

# TENSS 2014 Schedule

Color code:    General    Lectures    Labs    Student presentations

DAY	TIME SLOT	MAIN RESPONSIBLE	GROUPS	CONTENT
DAY 1	08:00 – 09:00			Breakfast
	09:00 – 10:00	Florin, Raul and Adam Florin Albeanu		Introduction to the course
	10:00 – 11:15			Properties of light - Refraction, diffraction & Resolution
	11:15 – 11:30			Coffee break
	11:30 – 13:00	Adriana Dabacan		Image formation with Lenses
	13:00 – 14:00			Lunch
	14:00 – 17:00	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Simple microscopes : Lenses and image formation properties
	17:00 – 17:30			Coffee
	17:30 – 18:30	Priyanka/Mehrab		Koehler Illumination and Numerical aperture
	18:30 – 20:30	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Bench-top koehler microscopes – depth of field and aperture
	20:30 – 21:30			Dinner
21:30 – 23:00	Mehrab/Priyanka		Recap – diffraction, resolution, numerical aperture, objectives	
DAY 2	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 11:15	Ashesh Dhawale		Fluorescence: Wide-field epi-fluorescence, PSFs and resolution, dF/F, bleaching, ratiometry (dF/dR)
	11:15 – 11:30			Coffee break
	11:30 – 13:00	Adam Kampff		Detecting signals: Noise, Cameras, PMTs and diodes
	13:00 – 14:00			Lunch
	14:00 – 16:30	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Convert bench-top koehler microscopes to epi-fluorescence
	16:30 – 17:00			Limits of your microscope : noise sources and PSFs (Introduction to the lab session on noise measurements)
	17:00 – 17:30			Coffee break

	17:30 – 20:30	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Noise measurements, measure PSFs using fluorescent beads
	20:30 – 21:30			Dinner
	21:30 – 23:00			Discussion, analysis, continue Labs
<b>DAY 3</b>	08:00 – 09:00 09:00 – 10:00			Morning run/swim Breakfast
	10:00 – 11:30	Juan Burrone		Fluorescent probes: GFP, calcium indicators vs. voltage dyes, synaptophluorins
	11:30 – 11:45			Coffee break
	11:45 – 13:00	Mark Hubener		Wide-field imaging of Intrinsic optical signals
	13:00 – 14:00			Lunch
	14:00 – 17:00	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Image fixed brain slices on the bench-top fluorescence microscopes, Compare noise and PSFs on commercial Scientifica and Olympus microscopes (1-2 students per group can combine and do this together), In parallel, all groups analyze noise and PSF measurements, compile results and make presentations
	17:00 – 17:30			Coffee break
	17:30 – 20:30	Adriana, Ashesh, Mehrab and Priyanka	ABCD	Acquire images of fluorescent samples - fish, slices etc. Continuation of analysis and making presentations.
	20:30 – 21:30			Dinner
	21:30 – 23:00			Student presentations (15 + 5 minutes): PSFs, noise characterization of wide-field microscopes
<b>DAY 4</b>	10:00 – 19:00	Raul		Trip to Cluj (Lunch at Mesele Vesele)
	19:30 – 20:30			Dinner
	21:00 – 23:00	Adam Kampff	ABCD	Introduction to Arduinos
<b>DAY 5</b>	08:00 – 09:00 09:00 – 10:00			Morning run/swim Breakfast
	10:00 – 11:30	Adam Kampff		Scanning and confocal microscopy
	11:30 – 11:45			Coffee break
	11:45 – 12:15	Adam Kampff		Intro to Lab session on scanning software
	12:15 – 13:00	Florin Albeanu		Intro to Lab session on intrinsic imaging - practical aspects and comparison with wide field fluorescence imaging
	13:00 – 14:00			Lunch

	14:00 – 16:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	AB	Set up microscopes for intrinsic optical imaging and determine optimal imaging parameters
			CD	Set up bench top scanners and simple beam alignment
	16:00 – 16:30			Coffee break
	16:00 – 20:30	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	AB	Image intrinsic optical and fluorescence signals, analyze acquired signals
			CD	Write scanning software in Labview
	20:30 – 21:30			Dinner
	21:30 – 23:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	Continue respective lab sessions
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DAY 6	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 12:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka	AB	Set up bench top scanners and simple beam alignment
			CD	Set up microscopes for intrinsic optical imaging and determine optimal imaging parameters
	12:00 – 13:00			Early Lunch
	13:00 – 17:30	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka	AB	Write scanning software in Labview
			CD	Image intrinsic optical and fluorescence signals, analyze acquired signals
	17:30 – 18:00			Coffee break
	18:00 – 19:30	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	Continue respective lab sessions
	19:30 – 20:30			Early Dinner
	20:30 – 22:00		ABCD	Student presentations (15 + 5 minutes): Widefield imaging
	22:00 – 23:00	Viviana Gradinaru		Introduction to optogenetics
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DAY 7	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 11:00	Adam Kampff		Two-photon microscopes – the THEORY
	11:00 – 11:15			Coffee break
	11:15 – 13:00	Adam Kampff Florin Albeanu	AB	Write X-Y scanning and image acquisition software in Labview, controlling Z-focus using motorized stages or Electrically tunable lenses
			CD	Building a two-photon microscope – general discussion on practical aspects and brief overview of commercially available setups
	13:00 – 14:00			Lunch

	14:00 – 17:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	AB CD	<b>Write X-Y scanning and image acquisition software in Labview</b> <b>Build your own two-photon microscope</b>
	17:00 – 17:30			Coffee
	17:30 – 20:30	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	<b>Continuation of lab sessions</b>
	20:30 – 21:30			Dinner
	21:30 – 23:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	<b>Continuation of lab sessions</b>
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DAY 8	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 11:00	Venki Murthy		<b>New voltage sensors and several novel widefield fluorescence methods for in vivo imaging</b>
	11:00 – 11:15			Coffee break
	11:15 – 13:00	Florin Albeanu Adam Kampff	AB CD	<b>Building a two-photon microscope – general discussion on practical aspects and brief overview of commercially available setups</b> <b>Write X-Y scanning and image acquisition software in Labview, controlling Z-focus using motorized stages or Electrically tunable lenses</b>
	13:00 – 14:00			Lunch
	14:00 – 17:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	AB CD	<b>Build your own two-photon microscope</b> <b>Write X-Y scanning and image acquisition software in Labview</b>
	17:00 – 17:30			Coffee
	17:30 – 20:30	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	<b>Continuation of lab sessions</b>
	20:30 – 21:30			Dinner
	21:30 – 23:00	Adam, Florin, Adriana, Ashesh, Mehrab, Priyanka and Elena	ABCD	<b>Continuation of lab sessions</b>
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DAY 9	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 13:00			<b>in vivo 2p Lab session</b>
	13:00 – 14:00			Lunch
	14:00 – 17:00			<b>in vivo 2p Lab session</b>

17:00 – 17:30 Coffee  
 17:30 – 20:30 **in vivo 2p Lab session**  
 20:30 – 21:30 Dinner  
 21:30 – 23:30 **in vivo 2p Lab session / make presentations**

**DAY 10** 08:00 – 09:00 Morning run/swim  
 09:00 – 10:00 Breakfast  
 10:00 – 11:00 Shy Shoham **Patterned illumination**  
 11:00 – 13:00 **Continue 2p lab session if needed**  
 13:00 – 18:00 Picnic/Barbecue on the hills  
 19:00 – 20:30 Pool time  
 20:30 – 21:30 Dinner  
 21:30 – 23:00 Balkan party by Socol

**DAY 11** 08:00 – 09:00 Morning run/swim  
 09:00 – 10:00 Breakfast  
 10:00 – 10:30 Adam Kampff  
 10:30 – 12:00 Upi Bhalla **Introduction to the behavior and physiology module**  
**Biophysics of neurons - RC circuits, dipoles and impedance (Introduce 'cell in a dish' lab demo)**  
 12:00 – 12:15 Coffee break  
 12:15 – 13:15 Josh Siegle **Introduction to chronic extracellular recordings**  
 13:15 – 14:15 Lunch  
 14:15 – 15:15 Balazs, Josh and Petr **AB** **Tetrode making**  
**CD** **Building Tetrode drives**  
 15:15 – 17:15 Upi, Mehrab and Adriana **AB** **Cell in a dish: Bench top electronics and basics of electrophysiology**  
 Balazs, Josh and Petr **CD** **Building Tetrode drives**  
 17:15 – 17:30 Coffee break  
 17:30 – 18:30 Balazs, Josh and Petr **AB** **Building Tetrode drives**  
**CD** **Tetrode making**  
 18:30 – 20:30 Balazs, Josh and Petr **AB** **Building Tetrode drives**  
 Upi, Mehrab and Adriana **CD** **Cell in a dish: Bench top electronics and basics of electrophysiology**  
 20:30 – 21:30 Dinner  
 21:30 – 23:00 Georg Keller and Tom Flogel **An overview on fast scanning and fast sampling strategies for 2p imaging - why bother?**

**DAY 12** 08:00 – 09:00 Morning run/swim  
 09:00 – 10:00 Breakfast

	10:00 – 11:00	Tomas Hromadka		Introduction to patch clamp
	11:00 – 12:00	Sonja Hofer		Two photon guided patching - method and interesting applications
	12:00 – 12:15			Coffee
	12:15 – 13:00	Adam Kampff		Behavior and machine vision techniques - A primer to upcoming behavior lab sessions
	13:00 – 14:00			Lunch
	14:00 – 17:00	Tomas Hromadka Adam and Elena	AB CD	In vivo patch clamp Animal behavior I - basic principles, clicker training
	17:00 – 17:30			Coffee break
	17:30 – 20:30	Adam and Elena Tomas Hromadka	AB CD	Animal behavior I - basic principles, clicker training In vivo patch clamp
	20:30 – 21:30			Dinner
	21:30 – 23:00	Tomas and Balazs	ABCD	Programming principles - interactive session
<b>DAY 13</b>	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 13:00	Balazs, Josh and Petr Adam and Elena	AB CD	Physiology I - familiarize with set-up and implanted animals, record single cell and local field data Animal behavior II - basic principles, clicker training
	13:00 – 14:00			Lunch
	14:00 – 17:00	Adam and Elena Balazs, Josh and Petr	AB CD	Animal behavior II - basic principles, clicker training Physiology I - familiarize with set-up and implanted animals, record single cell and local field data
	17:00 – 17:30			Coffee break
	17:30 – 18:30	Balazs Hangya		Introduction to data analysis (filtering, spike sorting, PSTH)
	18:30 – 20:30	Balazs, Josh and Petr	ABCD	Analysis of acquired data (filtering, spike sorting, PSTH)
	20:30 – 21:30			Dinner
	21:30 – 22:30	Steffen Katzner		Extracellular recordings from the mouse on the ball: benefits & challenges
	22:30 – 23:30	Raul Muresan		Advanced data analysis of neuronal data
<b>DAY 14</b>	08:00 – 09:00			Morning run/swim
	09:00 – 10:00			Breakfast
	10:00 – 11:00	Bence Ölveczky		High throughput and automated behavior and physiology
	11:00 – 12:00	Georg Keller and Florian Engert		Virtual reality and closed loop behaviors
	12:00 – 13:00			Early lunch
	13:00 – 16:00	Balazs, Josh and Petr Adam and Elena	AB CD	Physiology II - recording from freely moving mice, optogenetic stimulation, spike sorting Animal behavior III - Designing and implementing a behavioral paradigm

	16:00 – 16:30			Coffee break
	16:30 – 19:30	Adam and Elena Balazs, Josh and Petr	AB CD	Animal behavior III - Designing and implementing a behavioral paradigm Physiology II - recording from freely moving mice, optogenetic stimulation, spike sorting
	19:30 – 20:30	Balazs Hangya		Math concepts in data analysis
	20:30 – 21:30			Dinner
	21:30 – 23:00	Balazs, Josh and Petr	ABCD	Analysis of acquired data (auto-correlation, cross-correlation, power spectrum, phase histogram, rate map)
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DAY 15	08:00 – 09:00 09:00 – 10:00			Morning run/swim Breakfast
	10:00 – 11:00 11:00 – 12:00	Adam Kepecs Danko Nikolić		Combining electrophysiology, optogenetics, high-throughput behavior and modeling Cybernetics in the brain
	12:00 – 13:00			Early lunch
	13:00 – 14:30	Florian Engert		Florian speaks
	14:30 – 15:00			Coffee break
	15:30 – 20:30 20:30 – 21:30 20:30 – 23:00	Georg Keller	ABCD	Virtual Reality lab demo and student experiment Dinner Party
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DAY 16	08:00 – 09:00 09:00 – 10:00			Morning run/swim Breakfast
	10:00 – 11:00 11:00 – 12:00	Hannah Monyer Wolf Singer		Molecular and electrophysiological approaches to study GABAergic neurons at the cellular and network level Time as coding space in cortical processing
	12:00 – 13:00			Early lunch
	13:00 – 18:00	Adam, Balazs and Keller	ABCD	Behavior and physiology student experiment
	18:00 – 20:30		ABCD	Time for making presentations
	20:30 – 21:30			Dinner
	21:00 – 23:00			Student presentations (15 + 5 minutes): 2p, ephys and behavior
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DAY 17	08:00 – 09:00 09:00 – 10:00			Morning run/swim Breakfast
	10:00 – 11:45			Informal chalk board talks by students (10 + 5 minutes): Very brief intro to current research work and defend future proposals to use knowledge acquired at the course
	11:45 – 12:00			Coffee

**12:00 – 13:30**

**Informal chalk board talks by students continue**

**13:30 – 14:30**

**Lunch**

**14:30 – 16:00**

**Round up and feedback**

**Evening**

**Music, movies, swim and party**

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