

# Berlin School of Sound

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### Course Module 3:

## Introduction to Modular Synthesis and Circuitry Building

November 15th, 2022 - January 29th, 2023,

Class Time: Mondays and Thursdays from 2-5pm

First class time, Tuesday November 15th, 2-5pm

(exceptions per arrangement with the instructors)

Lecturers: Katharina Bévand, Stephane Lefrancois, Georg Werner

Guest Lecturers: Jan Hennig aka Kabuki, Jessica Kert, Steve Williams aka Drusnoise, Eliad Wagner, JacqNoise and Simon Berz

**Berlin Modular Society** - free show on November 18th, ticket discount to all further Berlin Modular Society events during the course, workshop/talk discussing professional club night set up on December 15th

Modular units provided by **Doepfer Musikelektronik** for our courses (currently first two weeks only)

In this hands-on course the participants learn fundamental theory and approaches to modular synthesis while also learning the basics of electronics for building circuitry and synth modules. New ways of integrating diverse configurations of gear including modular synths will be introduced. Assignments help the participants learn strategies for better achieving their artistic goals and structuring work. In the last two weeks of the course, approaches to composition, improvisation and performance with modular synthesis and built interfaces will culminate in performances at the Acud Club Room and a field trip to Fitzroy club with Berlin Modular Society.

In the final phase participants may opt to participate in three evenings of performances together with course leaders and guests (in planning) at the Acud Club. The cooperation with Berlin Modular Society also provides a channel through which performance opportunities for some participants may materialize.

Modular synthesis connects many realms of electronic music and sound art. Intelligently integrating other interfaces and gear with modular synths can open many new creative avenues. In this course, students will learn about synthesis, especially as applied to a modular ecosystem, in order to accurately assess their needs and desires, to build a system which represents their “ideal instrument”.

The students will also learn about the basics of electricity, electronics and they will gain an understanding of the foundations of electroacoustics, i.e., how we can use electric circuits to produce and sense sounds. Furthermore we will explore how the most common modular synth system (Eurorack) works and how modules are connected. On the basis of this knowledge there will be a hands-on session where the participants learn to solder while assembling a simple DIY module from a kit (parts cost 15-30 Euro).

A fundamental knowledge of how electronics and building one's own basic interfaces work are key to the full creative potential of electronic sound.

### **Recommended prerequisite for the course:**

Best is if the participants already own a modular or semi-modular synthesis system at the start of the course – please contact us for questions or a free consultation if you want to obtain one. A group discount for purchases at a local vendor will be arranged (e.g. Schneidersladen etc., – currently in planning). Also Doepfer Musikelektronik has agreed to sponsor us with modular units for the first 2 weeks of the course so that everyone can get started on hardware right away.

Even without hardware however, the Course Module can be completed while only using the softwares VCV Rack and Modulargrid. They will be covered thoroughly in the classes and provide a solid foundation upon which to build a system.

In between, references to readings in course texts and viewing of key instructional videos will compliment the seminars. With VCV Rack, Modulargrid, the course, and videos, beginning students will be more than ready to approach the modular world with complete confidence, even if they have never bought a modular synthesis system before.

### **Classes and Workshop Schedule (still subject to change)**

**Tuesday 15th, 2-5pm**

**Class 1 (SL, KB and GW) Introduction to VCV rack, basic building blocks, modulation, sequencing**

#### **Introduction to VCV Rack**

brief overview of the different modules

patching assignments

#### **Basic building blocks**

oscillator (VCO) (sine, triangle, sawtooth, square, PWM)

filter (VCF)

amplifier (VCA)

low pass gate

wave folder / wave shaper

wavetable oscillator

Modulation

envelope (AD, ADSR, looping envelope)

low frequency oscillator (LFO)

modulation range, attenuverter

## **Sequencing**

clocking, clock distribution and division

reset

trigger sequencer

CV sequencer

alternate ways of sequencing (LFO, random source, sample & hold)

**Friday 18th, 2-5pm**

**Class 2 (SL) Synthesis types, essential patching examples**

## **Synthesis types**

subtractive (east coast)

additive (west coast)

frequency modulation (FM)

ring modulation

granular

low pass gate

wave folder / wave shaper

wavetable oscillator

karplus strong

## **Essential patching examples**

traditional subtractive voice

simple FM patch

simple 1 - voice sequencing

modulating the modulator

krell patch

frequency modulation (FM)

ring modulation

**18.11 Evening - Berlin Modular Society event at ACUD club! Free entrance for BeSoS students, 8pm**

**Monday 21.11, 2-5pm**

**Class 3 (SL) sound design patching**

**Sound design patching**

kick drum patch

snare drum patch

hi hat patch

bass line patch

melodic patch

drone patch

feedback patching

self patching

Tuning considerations and techniques

Micro tuning, just intonation, scales and quantizers

**listening session III**

**Thursday 24.11, 11-2pm,**

**Class 4 (SL) Designing a system, performing with a system**

**Designing a system**

power considerations

size considerations

which modules to buy

introduction to Modular Grid

design a system in Modular Grid

## **Combining software with modular synthesis for performance**

MIDI and routing

channels and mixing

## **Performing with a system**

design choices

achieving a polished sound from a modular setup

performing tips and tricks

writing tips and tricks (randomizing)

## **Modular video**

introduction to LZX Visual Cortex and integrating it with audio modules

## **listening session IV**

**Monday 28.11, 2-5pm**

## **Class 5 (GW) Electrical basics, electric parts and introduction to electroacoustics**

### **Electrical basics**

What are voltage, current, resistance and how are they related

AC / DC

Electromagnetism

### **Electronic parts**

Resistors

Capacitors

Inductors

Electrical circuits

How to connect things

Measurement

How to use a multimeter

Introduction to electroacoustics

How does a speaker work

How does a microphone work

**Friday 2.12, 11-2pm**

**Class 6 (GW) Introduction to circuits, circuit diagrams and the electrical design of modular systems (Eurorack)**

**Introduction to circuits**

Voltage dividers

Analog filters

Amplifiers

Digital ICs

Circuit diagrams

Symbols for electronic parts

How to read and write circuit diagrams

The electrical design of modular systems (Eurorack)

How does the Eurorack system work internally

**Monday 5.12, 2-5pm**

**Class 7 (KB) Modular Sonic Arts I: Sonic artifacts and sustained tones**

Experimental music exploration with modular synths: artistic approach for live performance and installations.

A history of hearing and new music styles with electronic instruments. Machines changed our hearing.

Drone music: Practices of listening, time questions and perception of time. Atmospheres, noise, glitches and feedback. Manipulating time: granular synthesis and samplers..

Introduction to female pioneers in electronic music: listening session I - Eliane Radigue, Pauline Oliveros.

Assignment: watch documentary *Sisters with Transistors*.

**Thursday 8.12. 2-5pm**

**Class 8 (KB) Modular Sonic Arts II: Spatial explorations / Extending the modular setup with external inputs for performance or installations**

Hearing space, sound and psychoacoustics. Spaces for installations and performances, effects and quadraphonic explorations. Otoacoustics. Spatial composition with modular setups in performances or for installations.

Creative extension of the modular setup: external sound sources

Generative approaches for composing and modulation with random generators, sequencers and lfos.

Female pioneers in electronic music: listening session II - Maryane Amacher etc.

## **Monday 12.12, 2-5pm** **Guest Workshop I**

### **Nicolas Collins**

A versatile synthesizer made of nothing more than a speaker, a battery, some clip leads and scrap metal? And no soldering required? Welcome to John Bowers' "Victorian Synthesizer", presented by Nicolas Collins, author of that essential survival guide, *Handmade Electronic Music*.

### **Eliad Wagner**

#### **Serge modular synthesizers, patch programmability and mild cybernetics**

In this workshop we will be introducing various ideas prominent in the so-called 'west-coast approach' to synthesis: patch programmability (modules allowing multiple functionality depending on their internal patching- often used in Serge Tcherepninn's designs), feedback patching (using feedback as behavior generator in modules or patches), basic cybernetics and generating sounds from unexpected sources.

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Eliad Wagner is a composer, performer, sound artist and educator. He is a classically trained musician, holding academic degrees in physics and music. In 2012 Wagner relocated to Berlin, where he quickly became an active member of the city's experimental improvised music scene as a performer of electronic music (playing the modular synthesizer) as well as composing for ensembles and installations. Since 2015, He is the head of the Electronic Music Production and Performance degree programme at the Catalyst Institute for Creative Arts and Technology in Berlin.

His music has been performed/ published/ presented by Computer Music Journal (MIT Press), Guggenheim New York, Q-02, Steim, HKW Berlin, Worm Rotterdam, Ensemble Phoenix Basel, TU Berlin, UDK Berlin, Aarhus academy of music amongst others.

## **Thursday 15.12, 2-5pm** **Guest Workshop II**

### **Jacqnoise: DIY Modular building**

Building the eurorack - soldering work

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During live performances JacqNoise synchronizes with her surroundings. She finds her main source of inspiration in cultural cross-pollination. In the past years, JacqNoise has collaborated with musicians from all over the world. This is leading her curiosity to experiment and adapt new methodologies.

Lately, JacqNoise has pioneered hardware interfaces that support algorithms and are based on chaos in order to develop noises and specify sounds.

15.12 Evening - 6:30pm

Visit to Fitzroy club to hear a talk about the set up for that evening's event by **Berlin Modular Society** including an introduction to operations by Steve Williams aka Drusnoise. [Possible meet and greet with the artists on the night]

**Friday 16.12, 2-5pm Class 9 (GW)**  
**Continue building and testing the module**

Introduction to tools

Introduction to soldering

Begin building the module from the recommended kit (parts cost 15 Euro extra)

**Christmas Party...** 🌟🌲

Band performance in the evening "Environmental Damage" featuring Jonathan Woodruff on Trombone, keys and voice

- X-MAS BREAK -  
WAR IS OVER, IF YOU WANT IT

- HAPPY NEW YEAR 2023 -

**Saturday, January 7th, 2-5pm Guest Lecture III**  
**Jan Hennig aka Kabuki: Modular Harmony and Polyphonic Concepts**

Modular synthesizers are generally used to create monophonic sounds. The reason for this is that in the real world, a polyphonic patch with dedicated filter and envelope per voice is unwieldy and excessively expensive. However, there are ways to extrapolate monophonic voices from a chordal structure that are more native to the modular synth paradigm. Together we will look at different polyphonic concepts.

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Kabuki's heart beats for such seemingly different musical genres as Jungle, Jan or Ambient. For over 20 years, his productions have covered the complete spectrum of beat science, always in search of that special feeling.

From 1996 - 2021 he released over 200 single tracks as singles or released on compilations. He produced remixes for artists like Ennio Morricone, Tinashe, Hot 8 Brass Band and many more.

Since 2016 he has been teaching with a focus on sound synthesis at the Abbey Road Institute in Frankfurt am Main, Germany

2018 studies at the California Institute of the Arts (Sound Synthesis Using Reaktor) and from 2019 until today studies at Stanford University (Programming Max: Structuring Interactive Software for Digital Arts).

### **Simon Berz: DIY Instruments, modular and improvisation**

Based on electroacoustic equipment (D.I.Y. instruments, effects, mixer, modular system) Simon Berz shows extensive and creative ways of sound manipulation in improvisation.

The workshop shows possibilities of microscopic sound research using body sound microphones. He lets the participants experience how the simplest sound events can be transported into monumental walls of sound and create new improvisation ideas.

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Simon Berz's work in experimental and improvised music, in sound art and new forms of performance aims at innovation, interaction and participation. Simon Berz is a drummer and sound artist. He uses improvised music to create bridges between his compositions and performances to visual arts, dance and film. His work takes place in artist-run spaces as well as in clubs, galleries and concert halls.

Since his youth he has been involved in developing instruments, sound/art installations and performances based on listening and observing, sound and materials research, on the implementation of experimental formats and their aesthetic mediation. As well as developing his own rhythmic and sound language through an electro-acoustic drumset called the Rocking Desk, he has also developed a "lithophone" consisting of stones producing a sound made by liquid dripping from drip bags that he amplifies and distorts electronically. In 2011, this sound installation was awarded the "Werkjahr des Kantons Zug" prize.

### **Monday 9.1, 2-5pm** **Class 10 (GW) Building your own module**

Mechanical construction

Checking for errors

Connection to the Eurorack

Testing and having fun with the module

**Thursday 12.1, 2-5pm**  
**Class 11(KB)**

**Group work on final projects**

**Saturday 14.1, 2-5pm**  
**Guest Workshop IV:**

**Steve Williams aka Drusnoise: Live Performance Workshop**

This workshop will help you learn how to make the most of your modular synths in a live setting. We will cover topics like how to build a live set that works for the space and audience, concepts to keep in mind when performing, engaging with the crowd, and balancing planning and improvisation. We will also dive into more practical questions like choosing gear, audio/MIDI routing, integrating modular synths with other gear, mixing for live performance, packing, setup, and soundcheck tips.

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Drusnoise is a live, electronic music producer, sound artist and co-founder of the Berlin Modular Society hosting bi-month live electronic events in Berlin. Originally from Canada, his roots in techno lie in the 90s rave scenes of Toronto, Vancouver and London before reaching to the German capital where he currently resides. drusnoise integrates analog modular synthesizers with digital FX and organic samples to create a style that flows from lush ambient tones to gritty techno, in addition to a few curveballs along the way. Over the past years, drusnoise has performed live techno and experimental sets in clubs across Berlin, Prague, Amsterdam. Known in the outside world as Dr. Steve Williams, his academic work includes conducting and publishing research on sustainable energy transition in Canada, Germany, and Sweden. Keen to merge themes of sustainability with dance music and sound art in today's eco-challenging climate, drusnoise builds live sets from a plethora of natural sources incorporating field recordings, sonified climate change data, and feedback loops.

**Monday 16.1, 2-5pm**  
**Class 12 (KB, SL, GW): creative strategies and finalize**

Further software/hardware combinations

Managing workflow

Creative strategies

Develop a piece in groups

Improvisation and performance techniques

patching on the fly

live recording techniques

Notation in electronic music

Finalize and rehearse the piece in groups

review work and record extra sections

Write texts for the piece

Female pioneers in electronic music **listening session V**

**Thursday 19.1, 2-5pm (KB, SL, GW)**  
**Make-up seminar or continue Finalize**

**Monday 23.01, 2-5**  
**reserved for make-up seminars etc.**

**Project week: Performances / Collaboration / Presentations**

**Wed/Thur/Fri/Sat January 25th - 28th Acud Club**

### **Course Texts**

Handmade Electronic Music, Nicolas Collins

<https://www.handmadeelectronicmusic.com/index.htm>

Circuit Bending: Build Your Own Alien Instruments, Reed Ghazala

### **Links:**

<https://www.modulargrid.net>

<https://syntherjack.net>

<https://schneidersladen.de/>

### **Course Videos**

There are numerous further inspiring and insightful channels that can be suggested. Some fundamental ones are:

<https://www.youtube.com/c/DivKidVideo>

<https://www.youtube.com/c/Moltenmusictechnology>

<https://www.youtube.com/c/mylarmelodies>

Sisters with Transistors - Electronic Music's unsung heroines

<https://sisterswithtransistors.com>