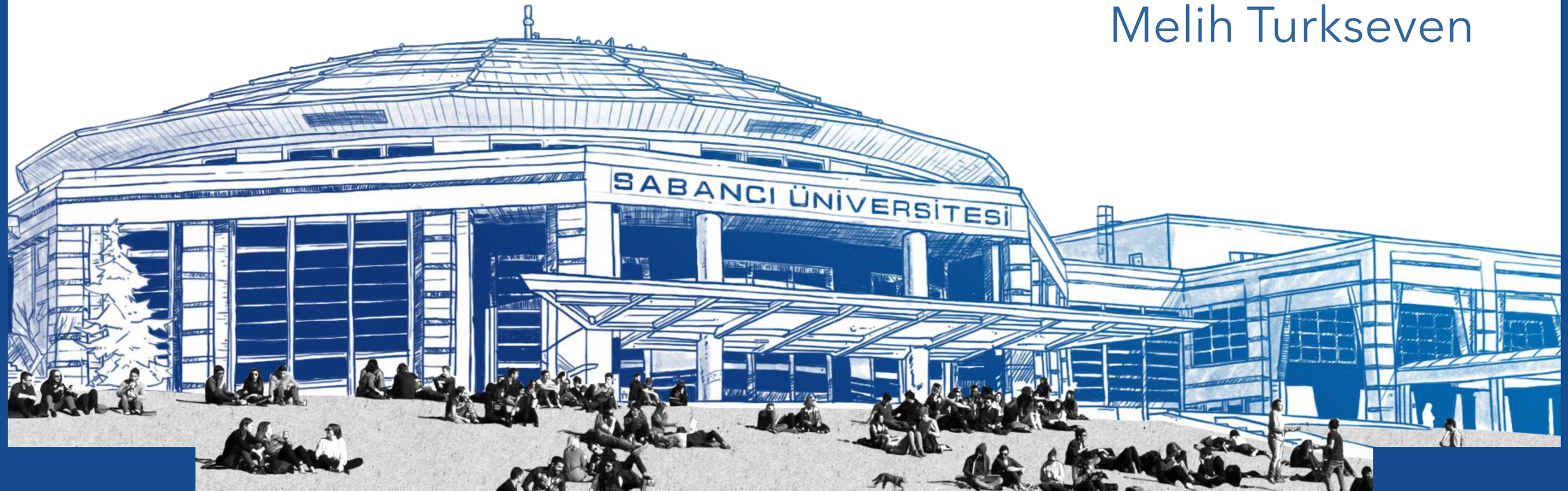
Sabancı Üniversitesi

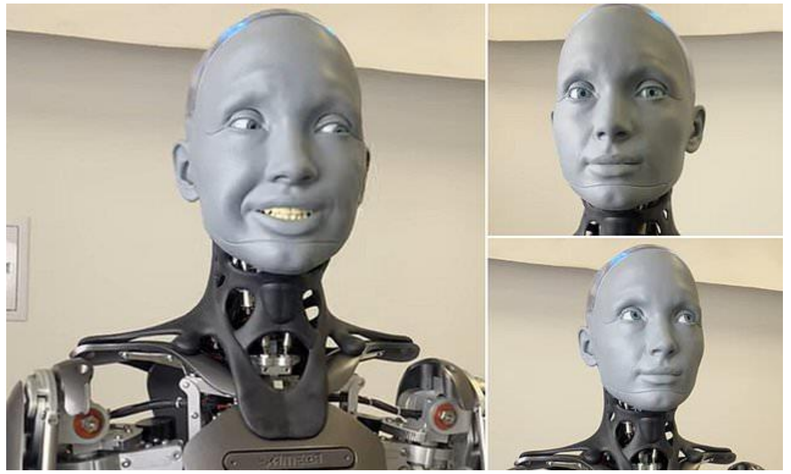
Mechatronics Engineering

Melih Turkseven



Part I - What is Mechatronics Engineering?

A **robot** is a machine -especially one programmable by a computer- capable of carrying out a complex series of actions automatically *(Oxford Dictionary)*.



Part I - What is Mechatronics Engineering?

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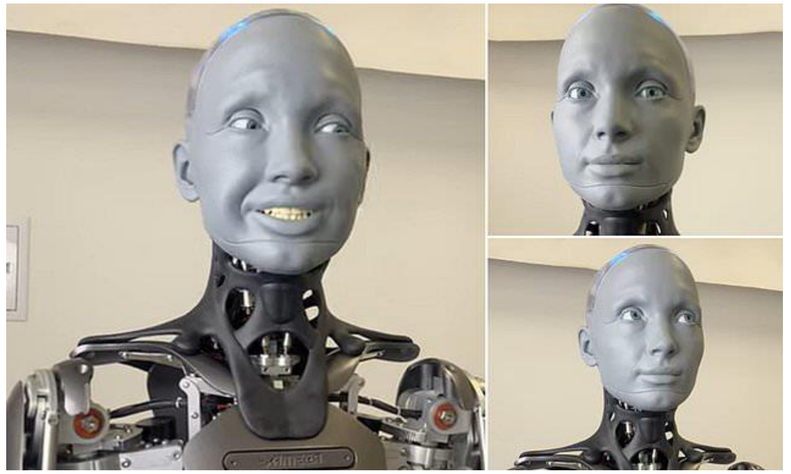
The term, “**mechatronics**”, is coined in 1971 prior to progress in robotics. The gap between “**robotics**” and “**mechatronics**” has been reduced ever since.



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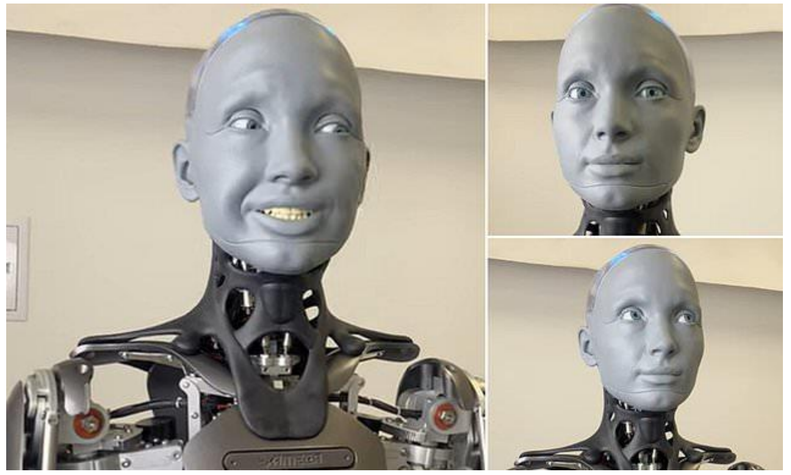
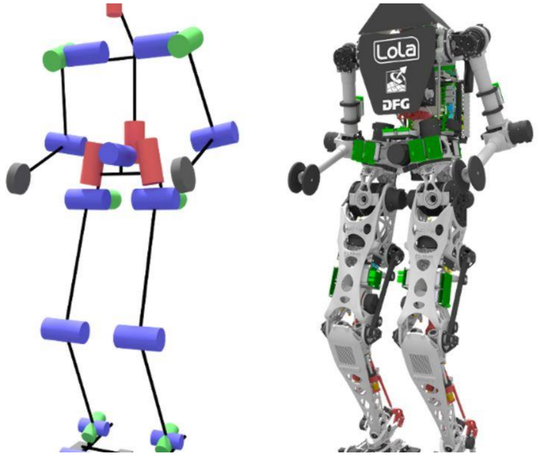


The term, “**mechatronics**”, is coined in 1971 prior to progress in robotics. The gap between “**robotics**” and “**mechatronics**” has been reduced ever since.

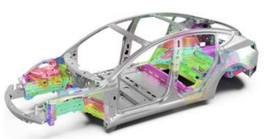
Requires the integration of systems from various disciplines:

- Mechanical systems
- Electrical systems
- Electronics
- Software & Automation
- Communication
- Product engineering & design
- …

Main Ingredients

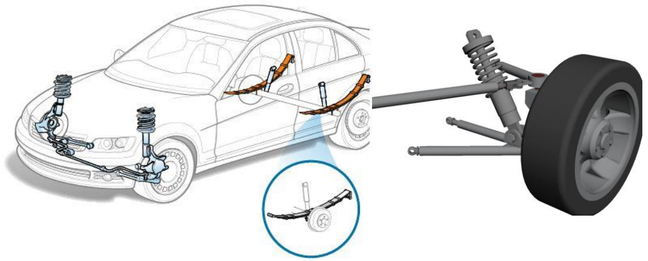


https://www.wevolver.com/article/design-considerations-for-humanoid-robots



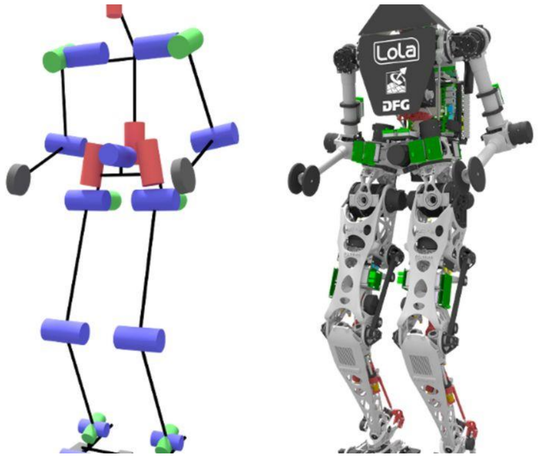
Model 3 body structure
171 pieces of metal highlighted

Austin-made Model Y body structure
2 pieces of metal highlighted
>1,600 fewer welds



Mechanical Design

Main Ingredients



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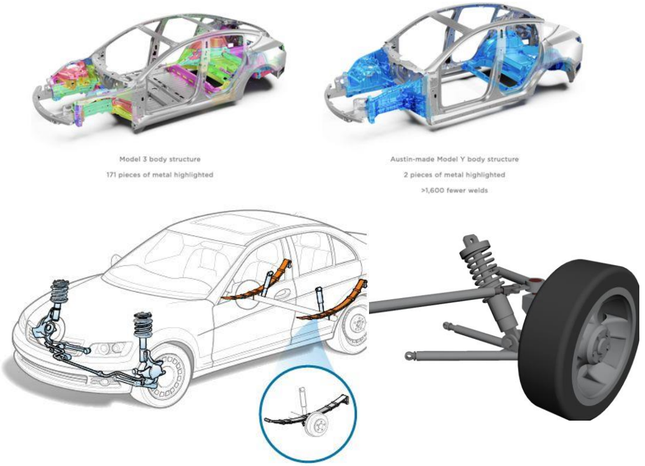
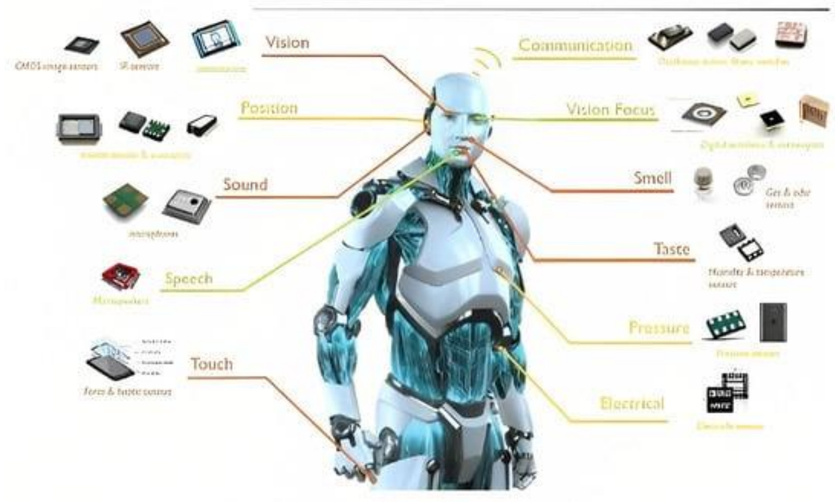
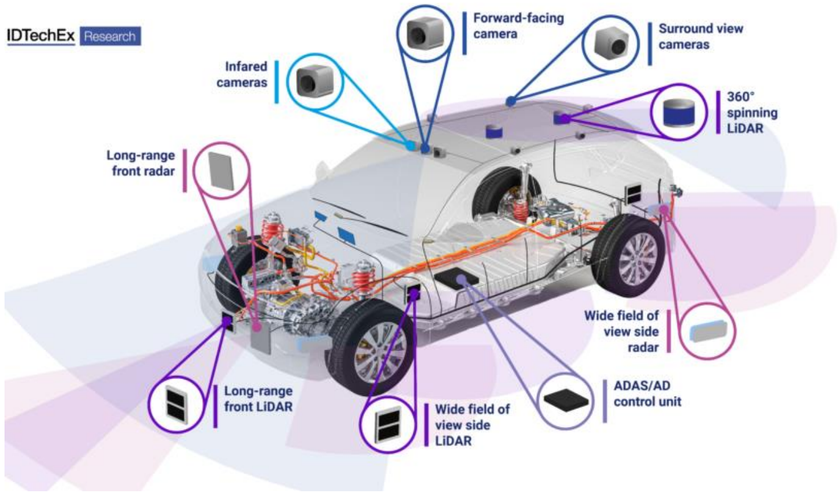


Mechanical Design

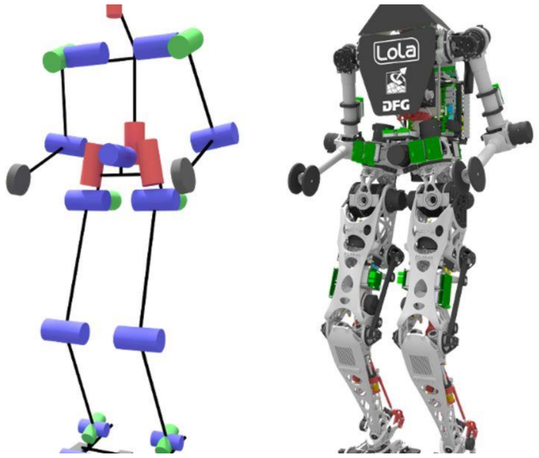




Electronics

Are we done already?

Main Ingredients



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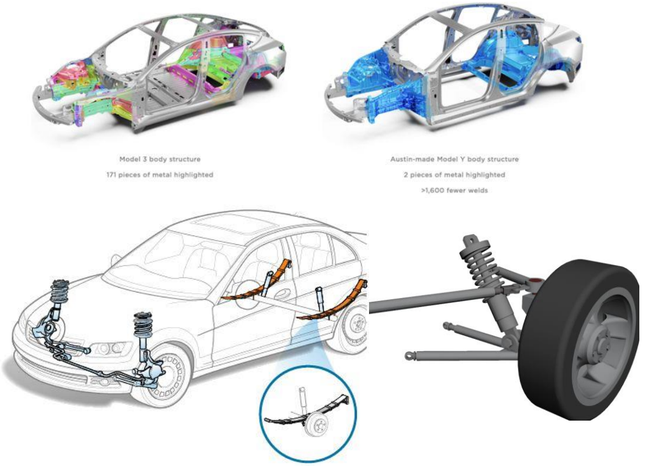
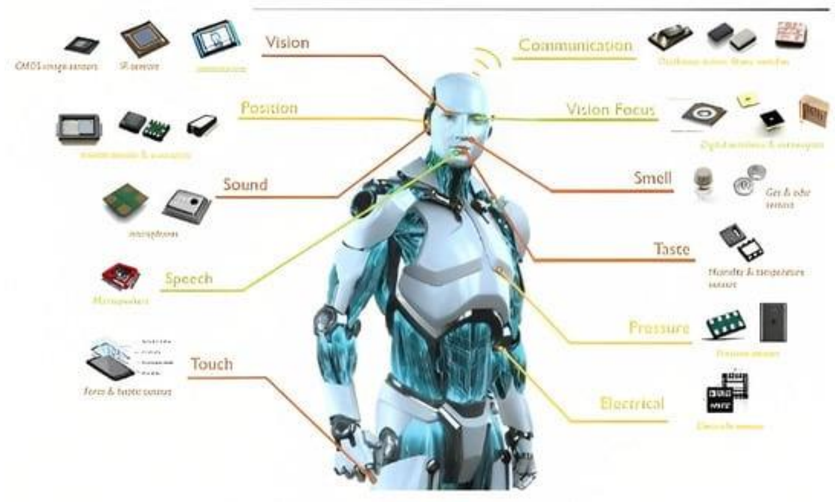
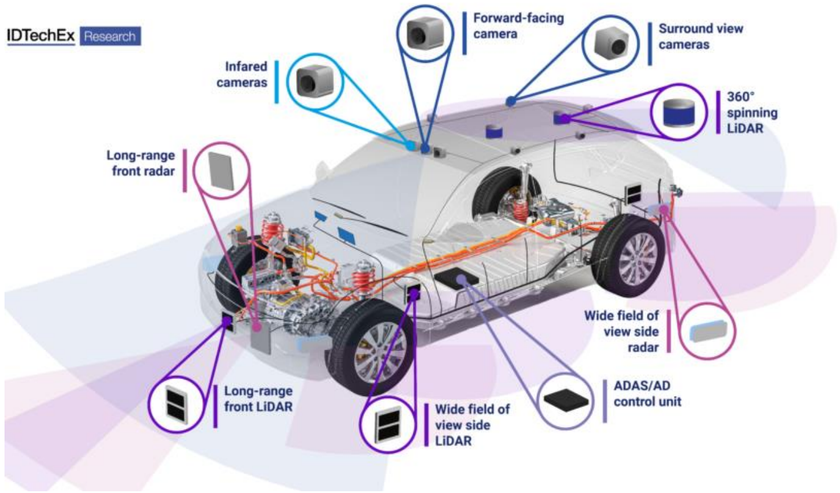


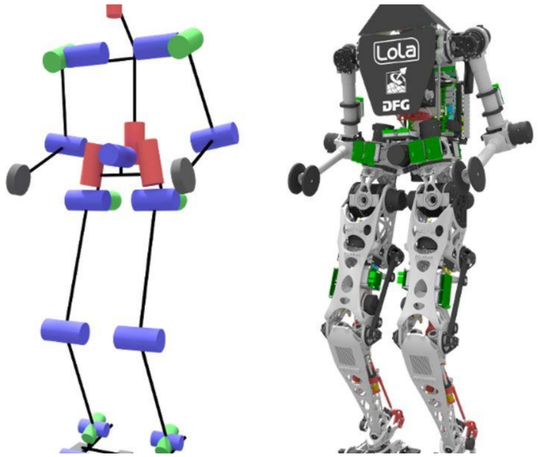
Mechanical Design





Electronics

Main Ingredients



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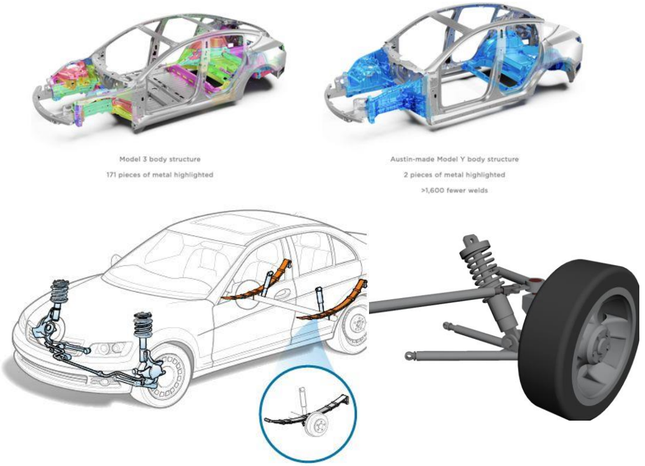
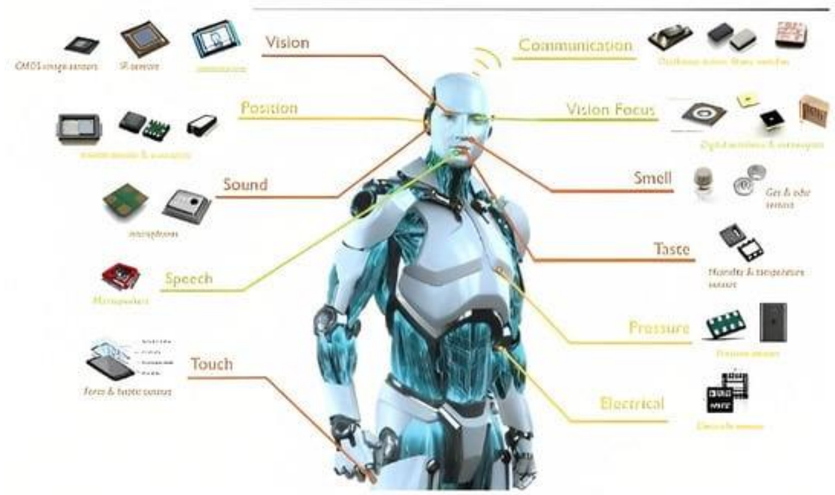
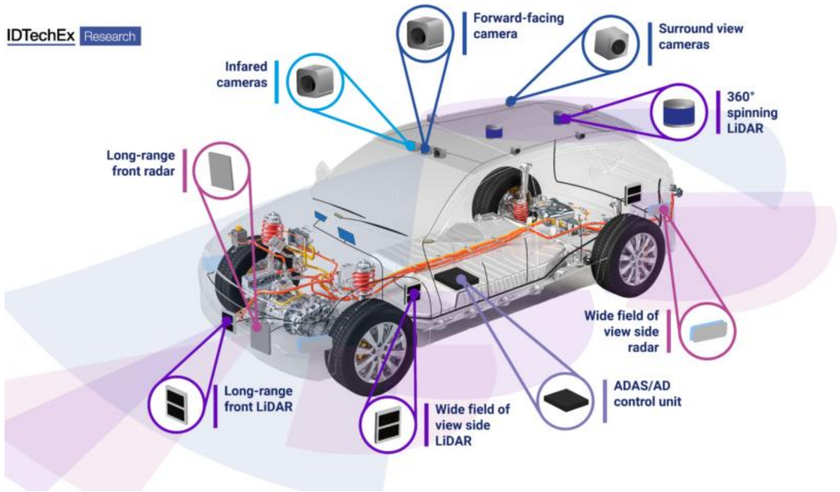


Mechanical Design





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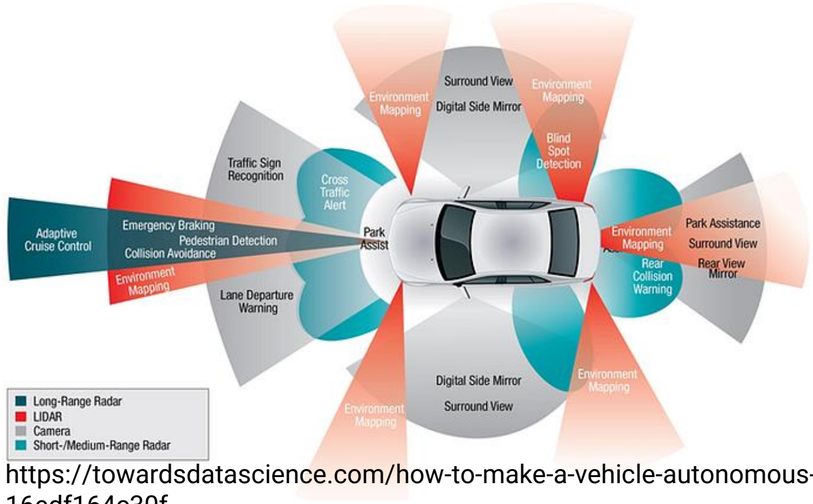


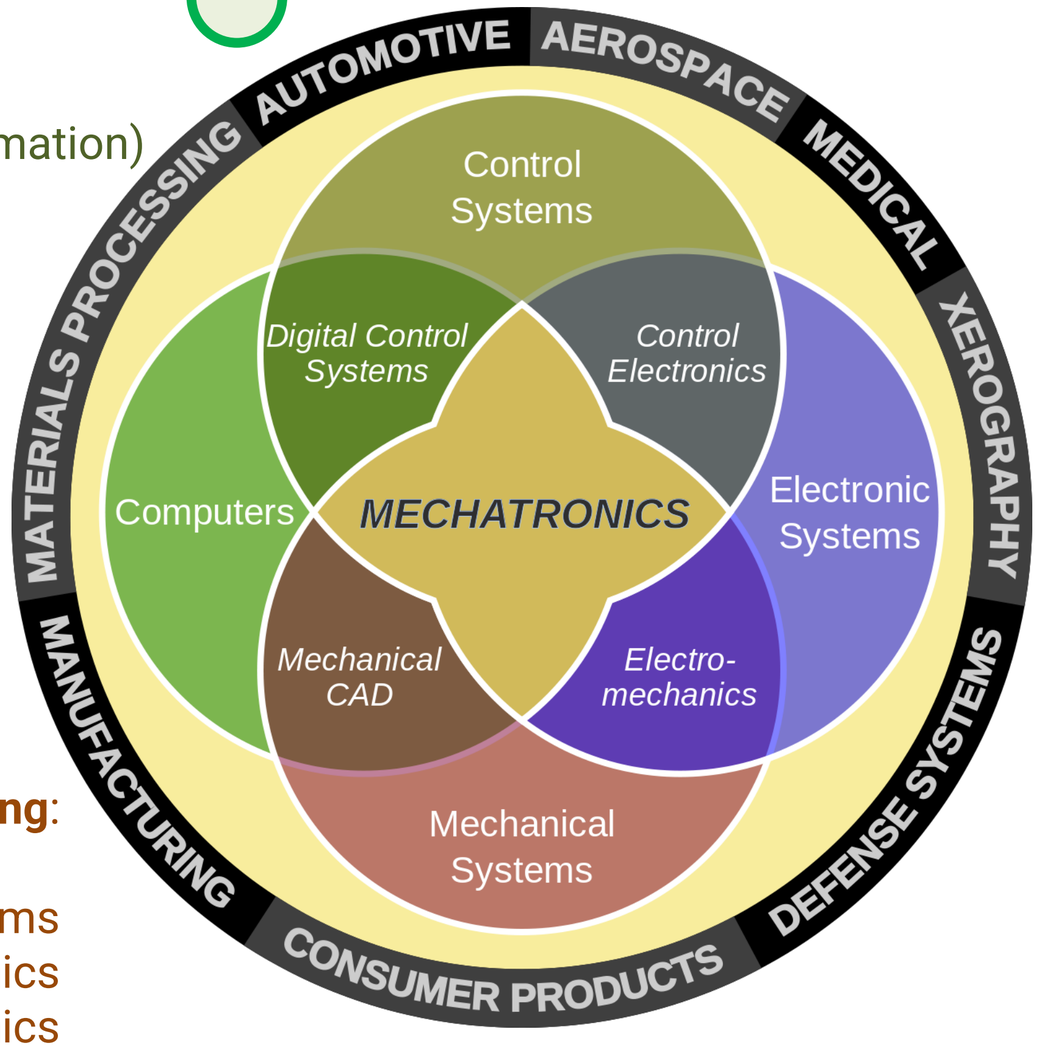
https://towardsdatascience.com/how-to-make-a-vehicle-autonomous-16edf164c30f

Control Systems

Part I - What is Mechatronics Engineering?

Control Engineering & Computer Science:

- Control System Design
- Algorithms (e.g. Planning, Estimation)
- Machine Learning & AI



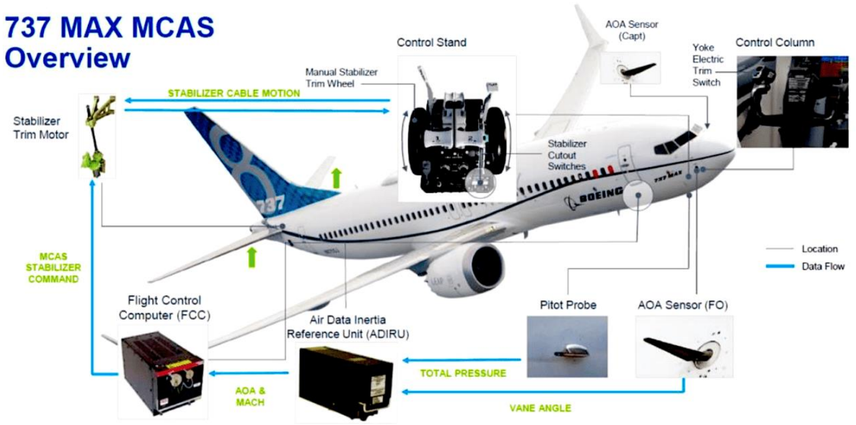
Electronics Engineering:

- Circuit Design
- Embedded Electronics
- Power Electronics

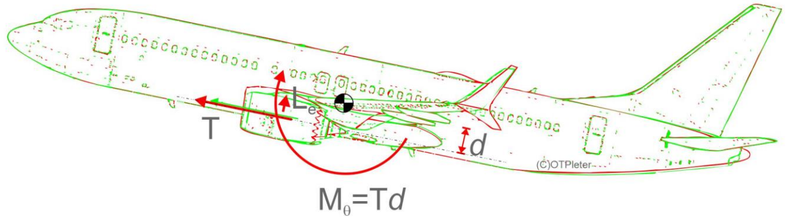
Mechanical Engineering:

- Design of Mechanical Systems
- Fluid Mechanics
- Statics & Dynamics

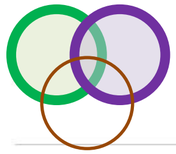
Interdisciplinary Nature of Mechatronic Systems



Boeing 737 MAX-8 Boeing 737-800 NG



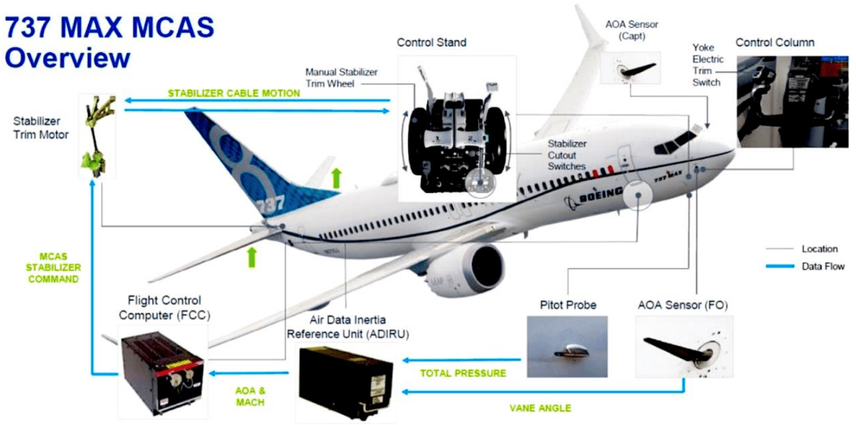
Interdisciplinary Nature of Mechatronic Systems



THE DRIVEN

Australia's most-trusted and well-read electric vehicle news site

EV NEWS | EV MODELS (NEW!) | EV SALES | ROAD TRIPS | REVIEWS | MULTIMEDIA



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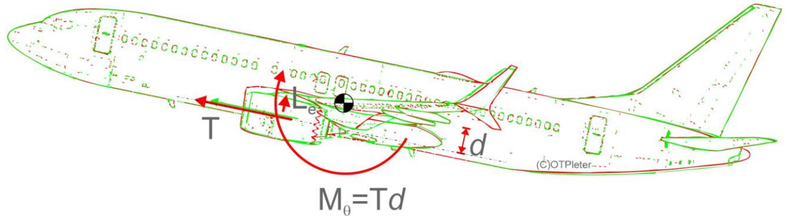
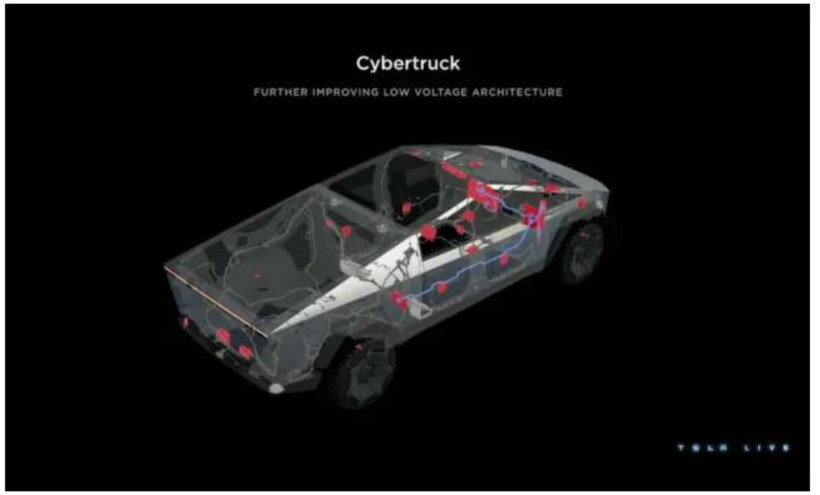


107 COMMENTS

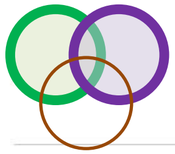
Why Tesla's move to 48-volt electrical architecture is an industry game changer

MARCH 20, 2023 · 107 COMMENTS · 4 MINUTE READ · TIM JAMES



TESLA 48-VOLT CYBERTRUCK

Interdisciplinary Nature of Mechatronic Systems



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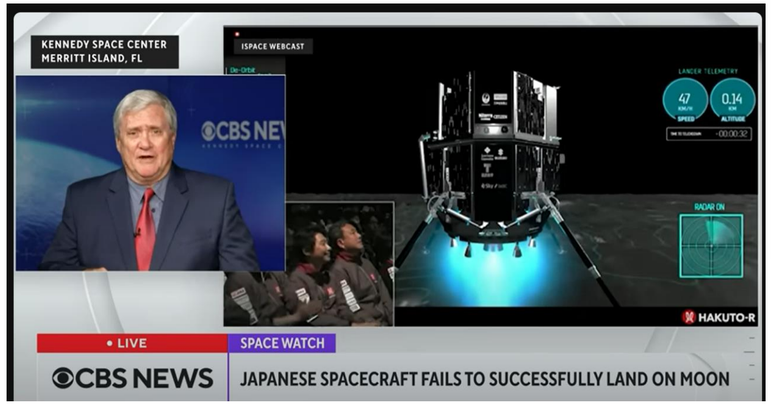

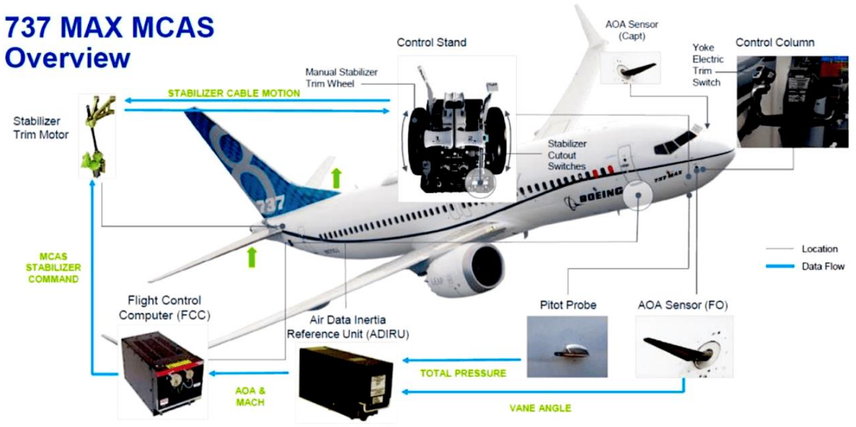

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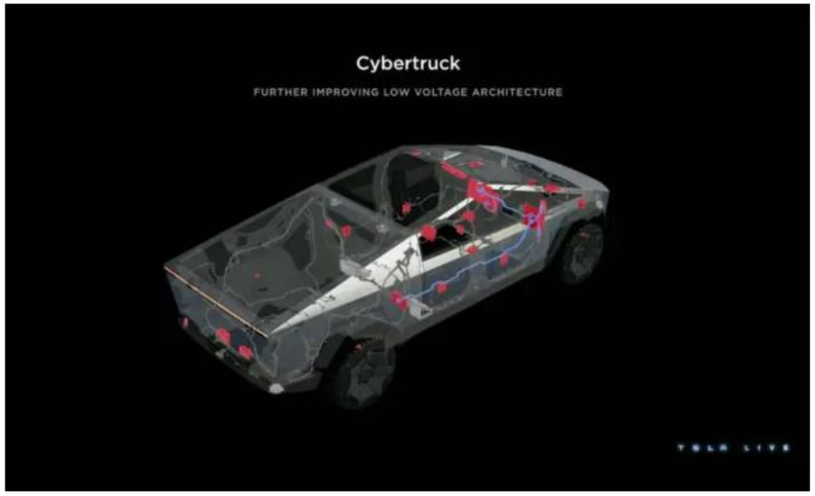

TESLA 48-VOLT CYBERTRUCK

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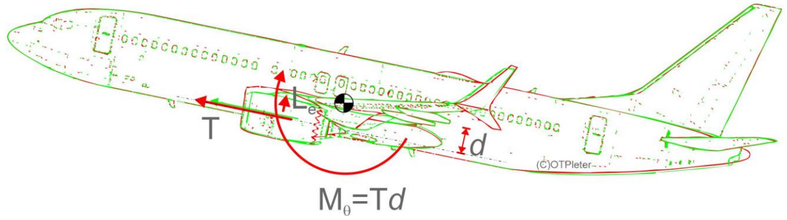
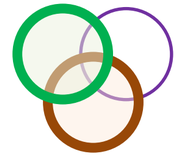
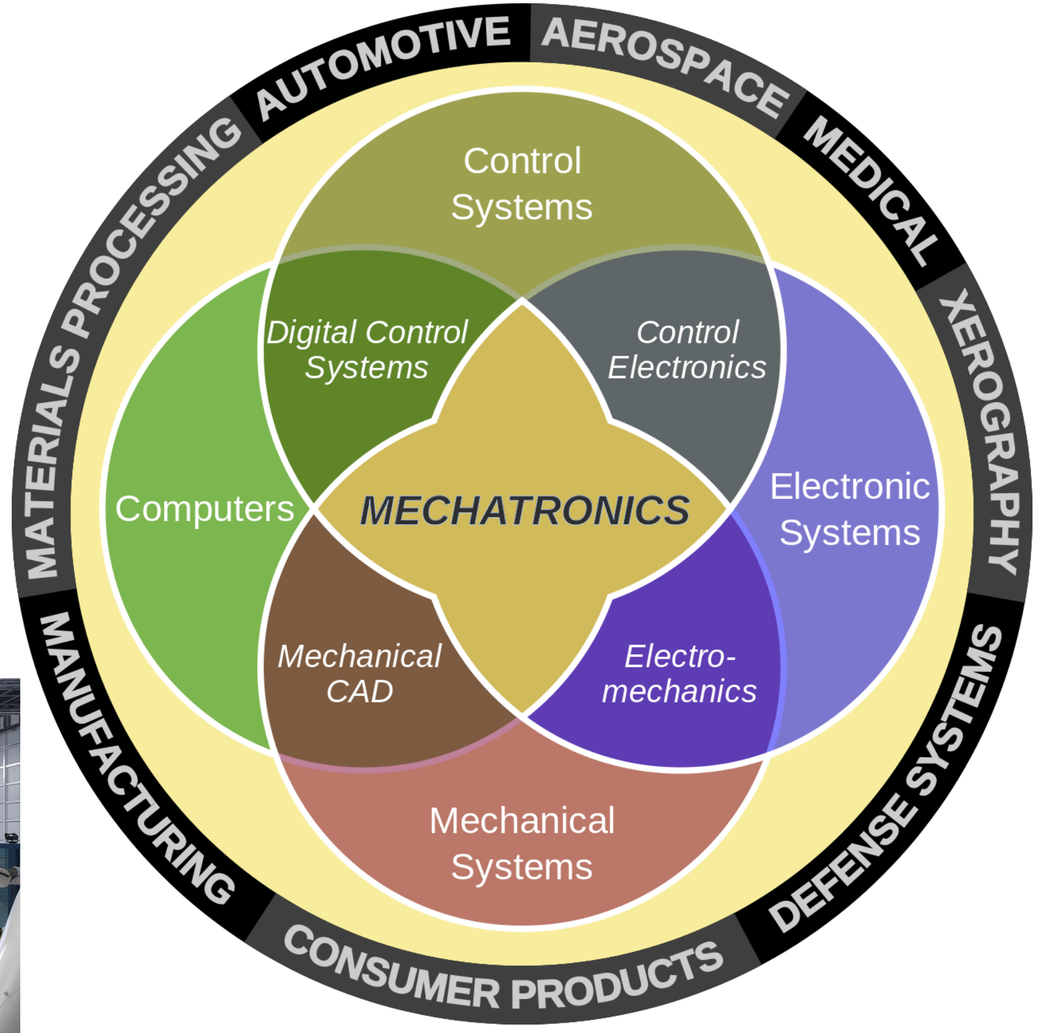
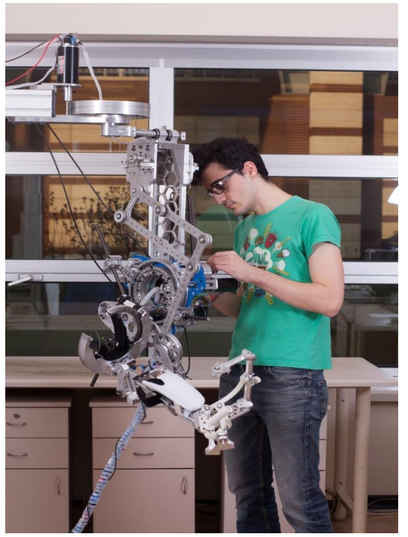




Part I - What is Mechatronics Engineering?

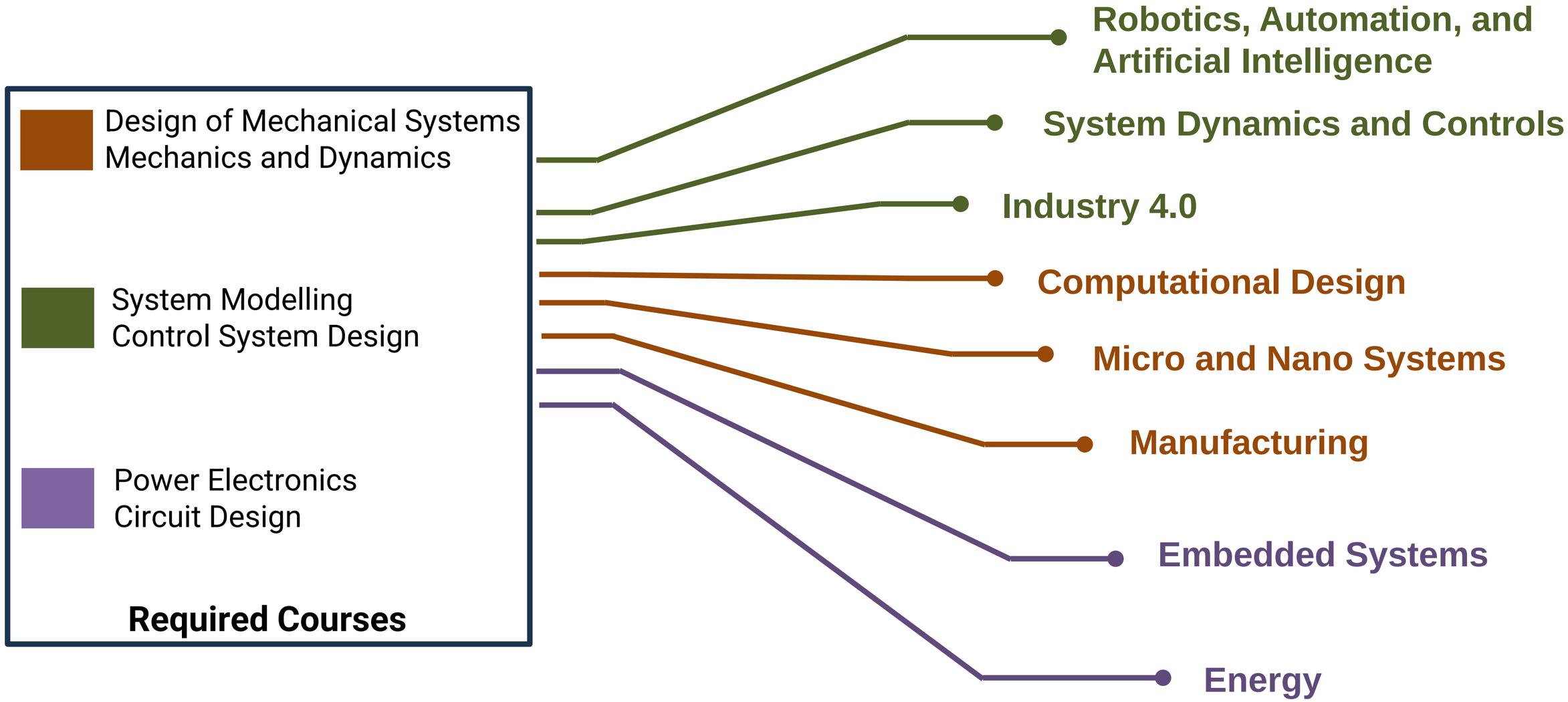


Mars rover Curiosity (NASA JPL)



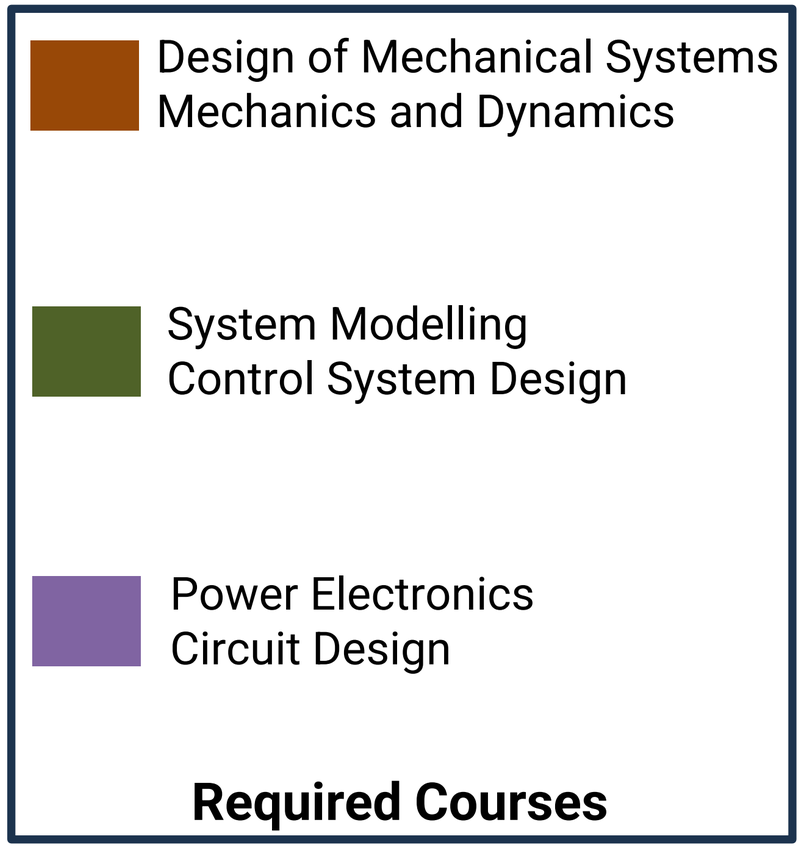
Rehabilitation Robotics (SU)

Part II - Mechatronics Engineering Degree at SU



Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi



Required Courses:

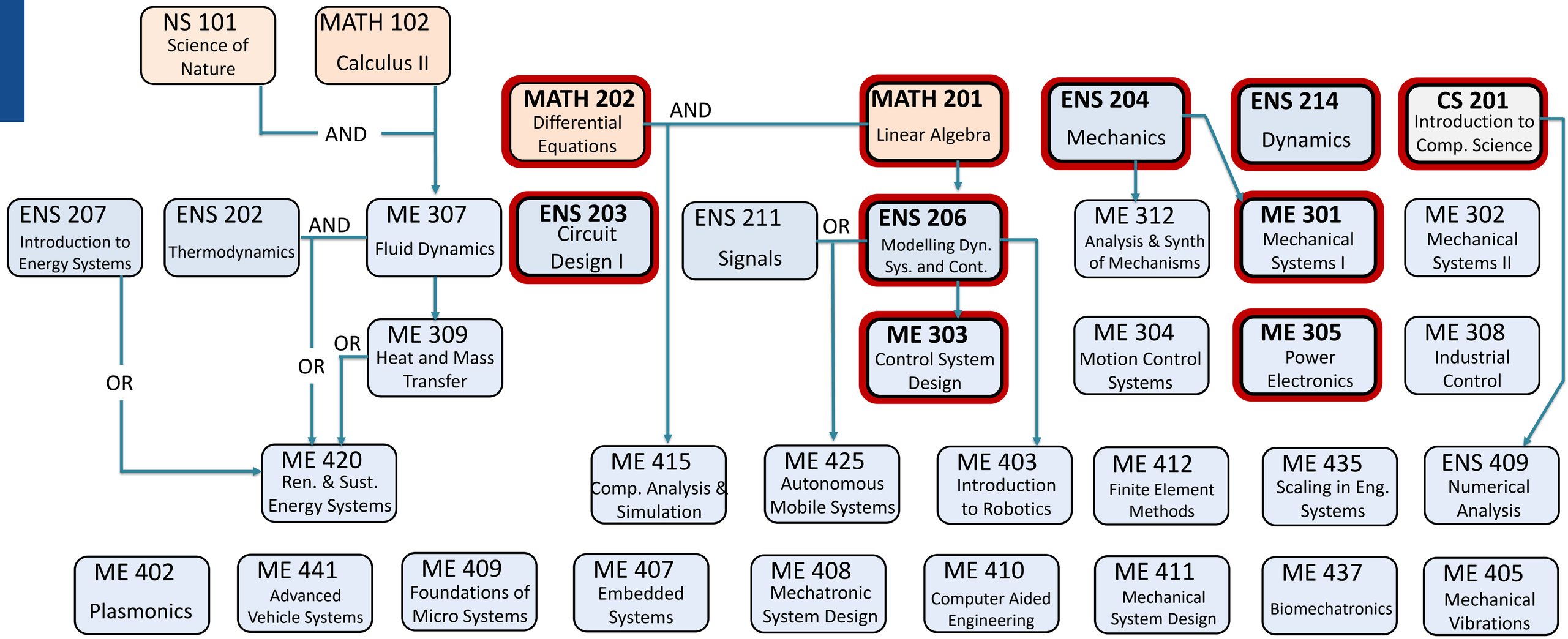
IF100 Computational Approaches to Problem Solving
CS201 Introduction to Computer Science
MATH201 Linear Algebra
MATH202 Differential Equations

ENS 203 Electronic Circuits I
ENS204 Mechanics
ENS206 Systems Modeling & Control
ENS214 Dynamics

ME301 Mechanical Systems I
ME303 Control System Design
ME305 Power Electronics

ENS491/2 Graduation Project

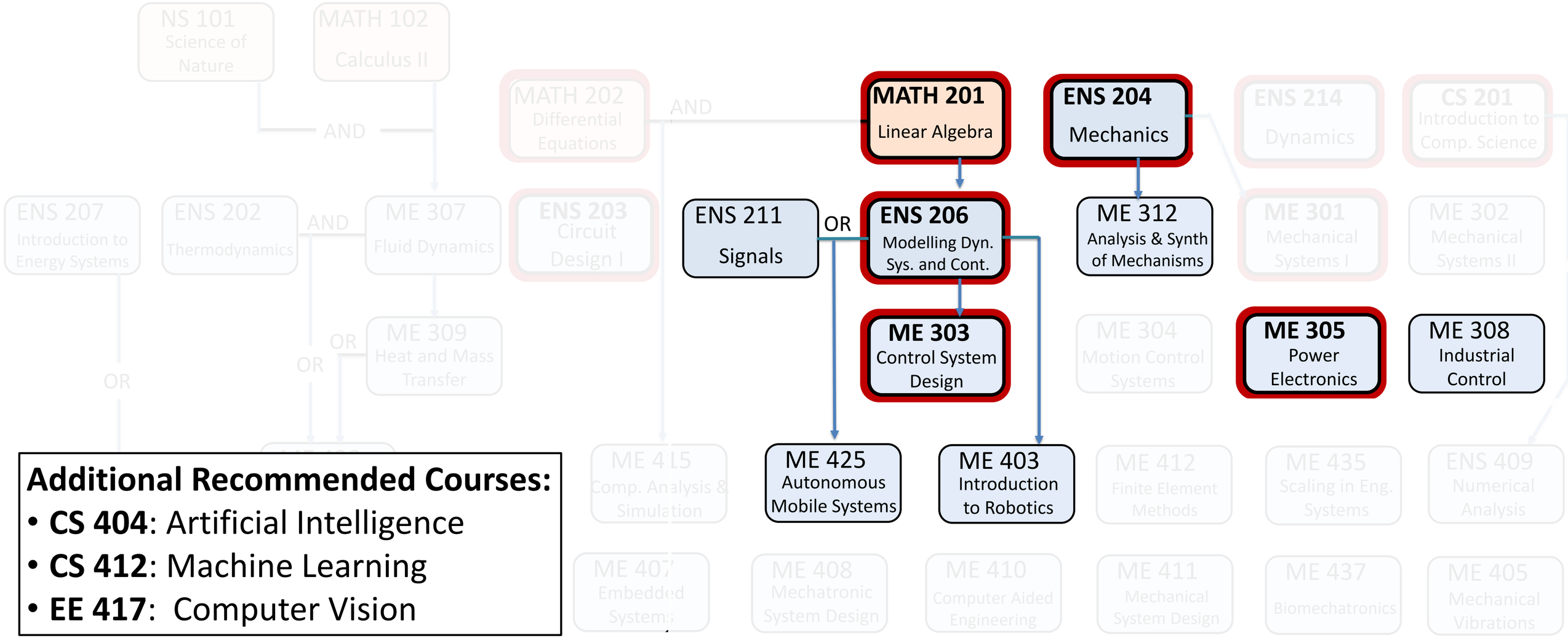
Part II - Mechatronics Engineering Degree at SU



Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi

Recommended courses for **Robotics, Automation, and Artificial Intelligence**



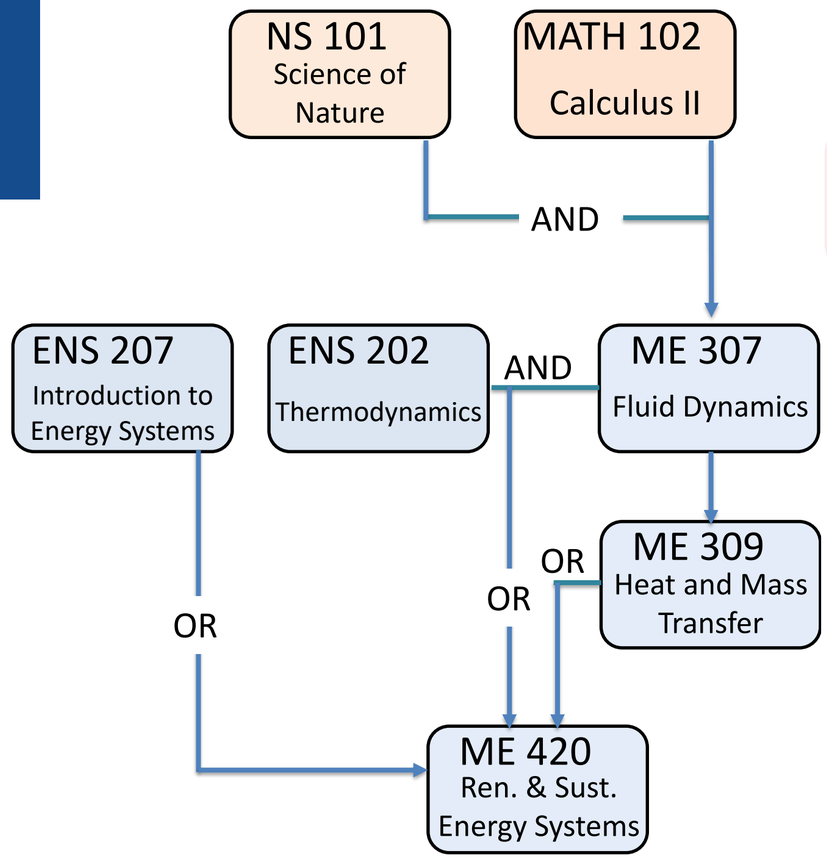
Additional Recommended Courses:

- **CS 404**: Artificial Intelligence
- **CS 412**: Machine Learning
- **EE 417**: Computer Vision

Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi

Recommended courses for **Energy**



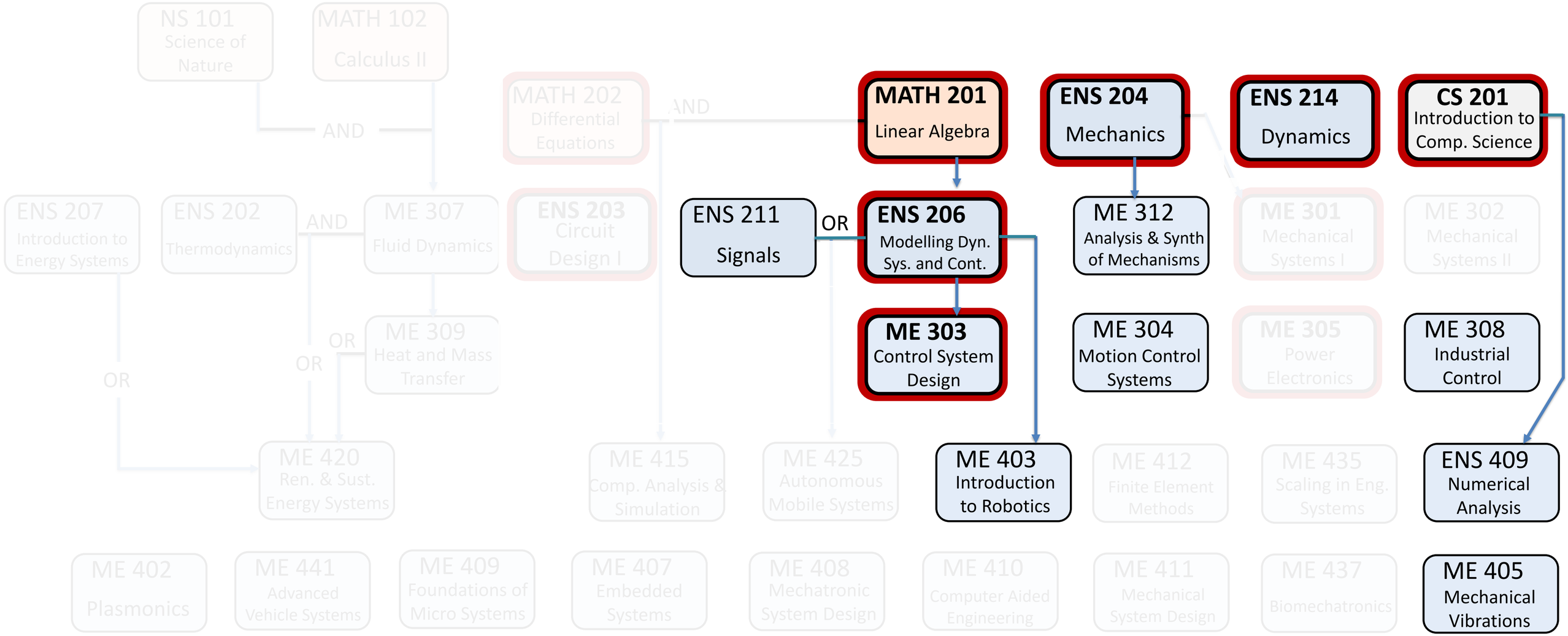
Additional Recommended Courses:

- **ENS 315**: Energy

Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi

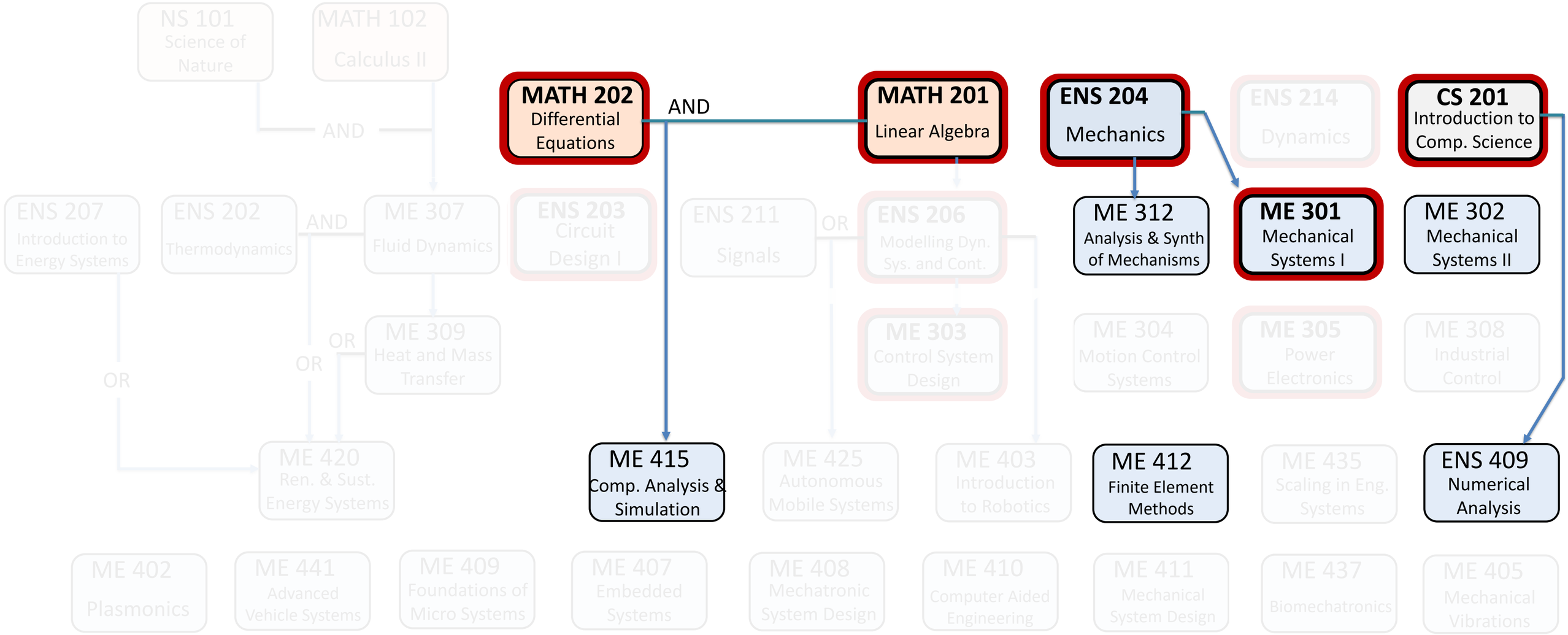
Recommended courses for **Systems, Dynamics and Control**



Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi

Recommended courses for **Computational Design**



Part II - Mechatronics Engineering Degree at SU

Sabancı Üniversitesi

Embedded Systems
- CS 204 Advanced Programming
- CS 303 Logic and Digital System Design
- EE 308 Microcomputer Based System Design
- CS 401 Computer Architectures
- ME 407 Embedded Systems

Industry 4.0
- CS 204 Advanced Programming
- EE 308 Microcomputer Based System Design
- CS 401 Computer Architectures
- ME 305 Power Electronics
- ME 308 Industrial Control
- CS 404 Artificial Intelligence
- CS 408 Computer Networks
- ME 403 Introduction to Robotics
- ME 425 Autonomous Mobile Robotics

Micro and Nano Systems
- EE 404 Introduction to Microelectromechanical Systems
- MAT 406 Nanoengineered Systems Fabrication
- ME 402 Plasmonics
- ME 409 Foundations of Microsystems
- ME 435 Scaling in Engineering Systems
- ME 437 Biomechatronics

Manufacturing
- ENS 209 Intro. Computer Aided Draft. Solid Modeling
- IE 309 Manufacturing Processes I
- IE 402 Integrated Manufacturing Systems
- IE 416 Additive Manufacturing

Part III – After Graduation?

Academia

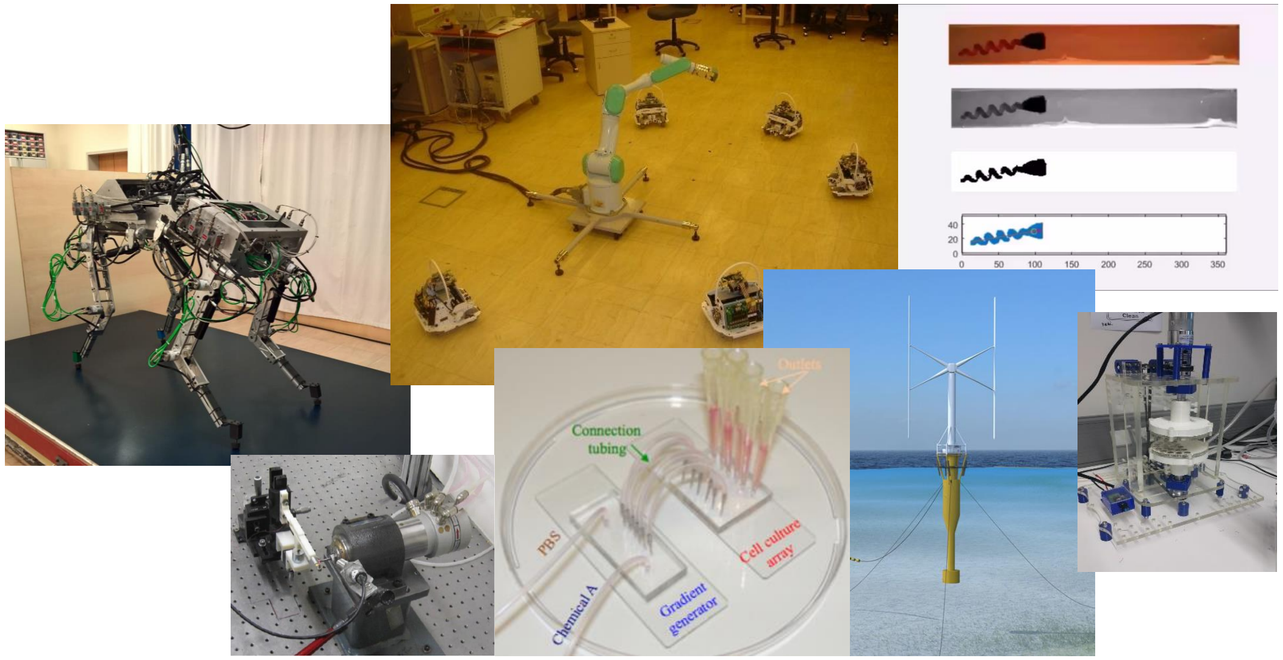
- MS & PhD opportunities in leading universities or research institutions in North America, Europe, and Asia
- Researchers and faculty members in several national and international institutions

Industry:

- Automotive (Ford Otosan, Mercedes, AVL, Bosch)
- Defence (Aselsan, Roketsan, TAI, TEI, Vestel)
- Robotics (Altınay, ABB, Staubli)
- Home Appliances (Arçelik, Vestel, B/S/H)
- Automation (Festo, Siemens, Altınay Robotics)

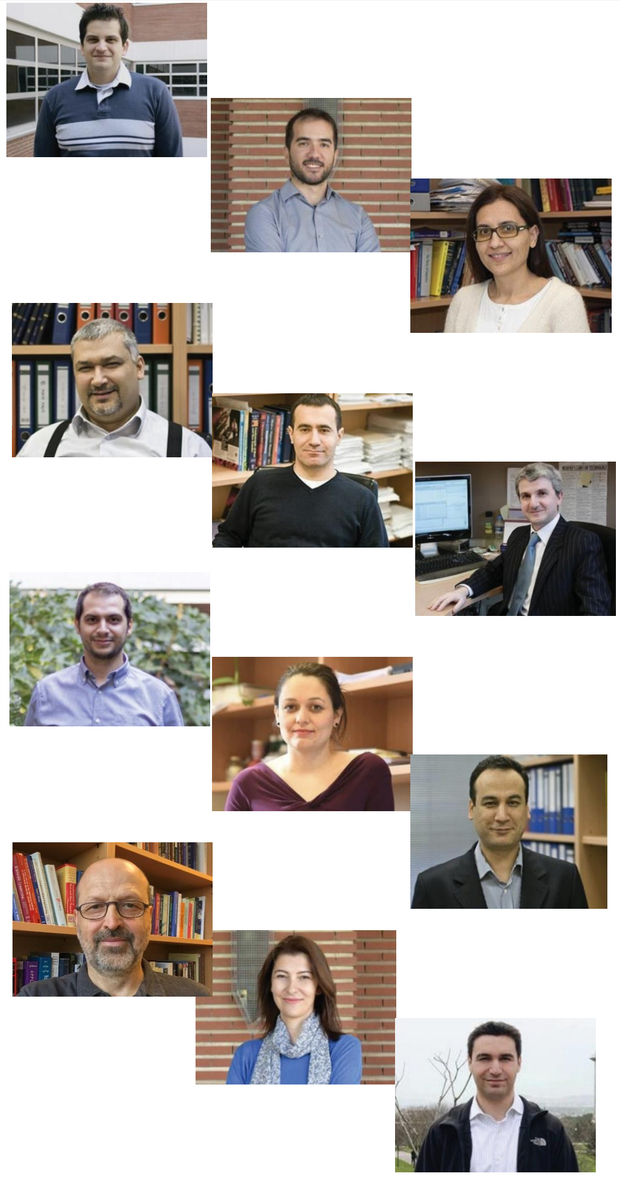
Research Areas at SU

- Robotics & Control
- Real-time Imaging and Vision Systems
- Automotive Systems
- Mechatronic System Design
- Dynamics & Vibration
- Energy Systems
- Micro & Nano Systems
- Design & Optimization
- Biomechatronics



Faculty Members

Ali Koşar	ME, RPI, USA
Bekir Bediz	ME, CMU, USA
Güllü Kızıltaş	ME, University of Michigan, USA
Kemalettin Erbatur	EE, Boğaziçi, TR
Kürşat Şendur	ECE, Ohio State University, USA
Mahmut Akşit	ME, RPI, USA
Melih Türkseven	ME, GeorgiaTech, USA
Meltem Elitaş	Bioengineering, EPFL, Switzerland
Mustafa Ünel	EECS, Brown, USA
Serhat Yeşilyurt	Nuclear Eng, MIT, USA
Tuğçe Yüksel	ME, CMU, USA
Volkan Patoğlu	ME, University of Michigan, USA



Questions?

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