

Astro Instruments 101

Summer Project 2022

Astronomy Club IITK

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Objective

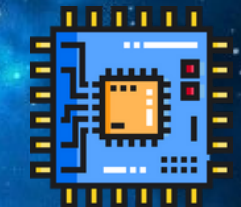
Fundamentals of Astronomical Instrumentation



Optics



Modelling



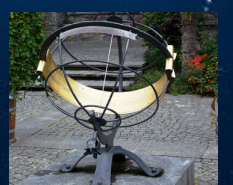
Electronics



Computer Interfacing

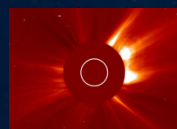
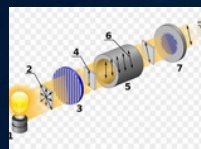
History of Astronomy & Ancient Instruments

1. Heliocentric and geocentric model
2. Galilean finding
3. Starchart
4. Planisphere
5. Astrolabe
6. Gyroscope
7. Sundial



Modern Instruments

1. Spectroscope
2. Polarimeter
3. Coronagraph
4. Interferometer



Applications

Hands-on making of instruments



Sundial



Planisphere



Spectroscope

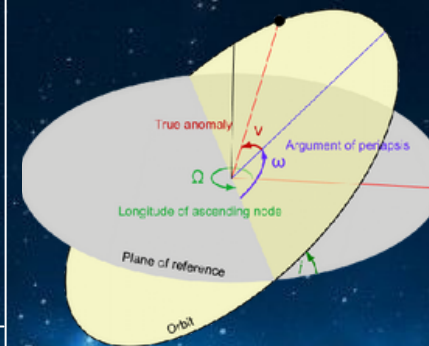
Night sky observations through Stellarium & Telescope



Celestial and Orbital Mechanics

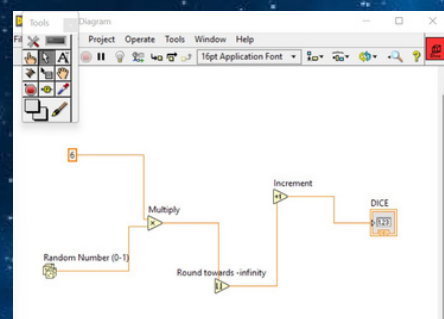
Celestial Mechanics is the study of the motion of celestial objects like stars, planets etc.

Orbital Mechanics is Celestial Mechanics applied to study the motion of artificial bodies like rockets and spacecraft under the effect of forces like gravity, drag, thrust (via propulsion systems).

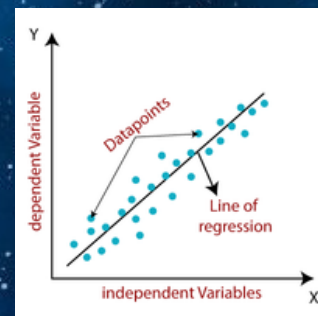


The two major governing laws are Kepler's and Newton's law of Gravitations

LabVIEW



Learning LabVIEW software to implement data aquisition



Building a linear regression model used in signal conditioning

LabVIEW is systems engineering software for applications that require test, measurement, and control with rapid access to hardware and data insights.

We used LabVIEW software to make the following programs:

1. Thermometer
2. Calculator
3. Dice Simulator
4. Projectile Simulator
5. Sundial Calculator

Lab Visit



MPX5010DP Pressure sensor connected to BNC-2120



SCC-68 sensor

Case Studies



Antikythera mechanism



Used by greeks to exactly predict the position of Sun and planets, Moon lunar phases and eclipses

Studied about Kepler's laws of motion and orbital elements: **a, e, v, I, w**

Future Works

- CAD Models of Space Telescopes
- Writing LabVIEW Programs from scratch to acquire data from sensors

