# QUALIFICATION FILE

## Unmanned Aircraft System Developer

☒ **Short Term Training (STT)** ☐ **Long Term Training (LTT)** ☐ **Apprenticeship**

☒ **Upskilling** ☐ **Dual/Flexi Qualification** ☐ **For ToT** ☐ **For ToA**

☐**General** ☐ **Multi-skill (MS)** ☐ **Cross Sectoral (CS)** ☒ **Future Skills** ☐ **OEM**

**NCrF/NSQF Level: 5**

**Submitted By:**

**Center for Development of Advanced Computing (C-DAC)**

C-DAC Innovation Park, S.No.34/1

Panchavati, Pashan

Pune–411008, Maharashtra

Tel: +91-20-25503200, Fax: +91 020 25868081

## Table of Contents

## Section 1: Basic Details

| 1. | **Qualification Name** | Unmanned Aircraft System Developer | |
|---|---|---|---|
| 2. | **Sector/s** | IT/ITES | |
| 3. | **Type of Qualification:** ☒ **New** ☐ **Revised** ☐ **Has Electives/Options** ☐**OEM** | **NQR Code & version of previous qualification**: *QG-05-IT-03499-2025-V1-CDAC* | **Qualification Name of existing/previous version:** **NA** |
| 4. | a. **OEM Name** <br> b. **Qualification Name** <br> (*Wherever applicable*) | a. **NA** <br> b. **Unmanned Aircraft System Developer** | |
| 5. | **National Qualification Register (NQR) Code &Version** (*Will be issued after NSQC approval*) | *QG-05-IT-03499-2025-V1-CDAC* | 6. **NCrF/NSQF Level: 5** |
| 7. | **Award (Certificate/Diploma/Advance Diploma/ Any Other)** (*Wherever applicable specify multiple entry/exits also & provide details in annexure*) | Advanced Certificate | |
| 8. | **Brief Description of the Qualification** | The Course is designed to provide comprehensive knowledge and hands-on skills essential for the design, operation, and maintenance of UAS, with a particular emphasis on safe, ethical, and regulatory-compliant practices. The program aims to produce industry-ready professionals equipped to handle a wide range of applications in sectors like agriculture, logistics, surveillance, environmental monitoring, and infrastructure management | |

| 9. | **Eligibility Criteria for Entry for Student/Trainee/Learner/Employee** | a. **Entry Qualification & Relevant Experience:** | |
|---|---|---|---|

| S. No. | Academic/Skill Qualification (with Specialization - if applicable) | Required Experience (with Specialization - if applicable) |
|---|---|---|
| 1 | Completed 2nd year of UG (UG Diploma) of 3-year / 4-year UG with courses related to Engg./Science, | NO experience |
| 2 | 2 year Diploma after 12 with courses related to Engg./Science | |
| 3 | 3 year Diploma after with courses related to Engg./Science | 1 Year of relevant experience |
| 4 | 12th grade pass with 1-year NTC/ NAC with courses related to Engg./Science | 1 Year of relevant experience |
| 5 | 12th grade Pass | 2 Years of relevant experience |
| 6 | 10th grade pass | 4 Years of relevant experience |

b. **Age:** No Bar

| 10. | **Credits Assigned to this Qualification, Subject to Assessment** (*as per National Credit Framework (NCrF)*) | 30 | 11. **Common Cost Norm Category (I/II/III)** (*wherever applicable*)**:** |
|---|---|---|---|
| 12. | **Any Licensing requirements for Undertaking Training on This Qualification** (*wherever applicable*) | None | |

| 13. | **Training Duration by Modes of Training Delivery** (Specify **Total Duration** as per selected training delivery modes and as per requirement of the qualification) | ☐Offline    ☐Online    ☒Blended |||||
|---|---|---|---|---|---|---|
| | | **Training Delivery Modes** | **Theory (Hours)** | **Practical (Hours)** | **OJT Mandatory (Hours)** | **OJT Recommended (Hours)** | **Total (Hours)** |
| | | **Classroom** | 300 | 270 | 330 | - | 900 |
| | | **Online** | | | | | |
| | | *(Refer Blended Learning Annexure for details)* |||||

| | | |
|---|---|---|
| 14. | **Aligned to NCO/ISCO Code/s** *(if no code is available mention the same)* | *2149.0100 ( Engineers and Related Technologists, Other)* |
| 15. | **Progression path after attaining the qualification** *(Please show Professional and Academic progression)* | **Academic**: Engineering Graduate with specialization in UAS, Post Graduate Diploma, Masters with specialization in Unmanned Systems, PhD in Unmanned Systems<br>**Professional**: UAS System Developer-> UAS Application Engineer->UAS Remote Sensing Professional |
| 16. | **Other Indian languages in which the Qualification & Model Curriculum are being submitted** | None |
| 17. | **Is similar Qualification(s) available on NQR-if yes, justification for this qualification** | ☐ Yes   ☒No URLs of similar Qualifications: |
| 18. | **Is the Job Role Amenable to Persons with Disability** | ☒ Yes   ☐ No<br>**If "Yes", specify applicable type of Disability:**  Locomotive disability, for people who can operate the computers and drones |
| 19. | **How Participation of Women will be Encouraged** | Project deliverable is common for all with no specific preference for Women, however Women may be encouraged through Govt initiatives like Drone Didi program.   C-DAC provides a safe, secure environment and equal opportunity for learning to women candidates. C-DAC is offering training exclusively for women candidates under specific funded projects by different state and central government departments. Equal job opportunity is offered to women participants. |
| 20. | **Are Greening/ Environment Sustainability Aspects Covered** *(Specify the NOS/Module which covers it)* | ☐ Yes   ☒ No |
| 21. | **Is Qualification Suitable to be Offered in Schools/Colleges** | Schools ☐ Yes  ☒No    Colleges  ☒Yes ☐ No |
| 22. | **Name and Contact Details of Submitting / Awarding Body SPOC** *(In case of CS or MS, provide details of both Lead AB & Supporting ABs)* | **Name: Dr Kalpana Johari**<br>**Email :  kalpanajohari@cdac.in**          **Contact No.: +91-9810237002**<br>**Website: www.cdac.in** |

| 23. | **Final Approval Date by NSQC:** *18 Feb 2025* | **24.  Validity Duration: 3 years** | **25.  Next Review Date: 17 Feb 2028** |
|---|---|---|---|

<Approved in 42nd NSQC meeting & Dated 18 Feb 2025>        < QUALIFICATION FILE- STT>        <NCVET-QG-05-IT-03499-2025-V1-CDAC>

## Section 2: Module Summary

## NOS/s of Qualifications
*(In exceptional cases these could be described as components)*

## Mandatory NOS/s:

Specify the training duration and assessment criteria at NOS/ Module level. For further details refer to the curriculum document.

*Th.-Theory  Pr.-Practical  OJT-On the Job Man.-Mandatory  Training  Rec.-Recommended  Proj.-Project*

| S. No | NOS/Module Name | NOS/Module Code & Version *(if applicable)* | Core/ Non-Core | NCrF/NS QF Level | Credits as per NCrF | Training Duration (Hours) | | | | | Assessment Marks | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Th. | Pr. | OJT-Man. | OJT-Rec. | Total | Th. | Pr. | Proj. | Viva | Total | Weightage (%) *(if applicable)* |
| 1. | Introduction to Unmanned Aircraft system | UAS/SD/I | Core | 5 | 1 | 30 | | | | 30 | 50 | | | - | 50 | NA |
| 2. | Programming for UAS | UAS/SD/P | Core | 5 | 3 | | 90 | | | 90 | 50 | 50 | | - | 100 | NA |
| 3. | Microcontroller Programming | UAS/SD/P-M | Core | 5 | 2 | 30 | 30 | | | 60 | 50 | 50 | | - | 100 | NA |
| 4. | Radio Communication & Protocol (MavLink) | UAS/SD/RCP | Core | 5 | 1 | 30 | | | | 30 | 50 | | | - | 50 | NA |
| 5. | Simulation Modeling of UAS | UAS/SD/SMU | Core | 5 | 2 | | 60 | | | 60 | 50 | 50 | | - | 100 | NA |
| 6. | Sensors, Camera & related Algorithms | UAS/SD/SCA | Core | 5 | 2 | 30 | 30 | | | 60 | 50 | 50 | | - | 100 | NA |
| 7. | Control Systems & GNC | UAS/SD/CSG | Core | 5 | 1 | 30 | | | | 30 | 50 | | | - | 50 | NA |
| 8. | ROS and UAS Simulators (Gazebo) | UAS/SD/RUS | Core | 5 | 2 | 30 | 30 | | | 60 | 50 | 50 | | - | 100 | NA |
| 9. | Drone Dynamics | UAS/SD/DD | Core | 5 | 1 | 30 | | | | 30 | 50 | | | - | 50 | NA |
| 10. . | Computer Vision & Image Processing | UAS/SD/CVIP | Core | 5 | 2 | 30 | 30 | | | 60 | 50 | 50 | | - | 100 | NA |
| 11. | Aptitude & Effective Communication (*Employability Skills*) | ES | Core | 5 | 2 | 60 | | | | 60 | 100 | | | - | Grade | NA |
| 12. | Project/Industrial Training | PROJ | Core | 5 | 11 | - | - | 330 | | 330 | | | 200 | 100 | Grade | NA |
| **Duration (in Hours) / Total Marks** | | | | | **30** | **300** | **270** | **330** | | **900** | **500** | **300** | **-** | **-** | **800** | **NA** |

Elective NOS/s:

| S. No | NOS/Module Name | NOS/Module Code & Version *(if applicable)* | Core/Non-Core | NCrF/NSQF Level | Credits as per NCrF | Training Duration (Hours) | | | | | Assessment Marks | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Th. | Pr. | OJT-Man. | OJT-Rec. | Total | Th. | Pr. | Proj. | Viva | Total | Weightage (%) *(if applicable)* |
| 1. | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2. | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Duration (in Hours) / Total Marks | | | | | | | | | | | | | | | | |

Optional NOS/s:

| S. No | NOS/Module Name | NOS/Module Code & Version *(if applicable)* | Core/Non-Core | NCrF/NSQF Level | Credits as per NCrF | Training Duration (Hours) | | | | | Assessment Marks | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Th. | Pr. | OJT-Man. | OJT-Rec. | Total | Th. | Pr. | Proj. | Viva | Total | Weightage (%) *(if applicable)* |
| 1. | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 2. | Na | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Duration (in Hours) / Total Marks | | | | | | | | | | | | | | | | |

## Assessment - Minimum Qualifying Percentage

*Please specify **any one** of the following:*

**Minimum Pass Percentage – Aggregate at qualification level:** __50__ % *(Every Trainee should score specified minimum aggregate passing percentage at qualification level to successfully clear the assessment.)*

**Minimum Pass Percentage – NOS/Module-wise:** __50__ % *(Every Trainee should score specified minimum passing percentage in each mandatory and selected elective NOS/Module to successfully clear the assessment.)*

## Section 3: Training Related

| | | |
|---|---|---|
| 1. | **Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)* | **B Tech in relevant domain with 2 years Post Qualification Experience** |
| 2. | **Master Trainer's Qualification and experience in the relevant sector (in years)** *(as per NCVET guidelines)* | **MTech in relevant domain with 5 years Experience in relevant domain** |
| 3. | **Tools and Equipment Required for Training** | ☒Yes   ☐No   *(If "Yes", details to be provided in Annexure)* ***Annexure 3.3*** |
| 4. | **In Case of Revised Qualification, Details of Any Upskilling Required for Trainer** | NA |

## Section 4: Assessment Related

| 1. | **Assessor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)* | **B Tech with 2 years Post Qualification Experience** |
|---|---|---|
| 2. | **Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)* | **Graduation** |
| 3. | **Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per NCVET guidelines)* | **B Tech with 3 Yrs experience** |
| 4. | **Assessment Mode (Specify the assessment mode)** | **Physical/Offline (Computer based assessment test with questions comprising of MCQs)** |
| 5. | **Tools and Equipment Required for Assessment** | ☒Same as for training  ☐ Yes   ☐ No *(details to be provided in Annexure-if it is different for Assessment)* |

## Section 5: Evidence of the need for the Qualification

*Provide Annexure/Supporting documents name.*

| | |
|---|---|
| 1. | **Latest Skill Gap Study (not older than 2 years) (Yes/No):**  Yes   Annexure 5.1 |
| 2. | **Latest Market Research Reports or any other source (not older than 2 years) (Yes/No):** Yes   Annexure 5.2 |
| 3. | **Government /Industry initiatives/ requirement (Yes/No):** Admin Approval    Annexure 5.3 |
| 4. | **Number of Industry validation provided:** Letter of Recommendation from Ministry of Electronics and IT  Annexure 5.4 |
| 5. | **Estimated nos. of persons to be trained and employed:** 240 per year    Annexure 5.5 |
| 6. | **Evidence of Concurrence/Consultation with Line Ministry/State Departments:** Yes, Admin Approval **Annexure 5.6**<br><br>If "No", why: |

# Section 6: Annexure & Supporting Documents Checklist

*Specify Annexure Name / Supporting document file name*

| | | |
|---|---|---|
| 1. | **Annexure:** NCrF/NSQF level justification based on NCrF level/NSQF descriptors *(Mandatory)* | Annexure 6.1 |
| 2. | **Annexure:** List of tools and equipment relevant for qualification *(Mandatory, except in case of online course)* | *Annexure 6.2* |
| 3. | **Annexure:** Detailed Assessment Criteria *(Mandatory)* | *Annexure 6.3* |
| 4. | **Annexure:** Assessment Strategy *(Mandatory)* | *Annexure 6.4* |
| 5. | **Annexure:** Blended Learning *(Mandatory, in case selected Mode of delivery is "Blended Learning")* | *Annexure 6.5* |
| 6. | **Annexure:** Multiple Entry-Exit Details *(Mandatory, in case qualification has multiple Entry-Exit)* | *NA* |
| 7. | **Annexure:** Acronym and Glossary *(Optional)* | *NA* |
| 8. | **Supporting Document:** Model Curriculum *(Mandatory – Public view)* | *Annexure 6.8* |
| 9. | **Supporting Document:** Career Progression *(Mandatory - Public view)* | *Annexure 6.9* |
| 10. | **Supporting Document:** Occupational Map *(Mandatory)* | *Annexure 6.10* |
| 11. | **Supporting Document:** Assessment SOP *(Mandatory)* | *Annexure 6.11* |
| 12. | **Any other document you wish to submit:** | *No* |

<Approved in 42nd NSQC meeting & Dated 18 Feb 2025>      < **QUALIFICATION FILE**- STT>      <NCVET-QG-05-IT-03499-2025-V1-CDAC>

## Annexure: Evidence of Level

| NCrF/NSQF Level Descriptors | Key requirements of the job role/ outcome of the qualification | How the job role/ outcomes relate to the NCrF/NSQF level descriptor | NCrF/NSQF Level |
|---|---|---|---|
| **Professional Theoretical Knowledge/Process** | (a) Basic & Theoretical understanding of Drone/UAS & related Systems including Hardware aspects<br>(b) Knowledge of Communication & programming aspects associated with Drone/UAS<br>(c) Control System, Dynamics & Image Processing | The course has adequate enhancement of such knowledge through modules on Basic Systems and hardwares (UAS, Sensor, Cameras, Simulators etc.), radio communication & MAVlink protocol, drone dynamics, control system, image processing etc. | 5.5 |
| **Professional and Technical Skills/ Expertise/ Professional Knowledge** | Technical Proficiency in UAS System understanding including Programming Skills for firmware system development, Simulation tools, Hardware etc. | The coverage includes C Programming, Python Programming, MatLab programming, MAVlink Protocol, ROS, MAVlink protocol, image processing enabling proficiency in these skills after course completion | 5.5 |
| **Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill** | Key Requirements for the Drone System Developer includes:<br>(a) **Industry-Relevant Skills:** Familiarity with the latest drone technologies, trends, and innovations in Drone/UAS & related fields such as autonomous flight, AI for drone navigation, and drone-based data collection.<br>(b) **Problem-Solving Abilities:** The ability to troubleshoot issues in drone systems, from hardware malfunctions to software bugs, and find solutions effectively. | The Course division provisions adequate practicals, aptitude, project and On Job Training/Internship modules in Drone/UAS & related field for development towards employability and entrepreneurship | 5.5 |
| **Broad Learning Outcomes/Core Skill** | (a) Design and Integration of Drone Systems<br>(b) Control & Autonomous Management<br>(c) Application of UAS in Various Industries<br>(d) Problem Solving and Troubleshooting<br>(e) Teamwork and Communication<br>(f) Research and Development (R&D) Capabilities with respect to latest UAS/Drone trends in Industries & market | The Drone System Developer will possess the advanced knowledge and understanding of Drone Systems including aspects like development, processing, monitoring and relevant application use-cases. The hands-on practical/lab sessions coupled with Industrial training ensures attainment of required expertise by the Beneficiary | 5.5 |
| **Responsibility** | A Drone System Developer is responsible to design, develop, and integrate UAV systems, including hardware and software. The responsibilities may also include activities like optimizing flight performance, integrating payloads, conducting testing, and ensuring regulatory compliance.<br>The role also manages maintenance, collaborates with teams, and contributes to research and innovation, while providing customer support and ensuring safe, efficient operations. | The Course aligns with the responsibility requirements of the Job Role as it includes coverage of advanced technical knowledge, independent problem-solving, and complex system design and integration through its Course structure, theoretical knowledge, practical teaching outcomes and industrial training module. | 5.5 |

## Annexure: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment's - Batch Size: 60  (4 batches per year)

| S.No. | Tool / Equipment Name | Specification | Quantity for a specific batch |
|---|---|---|---|
| 1 | Desktop | Processor: Intel Core i5 /i7<br>Memory: 32 GB or above<br>Hard Disk: 500 GB<br>Video Card: Intel Integrated Graphics / Nvidia | 30 |
| 2 | Ready-to-fly (RTF) drones for basic operations training.<br>Build-it-yourself (DIY) drone kits for assembly and programming. | Quadcopter and hexacopter | 10 |
| 3 | Flight Controllers Pixhawk, APM or Orange cube. | | 5 |
| 4 | Drone Programming Platforms | Q ground control, Mission Planner | 30 |
| 5 | Simulation Platforms | Gazebo, AirSim, or RealFlight for virtual flight testing | 30 |
| 6 | Python | Version 3.12 | 30 |
| 7 | Sensors | LIDAR, RADAR, Magentometer, gyro, thermal sensors | 5 |
| 8 | Cameras | FVA and HD | 3 |
| 9 | Drone battery | LiPo | 10 |
| 10 | Drone Repair kits | Screwdrivers, pliers, and spare parts | 10 |

## Classroom Aids:

The aids required to conduct sessions in the classroom are:

1. Meeting Platforms: Zoom, Teams

2. Digital Pad

3. Camera & Headphones

4. Ethernet / WIFI with 25 Mbps Speed Connection (UL /DL)

5. Smartboard

6. Magnetic White Board

7. Video Projector - (XGA / SVGA Compatible)

## Annexure: Industry Validations Summary

*Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.*

| S. No | Organization Name | Representative Name | Designation | Contact Address | Contact No | E-mail ID | LinkedIn Profile *(if available)* |
|---|---|---|---|---|---|---|---|

The course is offered under the Ministry of Electronics and IT, Govt. of India funded project "Capacity Building for Human Resource Development in Unmanned Aircraft System" .

## Annexure: Training & Employment Details

**Training and Employment Projections:**

| Year | Total Candidates | | Women | | People with Disability | |
|---|---|---|---|---|---|---|
| | Estimated Training # | Estimated Employment Opportunities | Estimated Training # | Estimated Employment Opportunities | Estimated Training # | Estimated Employment Opportunities |
| 2025 | 240 | 240 | 80 | 80 | - | - |
| 2026 | 240 | 240 | 80 | 80 | - | -- |
| 2027 | 240 | 240 | 80 | 80 | - | - |

**Training, Assessment, Certification, and Placement Data for previous versions of qualifications : : This is the new course submitted for NCVET approval.**

| Qualification Version | Year | Total Candidates | | | | Women | | | | People with Disability | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Trained | Assessed | Certified | Placed | Trained | Assessed | Certified | Placed | Trained | Assessed | Certified | Placed |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

**List Schemes in which the previous version of Qualification was implemented:** *NA*

**Content availability for previous versions of qualifications:**

☐ Participant Handbook  ☐ Facilitator Guide ☐ Digital Content  ☐ Qualification Handbook ☒ Any Other:  Source Book

**Languages in which Content is available: English**

# Annexure: Blended Learning

**Blended Learning Estimated Ratio & Recommended Tools:**

*Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:*
*https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf*

| S. No. | Select the Components of the Qualification | List Recommended Tools – for all Selected Components | Offline : Online Ratio |
|---|---|---|---|
| 1 | ☐Theory/ Lectures - Imparting theoretical and conceptual knowledge | 1. Physical classroom teaching<br>2. Online Digital learning through presentations/audio-video<br>3. Simulators<br>4. Reference Books/Material<br>5. Books/E-Books | 80:20 |
| 2 | ☐Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners | 1. Physical classroom<br>2. Online interactive mode<br>3. Curated Digital content<br>4. On Job Learning/during project/internship - Group discussions/mentoring | 50:50 |
| 3 | ☐Showing Practical Demonstrations to the learners | 1. Physical Laboratory<br>2. Workshop and Training Material/Actual Project site<br>3. Video-Audio<br>4. AR/VR/XR,<br>5. Simulators | 80:20 |
| 4 | ☐Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training | 1. Physical Laboratory<br>2. Simulator based Laboratories<br>3. Workshop and Training Material/Actual Project site<br>4. leveraging Software as a Service (SaaS)/ Platform as a service (PaaS)/, Infrastructure as a service (IaaS)  utilization as per requirements | 80:20 |
| 5 | ☐Tutorials/ Assignments/ Drill/ Practice | 1. Physical Mode - classroom / Field sessions, through labs<br>2. Offline/online assignment, submission, and offline/online assessment as per requirements<br>3. Lab/MCQ based tests as per requirements | 80:80 |
| 6 | ☐Proctored Monitoring/ Assessment/ Evaluation/ Examinations | 1. Offline assessments and examination | 100:0 |
| 7 | ☐On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training | 1. Offline: OJT, Internship, Apprenticeship at actual workplace/ project sight<br>2. Simulation training in the near actual job environment | 80:20 |

<Approved in 42nd NSQC meeting & Dated 18 Feb 2025>    < **QUALIFICATION FILE- STT**>    <NCVET-QG-05-IT-03499-2025-V1-CDAC>

## Annexure: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

| NOS / Module Name | Assessment Criteria for Performance Criteria / Learning Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|---|
| Introduction to Unmanned Aircraft system | • Understanding of UAS components and terminology.<br>• Ability to explain UAS applications in various industries.<br>• Practical quiz and oral assessment. | 50 | - | - | - |
| Programming for UAS | • Writing basic and intermediate-level scripts for UAS operations.<br>• Debugging and troubleshooting programming errors.<br>• Hands-on coding assignments and project evaluations. | 50 | 50 | - | - |
| Microcontroller Programming | • Development of firmware for microcontroller-based systems.<br>• Successful integration of peripherals like sensors and actuators.<br>• Lab-based practical assessments. | 50 | 50 | - | - |
| Radio Communication & Protocol (MavLink) | • Understanding of MavLink protocol and communication basics.<br>• Ability to establish and troubleshoot telemetry links.<br>• Assessment through simulation and real-world testing. | 50 | | - | - |
| Simulation Modeling of UAS | • Creation and analysis of UAS models using tools like Gazebo or MATLAB.<br>• Simulation of flight dynamics and control.<br>• Design of Controller for unmanned systems | 50 | 50 | - | - |
| Sensors, Camera & related Algorithms | • Implementation of algorithms for sensor data processing.<br>• Calibration and integration of cameras for UAS applications.<br>• Hands-on lab tasks and algorithm demonstrations. | 50 | 50 | - | - |
| Control Systems & GNC | • Understanding of guidance, navigation, and control (GNC) principles.<br>• Tuning of PID controllers for stable flight.<br>• Assessment through simulation and flight tests. | 50 | | - | - |

<Approved in 42nd NSQC meeting & Dated 18 Feb 2025>      < QUALIFICATION FILE- STT>      <NCVET-QG-05-IT-03499-2025-V1-CDAC>

| | | | | | |
|---|---|---|---|---|---|
| ROS and UAS Simulators (Gazebo) | • Development of ROS nodes for UAS tasks.<br>• Simulation of UAS in Gazebo with real-world scenarios.<br>• Lab-based assessments and project presentations. | 50 | 50 | - | - |
| Drone Dynamics | • Analysis of forces and moments acting on drones.<br>• Ability to calculate flight performance parameters. | 50 | | - | - |
| Computer Vision & Image Processing | • Implementation of vision-based navigation and obstacle detection.<br>• Development of image processing pipelines for aerial data.<br>• Evaluation through lab exercises. | 50 | 50 | - | - |
| Employability Skills | • General mathematical skills<br>• Quantitative & Logical reasoning skills<br>• General Communication skills<br>• English Grammar<br>• Business Vocabulary / E-mail etiquettes | 100 | | - | - |
| Project | • Requirement Analysis<br>• System design: screen layouts, process diagrams, pseudo code and, Level of Complexity<br>• Implementation<br>• Integration and testing: checking for interoperability & error rectification<br>• Installation and deployment<br>• Verification / Validation Strategy<br>Documentation of project | | | 200 (Grade) | 100 (Grade) |
| | Total Marks | 500 | 300 | Grade | Grade |

**General guidelines for the award of grades:**

The course grades shall be awarded as mentioned in the below table:

<Approved in 42ⁿᵈ NSQC meeting & Dated 18 Feb 2025>          <  QUALIFICATION FILE- STT>          <NCVET-QG-05-IT-03499-2025-V1-CDAC>

| Percentage %       | Grade |
|--------------------|-------|
| 85 and above       | A+    |
| 70 to Less than 85 | A     |
| 60 to Less than 70 | B     |
| 50 to less than 60 | C     |
| 40 to less than 50 | D     |
| Less than 40 (Fail)| F     |

# Annexure: Assessment Strategy

**Assessment Strategy**

1. **Assessment System Overview:**

Students are evaluated on a continuous basis and throughout the duration of the course to make a fair assessment of the skills acquired by them. To have a uniform & fair assessment/evaluation, the process is divided into two parts:

- o   Continuous Assessment - (weightage 60%)
- o   Course End Examination - (weightage 40%)

2.  **Assessment Quality Assurance levels/Framework:**

- Question Bank is created with the help of Assessors and the question papers are reviewed by Lead Assessors/SMEs

- Question Bank of 1000 -1200 questions are prepared per course

- Numbers – Three sets of question papers are prepared for each module and each paper contains 40-60 questions based on weightage of the particular module

- Quality – Question is framed in a clear, easily understandable language, without any vagueness

- Mechanism to select questions for assessment - While setting the question papers for Course End Examination (theory) the following weightages are assigned as per the difficulty level of the questions:

  - o   Level A - Low difficulty (25%)

  - o   Level B - Moderate difficulty (50%)

- o Level C - High difficulty (25%)

- Question Paper will be finalized as per given evaluation guidelines

3. **Method of verification or validation:**

- Identification of Proctors  and their training on exam software

- Mock exam one day before the exam

- Conduct Exam and Result processing

4. **Types of evidence or evidence-gathering protocol:**

The biometric/ identification details (if any) of the candidate:

- o C-DAC issues Admit card/ID card with PRN Number (Unique)

- o Govt. Photo ID card

- o Attendance sheet

5. **Method for assessment documentation, archiving, and access:**

- Hard copies of the documents (attendance) are stored

- Role based access of data only to select, specially-authorised personnel of the C-DAC

- Encrypted responses of all the candidates

- Maintains highly secured data repository and Audit Trails / Logs of all the events

- Electronically wipes off all examination and candidate related data from all servers at

   the examination centres after the end of exam

## Annexure: Acronym and Glossary

Acronym

| Acronym | Description |
|---|---|
| **AA** | Assessment Agency |
| **AB** | Awarding Body |
| **ISCO** | International Standard Classification of Occupations |
| **NCO** | National Classification of Occupations |
| **NCrF** | National Credit Framework |
| **NOS** | National Occupational Standard(s) |
| **NQR** | National Qualification Register |
| **NSQF** | National Skills Qualifications Framework |
| **OJT** | On the Job Training |

Glossary

| Term | Description |
|---|---|
| **National Occupational Standards (NOS)** | NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do. |
| **Qualification** | A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards |
| **Qualification File** | A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification. |
| **Sector** | A grouping of professional activities on the basis of their main economic function, product, service or technology. |
| **Long Term Training** | Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf |