USER MANUAL

OPTICAL DEVICE MODELING SYSTEM

For

# Simulation and Design of Optical Devices using Optical Constants and Interference effects in thin film

## Version 1.0

## 

### Group 10

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**USER'S MANUAL**

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##### Purpose and Scope:

The purpose of this document is to present a detailed description and usage of Optical Device Modeling System for Simulation and Design of Optical Devices using Interference Effects in Thin films.

This User manual explains how to install, configure and use the Optical Device Modeling Software. It also explains every feature and limitations regarding the usage of product.

##### Orgainzation :

This user manual is organized in the following manner. First it will explain the various capabilities of the software and its description. It will provide a proper of description all system functions. In the next chapter, it will describe how to prepare various function inputs and retrieve results from the system and then it will explain each and every operating instruction to initiate, maintain, restart, and terminate the software system. In the final chapters, it will describe the methods to handle various errors and Help facilities that are being provided by the software vendors.

##### Points of Contact:

This software is developed by our team comprising of Juniper Gujral, Shweta Katharia, Arvind Shokal and Batthala Sainath. If there is any problem or bug in the software , You can email to the following id’s.

Juniper Gujral – [cse1200113@iiti.ac.in](mailto:cse1200113@iiti.ac.in)

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1. System Capabilities

##### Purpose:

The crucial function of ODMS software is to design optical devices using approximated optical constants. This will be done by generating an interpolated graph between transmission and wavelength based on the experimental data. The experimental obtained data will be used to approximate the optical constants and generate theoretical graphs as close as possible to the experimental graphs. The approximated constants will be used to estimate the thickness of thin films used in optical devices

##### General Description:

The software is mainly divided into two components. Two separate Graphical User Interfaces are designed to achieve each goal. One is to simulate a graph of maximum and minimum Transmission envelop curves and calculate all optical constants of thin films i.e, Refractive Index, Absorption Coefficient, Band gap and another is to generate a combination of thin films to get a particular optical filter.

1. Description of System functions

The software is developed in the MATLAB Environment. The software automatically generates and displays maxima and minima curves of the sample transmission graph. The values on these curves are used to approximate functions for optical constants. Later the software, through an iterative algorithm approximates the values of various optical constants such as

Refractive Index, Absorption Coefficient and Band gap. This algorithm uses previously generated maxima and minima envelope curves.

The second part of the software generates the Optical filter based on the inputs given by the user. Based on the user requirements, the software simulates the required filter by calculating the thickness of each material used in the multilayered optical device.

1. Preparation of Function inputs

The software takes two types of data input from the user-one for substrate transmission and the other for sample transmission .The entire functioning of Optical Device Modeling System and the calculations done depend upon this data**.** The first GUI has the functionality of taking two data inputs from the user. The experimental data taken as the input is interpolated and converted into an experimental graph. This graph forms the basis of comparison with theoretical graphs generated by the software.

In the second part, in order to design appropriate Optical filter , The software takes in two types of user inputs for the simulation of required thin film based optical device. The first one is the type of optical filter. The user is required to input the type of wavelength filter he wants to model. The second one is the wavelength as well as the reflectivity the user expects from the optical device.

1. Results

The software generates and displays the theoretical graph of sample transmission based on the values of calculated optical constants. This graph is simultaneously displayed with the experimental graph, which gives the user an idea of accuracy of generated optical constants. The system also generates maxima and minima envelope curves. The system calculates all optical constants using these graphs and displays them to the user. The user can save the output for future use, based on his requirements.

In the second part, We are just using only two materials two build an optical filter. One of them is of high refractive index and another one is of low refractive index. Based on the user requirements, the software simulates the required filter by calculating thickness of each material used in Optical filter. The software then generates the graph of transmission of Given optical filter.

1. Operating Instructions

The software will run on the Windows Operating system, either 32 bit or 62 bit. The software is developed in MATLAB Environment. So MATLAB should be pre-installed to use this software. All options should have default values supplied by the application. Any way some features can be customized based on the user requirements. The software is related to Optics. So the user is expected to have some basic knowledge on the topic as well as the experiment that’s being conducted.

##### Initiate Operation:

After user initiates the application, the system asks the user to enter appropriate input files. If there are any errors in uploading input, the system displays the appropriate error dialogue box.

##### Maintain Operation:

Once the input files are given the system generates the output graphs and also calculates the optical constants and generates .xls files.

Similarly in the second part, the system asks the input from

User and generates the information regarding various thin films and their thickness to build given Optical filter.

##### Terminate Operation:

The user can save the files that are being generated by the software, before terminating the application.

1. Error Handling

No error condition can cause the unexpected termination of the System. Some times there may be some errors while uploading or reading the input files. At that time, the software generates a error dialogue box showing the particular error. You may have to restart the application based on the type of error, that is shown in the error box.

1. Help facilities

In case if there is any bug or unusual bahaviour in the application, the user can contact any of the developers through the following mail id’s.

Juniper Gujral – [cse1200113@iiti.ac.in](mailto:cse1200113@iiti.ac.in)

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