Cell phone case design

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Project 2

- Due at date of final for physical demonstrations, by Thurs of finals week for report, 11:59pm
- Design a new protective cell phone case out of ABS or PLA plastic for specified phone dimensions (iphone 6 dim and mass)
- The case and phone assembly must withstand static loads and dynamic loads without failure, can ablate to absorb energy under high impact
- The case assembly must reduce the impulsive shock a dropped phone would experience by a factor of at least 20%, preferably higher. The higher the reduction the higher the points for this portion
- You will perform FEA and static and dynamic stress and failure analyses to analyze the performance
- Extra credit for printing the case and actual testing with provided test hardware

- This is a group project, one report is to be turned in per group via turnitin link

- We will arrange a physical test of printed designs during the scheduled final

Specific questions

- Report format (digital turn in):
    - Same basic structure as previous - title page, introduction, project description, your design/approach (drawings with dimensions included here), methods and analysis, conclusion
- What is the maximum static force your design can withstand without failure in each major dropping ‘mode?’
- What design features mitigate stresses on the phone, how do they work, and what is the approximate reduction in max stress you expect (back up with empirical or theoretical calculations)?
- Perform a basic (hand, 1-2d) or complete (Solidworks or similar-based) FEA analysis of the case and case/phone assembly under expected loads statically and by being dropped from 5 feet
    - Where are the expected stress concentrations, characterize them as best you can with the method you chose
    - You can use this to provide additional stiffness or cushioning to mitigate accelerations and forces
        - Review impulse and momentum to compute an approximate dynamic load over time - hint - Impulse is Force acting on an object for a brief period of time. This force causes a change in momentum of the object from initial to final velocity. This is a rapid change when dropping a phone, so extending the length of deceleration is a common way to reduce loads. You can increase time by adding foam/rubber, protruding features, etc. This is one approach. The other is to make the assembly very stiff to distribute the load and avoid stress concentrations on the phone. Also note that the plastic will deform, thus acting like a spring/damper and extending deceleration time

Modeling

- Remember a model is an approximation
- Decide on certain things to model and limit your analysis to those items that are doable and give you a ballpark estimate. The deeper you go the less uncertainty about performance
- Example analyses might be to analyze the deflection once you estimate the force the system is going to be under at impact or under static loads (ie in your pocket) in 1 or 2-D