

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

**“Jnana Sangama” Belagavi – 590 010**



**PROJECT REPORT ON**

**“DESIGN AND SIMULATION OF ACTUATED  
MEMS MICROMIRROR”**

**Submitted in partial fulfillment of the requirements for the award of degree**

**BACHELOR OF ENGINEERING  
IN  
ELECTRONICS & COMMUNICATION ENGINEERING**

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**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING  
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**2019-2020**

# ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY

MOODBIDRI - 574 225

(Affiliated to VTU, BELAGAVI)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## CERTIFICATE

*Certified that the project work entitled "DESIGN AND SIMULATION OF ACTUATED MEMS MICROMIRROR" is a bona fide work carried out by*

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in partial fulfillment for the award of BACHELOR OF ENGINEERING in **ELECTRONICS & COMMUNICATION ENGINEERING** of the **VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI** during the year 2019-2020. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the Bachelor of Engineering Degree.



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# ABSTRACT

Micromirrors are versatile devices which find ingenious application in the fields such as optical switching, display and in medical fields for non-invasive imaging. The concept of digital micromirror is that the device can create images by altering different light sources. The mechanical design of this micromirror is a silicon micromirror with a pair of torsion hinges. . Micro Electro Mechanical System (MEMS) micromirrors are devices used in optical systems to direct light from one position to another over a range of reflection angles. The reflection angle of a micromirror can be adjusted by an actuation mechanism that rotates and moves the mirror surface. Actuation mechanisms such as electrostatic, piezoelectric, electromagnetic and electrothermal have been exclusively used in micromirror designs. These are MEMS mirrors, which mean that their states are controlled by providing voltage between the two electrodes around the mirror arrays. MEMS have the ability to sense, control and actuate on the micro scale and generate the effects on the macro scale.

This paper proposes a system efficient micromirror for optical communication must have minimal surface distortion and highest lift off. COMSOL Multiphysics provides an environment for analysis as required for this work. The use of COMSOL Multiphysics is due to the flexibility in this particular Computer Aided Design (CAD) tool to prepare the mirror structure and the cantilever beams which need to be analysed in the structural mechanics module to obtain the results. The simulation also points out the places where the lift-off is high and show colour gradation in the figure with respect to that.