



**POLITECNICO**  
MILANO 1863

## **PREREQUISITES FOR THE AGRICULTURAL ENGINEERING MSc. PROGRAMME**

**POLO TERRITORIALE DI  
CREMONA**

Before attending classes in the Agricultural Engineering MSc. programme, it is advisable that the students have a satisfactory background in some study subjects (see syllabi and recommended textbooks).

In particular:

- Students with an Engineering background
  - Automatic control
- Students with an Agrarian background
  - Electrical engineering
  - Mechanical engineering

For all students who do not have a background in computer programming, it is advisable to read the following tutorial on Python focusing on chapters 1-6  
[do1.dr-chuck.com/pythonlearn/EN\\_us/pythonlearn.pdf](http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf)

### **Textbooks**

#### Automatic control

- K.J. Åström and R.M. Murray  
Feedback Systems: An Introduction for Scientists and Engineers  
available on the web:  
[www.cds.caltech.edu/~murray/amwiki/index.php/Main\\_Page](http://www.cds.caltech.edu/~murray/amwiki/index.php/Main_Page)
- G.F. Franklin, J.D. Powell, M.L. Workman  
Digital control of dynamic systems  
Addison Wesley, 1997

#### Electrical engineering

- C.K. Alexander, M.N.O. Sadiku  
Fundamentals of Electric Circuits  
McGraw-Hill

#### Computer science

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- K.N. King  
C Programming A Modern Approach  
2nd Ed  
available on the web: [archive.org/details/c-programming-a-modern-approach-2nd-ed-c-89-c-99-king-by](https://archive.org/details/c-programming-a-modern-approach-2nd-ed-c-89-c-99-king-by)
- An online C compiler  
[www.onlinegdb.com/online\\_c\\_compiler](http://www.onlinegdb.com/online_c_compiler)

#### Mechanical engineering

- R.C. Hibbler  
Engineering Mechanics: Dynamics in SI Units  
Pearson, 2016  
ISBN: 978-1292088723
- F. Cheli, G. Diana  
Advanced dynamics of mechanical systems  
2020

### **Prerequisites**

#### Automatic control

1. System modeling (modelling concepts, state space models, examples): Åström & Murray, Chapters 2, 3
2. Dynamic behavior (differential equations, qualitative analysis, stability): Åström & Murray, Chapter 5 (5.1-5.3)
3. Linear systems (matrix exponential, input/output response, linearization): Åström & Murray, Chapter 6
4. Transfer functions (frequency domain modelling, transfer function, block diagrams, Bode plots, Laplace transform): Åström & Murray, Chapter 9
5. Frequency domain analysis (loop transfer function, Nyquist criterion, stability margins, Bode's relations, generalized gain and phase): Åström & Murray, Chapter 10 (10.1, 10.2, 10.3)
6. PID control: Åström & Murray, Chapter 11
7. Frequency domain design: Åström & Murray, Chapter 12
8. Basics of discrete time systems and digital control: Franklin, Powell & Workman, Chapters 3-7

#### Electrical engineering

1. Basic concepts of electricity
2. Ohm's law and Kirchhoff's laws
3. Series and parallel circuits
4. DC network analysis



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5. Capacitors and inductors
6. Capacitor, inductor and resistor circuits

Mechanical engineering

1. Kinematics of a point in the plane
2. Kinematics of a rigid body in the plane
3. Newton's laws of dynamics
4. Coulomb friction law
5. Kinetic and potential energy (spring and gravitational potential), work and power for the point and the rigid body
6. Dissipated energy (friction and damping)