Track 3: Healthcare

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	*Applied biostatistical modelling	2DBM90	1	BC2	A	5
2	*Physics behind medical technology: equipment and physiology	3MA100	1	GS4	A	5
3	*Molecular biosensing	3MN170	1	GS2	E	5
4	*Introduction to NMR/MRI for imaging and flow visualisation	3MT160	1	GS2	C	5
5	Biomedical sensing technology	5LSC0	1&2	GS3	A2	5
6	*Adaptive array signal processing	5SSC0	1	GS3	B1	5
7	*Systems medicine	8CM00	1	GS1	D	5
8	Orthopaedic Soft Tissues: biomechanics and mechanobiology	8TM10	1	GS2	D	5
9	Ultrasound in the (bio)medical engineering	8VM60	1	GS2	D	5
10	Human-robot interaction	0HM280	2	GS4	C	5
11	Behavioral operations management	1JM40	2	GS3	A	5
12	Monitoring of respiration and circulation	5LSB0	2	GS2	B1	5
13	*Computer Vision AI and 3D Data Analysis	5LSH0	2&3	GS2	E	5
14	Brain-inspired optical computation	5LTC0	2	GS4	E2&E3	2.5
15	Video health monitoring	5LIV0	3	GS2	C2	5
16	Image analysis for health-care technologies	5LSJ0	3	GS3	D1	5
17	***Medical image analysis	8DC00	3	**BC1	**C	5
18	Capita selecta in medical image analysis	8DM20	3	GS3	A&B1	5
19	Machine learning for signal processing	5LSL0	4	GS4	A2&A3	5
20	Neural networks for computer vision	5LSM0	4	GS3	E	5
21	Machine learning in medical imaging and biology	8DM50	4	GS1	B	5

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Track 4: Smart cities

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	Decision making in transport and mobility	1CM110	1	GS2	A	5
2	Building performance and energy systems simulation	7LY3M0	1	GS1	C	5
3	Data science for intelligent buildings	7LY5M0	1	GS1	B	5
4	Smart healthy urban environments	7ZW5M0	1	GS2	D	5
5	Advanced cognitive engineering	0HM150	2	GS3	E2&E3	5
6	Digital design and manufacturing	7KT4M0	2	GS2	**B	2.5
7	Algorithms for Geovisualization	2IMA20	3	GS3	E1	5
8	*Computer Vision AI and 3D Data Analysis	5LSH0	3&4	GS2	E	5
9	Fundamentals of building information modeling	7M900	3	GS2	E	5
10	Neural networks for computer vision	5LSM0	4	GS3	E	5
11	Data fusion and semantic interpretation	5XSK0	4	BC3	E	5

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Track 5: Science and Discovery

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	Advanced fluid dynamics	3MS010	1	GS1	E	5
2	Soft matter physics	3MS020	1	GS2	B	5
3	Chaos	3MT100	1	GS3	D	5
4	Interfacial transport phenomena in engineering flows	4BM60	1	**GS2	D2&D3	5
5	Scientific computing for Mechanical Engineering	4EM30	1	GS3	**A	5
6	Heat and flow in microsystems	4EM40	1	GS2	C	5
7	Advanced computational continuum mechanics	4MM10	1	**GS1	**D	5
8	Microscale modeling of heat storage materials	4SE20ONL	1	GS2	none	5
9	*Physics Modelling and Simulations	34PMS	2	BC1	E	5
	****Physical modelling and simulating	3FMX0	2	BC1	E	5
10	Computational and mathematical physics	3MA010	2	GS1	B	5
11	Advanced computational fluids and plasma dynamics	3MT120	2	GS3	E	5
12	Optimal control and reinforcement learning	4SC000	2	GS2	D	5
13	Research topics in data mining	2AMM20	3	GS1	B1&B2	5
14	Advanced simulation	2DI66	3	GS3	B	5
15	Model reduction	5LMA0	3	GS2	C	5
16	Machine learning for fluid mechanics	3MT170	4	GS1	D	5
17	Machine learning for multi-physics modeling and design	4AI000	4	GS4	E	5

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Track 6: Manufacturing Systems

No.	Available courses	Code	Theme(s)	Quarter(s)	Timeslot(s)	ECTS
1	Manufacturing technology	1CM160	1	GS1	D	5
2	Modeling and analysis of manufacturing systems	1CM10	2	GS2	D	5
3	Multi-echelon inventory management	1CM100	2	GS3	C1	5
	<i>****Advanced maintenance and service logistics</i>	<i>1CM120</i>	2	<i>GS2</i>	<i>A</i>	<i>5</i>
4	*Maintenance Optimization and Engineering	1CM290	2	GS1	A	5
5	*Design for smart industry	1CM310	2	GS4	B2	5
V	Integrated system design	4CM70	2	GS2	E	5
7	Modeling and control of manufacturing networks	4DM40	2	GS4	A	5
8	Supervisory control of cyber physical systems	4SC080	2	GS3	D	5
9	Data-driven artificial intelligence	1BM110	3	GS3	C2	5
10	Advanced simulation	2DI66	3	GS3	B	5
11	Human-robot interaction	0HM280	4	GS4	C	5
12	Artificial intelligence for logistics and its interfaces	1CM240	4	GS3	D1	5
13	Behavioral operations management	1JM40	4	GS3	A	5
14	Optimal control and reinforcement learning	4SC000	4	GS2	D	5

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