

# Signals and Systems

With Moku:Go



Signals and Systems coursework is an important foundation for a wide range of engineering disciplines, from RF and Communications to Control and Mechanical Engineering. It is commonly taught in early years to large cohorts and can be difficult to design engaging and instructive lab programs. In order to scale, many institutions resort to simulation-heavy labs, while rare hands-on lab demonstrations can be rushed or overcrowded, leading to suboptimal learning outcomes.



Moku:Go is the basis for a new paradigm of Signals and Systems practical education. Its Instrument-on-Chip framework provides the flexibility of software-defined instruments with the performance of dedicated hardware. Instructors can leverage multiple instruments on a single platform to generate, process, and analyze signals. Demonstrate filtering and modulation concepts with real-time filter boxes, waveform generators, and demodulating amplifiers, or perform further analysis with the oscilloscope, real-time spectrum analyzer, and data logger. Simple and robust MATLAB, Python, and LabVIEW APIs provide a seamless path from simulation to practice.



## Moku:Go Specs and Features

### Key Specs

- 2 analog inputs at 30 MHz
- 2 analog outputs at 20 MHz
- 125 MSa/s sampling rate
- 16-channel digital I/O
- Up to 4 channel programmable power supply

### Features

- 11 integrated lab instruments
- API integration for Python, MATLAB, and LabVIEW
- Intuitive software for Windows and Mac

For full specifications, preordering, and education pricing, please contact [edu@liquidinstruments.com](mailto:edu@liquidinstruments.com)

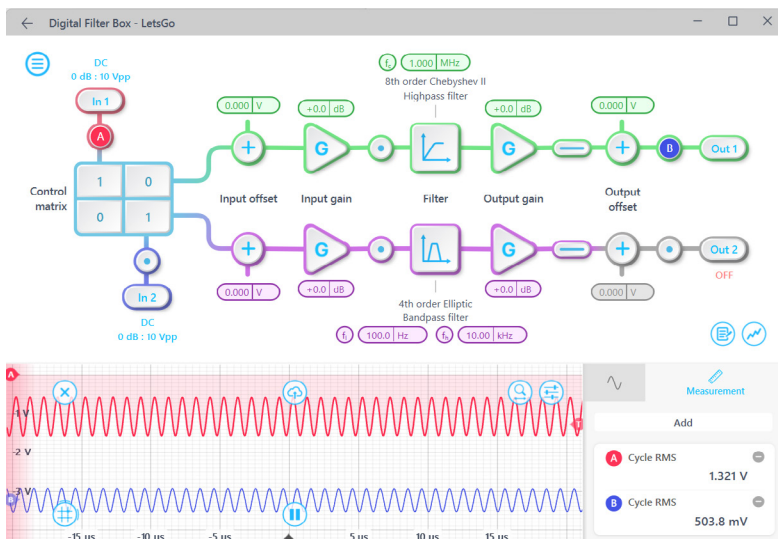
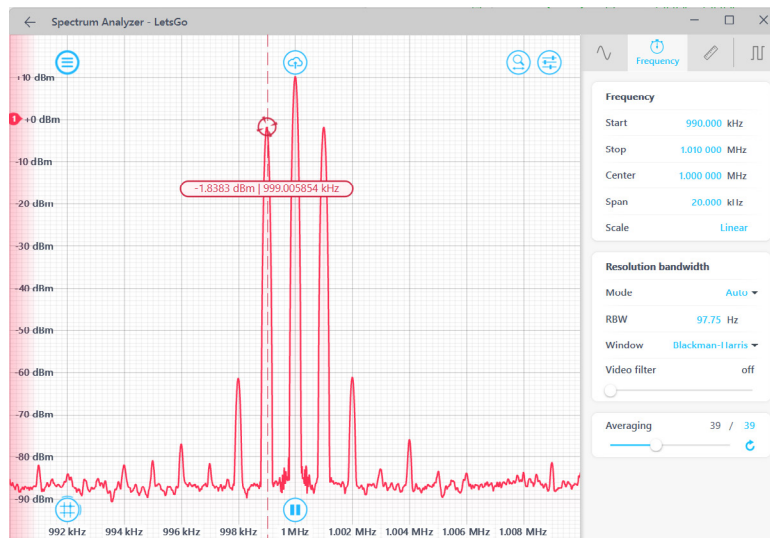
# Lab Concepts

## Fundamentals of Signals

Moku:Go's Waveform Generator can perform high bandwidth modulation, with either an internal waveform or an analog input.

The Spectrum Analyzer uses hybrid real-time spectrum analyzer architecture, which, unlike simple FFTs, provides excellent resolution bandwidth at any carrier frequency, allowing students to zoom in on sidebands.

Together, students can explore modulation, aliasing, mixing, and other concepts in the time and frequency domains, with one simple interface to control, view, measure, record, and share.



## FIR and IIR Filtering

Exploration of digital filtering has never been easier. Moku:Go has an FIR Filter Builder and IIR-based Digital Filter Box, both designed for highly flexible filtering of analog signals. Students can manipulate the filter parameters and, with the embedded Oscilloscope probe points, watch measurements change in real time. Audio-compatible I/O levels mean that with the addition of a source and speaker, students can hear changes too, helping intuition.

The filter builders can be used standalone, but can also be paired with our easy-to-use MATLAB and Python APIs to design and simulate custom coefficients that students can then run and characterize in real life.

## Analog Radio

Moku:Go is the first device to make the flexibility of a digital Lock-In Amplifier available to undergraduate education. This intuitive instrument can be used to receive and demodulate AM and PM signals, a great lab exercise of typical radio modulation schemes. It can also be combined with a second Moku:Go's Waveform Generator to form a phase-locked loop that demodulates FM.

Pair with the Waveform Generator's high-bandwidth modulation and turn every lab station into a radio station.

