Module 1: Facial Landmark Detection

1. Different Face Processing Applications
2. Facial Landmarks Detection using dlib
   - Introduction to Dlib
   - Facial Landmark Detection using Dlib
3. Application - Face Alignment
4. Improving Facial Landmark Detector
   - Improve in Speed
   - Improve in Stability
   - Landmark Stabilization in OpenCV
   - Optical flow
   - Lucas-Kanade Optical flow
5. Facial Landmark Detection Theory
   - Machine Learning Basics
   - Paper Review
6. Train a custom Facial Landmark Detector
   - How to Train a Custom landmark Detector

Module 2: Applications of Facial Landmarks

1. Alpha Blending
• Alpha Blending in OpenCV

2. Image Warping
   • Affine Transform
   • Geometric Transform
   • Triangle Warping

3. Delaunay Triangulation
   • Theory of Delaunay Triangulation

4. Face Averaging
   • Face Averaging using OpenCV

5. Face Morphing
   • Face Morphing using OpenCV

6. Application: Bug Eyes
   • Create a Bug eye app

7. Head Pose Estimation
   • Head Pose Estimation in OpenCV

Assignment1: Smile Detection

Module 3: SnapChat Filters

1. Face Swap
   • How Face Swapping can be achieved
   • Seamless Cloning
   • Seamless Cloning in OpenCV
   • Face Swapping in a video
2. Application: Beard Filter  
3. Application: Aging filter  
4. Non-linear Deformations
   - Moving Least Square
   - Application: MLS based Happify and Fatify Filters

**Project 1: Virtual Makeup**

**Module 4: Face Recognition**

1. Introduction to Face Recognition
   - Introduction to Face Recognition
2. Eigen Faces
3. Fisher Faces
4. Local Binary Patterns Histograms
5. Face Recognition API in OpenCV
6. Deep Learning based Face Recognition

**Project 2: DoppelGanger- Find Celebrity Look-Alike**

**Module 5: Introduction to Deep Learning**

1. Basics of Neural Networks
   - What is Neural Network
   - How does Neural Network Learn
2. Introduction to TensorFlow Keras(python) and LibTorch(C++)
   - Deep Learning Frameworks
   - The Keras Framework(Python)
   - Linear Regression using Keras(Python)
   - Introduction to LibTorch(C++)
3. LibTorch Installation and Usage(C++)
   - How to run LibTorch code on your Local System
   - How to run LibTorch code on Google Colab
   - Linear Regression using LibTorch

4. Feed Forward Neural Network
   - Importance of Hidden Layer in a Neural Network
   - Training a Neural Network using Backpropagation
   - Example: Image Classification using MLP

5. Convolutional Neural Network(CNN)
   - What is CNN
   - Example: Image Classification using CNN
   - Data Augmentation(Python)

Assignment2: Improve CNN Training

Module 6: Leveraging Pre-Trained Model

1. Introduction to Pre-trained model(Python)
   - Pre-Trained models in Keras

2. How to get Free GPU
   - Introduction to Google Colab
   - Introduction to Kaggle Kernels

3. Transfer Learning and Fine Tuning in Keras(Python)
   - How to use Custom Dataset in Keras
   - Introduction to Kaggle Datasets
   - Fine-Tuning an Image Classifier using Google Colab
   - Fine-Tuning an Image Classifier using Kaggle Kernel
4. Troubleshooting using Tensorboard(Python)
   - Using Tensorboard with Keras

5. From PyTorch to LibTorch(C++)
6. Fine Tuning using LibTorch(C++)
7. Fine Tuning using Caffe
   - Introduction to Caffe
   - Fine-Tuning in Caffe using Colab(C++)
   - Inference of Trained Caffe model using OpenCV(C++)
   - Train an Image Classifier using Fine-Tuning in Caffe(Python)

Module 7: **Object Detection**

1. Object Detection Overview
   - What is Object Detection
   - Traditional Object Detection Pipeline

2. Two Stage Object Detectors
   - Different two-stage Detectors
   - Faster R-CNN in OpenCV(C++)

3. Single Stage Object Detectors
   - SSD Object Detector in OpenCV

4. YOLO
   - What is YOLO
   - YOLO object Detection in OpenCV

5. Measure Performance of Object Detectors
Module 8 : Train a Custom Object Detector using YOLO

1. Problem Description
   - Which Object to Detect
   - Where to get the data for Training

2. YOLO and DarkNet
   - What is DarkNet
   - Build DarkNet
   - Run YOLO on DarkNet

3. Stepwise explanation of how train your detector on Colab
   - How to link your Google Drive
   - Compile DarkNet
   - Download and Prepare Dataset
   - How to start Training
   - Run Inference on New Images

Project 3: Train a Face Mask detector

Module 9 : Text Detection and Recognition

1. Overview of OCR
   - What is OCR
   - The OCR Pipeline
   - Challenges
   - Datasets and Competitions

2. Graphic Text Recognition using Tesseract
3. Text Detection
   - Text Detection using EAST
   - Text Detection using CRAFT(Python)

4. Modified Pipeline for scene Text Recognition using Tesseract(Python)

5. Scene Text recognition using Keras OCR(Python)
   - Text Recognition using CRNN

6. Comparing Keras-OCR and Tesseract(Python)

Assignment3: OCR on invoice

Case Study: Automatic Number Plate Recognition(Python)

1. ALPR system using YOLO-Net
   - YOLO-Net: License Plate Detector using YOLOv3
   - ALPR using YOLO-Net and Tesseract
   - ALPR using YOLO-Net and YOLO-OCR

2. ALPR system using WPOD-Net
   - ALPR using WPOD-Net and Tesseract
   - ALPR using WPOD-Net and YOLO-OCR
Module 10: Deploy Applications on Cloud

1. Create a Web Application using Flask
   - What is Flask
   - A minimal Flask Application
   - Using HTML Templates
   - A complete Flask Application

2. Deploy Web App on Heroku [Paas]
   - What is Heroku
   - How to create an account on Heroku
   - Prepare Application for Deployment
   - How to Deploy using Heroku CLI
   - How to Deploy using Heroku website

3. Deploy Web App on Google GCP [Iaas]
   - What is Google Cloud Platform (GCP)
   - Create account on Google Cloud Platform
   - Create and Configure a VM instance
   - Setup VM and Deploy App
   - Change Firewall settings and Check Deployment

Assignment 4: Deploy your Web App on Heroku