Web Page:	https://studyinmexico.tec.mx/
Contact Information:	studyinmexico@itesm.mx

Undergraduate Research Program

Project Name	Aberrations analysis to optimize human eye models
Campus & Location in Mexico	Monterrey
Faculty	Engineering and Sciences
Research Area	Visual Optics
Research Responsible	Alfonso Jaimes-Nájera
Description of the Project	The crystalline lens is a complex component of the human eye due to its physiological structure. Schematic eyes, which are simplified models of the eye made up of a cornea and a lens, ultimately depend on being able to incorporate a dynamic lens with a gradient refractive index (GRIN). Creating dynamic mathematical models of the human lens that take into account accommodation mechanisms, in which the lens changes its shape in order to focus on objects at different distances, is of great importance for all types of pre and post-operative studies in surgeries and interventions in the human eye. In this project, monochromatic as well as chromatic aberrations of different schematic eye models will be analyzed. One of the considered models will be the one recently developed by Jaimes-Nájera et al. (https://doi.org/10.1364/BOE.386459). Since the aberrations are a function of the parameters of the model in question, this analysis aims to optimize the parameters so that the aberrations are as close as possible to those reported experimentally, thus improving the modeling of the lens before and during the process of accommodation. This is relevant for generating more physiologically accurate and versatile models, which is important for modeling individual lenses. The latter is crucial, since a model that is capable of being adapted to describe custom lenses on demand will be of wide application in ophthalmology.
Training Provided	Optics, Ray tracing, basic Aberrations Theory, Visual Optics, and numerical simulation

Offered during:

SUMMER	X	WINTER		SEMESTER	X

Student

Tasks/Responsibilities	Consult the corresponding bibliography. Perform numerical methods on MatLab. Analyze and compare data. Write a technical report.
Required Language Proficiency	English: 3 Minimum Professional Proficiency
Required Skills and Abilities	Optics, numerical methods, programming skills in languages such as Matlab, Mathematica or C ++
Other Documents	1) Being at least in your 2nd year of bachelor 2) Accumulative grade point average (GPA) 2.5 3) Official Transcript 4) 2 letters of recommendation of faculty members 5) Resume 6) Letter of intention explaining the reason why you would like to participate in the research program