EDN-HE(14)-1/2022-MISC - LOOSE
Directorate of Higher Education
Himachal Pradesh

Dated: Shimla-171001 the 20th April, 2024

To

All the Principals of Govt. Colleges
Himachal Pradesh

Subject: **Regarding the Proposals for IT training for the Youth of Himachal Pradesh.**

Memo

This is in reference to letter No. C-DAC/P/ACTS/PACE/04/2024, dated 3rd April, 2024 received from the Scientist E, Project Director CDAC on subject cited above.

It is to inform you that the CDAC (Centre for Development of Advanced Computing) has proposed Specialized Courses for Beginner, Intermediate and Advanced levels alongwith their corresponding fee structure for the Youth of Himachal Pradesh. The detailed proposal alongwith list of courses offered is attached herewith.

You are therefore, directed to give wide publicity of these courses among students and list of interested students (course wise) alongwith your comments about usefulness of these courses be submitted to this office through email id: dhe-sml-hp@gov.in within a week.

Encls: As above.

(Dr. Harish Kumar)
Addl. Director of Higher Education
Himachal Pradesh

Endst. No. even dated Shimla-171001 the 20th April, 2024.

Copy to:
1. The Technical Officer, Directorate of Higher Education to upload on website.

Addl. Director of Higher Education
Himachal Pradesh

Specialized Courses:

Sr. No.	Course Name	Eligibility	Duration	Fee per candidate (in Rs.)
Beginner Level				
1	Certificate in Artificial Intelligence (Beginner)	12th std.	1½ months	4500
2	Certificate in Cyber Security (Beginner)	12th std.	1½ months	4500
3	Certificate in Information Security (Beginner)	12th std.	1½ months	4500
4	Certificate in Drone Technologies (Beginner)	12th std.	1½ months	4500
Intermediate Level				
1	Certificate in Artificial Intelligence (Intermediate)	Graduate	2 months	6000
2	Certificate in Cyber Security (Intermediate)	Graduate	2 months	6000
3	Certificate in Information Security (Intermediate)	Graduate	2 months	6000
4	Certificate in Drone Technologies (Intermediate)	Graduate	2 months	6000
Advanced Level				
1	Certificate in Artificial Intelligence (Advanced)	Graduate	3 months	9000
2	Certificate in Cyber Security (Advanced)	Graduate	3 months	9000
3	Certificate in Information Security (Advanced)	Graduate	3 months	9000
4	Certificate in Drone Technologies (Advanced)	Graduate	3 months	9000

Kaushal Sharma
Scientist E
(Project Director)

Course Name: Certificate Course in Artificial Intelligence (Intermediate)

Name of the Organization: C-DAC

1. **Course Objective:** To develop an understanding of Data Processing for AI.

2. **Prerequisite:**
   Candidates should have knowledge of Concept of Database Management and Python Programming.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	Duration(Hrs)
1.	Advanced Python for AI	20
2.	Data Cleaning and Preprocessing	20
3.	Data Analysis using Pandas	20
	Total	60

4. **Detailed Course Contents**

I.Advanced Python for AI (20 Hrs)

- Object-Oriented Programming (OOP) in Python
- Classes and objects
- Inheritance and polymorphism
- Encapsulation and abstraction
- Decorators and generators
- Exception handling
- Introduction to NumPy arrays
- Array operations and manipulations

II.Data Cleaning and Preprocessing (20Hrs)

- Data Cleaning Techniques
- Handling missing data
- Dealing with duplicates and outliers
- Data imputation strategies
- Exploratory Data Analysis (EDA)
- Descriptive statistics
- Data visualization with Matplotlib and Seaborn
- Case Study - Real-world Data Cleaning and Analysis

III. Data Analysis using Pandas (20 Hrs)

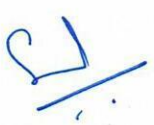
- Installing
- Grouping and aggregation
- Merging and joining DataFrames
- Time Series Data Handling
- De-duplicating
- Pivoting
- Munging
- Deleting
- Merging
- Pandas for Data Analysis
- Introduction to Pandas DataFrames
- Data manipulation and exploration

5. List of ~~Text~~/Reference Books

- Python For Everybody: Exploring Data In Python 3 by Charles R.Severance, Shroff Publishers & Distributors

6. Requirements (S/W and H/W)

- Desktop computer (PC) having a compatible processor with at least 8GB RAM and 250GB storage
- High speed Internet connection
- OS – Ubuntu 20 (or Higher)
- Python 3.x, Numpy, Scipy & Pandas



Course Name: Certificate Course in Artificial Intelligence (Advanced)

Name of the Organization: C-DAC

1. **Course Objective:** To develop an understanding of Machine Learning, Neural Networks and NLP.

2. **Prerequisite:** Candidates should have knowledge of computers, Object Oriented Programming using Java or Python, and Fundamentals of AI.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	Duration(Hrs)
1.	Fundamentals of Machine Learning	20
2.	Supervised Learning, Unsupervised Learning, and ML Algorithm	30
3.	Introduction to Neural Networks and NLP	30
4.	Advanced AI Applications and Trends	10
Total		90

4. **Detailed Course Contents**

I. How ML and AI work together (20 Hrs)

- Data Pre-processing for Machine Learning
- Feature scaling and normalization
- Encoding categorical variables
- Model Training and Evaluation
- Applying machine learning models on pre-processed data
- Model evaluation metrics

II. Supervised Learning, Unsupervised Learning and Machine Learning Algorithm (30Hrs)

- Regression and classification
- Model evaluation metrics
- Clustering algorithms
- Dimensionality reduction
- Advanced ML Algorithms
  - Ensemble Learning
  - Decision trees, random forests, and boosting
  - Model stacking

III. Introduction to Neural Networks and NLP(30 Hrs)

- Perceptron and activation functions
- Feedforward and backpropagation
- Building Neural Networks with TensorFlow / Keras

- Model architecture and design
- Training and evaluation
- Introduction to Natural Language Processing (NLP)
  - Tokenization and text processing
  - Sentiment analysis

IV. Advanced AI Applications and Trends (10 Hrs)

- Introduction to LLMs and GPT
- Understanding GPT's Architecture
- Applications of GPT
- Ethical Considerations and Limitations
- Hands-on Activity or Demo
- AI in Healthcare, Finance, and Industry
- Case studies and real-world applications

5. List of ~~Text~~/Reference Books

- Machine Learning using Python by Manaranjan Pradhan, U Dinesh Kumar, Wiley India

6. Requirements (S/W and H/W)

- Desktop computer (PC) having a compatible processor with at least 8GB RAM and 250GB storage
- High speed Internet connection
- OS – Ubuntu 20 (or Higher)
- Python 3.x, Numpy, Scipy & Pandas, Scikit-learn, seaborn, Matplotlib, Tensor Flow 2.x,PyTorch,Keras, NLTK,spaCy

Course Name: Basic Certificate Course in Cyber Security

1. **Course Objective:** To develop an understanding of the concept of cyber security.
2. **Prerequisite:** Candidates should have basic knowledge of computers and the Internet.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	Duration (Hrs)
1.	Introduction to Cyber Security	20
2.	Cyber Crime and Laws	25
Total		1 ½ month (45 hrs.)

4. **Detailed Course Contents**

I. **Introduction to Cyber Security (20 Hrs.)**
- Introduction to Cyber Space
- The Security Environment:
  - Threats, vulnerabilities, and consequences
  - Advanced persistent threats
  - The state of security today
  - Why does security matter to any organization?
- The state of security today
- Network vulnerabilities
- Free & paid tools to keep your security check up-to date

II. **Cyber Crime and Laws (25 Hrs.)**
- Introduction to cybercrime and cyber attack
- Types of cyber crime
- Malware and its types
- Introduction to the concept of cyber hygiene
- Challenges of maintaining cyber hygiene
- Cyber hygiene best practices for organizations
- Hackers-Attacker-Countermeasures
- Social Engineering
- How cyber criminals work
- How to prevent being a victim of cyber crimes
- Evolution of the IT Act
- Intellectual Property Rights, Domain Names, and Trademark disputes
- Cloud computing & law
- E-commerce and laws in India
- Cyber security regulations, roles of international law

5. **List of Reference Books**

Cyber Security and Cyber Laws by Nilakshi Jain, Ramesh Menon

6. **Requirements (S/W and H/W)**
- Desktop computer (PC) with 4GB RAM
- High speed internet connection with 25 Mbps Speed Connection

Course Name: Certificate Course in Cyber Security (Intermediate)

Name of the Organization: C-DAC

1. **Course Objective:** To develop an understanding of Cyber Security and Laws.

2. **Prerequisite:**
   Candidates should have basic knowledge of computers, networking fundamentals, and the Internet.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	Theory Hrs.
1.	Introduction to Cyber Security, Crime and Laws	30
2.	Concept of Cyber Hygiene	20
3.	Security Education, Training and Awareness	10
Total		60

4. **Detailed Course Contents**

I. Introduction to Cyber Security, Crime and Laws (30 Hrs

- Introduction to Cyber Security and Crimes
- The state of security today
- Why security matter to any organization
- Introduction to Cyber Crime
- Types of Cyber Crime
- Malware and its types
- Introduction, Cyber Security Regulations, Roles of International Law
- Evolution of the IT Act, IT Act, 2000
- Intellectual Property Rights, Domain Names and Trademark Disputes
- Cloud Computing & Law
- E – commerce and Laws in India
- Digital Data Protection Act - 2023

II. Concept of Cyber Hygiene (20 Hrs)

- Introduction to Concept of Cyber Hygiene
- Challenges of maintaining Cyber Hygiene
- Cyber hygiene best practices for organizations
- FREE & Paid tools to keep your security check up-to date

III. Security Education, Training and Awareness (10 Hrs)

- Human factors in security
- Developing and implementing a security training plan
- Social Engineering (Phishing)

- Cross-domain training
- The future of cybersecurity

5. List of ~~Text~~/Reference Books

- Cyber Security and Cyber Laws by Nilakshi Jain (Author), Ramesh Menon (Author)

6. Requirements (S/W and H/W)

- Desktop computer (PC) having a compatible processor with at least 8GB RAM and 250GB storage.
- High speed Internet connection
- OS – Ubuntu 20 (or Higher)
- Openssh,winscp, putty
- Nessus, Avast Free Antivirus
- ProtonVPN, KeePass

Course Name: Certificate Course in Cyber Security (Advanced)

Name of the Organization: C-DAC

1. **Course Objective:** To learn essential concepts and methods of Cyber Security.
2. **Prerequisite:** Familiarity with Fundamentals of Networking, Unix, Linux, and Windows Operating Systems.
3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	No of Hours.
1.	Introduction to Cyber Security and Latest Trends	20
2.	Introduction to Ethical Hacking and Web Application Security	70
	Total	**90**

4. **Detailed Course Contents**

- **Introduction to Cyber Security and Latest Trends (20 Hrs)**
  - Introduction to Cybersecurity
  - Classification of Cyber Crimes
  - Why Cyber security matter to any organization
  - Security Fundamentals
  - Firewalls, Types of Firewalls, Limitations of firewall
  - Intrusion Detection and Prevention, Intrusion risks
  - Confidentiality, Integrity, and Availability (CIA)
  - Cybersecurity Best Practices
  - Current Trends in Cybersecurity

- **Introduction to Ethical Hacking and Web Application Security (70 Hrs.)**
  - Introduction to Ethical Hacking
  - Identifying Different Types of Hacking Technologies
  - Understanding the Different Phases Involved in Ethical Hacking
  - Session Hijacking Evading IDS, Firewalls, and Honeypots Hacking Web Servers
  - Hacking Web Applications SQL Injection
  - DDOS Attack, Email Hijacking, Metasploit
  - ARP Poisoning , DNS Poisoning, Cross Site Scripting
  - Introduction to Vulnerability Assessment and Web Security
  - OWASP Top 10
  - Conducting Vulnerability Scans
  - Vulnerability Scanning Using Nessus
  - Introduction to Penetration Testing
  - Getting Comfortable with Kali Linux
  - Getting Familiar With tools like Wireshark, Tcpdump, Netcat, Socat etc

- Active and Passive Information Gathering
- Web Application Assessment Tools (DIRB, BURP SUIT, NIKTO)
- Web Application Attacks & Exploiting Web Based Vulnerabilities
- Brute Force attacks, Port Redirection and Tunneling

5. List of ~~Text~~/Reference Books

- Cybersecurity Paperback by Dr. Erdal Ozkaya (Author)

6. Requirements (S/W and H/W)

- Desktop computer (PC) having compatible processor with at least 8GB RAM and 250GB storage.
- High speed Internet connection
- OS – Ubuntu 18 (or Higher) or Kali –Linux
- Metasploit, Burpsuit, Nessus, nmap, Ettercap
- Wireshark, Tcpdump, Owasp Zap, Nikto

Course Name: Basic Certificate Course in Information Security

Name of the Organization: C-DAC

1. **Course Objective:** To develop an understanding of Information Security.
2. **Prerequisite:** Candidates should have basic knowledge of computers and the Internet.
3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	Duration (Hrs.)
1.	Introduction to Information Security	45
Grand Total		45

4. **Detailed Course Contents**

Introduction to Information Security (45 Hrs.):

- What is Information Security
- Need for Information Security
- Difference between Information Security and Cyber Security
- Elements of Information Security
- Attributes of Information Security
- Authentication and Authorization
- Confidentiality
- Integrity
- Availability
- Non-Repudiation
- Threats and Vulnerabilities
- Classification of Threats and attacks
- Protecting Information System Security
- Information Security Management
- Responsibility for Information Security Management
- Basic Principle of Information Systems Security
- Information security risk analysis
- Risk Management and Risk Analysis
- Operation security
- Data Privacy Fundamentals
- ISMS Standards – ISO/IEC 27000 Series
- Cryptography
- Access Control
- Unauthorized Access
- Impersonation
- Denial of Service
- Malicious Software
- Viruses

- Worms
- Trojan Horses
- Definitions, Types of Authentications
- Password Authentication
- Password Vulnerabilities & Attacks: Brute Force & Dictionary Attacks
- Password Policy & Discipline
- Single Sign-on – Kerberos and Alternate Approaches
- Biometrics: Types of Biometric Techniques: False Rejection, False Acceptance
- Crossover Error Rates
- Physical and System Security
- IT Acts and Cyber Laws
- Case Studies

5. List of ~~Text~~/Reference Books

- Information Security: Principles and Practices, Second Edition
  by Mark S. Merkow, Jim Breithaupt

6. Requirements (S/W and H/W)

- Desktop computer (PC) with 4GB RAM
- High speed internet connection with 25 Mbps Speed Connection

Course Name: Certificate Course in Information Security (Intermediate)

Name of the Organization: C-DAC

1. **Course Objective:**
   - To understand of Effectiveness of an Information Security System

2. **Prerequisite:**
   - Candidates should have basic knowledge of computers, networking, and the internet

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	No of Hours.
1.	Introduction to Information Security	30
2.	Threats and Vulnerabilities	20
3.	Information Security Policy	10
	Total	**60**

4. **Detailed Course Contents**

- **Introduction to Information Security: (30 Hrs)**
  - The need for InfoSec
  - Concepts of Information Security
  - Understanding Information Security Terminology
  - CIA Triads & Non-repudiation
  - Authentication and Authorization
  - What is ISMS? (ISO 27001)
  - Data Breach and its consequences
  - Storage of Information on the Cloud
  - Case studies

- **Threats and Vulnerabilities: (20 Hrs)**
  - Concepts of Threat & Vulnerability
  - Adversarial Threat Sources and Events
  - Non Adversarial Threat Sources and Events
  - Brief about Vulnerability Assessment
  - Vulnerability Classification and Assessment Types
  - Vulnerability Assessment Solutions and Tools
  - Identity Theft and Countermeasures

- **Information Security Policy: (10 Hrs)**
  - Standards, Guidelines, and Procedures Adversarial
  - Program Policy & Issue-Specific Policy
  - System-Specific Policy & Interdependencies
  - Cost Considerations

5. **List of ~~Text~~/Reference Books**

   - Information Security: Principles and Practices, Second Edition by Mark S. Merkow, Jim Breithaupt

6. **Requirements (S/W and H/W)**

   - Desktop computer (PC) having compatible processor with at least 8GB RAM and 250GB storage.
   - High speed Internet connection
   - OS – Ubuntu 20 (or Higher)
   - Wireshark, nmap, tcpdump
   - Nessus, Burpsuit, Winscp

Course Name: Certificate Course in Information Security (Advanced)

Name of the Organization: C-DAC

1. **Course Objective:** To Learn essential concepts and methods of Information Security
2. **Prerequisite:** Familiarity with Fundamentals of Computer and Operating Systems
3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	No of Hours.
1.	Introduction to Information Security, Laws and Regulations	30
2.	Information Systems Security and System Audit	40
3.	Cryptography Concepts	20
	Total	**90**

4. **Detailed Course Contents**

- **Introduction to Information Security, Laws and Regulations (30 Hrs)**
  - Introduction to Information Security
  - Elements of Information Security
  - Information Security/ Privacy Standards – ISO27001, HIPPA, PCI DSS, GDPR
  - Information security roles and positions
  - Define Roles and Responsibilities
  - ISO 27701 & ISO 27017, DPDP - 2023
  - Data Breach and its consequences
  - OWASP Cloud Top 10 and its countermeasures.

- **Information Systems Security (40 Hrs)**
  - Security and Risk Management, Asset Security
  - Security Architecture and Engineering
  - Communication and Network Security
  - Identity and Access Management (IAM)
  - Security Operations and Software Development Security
  - Security Assessment and Testing
  - Information System Auditing Process
  - Governance and Management of IT
  - Information Systems Acquisition, Development and Implementation
  - IS Operations and Business Resilience
  - Information Asset Security and Control

- **Cryptography Concepts (20 Hrs)**
  - Encryption Algorithm
  - Cryptography Tools
  - PKI and Cryptanalysis
  - Email Encryption
  - Disk Encryption and Countermeasures

5. **List of ~~Text~~/Reference Books**
   INFORMATION SECURITY: PRINCIPLES AND PRACTICES, 1ST EDITION by Mark Merkow

6. **Requirements (S/W and H/W)**
   - Desktop computer (PC) having compatible processor with at least 8GB RAM and 250GB storage.
   - High speed Internet connection
   - OS – Ubuntu 20 (or Higher)
   - OpenVAS, Nessus, or Nmap
   - OWASP ZAP, Wireshark.
   - Cryptool, Openssl, VeraCrypt

I. Course Name: Certificate in DRONE Technologies (Beginner Level)

1. **Course Objective:** To develop an understanding of DRONE Technologies.
2. **Prerequisite:** Candidates should have basic knowledge of computers and the Internet.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module/Course Name	Duration (Hrs.)	Fees (Rs.)
1.	Introduction to DRONE Technologies	1 ½ months (45 hrs.)	4500

4. **Detailed Course Contents**

Introduction to DRONE Technologies (45 Hrs.)

- Introduction to UAS/ Drone
  - Different types of UAS/ Drone
  - UAS/ Drone terminologies
  - Application of UAS/ Drone
- Introduction to Flight Dynamics and Control
- Overview of Geospatial technology
- Drone Wireless Communication
- DGCA Drone Guideline
  - Digitalsky portal, Geo-Fencing, Flying Zones, Type Certification for Drone
  - Drone pilot roles and responsibilities
- Drone Components
  - Introduction to Drone components
  - Motor, Propeller, ESC, Battery, Battery Charger, Power Distribution
  - Flight Controller, Mission Planner, Telemetry Devices, GPS
  - Various Sensors and possible payload
- Drone Assembly and Drone Flying
  - Tuning & Testing & Assembling of the controller and components/ sensors
  - Battery Charging techniques
  - Best practices for assembly and flying drones
- Flight Simulation
  - Introduction to Flight Simulation (Controller tuning, waypoint navigation, loading of map, calibration)
  - Various Flight Simulation tools

5. **List of Reference Books**

- Drones For Dummies by Mark LaFay

Requirements (S/W and H/W)

- Desktop Computer (PC) with 8GB RAM
- High-speed internet connection with 25 Mbps Speed Connection
- PIXHAWK 2.4.8
- Simulator Ardu Pilot

II. Course Name: Basic Certificate Course in Artificial Intelligence

1. **Course Objective:** To develop an understanding of Artificial Intelligence.
2. **Prerequisite:** Candidates should have basic knowledge of computers and the Internet.
3. **Teaching Schema:**

Sr. No.	Module/Course Name	Duration	Fees (Rs.)
1	Introduction to AI	1 ½ months (45 hrs.)	4500

4. **Detailed Course Contents**

Introduction to AI

- Defining AI
- Evolution & Ethics of AI
- Responsible AI
- Meaning, Scope, and Stages of Artificial Intelligence
- Intelligence and Its Traits
- Advantages and Disadvantages of AI
- Effects of Artificial Intelligence on Society
- Adversarial attacks on AI
- Future of AI
- Applications of AI
- Fundamentals of Machine Learning
- Types of Machine Learning
- Introduction to Deep Learning
- Machine Learning Workflow
- Introduction to NLP
- Applications of NLP (Machine Translation, Speech Recognition, Search System, etc.)
- Introduction to Computer Vision
- Image Recognition
- Applications of CV (Image to Text conversion-OCR, Vehicle Number Detection, Face Recognition, Object Detection etc.)
- Case Studies
  - Sentiment Analysis on Movie Review
  - Facial Emotion Recognition

5. **List of Text/Reference Books**
   - Artificial Intelligence – A Modern Approach (3rd Edition) By Stuart Russell & Peter Norvig
6. **Requirements (S/W and H/W)**
   - Desktop computer (PC) with 4 GB RAM
   - High speed internet connection with 25 Mbps Speed Connection

Course Name: Certificate Course in Drone Technology (Intermediate)

Name of the Organization: C-DAC

1. **Course Objective:** To familiarize the students with the concepts and techniques used in Unmanned Aircraft Systems (UAS) and its applications.

2. **Prerequisite:** Basic understanding of DRONE components and working knowledge of Python Programming.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	No. of hours
1	Drone Dynamics & Design	25
2	Autopilots: Mission planning & QGround Control Station	25
3	Introduction to FPV racing Drones	10
	Total	60

4. **Detailed Course Contents**

i) Drone Dynamics & Design
- Drone Dynamics & Design
- Drone Endurance
- Drone Optimization & Parameters
- PDB Designing

ii) Autopilots: Mission planning & QGround Control Station
- Autopilots: Mission planning & QGround Control Station
- Various Flight Modes
- Firmware Bootloader and Upgrade
- Calibrations of Drone & Sensors
- Failsafe & Waypoints Setup

iii) Introduction to FPV racing Drones
- Introduction to FPV racing Drones
- Integration of drone & Payloads
- Simulation of FPV
- FPV Configuration & Calibration

5. **List of ~~Text~~/Reference Books:**

- "Introduction to Flight" by John D. Anderson Jr.
- "Aircraft Design: A Conceptual Approach" by Daniel P. Raymer -
- "Programming Arduino: Getting Started with Sketches" by Simon Monk
- "PX4 Developer Guide" by PX4 Autopilot Development Team
- "Mission Planning for Autonomous Vehicles: A Fast Marching Method Approach" by Rafael Murrieta-Cid, Antonio Sgorbissa, and Satoshi Suzuki

- "Build Your Own Drone Manual: The Practical Guide to Safely Building, Operating, and Maintaining an Unmanned Aerial Vehicle (UAV)" by Alex Elliott
- "FPV Drone Racing: The Complete Guide" by The Drone Racing League

6. Requirements (S/W and H/W)

S/W

- Pixhawk SITL (Software-In-The-Loop)
- Mission Planner
- QGround Control Station

H/W

- ARF Advanced Quadcopter kit
- FPV Drone & FPV googles

Course Name: Certificate Course in Drone Technology (Advanced)

Name of the Organization: C-DAC

1. **Course Objective:** To familiarize the students with the Advanced concepts and techniques used in Unmanned Aircraft Systems (UAS) and its applications.

2. **Prerequisite:** Understanding of DRONE components, Familiarity with Basic Electronics, and working knowledge of Python Programming.

3. **Teaching Schema: (Tabular format)**

Sr. No.	Module Name	No. of hours
1	Introduction to Open CV & Image Processing	35
2	Advanced Drone Operations & Applications	20
3	Artificial Intelligence Technologies for Drones	35
	Total	90

4. **Detailed Course Contents**

i) Introduction to Open CV & Image Processing

- Introduction to Open CV
- Image Processing on Drone-Captured Data
- Techniques for processing images and video
- Image enhancement, noise reduction & feature extraction
- Facial Recognition

ii) Advanced Drone Operations & Applications

- Advanced Drone Operations and Applications
- Live Streaming through video Telemetry
- Object Tracking and Recognition
- Integration of computer vision systems for object recognition
- Drone Data Acquisition and Processing
- Utilizing onboard sensors and cameras for data acquisition

iii) Artificial Intelligence Technologies for Drones

- Fundamentals of Artificial Intelligence
- Introduction to machine learning, Deep learning, Neural networks
- Applications of AI in drone technology
- Obstacle avoidance, autonomous flight, Object detection
- Drone case study

5. **List of ~~Text~~/Reference Books:**

- "OpenCV 3 Computer Vision with Python Cookbook" by Alexey Spizhevoy and Aleksandr Rybnikov
- "Learning OpenCV 4 Computer Vision with Python 3" by Joseph Howse, Joe Minichino, and Prateek Joshi

- "Practical Computer Vision Applications Using Deep Learning with CNNs" by Ahmed Fawzy Gad
- "GIS Fundamentals: A First Text on Geographic Information Systems" by Paul Bolstad
- "Mastering QGIS" by Kurt Menke, GISP, Dr. Richard Smith Jr., and Luigi Pirelli

6. Requirements (S/W and H/W):

S/W

- Visual Studio Code (Python)
  OR
- Google Colab

H/W

- Multispectral Camera
- Action camera
- Video Telemetry
- Drone of 2kg payload