COURSE SCHEDULE

Sunday, September 29

ORIENTATION  7:00 p.m.  SPECK AUDITORIUM – Rowe Bldg.

Introductions
Overview of course

Robert Hard, Hari Shroff, and Faculty

PIZZA PARTY  7:45 p.m.  Meigs Room, Swope, 2nd floor

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Lectures will be in Speck Auditorium – Rowe Building (SA)
Laboratories will be in Loeb (L)
Meals will be in Swope (SW) dining room

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Monday, September 30

8:30  SA  Geometric optics, the microscope and image formation  Hard
10:00  L  Coffee
10:30  SA  Image formation (continued)  Hard
12:00  SW  Lunch
1:00  L  Specimen preparation
Specimen requirements
Hard and DePasquale
1:45  L  Practice in use of different microscope stands
Koehler illumination
Use of diaphragms
Commercial Faculty
6:00  SW  Dinner
7:00  SA  Detection of light and fundamentals of electronic image formation  Fullerton
9:00  L  Rotation: Digital cameras, image processors  Commercial Faculty
Tuesday, October 1

8:30 SA  Wave Optics, Diffraction and Abbe's theory

10:30 L  Coffee

11:00 L  Demonstration: Abbe diffraction apparatus

12:00 SW Lunch

1:00 SA  Dark Field and Phase Contrast microscopy

1:45 SA  Incident light microscopy: Interference reflection microscopy

2:30 L  Laboratory: Resolution tests. Phase contrast

Demonstrations: Dark-field Microscopy
and Interference Reflection Microscopy

4:00 L  Laboratory: Use of digital cameras

4:30 L  Image Basics I

5:30 L  Problem Set 1 Digital cameras, resolution test slide, phase contrast

6:00 SW Dinner

7:00 SA  Polarization microscopy I

8:30 L  Laboratory: MacroPol exercises

Wednesday, October 2

8:30 SA  Polarization microscopy II

9:15 L  Coffee

9:30 L  Laboratory: Polarization microscopy

11:45 SW Lunch

12:45 SA  Differential interference contrast microscopy

2:00 L  Laboratory: Differential interference contrast microscopy

5:30 L  Laboratory: Image Basics II

6:00 SW Dinner

7:00 Laboratory: Digital Imaging Phase, Dark Field,
DIC and POL exercises + Phase/POL/DIC photos for contest

9:00 L  Problem Set 2 Digital cameras, POL and DIC

Thursday, October 3

8:30 SA  Introduction to fluorescence

10:00 L  Coffee

10:30 SA  Laboratory: Fluorescence microscopy, sample preparation

12:00 SW Lunch

1:00 SA  Advanced fluorescence microscopy I

Colocalization, TIRF, Live Cell Imaging

2:00 L  Laboratory Demonstration: Spectra and Optical Filter Properties

2:30 L  Fluorescence microscopy, continued (visual observations of fixed cells

Prabhat

North, DePasquale
4:30  SA  Cooled CCD and CMOS cameras  
cameras, video rate and slow-scan  

6:00  SW  Dinner  

7:00  L  Signal to noise ratio in fluorescence microscopy.  

7:30  L  Demonstrations: Characteristics of low-light level cameras;  
EM Cameras  

9:30  L  **Problem Set 3**  Low-light level cameras and image processors  
with fluorescent labeled specimens  

**Students Only**

*Friday, October 4*

8:30  SA  Advanced Fluorescence II  
Fluorescent proteins for monitoring live cell function  

9:30  SA  Advanced Fluorescence III  
FRAP/FLIP, Photoactivation, Day Photoswitching, Fluorescent Correlation Spectroscopy-lv.e cells,  
Fluorescence Polarization  

10:30  L  Coffee  

11:00  SA  Advanced Fluorescence IV – Intro FRET, FLIM, Fluorescence Pol. and FRET, Fret Measurements, Fluor. Prot. for FRET  

12:00  SW  Lunch  

1:00  SA  Digital Imaging Principles - I  

2:30  SA  Digital imaging principles - II  

3:30  L  FRET/FLIM Demo  

5:30  SW  Dinner  

6:30  SA  Digital Imaging Principles - III  

8:00  L  Demonstrations: Digital image processing  

*Faculty*

*Saturday, October 5*

8:30  SA  Digital Image Restoration (Deconvolution)  

10:00  SA  Evaluating optical performance using PSFs  

10:30  SA  Multispectral Imaging  

11:30  L  Multispectral Imaging Demo  

12:30  SW  Lunch  

1:30  Free Time - Pursue own projects  
Revisit equipment/exercises  
Prepare problem set presentation  

5:00  SA  Horizons Lecture –"In vivo deep tissue multiphoton microscopy"  

6:00  SW  Wine and Beer - Lounge  

7:00  SW  Banquet - Meigs Room  

9:00  Free time, Continued  

*Sunday, October 6*

8:30  L  Laboratory: Digital image restoration systems  

*McNally and*
10:00 L Coffee
10:30 L Laboratory: Digital image restoration systems (Con’t) McNally and Commercial Faculty
12:00 SW Lunch
1:00 SA Confocal scanning microscopy Murray
2:30 L Laboratory: Introduction to confocal scanning microscopy Murray, Sigurdson and Commercial Faculty
6:00 SW Dinner
7:00 SA Multiphoton Imaging McNally
7:45 L Demonstration: Multiphoton McNally, Sigurdson, Kerr
& Preparation for Problem Set Presentation Students

Monday, October 7

8:30 SA 3D Visualization Sigurdson
10:00 L Coffee
10:30 L Problem Set Discussion
12:30 SW Lunch
1:30 SA Super-Resolution – STED, PALM, STORM, GSD Shroff
2:30 L Demonstrations: STED, PALM, STORM, GSD Shroff, Commercial Faculty
5:00 SW Dinner
6:00 SA Super-Resolution – Structured Illumination, SIM Goodwin
7:00 SA Analogue SIM York
7:30 L Demonstrations: Structured Illumination, SIM Shroff, York, Goodwin
and Commercial Faculty

Tuesday, October 8

8:30 L Comparative Exercises
Two photon excitation fluorescence versus confocal microscopy versus deconvolution Hard, Sigurdson, McNally
11:00 L Comparison of results Sigurdson and McNally
12:00 SW Lunch
1:00 SA GRAND SUMMARY Lanni
2:30 L Demonstrations:
Laser Driven Light Source Demo Commercial Faculty
Spinning Disk Confocal Commercial Faculty
Light Sheet Microscopy Shroff, York
TIRF/FRAP Commercial Faculty
Orientation-Independent POL and DIC Oldenbourg and Shribak
(60 min)
6:00 SW Dinner
8:00 THE KIDD Open discussions Academic/
Commercial Faculty

Wednesday, October 9

7:00 SW Breakfast and Departure