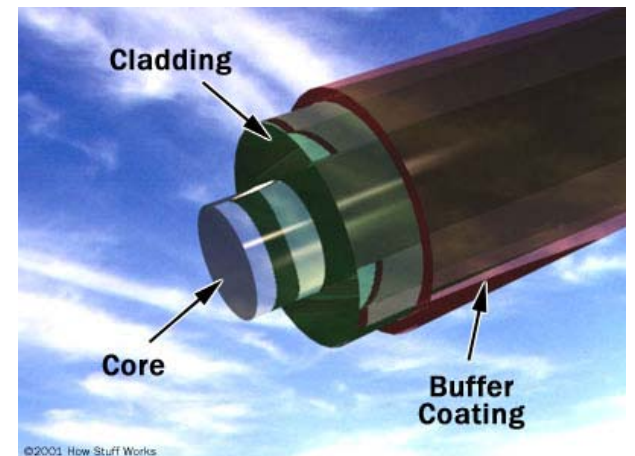
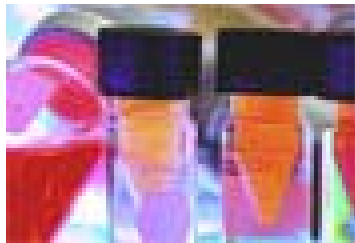


Last class

1. Exam on Friday, May 8, 10:30-12:30, same room
 - BRING A CALCULATOR
 - 4 ONE SIDED, OR 2 DOUBLE SIDED PAGES OF NOTES ALLOWED, IN YOUR OWN HANDWRITING ONLY
2. Grades
3. HW
4. Review
5. Surveys



Exam Prep

- Summary of topics uploaded to website today (prepFinal.pdf)
- Answers to HW4 and HW5 also uploaded to website today



Grades

HW 4, HW5, and Final not yet entered in scoring sheet.

Generally:

Assignments	40% total (5*8% each)
Midterm	25% total
Comp. Final Exam	35%

term score	term grade	term score	term grade
>92	A	>72	C
>90	A-	>70	C-
>88	B+	>68	D+
>82	B	>62	D
>80	B-	>60	D-
>78	C+	<	F

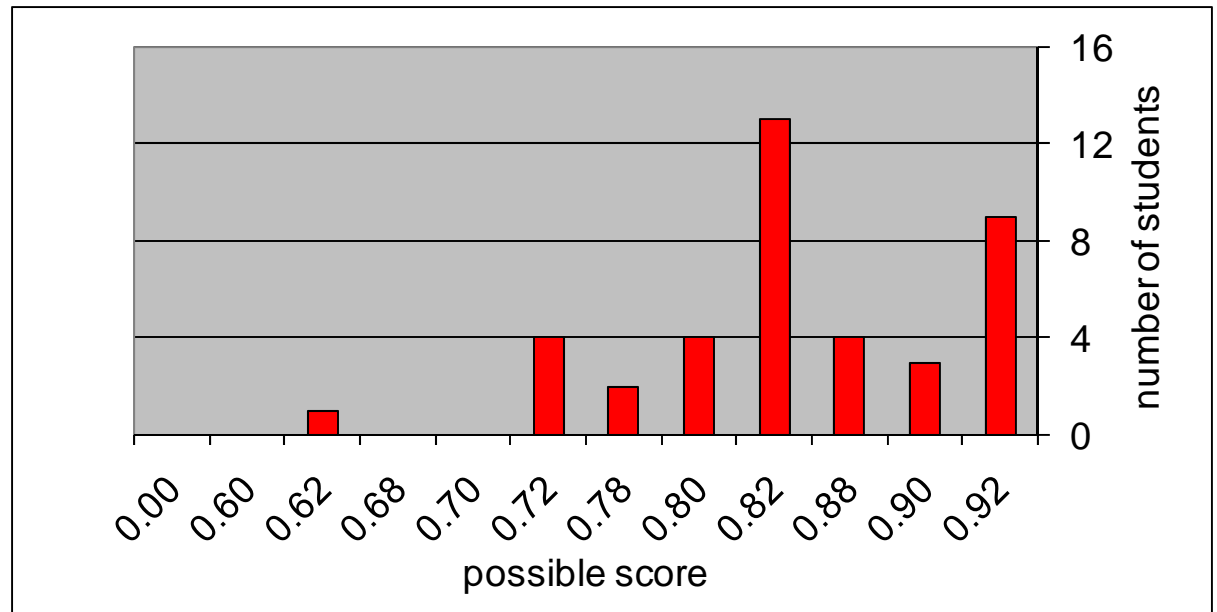


Current Standings

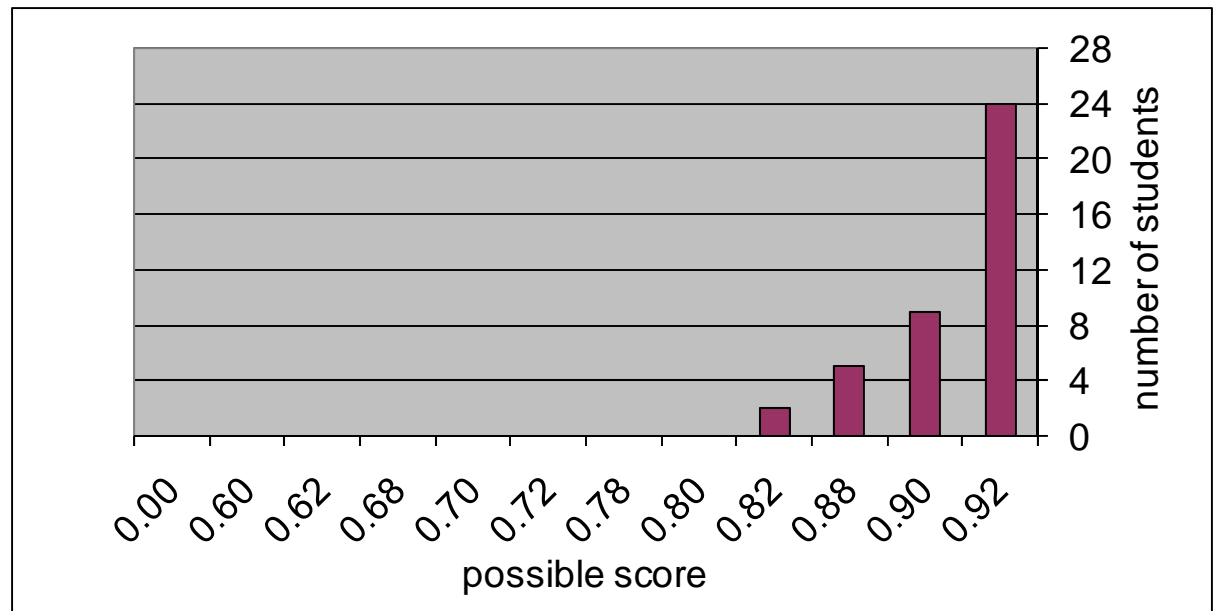
Peoplesoft	continue	perfect		Peoplesoft	continue	perfect
1536867	84.5%	92.1%		1539194	93.5%	95.9%
1551013	83.9%	92.2%		1594927	82.2%	91.1%
1560763	98.4%	98.8%		1559122	83.4%	92.1%
552328	84.9%	91.8%		1566599	80.2%	90.7%
1347106	80.9%	89.5%		1373969	90.9%	95.6%
1528788	74.0%	86.2%		1377848	87.9%	93.7%
1576299	83.2%	92.2%		1432702	79.9%	90.3%
1480086	96.5%	97.8%		1114208	86.6%	92.8%
1580406	92.6%	96.2%		1472492	92.7%	96.0%
1550318	92.7%	96.0%		1459072	66.8%	83.5%
1578035	80.4%	90.5%		1576873	82.3%	91.9%
369947	82.7%	91.3%		1570636	80.4%	90.2%
1485359	82.1%	91.5%		1557580	91.1%	95.5%
1561076	89.2%	94.7%		1342720	97.8%	98.5%
1419705	95.5%	97.2%		1442999	86.9%	93.1%
1540966	76.7%	89.2%		1579531	88.6%	94.9%
483843	87.2%	93.5%		1053448	78.7%	89.6%
1544808	95.5%	97.8%		1591782	76.6%	89.1%
754429	89.6%	94.5%		1597697	88.0%	94.3%
1452706	90.8%	94.8%		1465512	76.9%	88.5%
possible	100.0%	100.0%		max	98.4%	98.8%
average	85.8%	92.9%		min	66.8%	83.5%



- Grade distribution at present, assuming continued performance as before on remaining HW's and final:



- Grade distribution at present, assuming perfect marks for remaining HW's and final:



Recent HW

- HW4:
 - lb
 - IIa,b,d
 - 49
 - 56b

- HW5:
 - 20.24
 - 19.10
 - 21.18



Final Exam

- Focus on material since the midterm
- But still comprehensive (incorporates many ideas from earlier in term)
- Exam on Friday, May 8, 10:30-12:30, same room
 - BRING A CALCULATOR
 - 4 ONE SIDED, OR 2 DOUBLE SIDED PAGES OF NOTES ALLOWED, IN YOUR OWN HANDWRITING ONLY



Review

- You work for Intel and they are developing a next generation chip with square SiO_2 -based capacitor elements that are $50 \text{ nm} \times 50 \text{ nm}$ on a side. The relative dielectric constant for SiO_2 is 4.
- What is the capacitance in electrons/Volt (not Coulombs/V) if the plates are separated (z) by just 2 nm of SiO_2 ?**



$C = \epsilon_0 \epsilon_r A / \text{sep}$	Eps	$C/V \cdot m$	sep (nm)
50	50	$4 \cdot 8.85E-12$	2
$4.43E-17C$			
276.5625electrons			



- When a computer is operating, currents are so high in the many individual transistors that the temperature for the Silicon chip wants to increase from 25C to 225C. Given a thermal expansion coefficient of Si of $17 \cdot 10^{-6}/K$, and a Young's modulus for Si of 150 GPa.
 - **What percent would the length of the Si chip change with this temperature increase? *Note: you do NOT need the chip dimensions for this part.***

thermal expansion			
deltaT	200	$1.70E-05$	150
	0.0034	0.34%	



- You work for Cabelas and are asked to design a bow and arrow system where the bow-string is made out of a glass optical fiber. Just say, “yes boss, that sounds real pretty...”
- The fiber optic you are told to use has a circular cross-section and a *radius* of 2.5 mm. The max load which can be applied is well-approximated by a 3-point bend test, where the supports (the tips of the bow) are 1 meter apart. The Young’s modulus is 50 GPa, and the fracture strength for glass is 50 MPa:
 - What is the maximum load which can be applied to this fiberoptic bowstring before it snaps?
 - What is the max displacement of the fiberoptic (ie how far can you pull it back before it snaps)? *Note: Partial credit still given even if answer above is wrong.*
 - You only tested one bowstring in your experiment. Will all similarly sized and manufactured bowstrings perform the same way, and why or why not?
 - How can you guarantee that every ceramic bowstring you sell will perform up to a certain load?

mm	sep (m)	Young (Gpa)	sigma (Mpa)	sigma=Fmax*L/piR^3
2.5	1	50	50	2.454369Newtons
				Newtons



1st half of term

- Intro, Structures
- Ceramic Structures, planes
- Defects in Ceramics
- Mechanical Properties of Ceramics
- Ceramics Phase Diagrams
- Glass and glass processing
- Clay and powder processing, refractories
- Other ceramic processing
- Polymers I
- Polymers II
- Composite Materials I
- Composite Materials II
- Composites Materials III



2nd half of term

- Electronic Properties: metals
- Semiconductors
- Doped Semiconductors
- Diodes and Transistors
- Dielectrics and ionic conductors
- Magnetic Properties I
- Magnetic Properties II, Superconductivity
- Thermal Properties
- Optical Properties I
- Optical Properties II
- Final Optical Properties
- Exam Review, Surveys



Surveys

- 3 surveys:
 - University scantron (use a pencil please)
 - 10 is good, 1 is bad
 - University fill in
 - Dept. / course improvement
 - (true/false)
- I will not directly see your responses.
- We take the responses very, very seriously.
- Please be honest, fair, and thorough.

