

Getting started with MATLAB/Simulink, control systems and power systems

Contents:

1. Determine the purpose of learning MATLAB
 - a. Resources: time + money
 - b. Outputs of the training:
2. Hardware, software and related stuffs
 - a. Hardware (For heavily using: be careful with AMD CPU, safe choice: Intel):

Firstly, which version of MATLAB you want/ have to use (e.g. other hardware/ software require specific versions of MATLAB) (avoid too old version of MATLAB):

<https://www.mathworks.com/support/requirements/previous-releases.html>

Choosing a Computer to Run MATLAB and Simulink Products:

<https://www.mathworks.com/support/requirements/choosing-a-computer.html#memory>

For those who love AMD: Update news on AMD CPU:

<https://www.extremetech.com/computing/308501-crippled-no-longer-matlab-2020a-runs-amd-cpus-at-full-speed>

<https://itectec.com/matlab/matlab-does-matlab-perform-well-on-amd-ryzen/>

- b. Software

Version of MATLAB + toolboxes you want/need to have

Related tools/ toolboxes for each fields:

- Power systems: simscape specialized power system
(<https://www.mathworks.com/help/physmod/sps/specialized-power-systems.html>)
- Control systems: Yalmip (<https://yalmip.github.io/>) + solvers
(<https://yalmip.github.io/allsolvers/>)
 - o Semidefinite programming solver: MOSEK
(<https://yalmip.github.io/solver/mosek/>) and SDPT3
(<https://yalmip.github.io/solver/sdpt3/>)
 - o There are more, check them yourself

3. Resources for self and fast learning:
 - a. Official document from MATLAB:
 - Start learning MATLAB and Simulink with free tutorials (web-based MATLAB app):
<https://www.mathworks.com/support/learn-with-matlab-tutorials.html>
 - getting started with matlab: <https://www.mathworks.com/help/matlab/getting-started-with-matlab.html>
 - PDF Documentation for MATLAB:
https://www.mathworks.com/help/pdf_doc/matlab/index.html?s_cid=doc_ftr

- Get Started with Simulink: <https://www.mathworks.com/help/simulink/getting-started-with-simulink.html>
- Help Center: <https://www.mathworks.com/help/index.html>

b. Unofficial:

- Short course: <https://www.youtube.com/watch?v=NSSTkkKRabI>
- A bit longer one: https://www.youtube.com/watch?v=T_ekAD7U-wU&t=1861s
- Other courses on YouTube:
https://www.youtube.com/results?search_query=matlab+tutorial

Caution: don't spend more than 2-4 hours for general stuff with MATLAB (you will forget most of its), better to save time and energy on specific stuffs you want/ have to learn. It's how to speed up the learning curve.

4. Resources for control systems:

a. References:

- Juang, Jer-Nan, and Minh Q. Phan. *Identification and control of mechanical systems*. Cambridge University Press, 2001.
- Ogata, Katsuhiko. *Modern control engineering*. Prentice hall, 2010.
- Dorf, Richard C., and Robert H. Bishop. *Modern control systems*. Pearson, 2011.
- Wonham, W. Murray. "Linear multivariable control." *Optimal control theory and its applications*. Springer, Berlin, Heidelberg, 1974. 392-424. (Internal model principle (=> the well-known PID))

b. Self-taught courses

- Feedback Control Systems (MIT): <https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedback-control-systems-fall-2010/lecture-notes/>
- Control Tutorials for MATLAB and Simulink (UMICH):
<https://ctms.engin.umich.edu/CTMS/index.php?aux=Home>

5. Resources for power systems

a. References

Linear control in power systems:

- Sauer, Peter W., and Mangalore Anantha Pai. *Power system dynamics and stability*. Vol. 101. Upper Saddle River, NJ: Prentice hall, 1998.
- Pal, Bikash, and Balarko Chaudhuri. *Robust control in power systems*. Springer Science & Business Media, 2006.
- Rogers, Graham. *Power system oscillations*. Springer Science & Business Media, 2012.
- Kundur, Prabha. "Power system stability and control." *Edited by Neal J. Balu, and Mark G. Lauby* 4.2 (1994).

Power electronics:

- Bacha, Seddik, Iulian Munteanu, and Antoneta Iuliana Bratcu. "Power electronic converters modeling and control." *Advanced textbooks in control and signal processing* 454 (2014): 454.