



ENGINEER  
NEXT

VIP2017

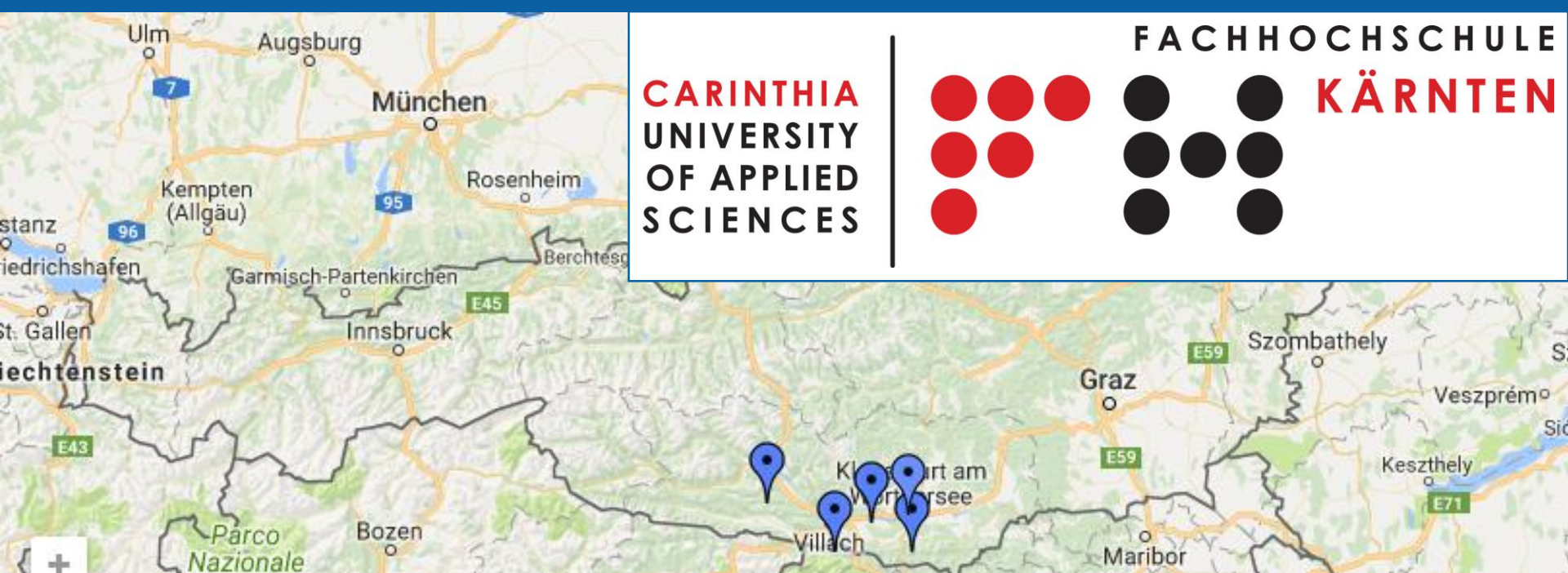
The logo features the text "ENGINEER" in a smaller, white, sans-serif font above the word "NEXT" in a larger, white, sans-serif font. A yellow graphic element, resembling a stylized 'X' or a folded ribbon, is positioned between the two words. To the left of "NEXT" is a white rectangular box containing the text "VIP2017" in a white, sans-serif font. The entire logo is set against a blue background with diagonal stripes in various shades of blue, orange, and green.



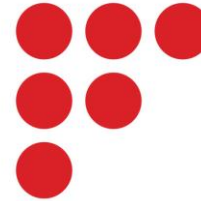
# Analog Computing with myDAQ Pocket Labs

Carinthia University of Applied Sciences (FH Kärnten)  
Engineering & IT

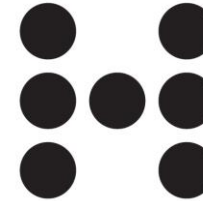
Thomas Klinger / Andreas Pester



**CARINTHIA**  
UNIVERSITY  
OF APPLIED  
SCIENCES



**FACHHOCHSCHULE**  
**KÄRNTEN**

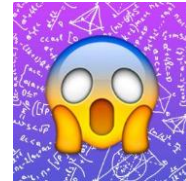


- 30 study programs (Engineering, Management, and Health Sciences)
- About 2000 students



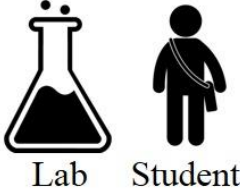
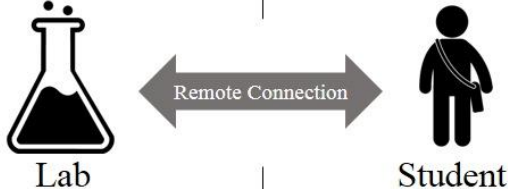
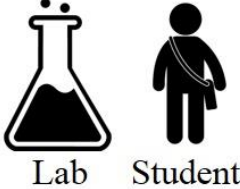
## The Challenge:

- Hands-on projects and exercises are cool! 😎
- BUT: Academic education demands theoretical background.
- Find a link!



# What are Pocket Labs?

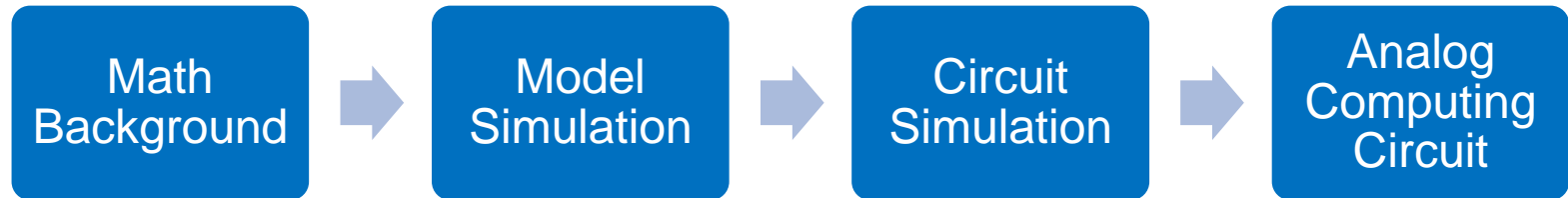


	Fixed Location	Free Location (and Time)
Classic Labs		
Remote Labs		
Pocket Labs		



# Our Solution:

- Small projects in first study year
- Idea: Analog computation of mathematical models
- Examples:
  - Predator-Prey model
  - Lorenz attractor
  - Fourier series



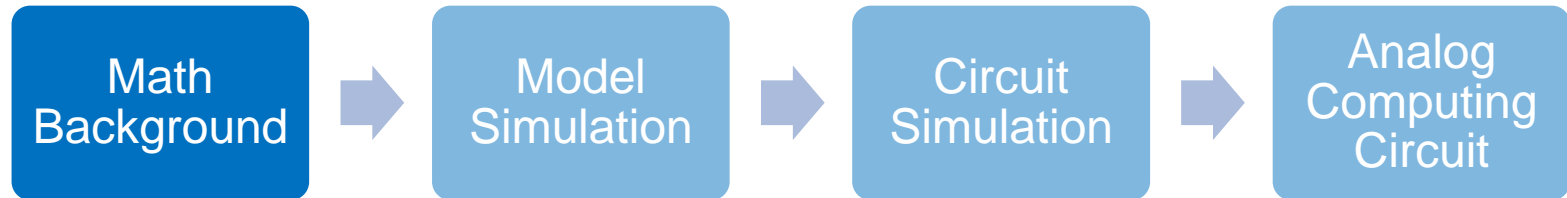
# Example: Predator-Prey Model

- Lotka-Volterra equations:

- $P$ : prey population
- $Q$ : predator population
- $a$ : prey birth rate
- $b$ : prey death rate
- $c$ : predator population increase rate
- $d$ : predator death rate

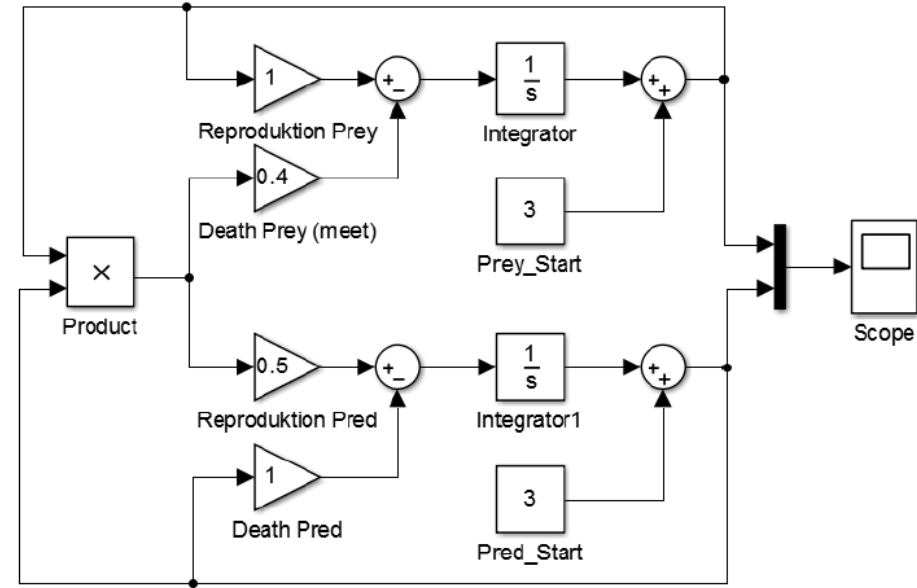
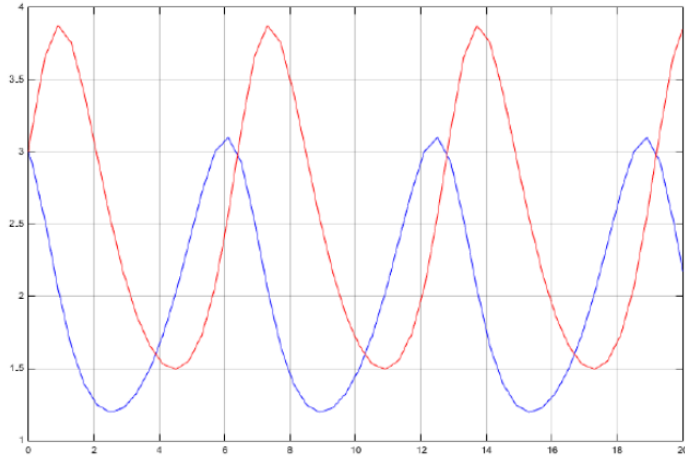
$$\frac{dP(t)}{dt} = P(t) [a - b \cdot Q(t)]$$

$$\frac{dQ(t)}{dt} = -Q(t) [d - c \cdot P(t)]$$





# Example: Predator-Prey Model



Math  
Background



Model  
Simulation

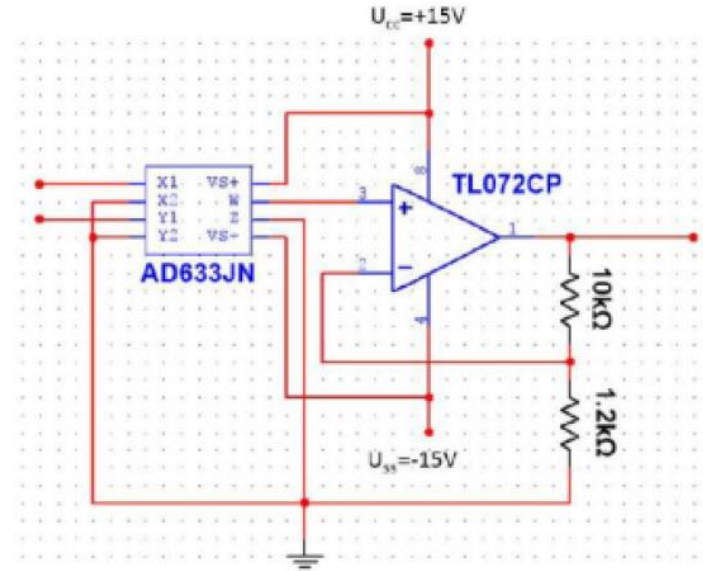
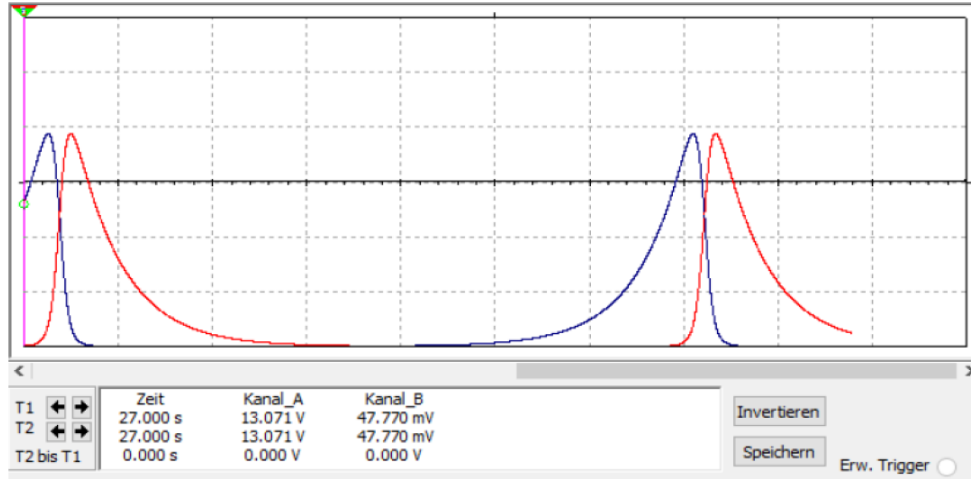


Circuit  
Simulation



Analog  
Computing  
Circuit

# Example: Predator-Prey Model



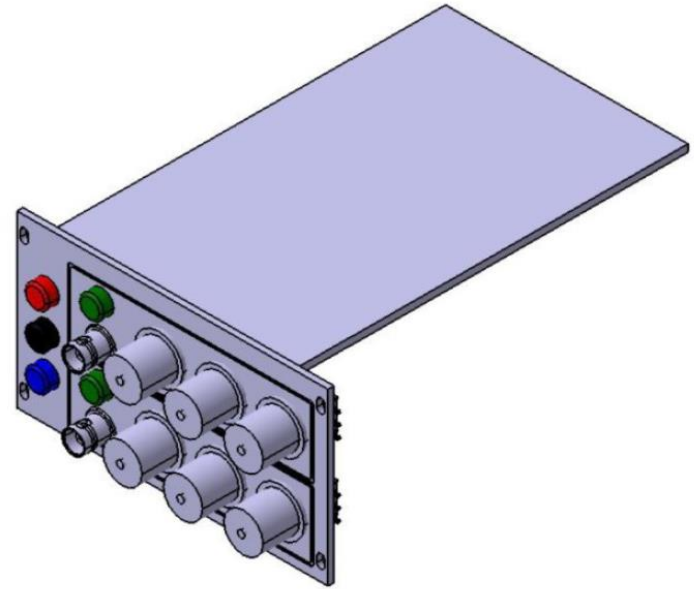
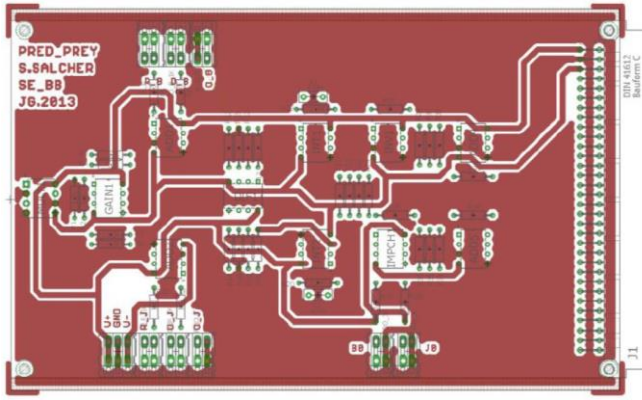
Math  
Background

Model  
Simulation

Circuit  
Simulation

Analog  
Computing  
Circuit

# Example: Predator-Prey Model



Math  
Background



Model  
Simulation



Circuit  
Simulation



Analog  
Computing  
Circuit

# Where is the myDAQ?

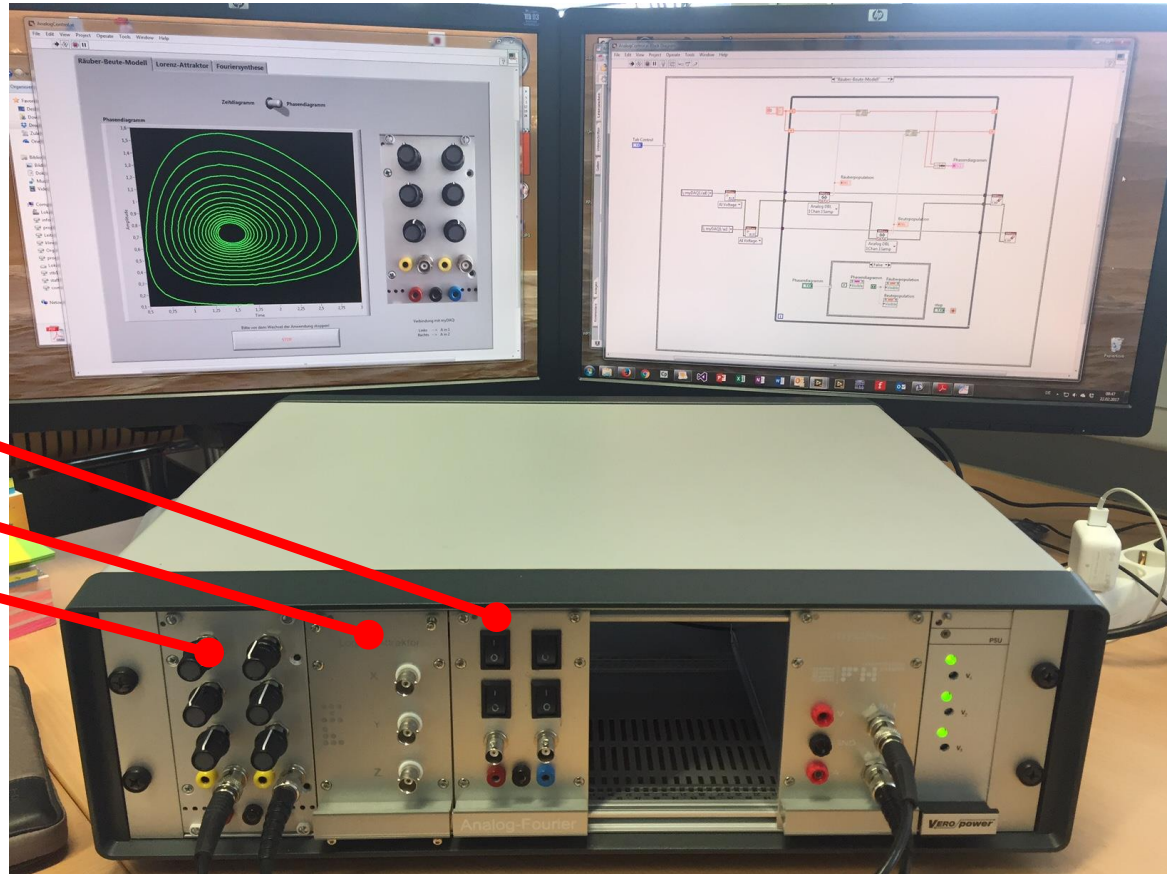


# Analog Computer:

Fourier series module

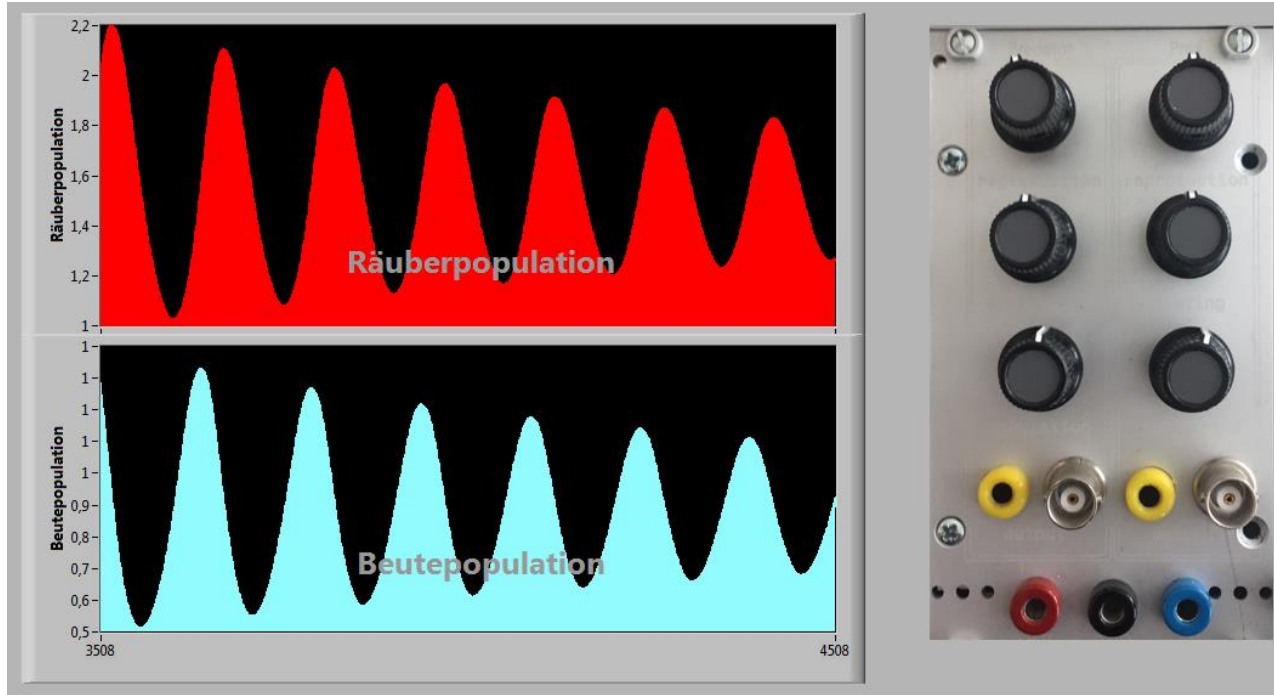
Lorenz attractor module

Predator-Prey module (active)

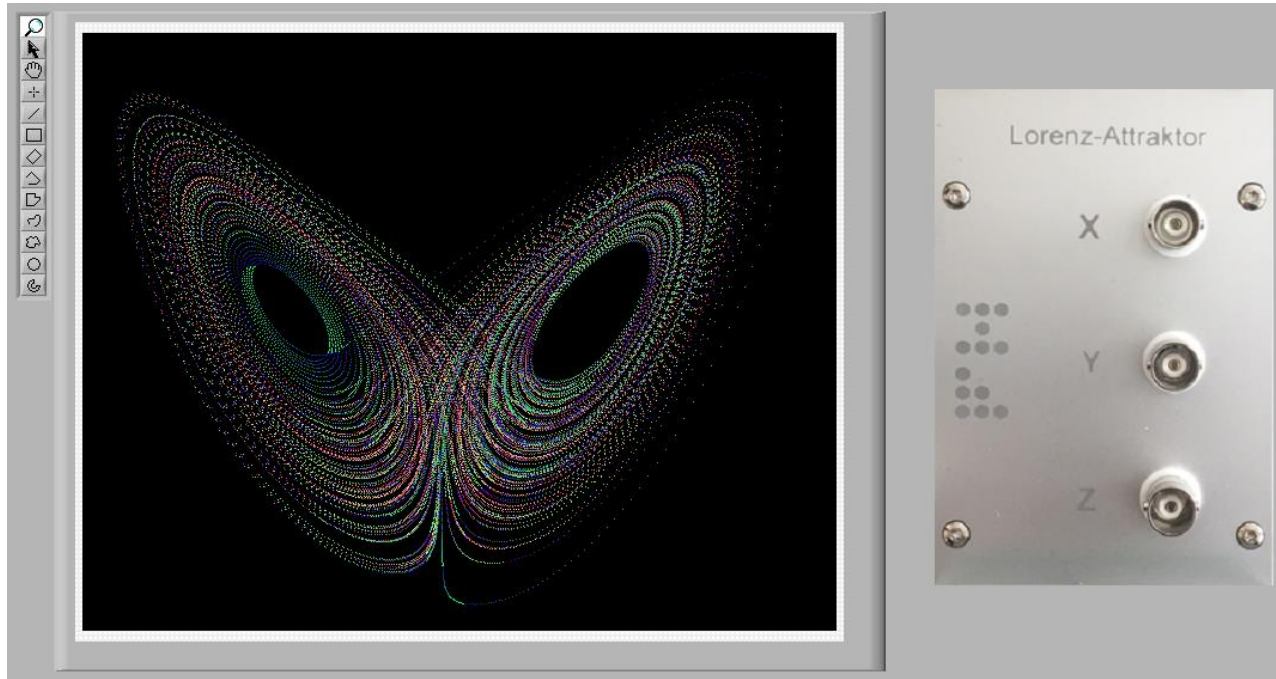




# Predator-Prey Screenshot



# Lorenz Attractor Screenshot

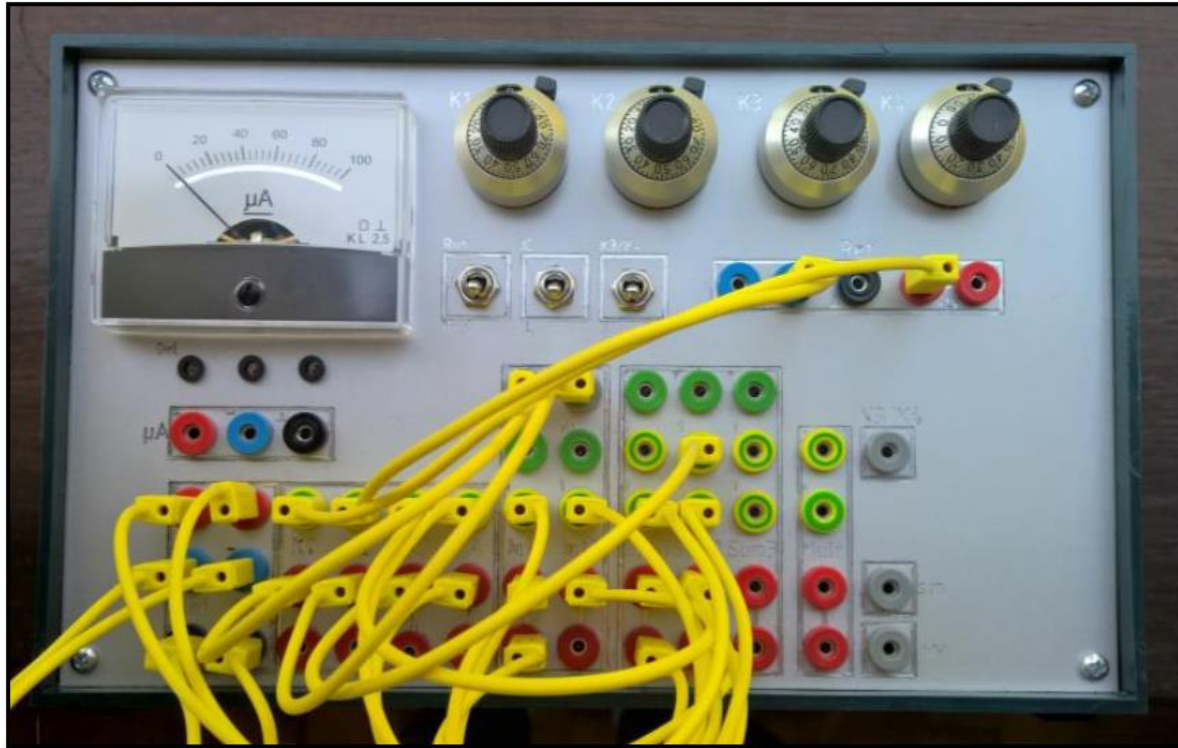




# Fourier Series Screenshot



# Another Analog Computer with myDAQ



# Summary

- We introduced small projects in the beginning of our engineering program
- Goal: To bridge the gap between theoretical and practical topics
- Topic: Analog computing: From math background over simulation to circuit design
- Result: Students have better understanding for the need of fundamental and theoretical topics

## Stay Connected During and After VIPDays



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