



RoboMaster 2020 High School Robotics Summer Camp Learning Guide Book

I. 2020 Summer Camp Learning Guide for Mechanical Track

Students in the Mechanical track are advised to conduct their learning in the following order according to their individual circumstances.

- a) Students who have never participated in any robotics competition and the joining and building of mechanical structures
 - i. Refer to books for learning basic mechanical structures such as “Mechanical Design” and “Mechanical Principles”
 - ii. Search for mechanical animations on Zhihu or Tiktok (Douyin) for a more interesting learning experience
 - iii. Try “Disassembling (electrical appliances or toys)”, but the items must be reassembled, in order to understand the machines’ internal structures.
- b) Students who have participated in robotics-related competitions
 - i. Must know how to use one type of 3D modeling software, the preferred choice being SolidWorks, as it is the modeling software used in the camp.
 - ii. Online lessons are recommended, including “Wo Yao Zi Xue Wang” (51zxw.net) and “Tencent Classroom” (ke.qq.com) which provide relevant learning videos. Expectation: to be able to draw parts and assemblies of varying specifications
 - iii. Able to draw a structure commonly seen in everyday life, such as a folding table, drawers, etc.

II. 2020 Summer Camp Mechanical Track Resume Questions Answering Guide and Reference Materials (Appendix)

- a) Learn the basics of mechanical development for robotics (basic knowledge)

Recommended learning materials:

- i. Introductory video for Mavic: https://www.dji.com/cn/mavic?site=brandsite&from=landing_page
- ii. RoboMaster Zhihu Column: <https://zhuanlan.zhihu.com/p/49922820>

Expectations:

- iii. Understand important and common robotic components.
- iv. Understand the functions and structure of DJI Mavic

Practice questions:

- v. Identify some motorized machines from everyday life, and point out their execution, motive, transmission and sensor components.
- vi. Think about the strengths and weaknesses of certain structures used in everyday life, and whether a better solution can be provided.

- b) Learn how to operate 3D CAD design software SolidWorks (basic skill)

Recommended learning materials

- i. “Tencent Classroom”: <https://ke.qq.com/course/list/SolidWorks>
- ii. “Wo Yao Zi Xue (I want to teach myself)” website: <https://www.51zxw.net/list.aspx?cid=518>

III. 2020 Summer Camp Learning Guide for Embedded System Track

- I. Compulsory learning: Watch RoboMaster open lessons <https://www.bilibili.com/video/av41259569/?p=13>

II. Students in the Embedded System track are advised to conduct their learning in the following order according to their individual circumstances.

- a) Students who have never participated in any robotics competition and the development of microcontrollers or other embedded system
 - i. Self-learning using the Arduino Uno learning kit



- ii. Official forum: <https://www.arduino.cc/>
- b) Students who are relatively familiar with Arduino or other official SDKs, and are able to propel mechanisms to complete certain tasks
 - i. ALIENTEK Mini Development Board (without screen) is recommended for learning about STM32.
 - ii. Students are advised to run the LED and serial routines first, then attempt to modify the method of creation, such as creating a double-buffering mechanism
 - iii. Students who are unable to purchase development boards may download the software and materials and learn through simulation using MDK. Note that MDK is not authorized and can only be used to compile programs within 2kb
 - iv. openEdv Forum: <http://47.111.11.73/>
- c) Students who have participated in FRC/FTC, Makerathons, etc., and are relatively familiar with Arduino or other control platforms
 - i. Students are advised to use ALIENTEK Mini-transplanted FreeRTOS to build two threads to create two LEDs with different flickering frequencies, and to learn about how serial ports on hardware and serial communication sequences operate.
- d) Students who have used microcontrollers before, have a clearer understanding of official SDKs, understand low-level development, and have a basic understanding of low-level hardware
 - i. Create a PID code through self-learning, by purchasing a PID learning platform suitable for yourself on Taobao to assist your learning
 - ii. Develop a clearer understanding of the differences between development platforms, and able to quickly absorb the content of basis documents
 - iii. Read the manuals of RoboMaster International Development Board Type A
 - iv. Read the manuals of RoboMaster Motor
 - v. Learn about STM32 CAN

IV. Guide and Reference Materials for 2020 Summer Camp Embedded System and Algorithm Resume Questions (Appendix)

- a) The C programming language - students are advised to first read about the C syntax, then proceed directly to learn about Single-chip microcomputer engineering. Students can refer to any textbook on C
- b) The PID concept: Watch open lesson <http://www.icourse163.org/course/HIT-1003471013>
- c) Learn about subjects relating to the following questions through online or library research, and answer 2-3 of the questions:
 - i. What are the industrial applications for drones?
 - ii. What are the differences between an accelerometer and an angular velocity meter?
 - iii. What are the commonly used sensors and algorithms for drone localization and navigation?
 - iv. What are the common communication buses for sensors and microcontrollers in drones?
 - v. Based on your own analysis, what sensors are used in the Mavic Enterprise version?
 - vi. What are the differences between the Mavic Enterprise version, Agras T16 Plant Protection drone and VTOL Fixed-Wing mode?
- d) Relevant learning materials for ROS
 - i. To learning about ROS, refer to <http://wiki.ros.org/cn> (Chinese version), <http://wiki.ros.org> and <https://www.cse.sc.edu/~jokane/agitr/> to complete ROS installation, introductory and tutorial sessions. These questions focus on the writing of nodes, subscribing to and publishing of topics, and use of the TF library.
 - ii. To learn about TF coordinate transformations and how to use the TF library, refer to http://wiki.ros.org/tf/Tutorials_and [https://mirror.umd.edu/roswiki/navigation\(2f\)Tutorials\(2f\)RobotSetup\(2f\)TF.html](https://mirror.umd.edu/roswiki/navigation(2f)Tutorials(2f)RobotSetup(2f)TF.html)和<http://www.guyuehome.com/355> (Chinese Version)