**Short version for Email**:

**LIFE DETECTION**

The primary objective of this subsystem is to design experimental techniques to detect presence or absence of life. This requires multiple levels of analysis –

* **COMPUTATIONAL AND SPECTROSCOPIC ANALYSIS** of soil data collected collect through cameras, various sensors and custom-built spectrometers. Understanding of **Python** and relevant libraries like **Numpy** and **Scipy**, **OpenCV, ML libraries (Pytorch or Fast.ai)**, **Arduino** and **bash** are needed to get started.
* **BIOENGINEERING AND BIOTECHNOLOGY:** Research, design and development of upcoming technologies like **biosensors** and **bioelectronics** along with traditional lab techniques.

Long version for reference

**LIFE DETECTION**

The primary objective of this subsystem is to design experimental techniques to detect presence or absence of life. This requires multiple levels of analysis –

* **COMPUTATIONAL AND SPECTROSCOPIC ANALYSIS**: Extraction of various features of soil from the data collected through cameras, various sensors and custom-built spectrometers using Image processing with OpenCV and Neural networks.
  + Understanding of **Python** and relevant libraries like **Numpy** and **Scipy**, **OpenCV, ML libraries (Pytorch or Fast.ai)**, **Arduino** and **bash** are needed to get started.
  + Along with the above, basic understanding spectroscopy and bio-markers is recommended.
* **BIOENGINEERING AND BIOTECHNOLOGY:** Research, design and development of upcoming technologies like **biosensors** and **bioelectronics** for life detection analysis. And, design experiments for robust wet test analysis, to determine pH level, to detect presence of proteins and other molecules with the guidance of professors from MSc Biological Sciences department.
  + Good understanding of concepts in General Biology (Non-Bio students) is recommended.
  + Keen interest in multi-disciplinary technologies (Ex: Bioelectronics) and reading & writing scientific articles is recommended.

**LIFE DETECTION COURSE PLAN**

The primary objective of this subsystem is to design experimental techniques to detect presence or absence of life. This requires multiple levels of analysis –

* **COMPUTATIONAL AND SPECTROSCOPIC ANALYSIS**: Extraction of various features of soil from the data collected through cameras, various sensors and custom-built spectrometers using Image processing with OpenCV and Neural networks.
  + Understanding of **Python** and relevant libraries like **Numpy** and **Scipy**, **OpenCV, ML libraries (Pytorch or Fast.ai)**, **Arduino** and **bash** are needed to get started.
  + Along with the above, basic understanding spectroscopy and bio-markers is recommended.

**6 WEEK PLAN**:

**Week 1**: Getting started with python (and Numpy) basics and Git basics.

**Assignment**:

**Week 2**: Practice python concepts with OpenCV assignments.

**Assignment**:

**Week 3**: Learn relevant OpenCV functions and Plotting with Matplotlib.

**Assignment**:

**Week 4 & 5**: Getting started with Deep Learning and ML with Fast.ai

**Assignment**:

**Week 6**: Basics of Arduino and Bash. Final report work and basic literature review of Spectrometry and Bio-markers.

This plan applies to people who haven’t worked with python before. A customized plan needs to be made on a case by case basis.

* **BIOENGINEERING AND BIOTECHNOLOGY:** Research, design and development of upcoming technologies like **biosensors** and **bioelectronics** for life detection analysis. And, design experiments for robust wet test analysis, to determine pH level, to detect presence of proteins and other molecules with the guidance of professors from MSc Biological Sciences department.
  + Good understanding of concepts in General Biology (Non-Bio students) is recommended.
  + Keen interest in multi-disciplinary technologies (Ex: Bioelectronics) and reading & writing scientific articles is recommended.

**6 WEEK PLAN**:

**Week 1**: Current Science plan analysis (Wet test + Sensors concepts + Spectrometry concepts)

**Assignment**:

**Week 2**: Research on UV/Visible lab Spectrometry, Learn about Florescence

**Assignment**:

**Week 3 & 4 & 5 a bit**: Research and identification of relevant Bioelectronics applications for Life Detection. (I have a pdf of a Nano biotech book for this. Its very good)

**Assignment**:

**Week 5**: Research on Microbial Fuel Cell.

**Assignment**:

**Week 6:** Come up with an updated Science plan with what you have learnt in the last 3 weeks.

**Assignment**: