

# Report content

## ***Table of Content***

List of symbols used

## ***State of art***

Write a survey of operating principles and present performances. Provide a **critical review** of the technical literature. Try to identify: performance parameters needed by the application(s) (identify the major quantitative parameters), critical technical/technology limitations and their sources, existing and future market. Use the link to the reference list (show the sources of your information).

## ***Description of your solution***

Describe the choice of the operating principle, motivation/arguments for the choice made. Explain in non-specialist terms the application and the microsystem.

## ***System level analysis***

Build a simplified analytical model (you may also use computer algebra system tools like Mathematica, Maple, etc.) to explain the operating principle and derive the main equations. Try to already infer some basic characteristics of the system from these equations.

Based on the previous (symbolic) analysis, design and simulate the system level of your applications (implement for instance the differential equations in a block diagram or Spice like software tool, and perform simulations).

System level analysis will contain the entire set of subsystems, from MEMS devices to electronics. It is the design& simulation level where you are able to handle the entire multiphysics, the coupling/feedback between various subsystems, and the system optimization.

Insert concrete simulation results. The figures must be clearly labeled and commented.

Tools: Matlab/Simulink, **Spice (B2Spice)**

## ***Finite element analysis***

Design the geometry of the MEMS device and perform the finite element analysis in Comsol Multiphysics. Include clear simulation results, with their explanations and interpretations. **Compare the results** with the simplified model used for the MEMS device in the system-level design and analysis. If possible, try to extract a better behavioral model for use in system level simulations, based on the finite element analyses.

If you have the possibility, think about ways of optimizing the structure, and how would you implement them in FEA.

If the nature of the project makes it difficult to provide the finite element analysis phase, then place in this section the results (and associated comments) from the homework.

### ***Conclusions, further developments***

Combine the results from the previous sections into a general chapter where you analyze the performance of your system, and compare it with other existing solutions. Suggest further improvements and developments, or new ideas originating from your simulations.

### ***References***

Provide a list of references, similar with IEEE Transaction style ([www.zotero.org](http://www.zotero.org))

#### Grading Rubric for written assignment:

<p>Outstanding 90-100</p>	<ul style="list-style-type: none"> <li>• all spelling &amp; grammar correct;</li> <li>• very professional looking</li> <li>• very well organized, excellent flow, easily followed and understood, key points very clear</li> <li>• all topics covered with just the right detail; selected and omitted the right information</li> <li>• Excellent critical thought is evident, especially in analyzing the state-of-the-art in the field</li> <li>• Innovative aspects</li> <li>• Design and simulation at different levels of detail, with good coupling between them: analytical model, numerical simulation using macromodels, finite element analysis</li> </ul>
<p>Very Good 80-90</p>	<ul style="list-style-type: none"> <li>• one spelling or grammar error;</li> <li>• professional looking</li> <li>• well organized, good flow, quite easy to follow and understand, key points clear</li> <li>• content covers all topics but with uneven detail with some inappropriate information omitted or included</li> <li>• good original critical thought is evident</li> <li>• good structured hierarchical design approach; the link and comparison between levels of design not always made</li> </ul>
<p>Good 70-80</p>	<ul style="list-style-type: none"> <li>• a few spelling &amp;/or grammar errors;</li> <li>• professional looking</li> <li>• material is a bit difficult to follow &amp;/or does not flow, key points not very clear</li> <li>• content does not cover some key topic areas adequately</li> <li>• some critical thought is evident</li> </ul>
<p>Adequate 60-70</p>	<ul style="list-style-type: none"> <li>• sloppy but adequate spelling &amp;/or grammar;</li> <li>• only minimally professional looking</li> </ul>

	<ul style="list-style-type: none"> <li>• not well organized, difficult to follow, does not flow, key points difficult to discern</li> <li>• key information or topics missed</li> </ul>
Poor < 60	<ul style="list-style-type: none"> <li>• sloppy grammar &amp;/or spelling</li> <li>• unprofessional looking document</li> <li>• poorly organized, difficult to follow; does not flow; key points not discernable</li> <li>• content misses several key topic areas</li> <li>• little critical thought is evident</li> </ul>

Grading Rubric for oral presentations

Outstanding 90-100	<ul style="list-style-type: none"> <li>• very professional presentation –volume, pace, audience engagement, enthusiasm</li> <li>• excellent use of visual aids</li> <li>• very well organized, excellent flow, easily followed and understood, key points very clear</li> <li>• all topics covered in just the right detail; selected and omitted the right information</li> <li>• Excellent critical thought is evident</li> <li>• Good participation in commenting the oral presentations of other students, and in identifying their weak points.</li> </ul>
Very Good 80-90	<ul style="list-style-type: none"> <li>• professional presentation</li> <li>• very good use of visual aids</li> <li>• well organized, excellent flow, easily followed and understood, key points very clear</li> <li>• all topics covered in appropriate detail; selected and omitted the right information</li> <li>• good critical thought is evident</li> <li>• active positive participation in discussing the oral presentations of other students</li> </ul>
Good 70-80	<ul style="list-style-type: none"> <li>• professional presentation</li> <li>• good use of visual aids</li> <li>• fairly well organized, good flow, a bit difficult to follow and understand, key points sufficiently clear</li> <li>• most topics covered in appropriate detail; selected and omitted most of the right information</li> <li>• some critical thought is evident</li> </ul>
Adequate 60-70	<ul style="list-style-type: none"> <li>• not very professional presentation</li> <li>• adequate use of visual aids</li> <li>• not very well organized, doesn't flow well, difficult to follow and understand, key points not clear</li> <li>• some topics not covered in appropriate detail; did not select or omit the right information</li> </ul>

	<ul style="list-style-type: none"><li>• little critical thought is evident</li></ul>
Poor < 60	<ul style="list-style-type: none"><li>• unprofessional presentation</li><li>• no use of visual aids</li><li>• not well organized, doesn't flow, impossible to follow and understand, key points not apparent</li><li>• most topics not covered in appropriate detail; did not select or omit the right information</li><li>• no critical thought is evident</li></ul>