

Index to online lectures

To view lectures go to

<http://www.youtube.com/user/StuartLindsay1>

Click on "Playlists" to see videos sorted by Chapter. Lecture Titles are "NAN544_X_Y" where X= chapter, Y=module number.

Unit number (X_Y)	Title	Book Sections
0	Video overview produced by the Biodesign Institute	
1.1	Overview of the book; The atomic length scale	1.1
1.2	"There's plenty of room at bottom"	1.2 - 1.3
1.3	Quantum effects	1.4
1.4	Fluctuations	1.5
2.1	Overview of Chapter 2	2.1
2.2	The uncertainty principle	2.2 -2.3
2.3	The Rules!	2.4
2.4	Indistinguishable particles: Fermions and Bosons	2.5 - 2.9
2.5	The Schroedinger Equation	2.10
2.6	Solution of the Schroedinger equation for a constant potential	2.12-14
2.7	Solution of the Schroedinger equation for a barrier and a box	2.15
2.8	Density of states for a free particle	2.15
2.9	A tunnel junction	2.15
2.10	The hydrogen atom 1	2.16
2.11	The hydrogen atom 2	2.16
2.12	The hydrogen atom as a model for the elements	2.17
2.13	The periodic table	2.18
2.14	Perturbation theory	2.19
2.15	Chemical bonds	2.10
2.16	Length of chemical bonds	2.20
2.17	Density functional theory	2.22
3.1	Overview, thermodynamic quantities and entropy	3.1 - 3.2
3.2	Boltzmann's distribution and definition of entropy	3.3
3.3	More on Boltzmann's distribution and definition of entropy	3.4 - 3.5
3.4	The equipartition theorem	3.6
3.5	Thermodynamic potentials	3.7
3.6	Partition function for an ideal gas	3.8
3.7	Properties of an ideal gas from the partition function	3.9
3.8	Quantum gasses	3.10
3.9	Fluctuations from the partition function	3.11
3.10	The Langevin equation	3.12
3.11	Diffusion	3.13

3.12	Chemical reactions 1	3.17
3.13	Chemical reactions 2	3.17
3.14	Acid-base equilibria	3.18
3.15	Molecular association	3.19
3.16	Molecular Dynamics Simulations	3.22
3.17	Thermal Fluctuations and quantum mechanics	3.24
4.1	Overview and history	4.1
4.2	STM 1	4.1
4.3	STM 2	4.1
4.4	AFM Basics	4.2
4.5	AFM probe-sample interactions	4.2
4.6	AFM mechanical imaging modes 1	4.2
4.7	AFM mechanical imaging modes 2	4.2
4.8	Single molecule force spectroscopy	4.2
4.9	Other AFM sensing modes	4.2
4.10	Electron Microscopy	4.3
4.11	Single Molecule Fluorescence	4.4
4.12	Applications of single molecule fluorescence	4.4
4.13	Manipulating single molecules	4.5
4.14	Applications of single molecule manipulation	4.5
5.1	Overview and photolithography	5.1-5.2
5.2	E-beam lithography and MEMS	5.3-5.4
5.3	Thin films and MBE	5.5-5.6
5.4	Self-assembled masks	5.7
5.5	Focused Ion Beam Milling	5.8
5.6	Stamp technology and nanojunctions	5.9-5.10
6.1	Overview and Organic synthesis 1	6.1-6.2
6.2	An example of coupling chemistry	6.2
6.3	Purification and analysis	6.2
6.4	Non-bonded interactions	6.3
6.5	Hydrogen bonds	6.3
6.6	Vesicles and micelles	6.4
6.7	Critical micelle concentration	6.5
6.8	The mitochondrion	6.6
6.9	Monolayers and nanocrystals	6.7-6.8
6.10	Self-assembly of the DNA double helix	6.9
6.11	DNA Nanotechnology	6.9
7.1	Free electrons	7.1-7.3
7.2	The Sommerfeld Model	7.3-7.4
7.3	Band Structure 1: Bloch's theorem	7.5
7.4	Band Structure 2: Tight binding	7.6
7.5	Band Structure 3: Conductors and insulators	7.6
7.6	Band Structure 4: Why are most elements metals?	7.7
7.7	The Landauer Resistance	7.8

7.8	The Coulomb Blockade	7.9-7.10
7.9	Resonant tunneling	7.11-7.12
7.10	Localization	7.13
8.1	Overview	8.1
8.2	Lewis structures	8.2
8.3	Linear combination of atomic orbitals	8.3-8.4
8.4	Hybridization and molecular orbitals	8.5-8.6
8.5	Molecular orbital energy level diagrams	8.6
8.6	The Huckel model and delocalization energy	8.7-8.8
8.7	Electrochemistry 1	8.9.1-8.9.3
8.8	Electrochemistry 2	8.9.3
8.9	Redox processes in molecules	8.9.3-8.9.5
8.10	Marcus Theory	8.10
8.11	Marcus Theory - the Movie	8.10
8.12	Charge transport in molecular solids	8.11-8.12
8.13	Single Molecule Electronics 1	8.14-8.17
8.14	Single Molecule Electronics 2	8.17-8.18
9.1	Introduction and the density of states	9.1-9.2
9.2	0 and 1D electronic structures	9.3-9.5
9.3	2D electronic structures	9.5
9.4	Plasmonics	9.6
9.5	Photonic density of states	9.7-9.8
9.6	Nanomagnetism	9.9-9.11
9.7	Nanostructured thermal devices	9.12
9.8	Nanofluidics	9.13-9.16
9.9	Biomimetic materials	9.17
10.1	Nanobiology: Introduction and background	10.1-10.2
10.2	Molecular Biology	10.2
10.3	Protein mechanics	10.3
10.4	What enzymes do	10.4-10.5
10.5	ATP and molecular motors	10.6-10.8
10.6	Types of molecular motor	10.9
10.7	Fluctuations in gene expression and splicing	10.10-10.11