Subject Area	Project	Description	Maximum # of Scholars
DNA Melting	Lock-in amplifier, TEC	• Design and build a lock-in amplifier for the DNA melting apparatus • Use a thermoelectric cooler (TEC) to heat/cool sample	3 groups of 2
	Bump investigation	• Design and execute experiments to definitively explain the DNA melting bump	2 groups of 2
Atomic Force Microscopy	Teaching AFM characterization	• Image several samples • Estimate elastic modulus of materials by microindentation • Measure instrument performance	4 groups of 2
	Teaching AFM algorithm development	• Image several samples • Estimated elastic modulus of materials by microindentation • Develop image processing algorithms to reduce artifacts	
Optical Trapping	Molecular motor characterization	• Calibrate trap stiffness • Culture KAF95 *E. Coli* bacteria • Prepare samples • Characterize torque/speed curve of *E. Coli* flagellar motor	6 groups of 2
	Tethered assay	• Calibrate trap stiffness • Prepare samples • Estimate force vs. displacement curve	
Optical Microscopy	Confocal Microscope	• Modify microscope for confocal microscopy • Use motorized X-Y-Z stage • Develop control and image reconstruction software • Image several samples	2 groups of 2-3
	Microrheology of Cells	• Culture 3T3 cells • Add nanoparticles to cells • Estimate microrheological parameters by tracking endocytosed particles • Use a drug to disrupt actin polymerization • Compare microrheological properties before and after actin disruption	4 groups of 2
Other	Fluorescence Correlation Spectroscopy	• Incorporate a microfluidic device and PMT detector into optical microscope to perform FCS on fluorescent microspheres	1 group of 2-3
	Diamagnetic density sensor	• Implement density sensor based on Whitesides Lab	1 group
	Epigenetic Analysis of DNA	• Implement DNA methylation detector	1 group
	Student Proposal	• Relevant, quantitative, achievable project	1-2 groups