



UNIVERSITÀ
DEGLI STUDI
DI PADOVA



DIPARTIMENTO
DI INGEGNERIA
DELL'INFORMAZIONE

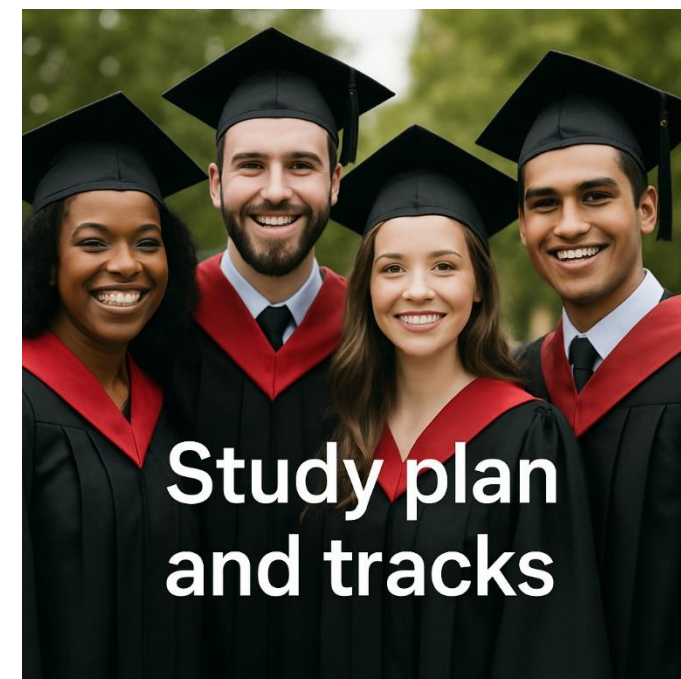
MASTER'S DEGREE IN **ELECTRONIC ENGINEERING**

Matteo Meneghini

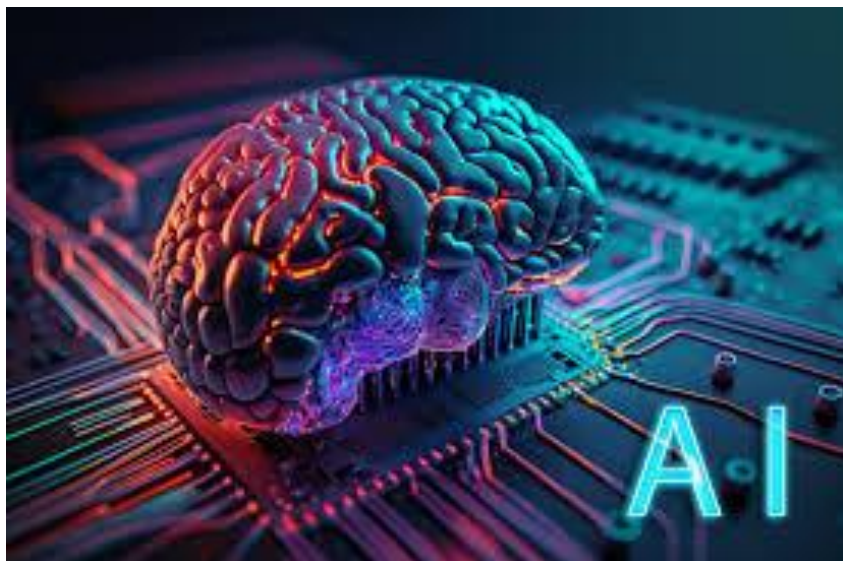
matteo.meneghini@unipd.it,

Global challenges

(i.e. why study electronics?)

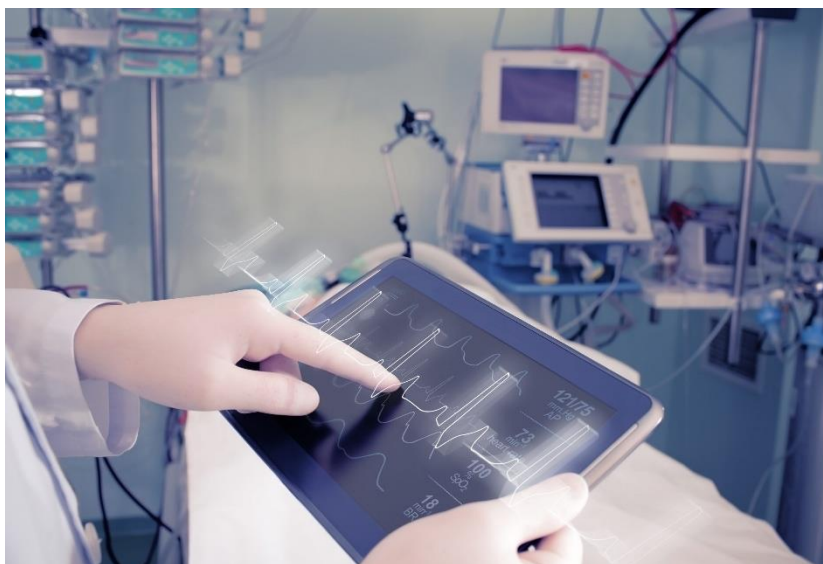


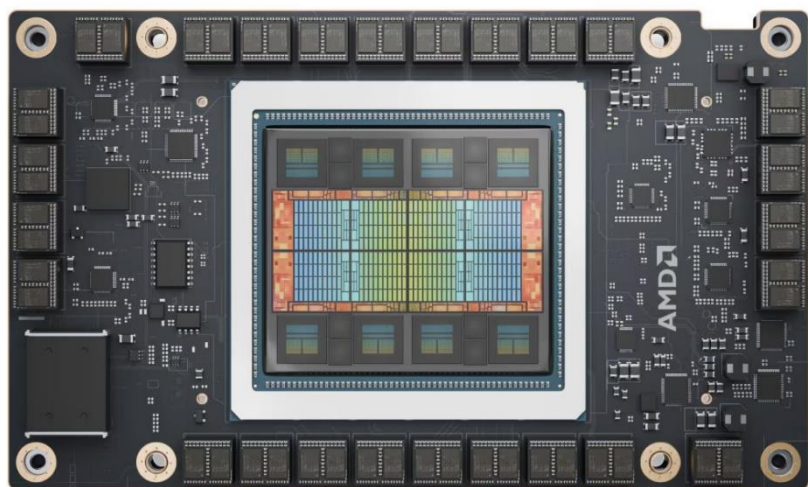
WE ARE IN THE MIDDLE OF A REVOLUTION



New opportunities
and challenges:

- AI
- E-mobility
- Renewable energy
- E-health
- Advanced ICs
- ...





If the AI revolution is to continue at its current pace...

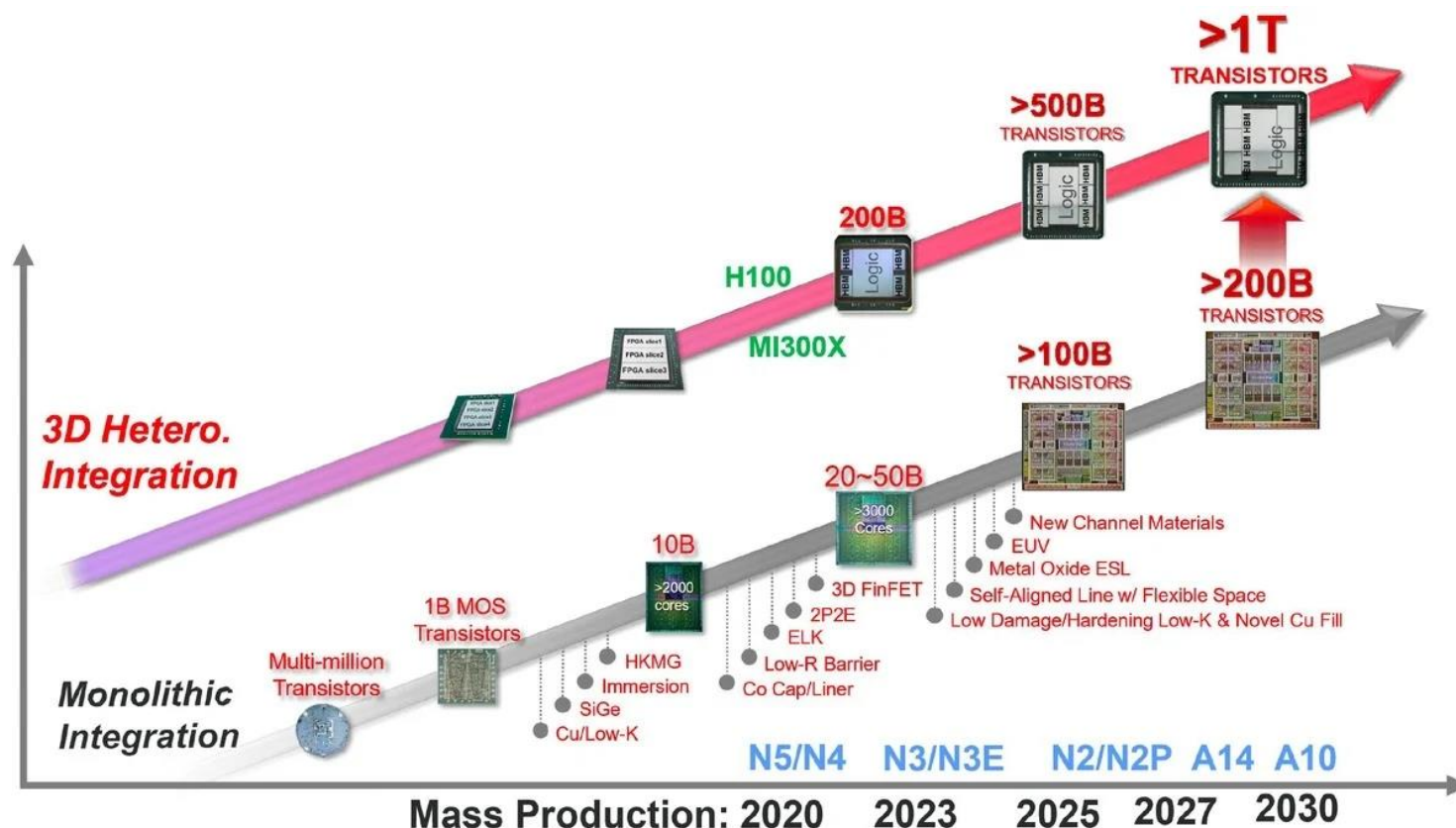
within a decade, it will need a 1-trillion-transistor GPU (10x compared to today)

Related courses/topics :

- Microelectronics
- Nanoelectronics
- Digital circuits for neural networks
- Advanced IC design

<https://spectrum.ieee.org/trillion-transistor-gpu>

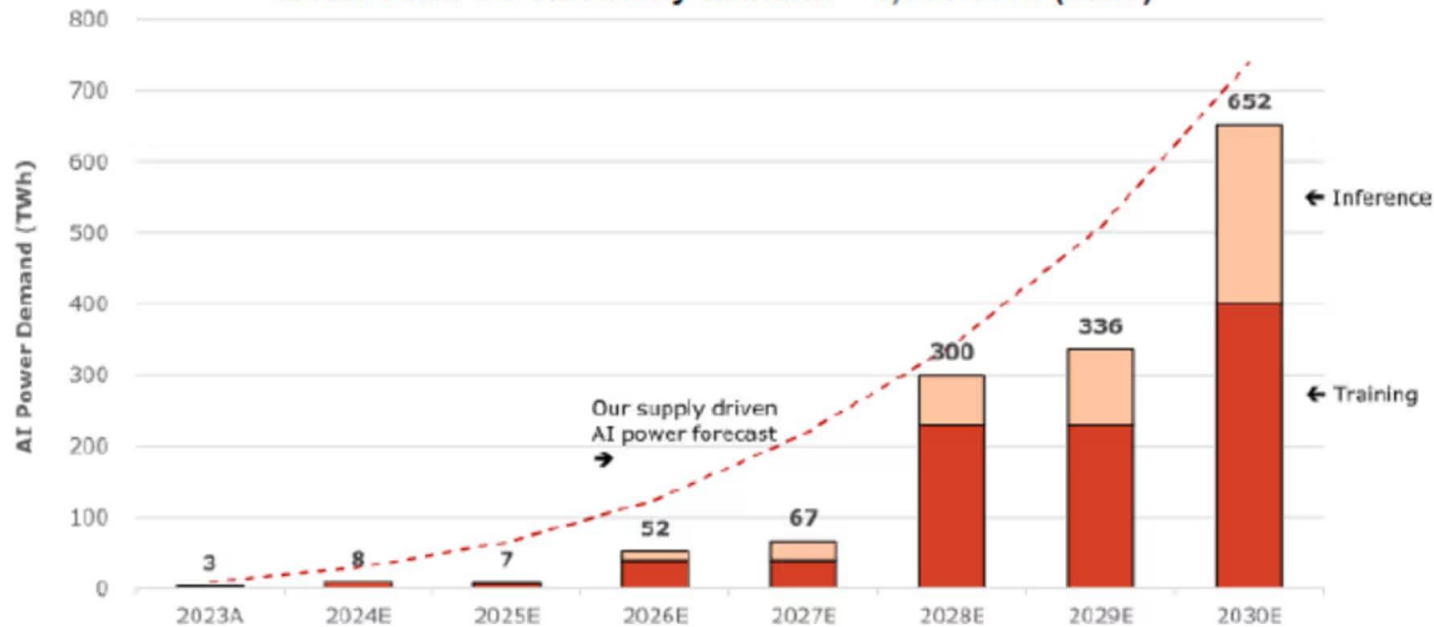
https://static.tweaktown.com/news/9/7/97265_23_tsmc-executives-outline-how-theyll-get-to-monster-1-trillion-transistor-gpu_full.jpg



Summary of GenAI demand forecast

Source: Wells Fargo

Note: Total US electricity demand – 4,000 TWh (2023)



	2023A	2024E	2025E	2026E	2027E	2028E	2029E	2030E
(+) Training power demand (TWh)	3	8	7	40	40	229	229	402
(+) Inference power demand (TWh)	0	0	0	12	27	70	107	250
Demand driven AI power forecast (TWh)	3	8	7	52	67	300	336	652
Supply driven AI power forecast (TWh)	9	29	65	125	217	341	508	739

Source: Wells Fargo Securities, LLC estimates

Energy consumption by AI is increasing

“By 2028 the power going to AI will rise to 326 terawatt-hours per year.

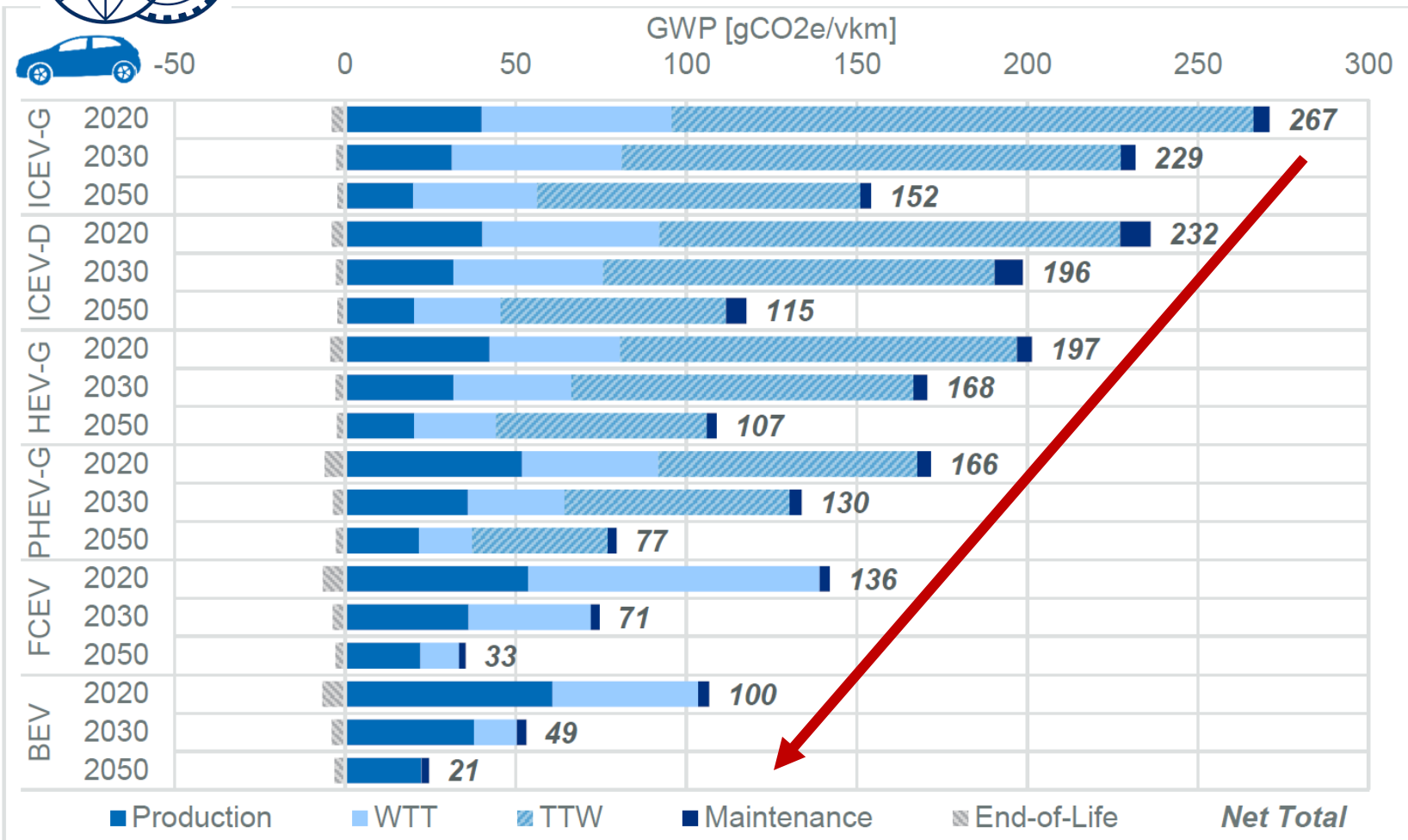
That could generate the same emissions as driving over 300 billion miles—over 1,600 round trips to the sun from Earth.”

“data centers are expected to trending toward using **dirtier, more carbon-intensive forms of energy (like gas) to fill immediate needs**”

MIT Technology Review

Related courses/topics :

- Power electronics
- Optoelectronics and Photovoltaics
- Microelectronics
- Nanoelectronics



Current BEVs can reduce GHG emissions by approximately 43% in Europe (compared to gasoline ICEVs over a 15-year service life)

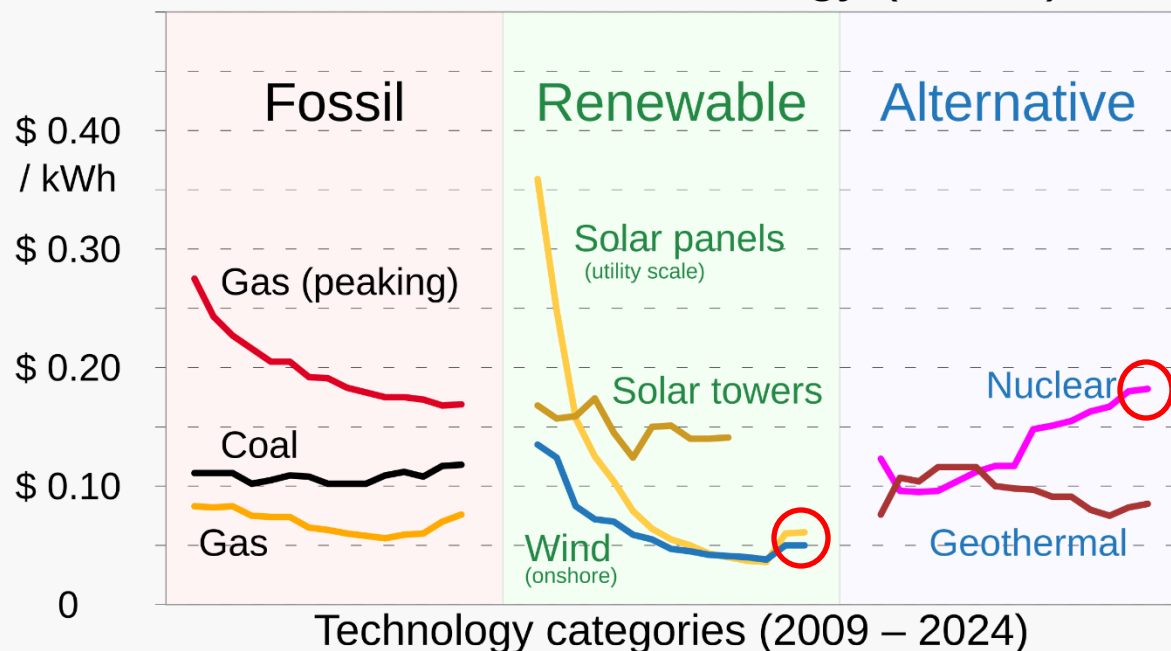


Related courses/topics:

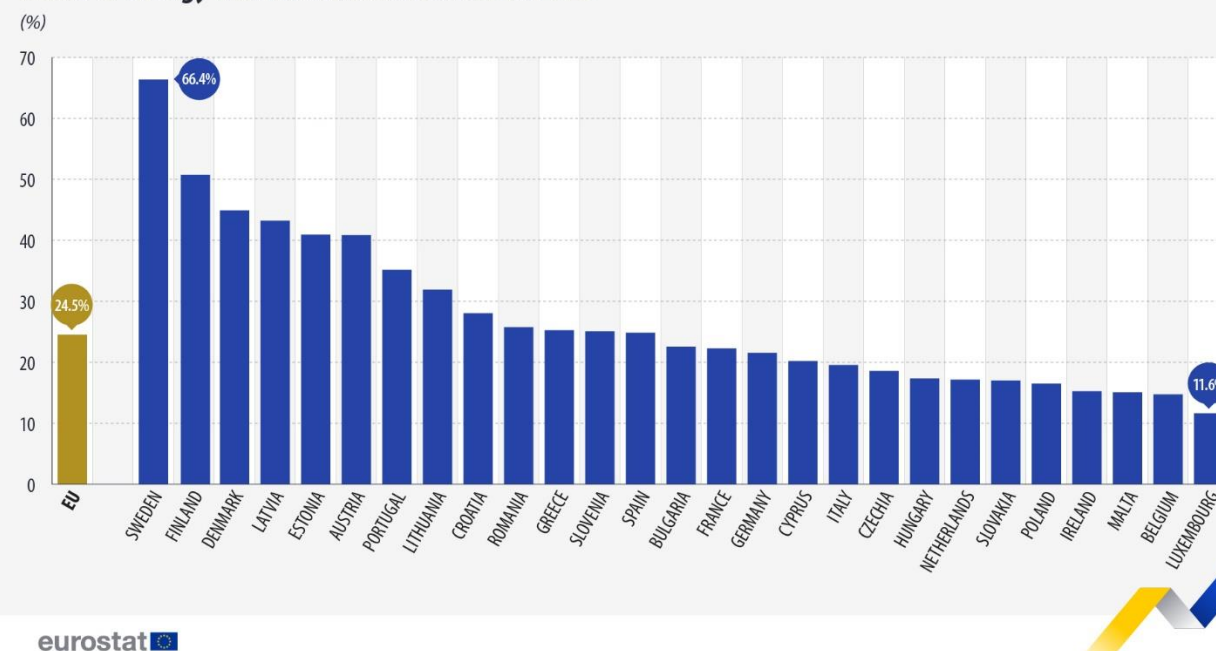
- Automotive and domotics
- Optoelectronics and Photovoltaics
- Power Electronics
- Integrated circuits

THE CHALLENGE OF RENEWABLE ENERGY

Levelized cost of energy (LCOE)



Share of energy from renewable sources in 2023



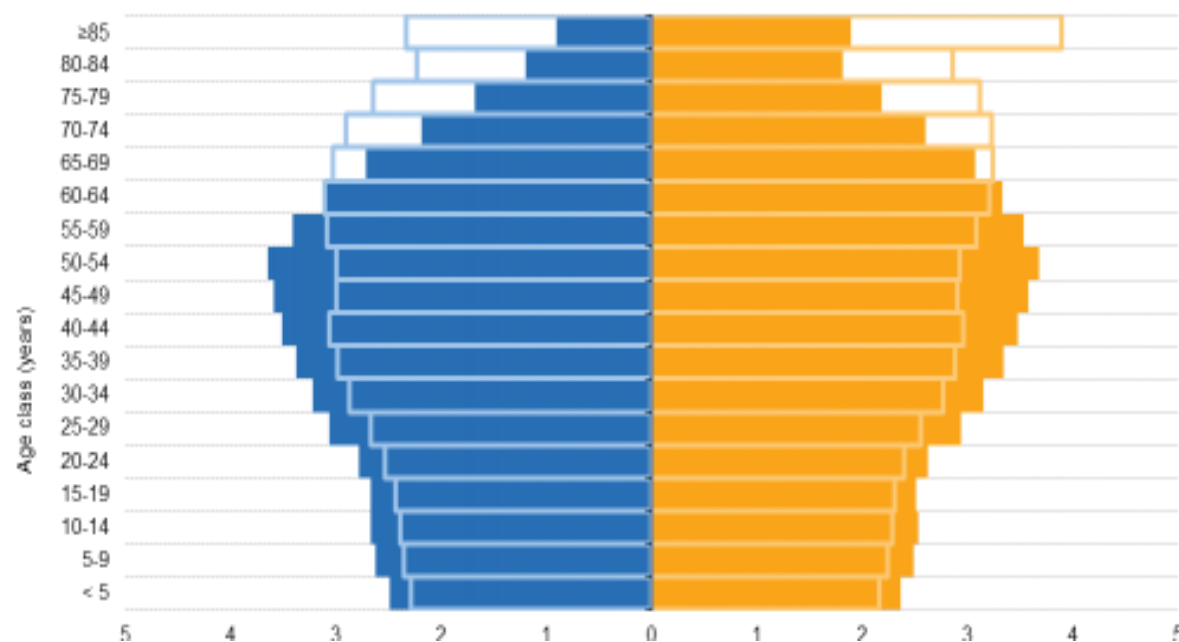
- Renewable energies are much less expensive than fossile and nuclear
- The field of sustainable energy is creating relevant job opportunities

Related courses/topics :

- Optoelectronics and photovoltaics
- Power Electronics
- Organic Electronics

Population pyramids, EU-27, 2019 and 2050

(% share of total population)



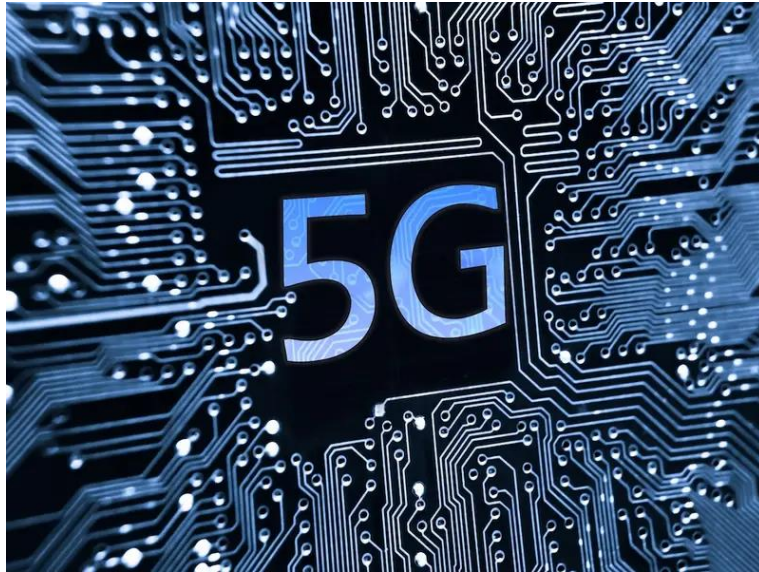
Ageing population and lower budget for healthcare system requires the development of advanced (electronics-based) medical equipment

Related courses/topics :

- Biomedical and healthcare (track)
- Integrated circuits for signal processing
- Organic Electronics

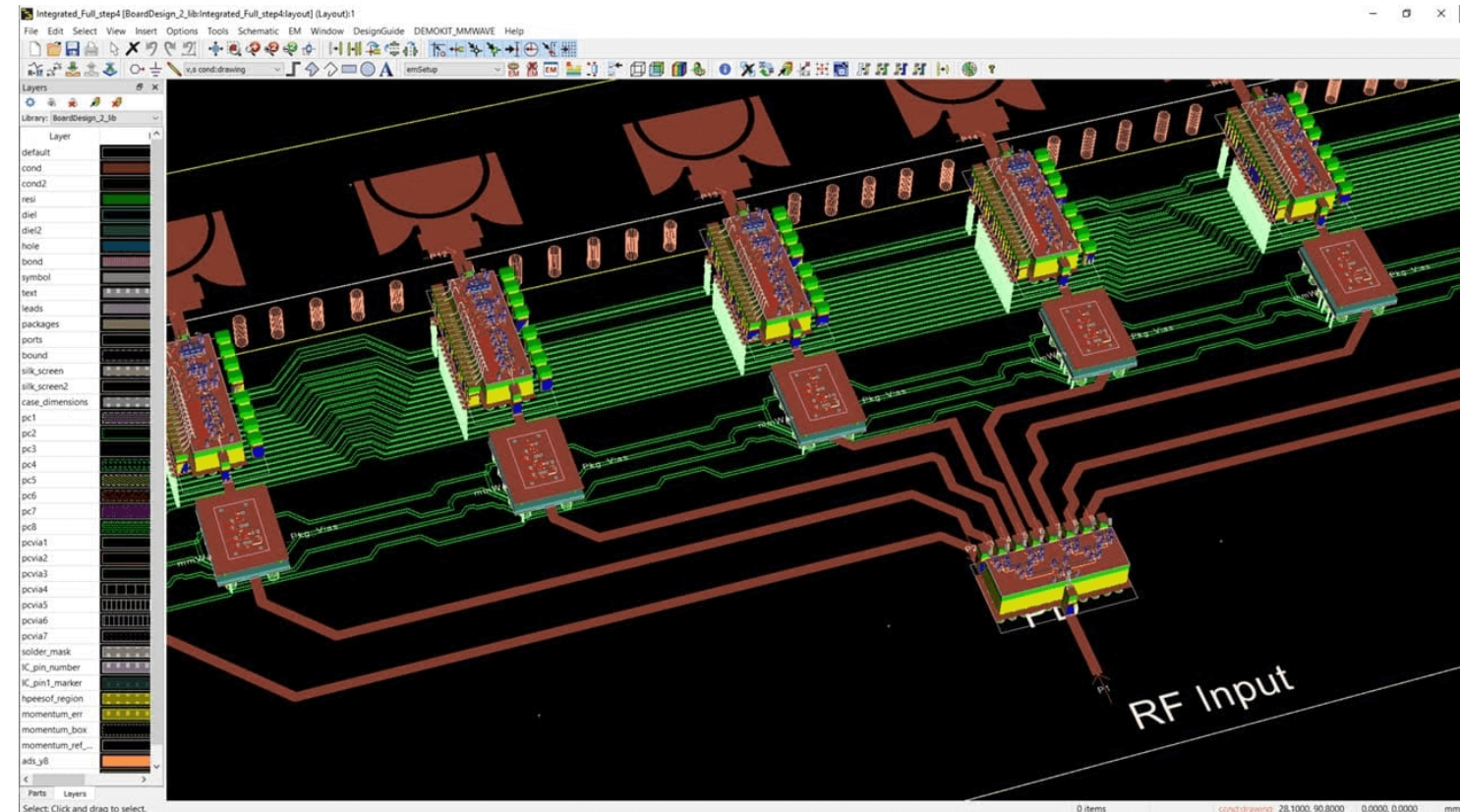


THE CHALLENGE OF INCREASED CONNECTIVITY



Increased connectivity requires innovative integrated circuits for high-frequency communications

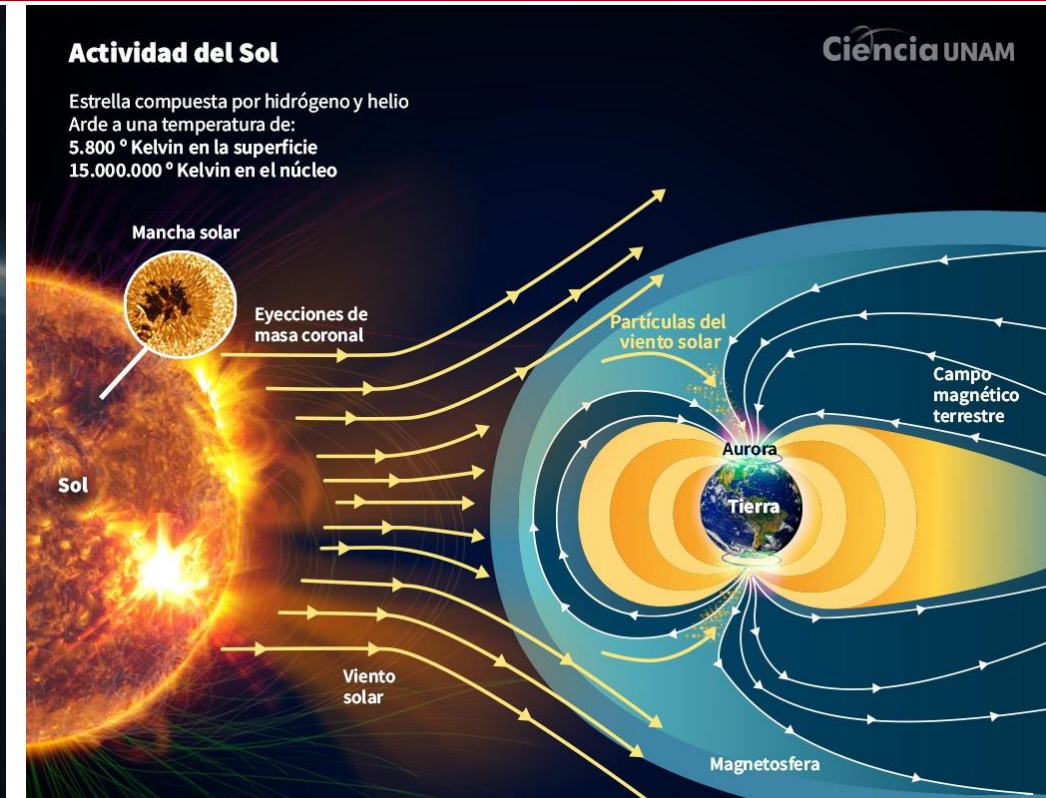
IC design is a key field to contribute in direction



Related courses:

- Analog integrated circuit design
- Radiofrequency ICs

THE CHALLENGE OF ELECTRONICS FOR SPACE



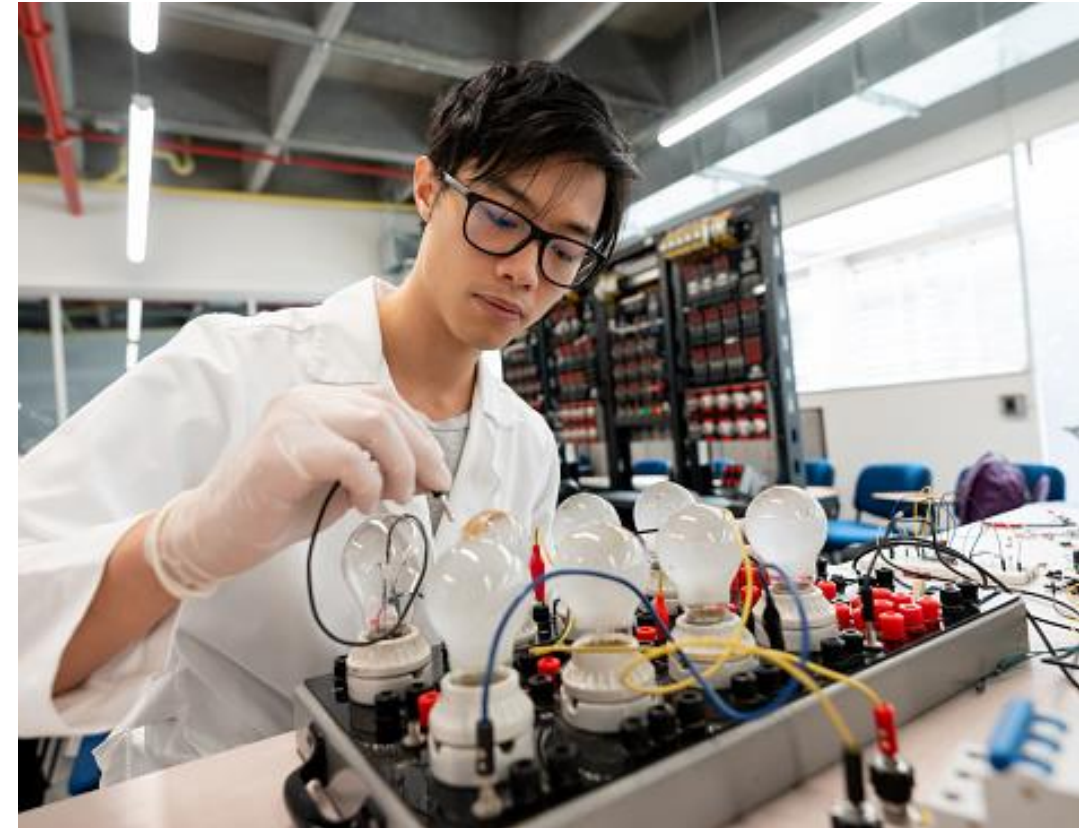
- Increasing need for electronics in space
- How to design rad-hard electronics, to be used in space and avionics?

Related courses/topics:

- Microelectronics
- Quality and reliability
- Optoelectronics and photovoltaics
- IC design
- Microelectronics

Graduates will be able to:

- Master **analog and digital electronics**, **signal processing**, and **power systems**
- Design **integrated circuits (ICs)**, **embedded platforms**, and electronic **control systems**
- Know the fundamentals of **semiconductor science** and advanced technologies
- Apply knowledge in
 - **Renewable energy systems**
 - **Automotive and domotics**
 - **Space applications**
 - **Biomedical equipment**
 - **Consumer electronics**
- Tackle complex engineering problems with focus on innovation and critical thinking



Professional roles include:

- **R&D Engineer in Consumer Electronics**
- **IC Design Engineer (ASIC/FPGA/SoC)**
- **Power Electronics Engineer** (energy conversion, renewables)
- **Semiconductor specialist** (latest technologies)
- **Space Electronics Engineer** (radiation-tolerant systems)
- **Test Engineer**
- **HW Specialist for Control and Automation**
- **Embedded Systems Developer**
- **Telecom Hardware Designer**
- **IoT/AI Hardware Architect**
- **Academic Researcher / Ph.D. Student**





https://www.ilsole24ore.com/art/impresa-e-territori/2017-09-13

il mattino 40

Nei EVENTI NEWS

MENU CERCA

IL GAZZETTINO.it

NORDEST

VENEZIA-MESTRE TREVISO PADOVA BELLUNO ROVIGO VICENZA-BASSANO VERONA

Mancano mille ingegneri, le imprese trevigiane non trovano laureati da assumere

NORDEST > TREVISO

Giovedì 24 Febbraio 2022 di Mattia Zanardo

TREVISO - Le imprese trevigiane nel 2021 stimavano di aver bisogno di assumere 1.900 ingegneri: in prevalenza laureati in ingegneria industriale o elettronica e dell'informazione, ma anche civile o in altri indirizzi affini. In quasi sei casi su dieci, tuttavia, questi profili sono molto difficili da trovare: il 57,4 per cento, per la precisione, tre punti in più dell'anno precedente. Per elettronici e informatici il tasso di "irreperibilità" supera addirittura il 70%. Significa che circa 1.100 entrate previste sono rimaste vacanti, per mancanza fisica di candidati o perché, chi si è presentato, non aveva le competenze richieste. A livello veneto, sono oltre 10.300

1/8 Aziende padovane a caccia di ingegneri elettronici

«Trovassi un paio di ingegneri specializzati nell'elettronica analogica e nelle telecomunicazioni li assumerei immediatamente, invece sembra che nessuno voglia occuparsi di misurazioni». Pierluigi Egidi è il titolare di Seneca, azienda

Torna il lavoro, mancano i profili. Un Paese senza periti e ingegneri

Sono 880 mila le occupazioni per le quali le aziende faticano a trovare candidati Il problema è più marcato nell'industria: difficile coprire un posto su quattro



di Padova

il mattino 40

Nei EVENTI NEWS

MENU CERCA

IL GAZZETTINO.it

NORDEST

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La Ferrari va a caccia di ingegneri padovani



CORRIERE DELLA SERA

L'Economia

RISPARMI, MERCATI, IMPRESE

I titoli di studio più richiesti di Diana Cavalcoli | 1 febbraio 2022

Nel 2021 si contano 1,4 milioni diplomati ricercati dalle imprese (31% del totale entrate) e 634mila i laureati (13,7%). «I qualificati professionali contano 1,1 milioni di ingressi programmati (23,7%) e i diplomati ITS quasi 70mila profili richiesti (1,5%)», si legge nel report. Arriva poi a coprire il 30% delle assunzioni programmate l'indicazione di professioni senza titolo di studio. Sono introvabili i laureati in ingegneria elettronica e dell'informazione (con una difficoltà di reperimento del 57%), i laureati in scienze matematiche,

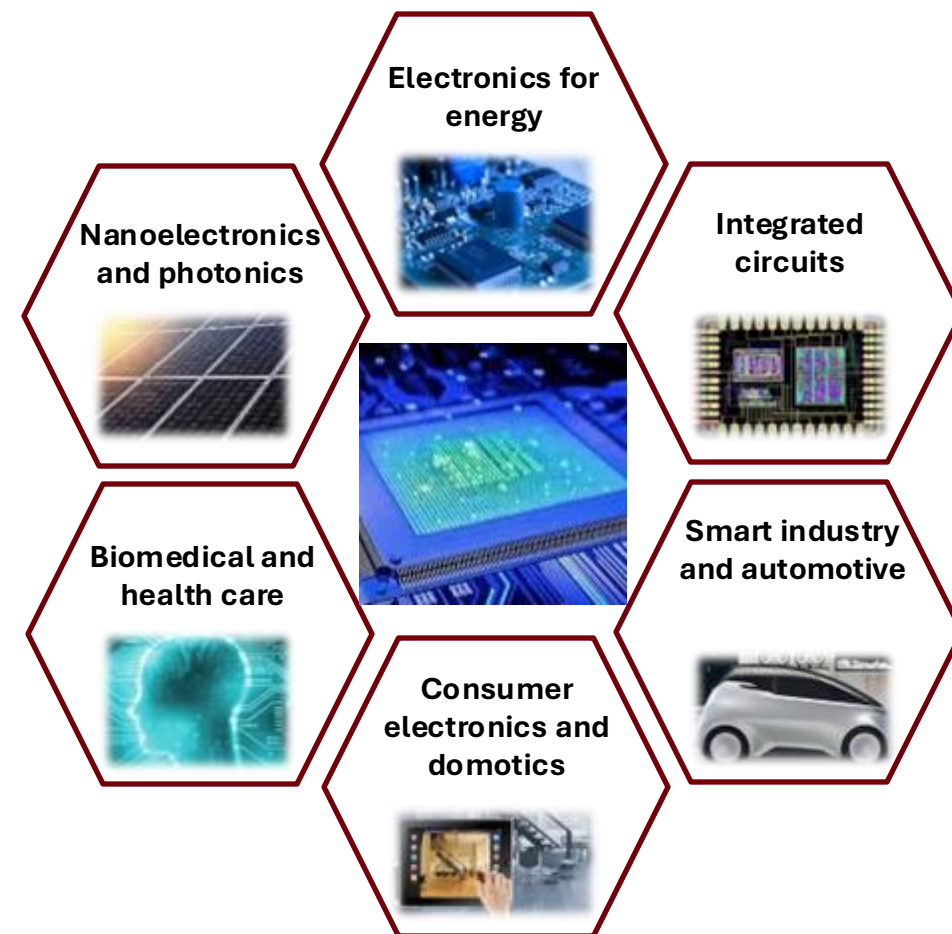
CORRIERE DELLA SERA

Il boom dei laureati di Alice Scaglioni | 12 gennaio 2020

La domanda di laureati tocca il 18,3% delle entrate totali previste: dalle 68mila assunzioni programmate nel gennaio 2019 si arriva quindi a 84mila previste per inizio anno. Aumenta la domanda di laureati negli indirizzi architettura, con un incremento del 45,2% rispetto a gennaio 2019, economia (+33,6%), ingegneria civile e ambientale (+29%), ingegneria elettronica e dell'informazione (+27,9%) nonché nell'indirizzo scientifico, matematico e fisico (+25,4%).

New degree → 6 tracks, a multidisciplinary approach

- **News: master thesis (21 ECTS) + Stage (9 ECTS) → *Learning by doing***
- **All in English**
- **International:** Erasmus, Ulisse, stages/trainsheeps in industries and research centers
- **Higher education:** Direct link with PhD, also in the framework of large research networks/projects



PROPOSED TRACKS



- Nanoelectronics and photonics



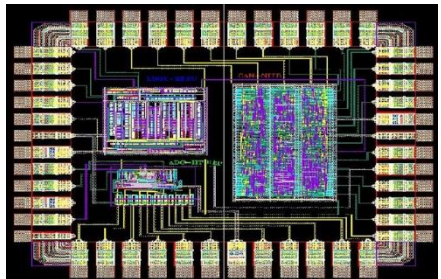
- Biomedical and health care



- Electronics for energy



- Consumer electronics and domotics



- Integrated Circuits



- Smart industry and automotive

FUNDAMENTAL (CORE) COURSES

Consolidate the basics in all aspects of electronics

Fundamental courses (Mandatory)				
SSD	Teaching	ECTS	Year	Period
ING-INF/01	ANALOG ELECTRONICS	6	I	S1
ING-INF/07	ELECTRONIC MEASUREMENTS*	9	I	S1
ING-INF/02	MICROWAVE DEVICES	9	I	S1
ING-INF/01	MICROELECTRONICS	9	I	S2
ING-INF/01	ANALOGUE INTEGRATED CIRCUIT DESIGN*	9	I	S2
ING-INF/01	POWER ELECTRONICS*	9	I	S2

*Include laboratory activities

Fundamental courses (Mandatory)				
	Teaching			
	ANALOG ELECTRONICS			
	ELECTRONIC MEASUREMENTS*			
	MICROWAVE DEVICES			
	MICROELECTRONICS			
	ANALOGUE INTEGRATED CIRCUIT DESIGN*			
	POWER ELECTRONICS*			

1

2

3

Nanoelectronics and photonics

Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
NANOELECTRONICS	6	II	S1
OPTOELECTRONIC AND PHOTOVOLTAIC DEVICES	9	II	S1
FROM 12 TO 15 ECTS AMONG THE FOLLOWING COURSES			
NANOPHOTONICS AND METASURFACES	6	II	S1
QUALITY AND RELIABILITY IN ELECTRONICS	9	II	S1
ORGANIC AND MOLECULAR ELECTRONICS	6	II	S2
BIOPHOTONICS	6	II	S1
MICROELECTRONICS AND GEOPOLITICS	9	I	S2
12 ECTS AMONG THE FOLLOWING COURSES			
PHYSICS AND OPTICS AT THE NANOSCALE	6	I	S1
QUANTUM OPTICS AND LASER	6	II	S1
QUANTUM TECHNOLOGIES	6	II	S2
INDUSTRIAL APPLICATIONS OF IONIZING RADIATION SOURCES	6	II	S2

Electronics for energy

Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
POWER ELECTRONICS DESIGN	9	II	S1
SMART GRIDS	6	II	S1
9 ECTS AMONG THE FOLLOWING COURSES			
ELECTROMAGNETIC COMPATIBILITY	9	II	S1
OPTOELECTRONIC AND PHOTOVOLTAIC DEVICES	9	II	S1
ANALOG ELECTRONICS DESIGN	9	II	S1
FROM 15 TO 18 ECTS AMONG THE FOLLOWING COURSES			
SYSTEMS THEORY	9	I	S1
INDUSTRIAL AUTOMATION	9	I	S2
MODELLING AND CONTROL OF ELECTRIC DRIVES	9	II	S1
DIGITAL CONTROL	6	I	S1
CONTROL ENGINEERING LABORATORY	9	II	S2
ELECTROCHEMICAL ENERGY STORAGE TECHNOLOGIES	6	II	S1

Integrated Circuits

Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
INTEGRATED CIRCUITS FOR SIGNAL PROCESSING	9	II	S1
RADIOFREQUENCY INTEGRATED CIRCUITS DESIGN	9	II	S1
9 ECTS AMONG THE FOLLOWING COURSES			
ELECTROMAGNETIC COMPATIBILITY	9	II	S1
ANTENNAS AND WIRELESS PROPAGATION	9	II	S2
DIGITAL CIRCUITS FOR NEURAL NETWORKS	9	II	S2
ANALOG ELECTRONICS DESIGN	9	II	S1
12 ECTS AMONG THE FOLLOWING COURSES			
INTERNET OF THINGS AND SMART CITIES	6	II	S1
DIGITAL CONTROL	6	I	S1
COMPUTER VISION	6	I	S1
MACHINE LEARNING FOR BIOENGINEERING	6	I	S2

Fundamental courses (Mandatory)				
	Teaching			
	ANALOG ELECTRONICS			
	ELECTRONIC MEASUREMENTS*			
	MICROWAVE DEVICES			
	MICROELECTRONICS			
	ANALOGUE INTEGRATED CIRCUIT DESIGN*			
	POWER ELECTRONICS*			

4

Biomedical and health care			
Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
BIOSENSORS	9	II	S1
INTEGRATED CIRCUITS FOR SIGNAL PROCESSING	9	II	S1
9 ECTS AMONG THE FOLLOWING COURSES			
ELECTROMAGNETIC COMPATIBILITY	9	II	S1
WEARABLE SENSING DESIGN FOR HEALTHCARE	9	II	S2
RADIOFREQUENCY INTEGRATED CIRCUITS DESIGN	9	II	S1
12 ECTS AMONG THE FOLLOWING COURSES			
BIOMEDICAL WEARABLE TECHNOLOGIES FOR HEALTHCARE AND WELLBEING	6	II	S2
MACHINE LEARNING FOR BIOENGINEERING	6	I	S2
CONTROL OF BIOLOGICAL SYSTEMS	6	II	S1
IMAGING FOR NEUROSCIENCE	6	II	S1

5

Consumer electronics and domotics			
Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
INTEGRATED CIRCUITS FOR SIGNAL PROCESSING	9	II	S1
AUTOMOTIVE AND DOMOTICS	9	II	S2
9 ECTS AMONG THE FOLLOWING COURSES			
ANTENNAS AND WIRELESS PROPAGATION	9	II	S2
DIGITAL CIRCUITS FOR NEURAL NETWORKS	9	II	S2
QUALITY AND RELIABILITY IN ELECTRONICS	9	II	S1
RADIOFREQUENCY INTEGRATED CIRCUITS DESIGN	9	II	S1
OPTOELECTRONIC AND PHOTOVOLTAIC DEVICES	9	II	S1
12 ECTS AMONG THE FOLLOWING COURSES			
ELECTROCHEMICAL ENERGY STORAGE TECHNOLOGIES	6	II	S1
COMPUTER VISION	6	I	S1
INTERNET OF THINGS AND SMART CITIES	6	II	S1

6

Smart industry and automotive			
Teaching	ECTS	Year	Period
MANDATORY COURSES			
Fundamental courses (see previous slide)			
QUALITY AND RELIABILITY IN ELECTRONICS	9	II	S1
OPTOELECTRONIC AND PHOTOVOLTAIC DEVICES	9	II	S1
9 ECTS AMONG THE FOLLOWING COURSES			
ELECTROMAGNETIC COMPATIBILITY	9	II	S1
INTEGRATED CIRCUITS FOR SIGNAL PROCESSING	9	II	S1
POWER ELECTRONICS DESIGN	9	II	S1
AUTOMOTIVE AND DOMOTICS	9	II	S2
12 ECTS AMONG THE FOLLOWING COURSES			
COMPUTER VISION	6	I	S1
DIGITAL CONTROL	6	I	S1
INDUSTRIAL APPLICATIONS OF IONIZING RADIATION SOURCES	6	II	S2

- <https://didattica.unipd.it/off/2024/LM/IN/IN2645>
- [Allegato 3](#) (Study plans automatically approved)
- <https://degrees.dei.unipd.it/master-degrees/electronic-engineering/>
- Uniweb
 - Study plans submission
 - To be activated

– Premi Infineon Ingegneria Elettronica in memoria di Alessia Lovato -

A chi è rivolto: studentesse e studenti di cittadinanza italiana o straniera che abbiano effettuato la pre-immatricolazione al corso di laurea magistrale in “Ingegneria elettronica” presso l’Ateneo patavino

Tipologia: due premi di studio, del valore di 5.000,00 euro ciascuno.

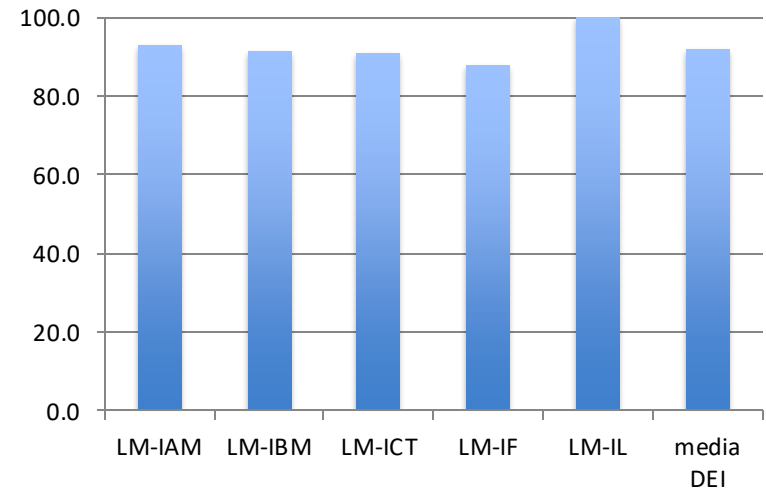
[Domanda di partecipazione in Moodle](#)

Bando

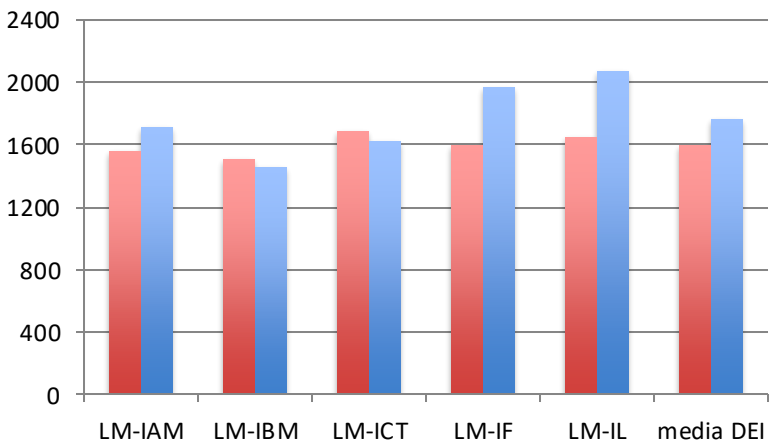
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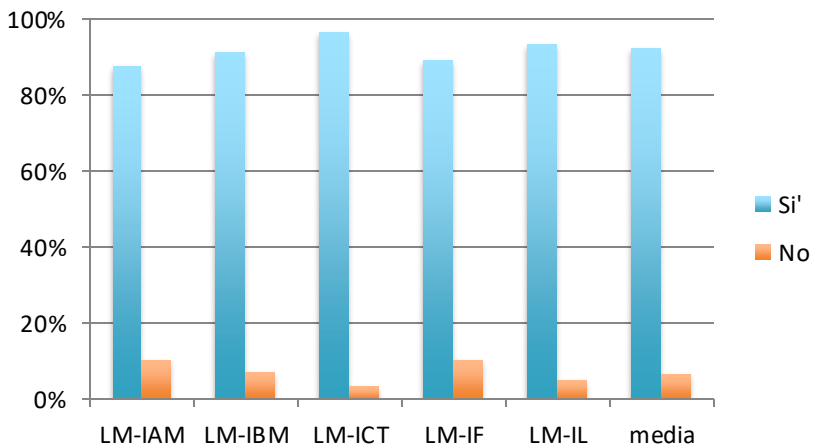
tasso di occupazione a 1 anno (ISTAT)



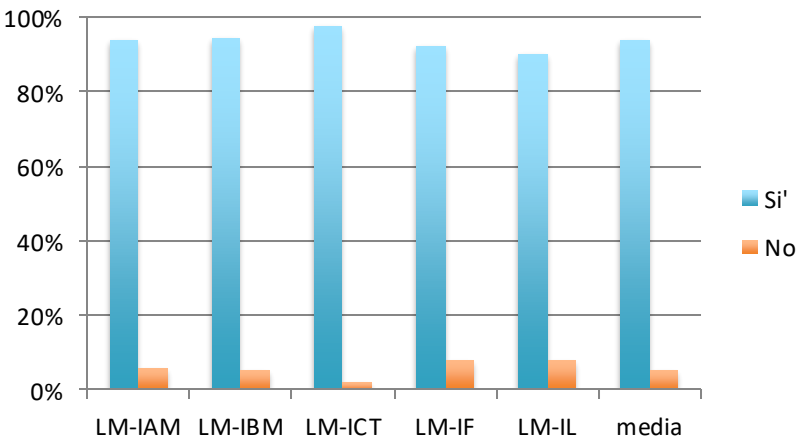
Stipendio medio a 1 anno / 3 anni (euro/mese)



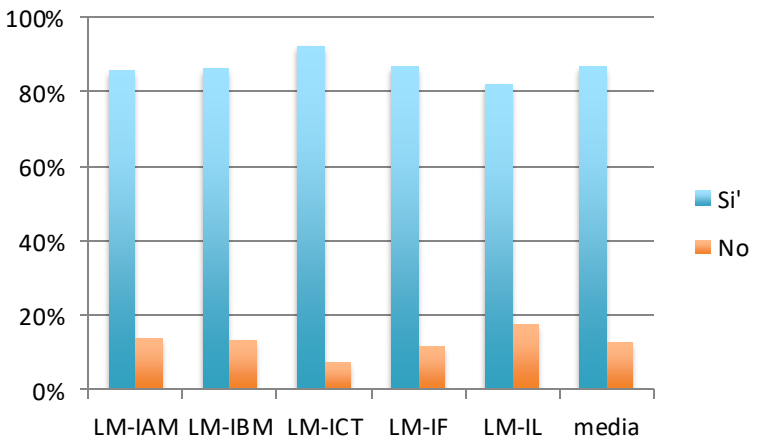
Soddisfatti del corso



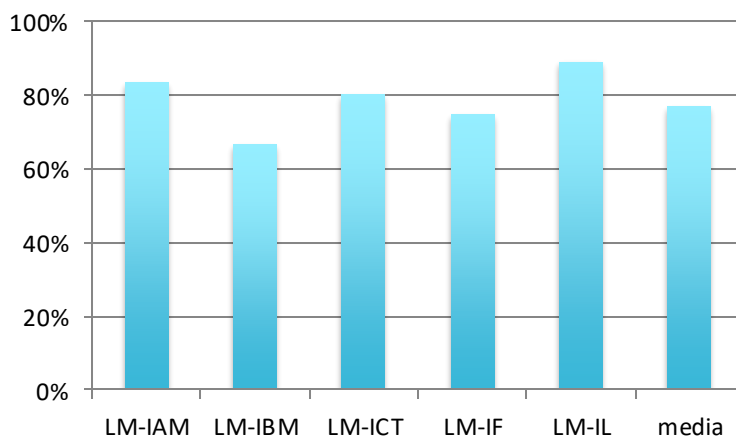
Soddisfatti dei docenti



Carico adeguato



Ti iscriveresti ancora?



Electronics

- Faces global challenges
 - Energy and sustainability
 - Connectivity, interfaces, sensors
 - Life & Health
- Creates innovation
- More jobs than engineers
- Is the driver of the ICT area (multi-disciplinary)



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THANK YOU FOR YOUR ATTENTION!