EXPRESSION OF INTEREST &
PRE-QUALIFICATION DOCUMENT
No. EOI-302112026-1

FOR

HIRING OF TRAINING PARTNERS FOR THE TRAINING PROGRAMME TITLED

"ADVANCED BOOTCAMPS & FREELANCING TRAINING"

GOVERNMENT OF THE PUNJAB

Punjab Information Technology Board (PITB)
11th Floor, Arfa Software Technology Park (ASTP),
346-B, Ferozepur Road, Lahore, Pakistan
Phone: (+ 92) (42) (99000000), Fax: (+92) (42) (99232123)
URL: www.pitb.gov.pk

Contents

ABBREVIATIONS 3

DEFINITIONS 4

DISCLAIMER 5

1. GENERAL 6

2. PURPOSE OF THIS DOCUMENT 6

3. PROJECT BACKGROUND 7

4. BRIEF SCOPE OF WORK 8

5. INSTRUCTIONS TO APPLICANTS 16

6. OTHER FACTORS 22

ANNEX-A 23

APPLICATION FORM A-1 25

APPLICATION FORM A-2 26

APPLICATION FORM A-3 27

APPLICATION FORM A-4 28

APPLICATION FORM A-5 29

APPLICATION FORM A-6 30

ANNEX-B 31

1. PROGRAM OVERVIEW 32

1.1 Standard Program Schedule 32

1.2 Mandatory Curriculum Requirements (Applicable to All Tracks) 32

1.3 Soft Skills Curriculum (Applicable to All Tracks) 33

2. SPECIALIZATION DOMAIN 35

2.1. AI Engineering & Intelligent Automation 35

2.2 Full-Stack Development & AI Test Automation 40

2.3 Data Science & Data Engineering 45

2.4 Information Security & Ethical Hacking 50

2.5 Emerging Technologies: IoT, Robotics, Drones, XR (AR/VR) & Game/Interactive Technologies 55

2.6 DevOps Engineering 61

2.7 GPU Infrastructure Engineer 66

ABBREVIATIONS

Term	Definition
EOI-PQ	Expression of Interest – Pre-qualification
PITB	Punjab Information Technology Board
JV	Joint Venture
RFP	Request for Proposal
LMS	Learning Management System
KPI	Key Performance Indicator
MoU	Memorandum of Understanding
API	Application Programming Interface
PPRA	Punjab Procurement Regulatory Authority

DEFINITIONS

In this document, unless there is anything repugnant in the subject or context:

I. "Applicant" means the party which submits a proposal in response to this EOI-PQ Document.

II. "Training Partner" means the Applicant (single firm, JV or Consortium) which is selected through the subsequent RFP process to deliver the training services described in this document.

III. "Authorized Representative" means any representative appointed, from time to time, by the Applicant, Purchaser or Client.

IV. "Purchaser" and "Client" means the Punjab Information Technology Board (PITB), or any other entity for the time being or from time to time duly appointed in writing by the Government to act as Purchaser for the purpose.

V. "Day" means calendar day.

VI. "Employer" means Purchaser and/or Client.

VII. "EOI-PQ Document" means the Expression of Interest-Pre-Qualification Document in consideration.

VIII. "Joint Venture / Consortium": A legal entity or contractual association formed under the laws of Pakistan to submit a proposal and participate in subsequent tendering processes in response to this EOI-PQ Document. The Joint Venture (JV) / Consortium shall comprise a minimum of two (2) and a maximum of five (5) companies, inclusive of the Lead Partner: at least one of the constituent firms must be registered and operating in Pakistan and shall be referred to hereinafter as the Lead Partner of the Joint Venture / Consortium. (In this document, "JV" includes a Consortium.)

IX. "Person" includes an individual, an association of persons, firm, company, corporation, institution and organization, etc.

X. "Prescribed" means prescribed in the EOI-PQ Document.

DISCLAIMER

This EOI-PQ document for "Hiring of Training Partners for the Training Program title: “Advanced Bootcamps & Freelancing Training” ('the Project') contains brief information about the Project and qualification process for shortlisting and pre-qualification of applicants for the RFP stage. The purpose of the Document is to provide the applicants with information to assist the formulation of their EOI-PQ proposal and to pre-qualify Interested Parties / Training Partners for the RFP Stage.

While all efforts have been made to ensure the accuracy of information contained in this EOI-PQ Document, this document may not contain all the information required by the Applicants. The Applicants should conduct their own independent assessment, investigations and analysis and may prepare their proposals in the light of relevant experience and international best practices. PITB, Government of the Punjab, or any of its employees or advisors/consultants, shall incur no liability under any law, statute, rules or regulations as to the accuracy or completeness of the EOI-PQ Document.

PITB reserves the right to change any or all conditions/information set in this EOI-PQ Document by way of revision, deletion, updation or annulment through issuance of appropriate advertisement as the Client may deem fit in accordance with the Punjab Procurement Rules, 2014. Participation in the EOI-PQ process does not qualify any applicant for the next stage of the procurement process.

PITB and any other Government Department will not entertain or be liable for any claim for costs and expenses in relation to the preparation of the EOI-PQ proposal to be submitted in terms of this Document.

TERMS AND CONDITIONS OF THE PRE-QUALIFICATION

1. GENERAL

Punjab Information Technology Board (PITB) intends to invite EOI-Prequalification (EOI-PQ) proposals from interested applicant(s) for hiring Training Partners for the delivery of "Advanced Bootcamps & Freelancing Training Program" across Punjab. All well-reputed, registered and established firms, training institutions and companies (including international firms, JVs and Consortia) having requisite technical, financial and managerial capabilities are invited to participate in the EOI-PQ process for the above-said Project through submission of their proposals.

2. PURPOSE OF THIS DOCUMENT

The purpose of this document is to shortlist/prequalify eligible applicant(s), capable of accomplishing the tasks outlined in this document. The applicants are required to provide profiles of their firm comprising experience, personnel and financial strength along with proposed technical solutions.

3. PROJECT BACKGROUND

The Punjab Information Technology Board (PITB) intends to procure Training Partners for development scheme, namely the "Advanced Bootcamps and Freelancing Training Programme", delivered as an integrated, employment and industry-oriented human capital development initiative. This scheme shall remain governed and financed under its respective PC-I. The programme will be implemented over a period of **up to four (04) years (Tracks 1–4, up to June 2030)**, adopting a structured, tiered, cohort-based, and market-aligned implementation framework. PITB will serve as the programme owner and governing authority, while training delivery will be carried out through authorized and competitively selected private-sector training institutions and certified trainers.

The programme will cater to approximately **12,500 participants (10,000 Youth and 2500 executives/professionals)**, selected through a structured, skill-centric screening process, and will be offered relevant technical training, advanced bootcamps, international certification pathways and freelancing / remote-work readiness support. The programme will place a strong emphasis on extensive hands-on practical training and in-person delivery.

Upon completion of relevant training, participants may pursue internationally recognized certifications from leading technology organizations such as Microsoft and Google through PITB's Global IT Certifications Programme, with full or partial financial support for eligible international certification examinations, subject to successful completion and certification requirements.

No stipend is payable to trainees under this program. Payments to Training Partners will be tranche-based and linked to defined milestones and performance indicators, including certification outcomes and independent pre- and post-training assessments by a third party engaged by PITB. PITB may deduct proportionate amounts for undelivered sessions, breach of the Terms of Reference, or a pass rate below the prescribed minimum. Detailed payment terms will be provided in the RFP.

Through this model, the programme aims to develop an AI-ready, digitally skilled and globally competitive IT workforce while contributing to increased employability, productivity and IT-enabled services exports from Punjab.

4. BRIEF SCOPE OF WORK

4.1 Program at a glance

Parameters	Value
Total trainees	12,500
Programme duration	Up to 4 years (Tracks 1–4: up to June 2030)
Annual target	Approximately 4,167, as detailed in Clause 4.2
Cohort length	16 weeks (4 months) Component 1: Comprising 450 - 500 credit hours Component 2: Comprising 300 - 320 credit hours
Cohorts per year	2-3 cohorts per year, delivered consecutively, with a 15-day gap between each cohort
Maximum class size	30 trainees per class / lab
Training tracks	4 tracks comprising 7 domains
Procurement packages	Single RFP with different regional Lots
Training cities	12 across Punjab
Employment outcomes	Completion, certification, placement and freelancing KPIs for Tracks 1–4, aligned with the PC-I results framework (e.g., 80% training completion; 80% of graduates actively earning or engaged on freelance platforms), to be specified in the RFP and linked to payment tranches; direct absorption of top performers by the Training Partner / its industry partners are encouraged.

4.2 Procurement Structure

The programme shall be procured through a single Request for Proposals (RFP), divided into separate Lots on a regional basis. The training will be conducted across the following twelve (12) cities in Punjab:

Region	Training Cities	Trainees	Proximate Annual Target
Central Punjab	Lahore, Faisalabad, Gujranwala, Gujrat, Sahiwal	7,500	2500
North Punjab	Rawalpindi, Sargodha, Jhelum	3,000	1000
South Punjab	Multan, Bahawalpur, Dera Ghazi Khan, Rahim Yar Khan	2,000	667
Total (12 cities)		**12,500***	**4,167**

***** The total number of trainees (12,500) includes both “Individual/Youth” and “Executive/Professional” trainees.

Trainee numbers shall be distributed by region according to the size of the local technology market and the availability of training infrastructure according to projected employer demand.

Note: Training domains listed in clause 4.4 for Tracks 1 to 4 shall be finalized by PITB. PITB may add, remove or substitute domains based on industry demand. Delivery of drone-related training shall be subject to applicable regulatory permissions.

4.3 Rules Governing the Three Packages

- Applications may be submitted by a single firm or a joint venture / consortium, provided the lead partner is clearly identified and must be registered and operating in Pakistan with full contractual liability.
- Applicants shall be assessed for pre-qualification in accordance with the eligibility and evaluation criteria specified in the EOI document. The EOI stage shall not involve the allocation or award of any Lots. No bidder or consortium may be awarded more than one Lot. Three distinct vendors will be awarded separate contracts for each region. The bidding procedure, contract structure, and detailed evaluation methodology, where applicable, shall be specified in the subsequent RFP.
- Candidates from anywhere in Punjab may apply to any training location, subject to meeting the eligibility criteria. Pre-qualification shall not be restricted by geographical location within Punjab.
- Pre-qualified firms shall be required to comply with the Employability and Placement Framework and other applicable programme requirements, as specified in the subsequent RFP and contract documents. The geographical scope of training delivery, trainee allocation, and associated contractual obligations shall be defined at the RFP stage.

4.4 Training Tracks

Track	**Domains Offered**	**No. of Trainees**
Track 1 – AI Platforms	1. AI Engineering & Intelligent Automation; 2. Full-Stack Development & AI Test Automation	12,500 for Tracks 1 to 4 combined (Component 1 = 10,000 individuals; Component 2 = 2,500 professionals/executives)
Track 2 – Cloud, Data & Infrastructure	3. Data Science & Data Engineering; 4. DevOps Engineering; 5. GPU Infrastructure Engineer	
Track 3 – Information Security	6. Information Security & Ethical Hacking	
Track 4 – Emerging Technologies	7. IoT, Robotics, Drones, XR (AR/VR), Game & Interactive Technologies	

The share of target and core technology stack for each of the seven domains offered under Tracks 1 to 4 are summarized below:

Sr. #	Domains	Share of Target	Core technology stack
1	AI Engineering & Intelligent Automation	25%	Python, ML/DL, GenAI, LLMs, AI Agents, RAG, APIs
2	Full-Stack Development & AI Test Automation	20%	TypeScript/JavaScript, React, Node.js, APIs, Databases, Test Automation
3	Data Science & Data Engineering	15%	Python, SQL, Statistics, ML, Data Pipelines, Big Data, Data Warehousing
4	Information Security & Ethical Hacking	10%	Networking, Linux, Cybersecurity, Penetration Testing, SOC, Web/API Security
5	Emerging Technologies: IoT, Robotics, Drones, XR (AR/VR), Game & Interactive Technologies	10%	IoT, Embedded Systems, Robotics, Drones, Computer Vision, XR, Game Development
6	DevOps Engineering	15%	Linux, Cloud, Containers, Kubernetes, CI/CD, IaC, Observability
7	GPU Infrastructure Engineer	5%	GPU Computing, AI Infrastructure, CUDA, Containers, Kubernetes, GPU Clusters

The draft curriculum for the above-mentioned domains is provided in **Annex-B** for reference purpose**.** However, applicants shall submit a proposed course outline/design and detailed curriculum for each relevant domain along with their Expression of Interest (EOI).

4.5 Allocation of Trainees

The indicative allocation of trainees by domain and training city, for each region, is provided below. PITB reserves the right to revise or reallocate the number of trainees across domains, cities, and regions at any time during programme implementation, based on actual training demand and operational requirements.

Central Punjab: 7,500 trainees (proximate 2,500 per annual target)

Domain	Lahore	Faisalabad	Gujranwala	Gujrat	Sahiwal	Annual Total
1 – AI Engineering & Intelligent Automation	280	150	90	60	30	**610**
2 – Full-Stack Development & AI Test Automation	230	120	60	60	30	**500**
3 – Data Science & Data Engineering	170	90	60	30	30	**380**
4 – Information Security & Ethical Hacking	130	60	30	30	-	**250**
5 – Emerging Technologies (IoT, Robotics, Drones, XR (AR/VR), Game & Interactive)	130	60	30	30	-	**250**
6 – DevOps Engineering	170	90	60	30	30	**380**
7 – GPU Infrastructure Engineer	130	-	-	-	-	**130**
Annual Total	**1240**	**570**	**330**	**240**	**120**	**2500**
Program Total	**3720**	**1710**	**990**	**720**	**360**	**7500**

North Punjab: 3,000 trainees (proximate 1,000 per annual target)

Domain	Rawalpindi	Sargodha	Jhelum	Annual Total
1 – AI Engineering & Intelligent Automation	120	70	60	**250**
2 – Full-Stack Development & AI Test Automation	110	60	30	**200**
3 – Data Science & Data Engineering	60	60	30	**150**
4 – Information Security & Ethical Hacking	60	40	-	**100**
5 – Emerging Technologies (IoT, Robotics, Drones, XR (AR/VR), Game & Interactive)	60	40	-	**100**
6 – DevOps Engineering	60	60	30	**150**
7 – GPU Infrastructure Engineer	50	-	-	**50**
Annual Total	**520**	**330**	**150**	**1000**
Program Total	**1560**	**990**	**450**	**3000**

South Punjab: 2,000 trainees (proximate 667 per annual target)

Domain	Multan	Bahawalpur	Dera Ghazi Khan	Rahim Yar Khan	Annual total
D1 – AI Engineering & Intelligent Automation	50	50	30	30	**160**
D2 – Full-Stack Development & AI Test Automation	40	30	30	30	**130**
D3 – Data Science & Data Engineering	60	40			**100**
D4 – Information Security & Ethical Hacking	40	30			**70**
D5 – Emerging Technologies (IoT, Robotics, Drones, XR (AR/VR), Game & Interactive)	40	30			**70**
D6 – DevOps Engineering	60	40	-	-	**100**
D7 – GPU Infrastructure Engineer	37	-	-	-	**37**
Annual Total	**327**	**220**	**60**	**60**	**667**
Program Total	**981**	**660**	**180**	**180**	**2001**

4.6 Programme Components

Component	Description
Component 1 – Youth Bootcamps	**Cohort:** 16 weeks (4 months) of full-time, hands-on training, comprising 6 hours per training day (comprising 450 - 500 credit hours) including soft skills and freelancing modules. **Classes:** Weekday classes, Monday to Friday (10 AM to 04 PM).
Component 2 – Executive and Professional Upskilling	**Cohort:** 16 weeks, comprising 4 hours per day (comprising 300 - 320 credit hours) training for experienced professionals and self-employed executives. **Classes:** Weekday classes, Monday to Friday (05 PM to 09 PM).

4.7 Curriculum Structure Requirements

Every course under Tracks 1 to 4 must be structured around four common pillars. These are to be written into the RFP as mandatory curriculum requirements:

- **Theory, hands-on, project in every unit.** No module may be delivered as theory alone. Each week pairs concept delivery with a guided lab and a contribution to the running project.
- **A single cumulative project.** Weekly project work builds one continuous artefact across the course rather than disconnected exercises, with formal milestone checkpoints at roughly one-third intervals.
- **Graded assessment throughout.** Quizzes, assignments and mini-projects feed the cumulative score that determines the trainee's employability band.
- **Capstone presentation and career readiness.** Every course closes with a defended capstone before an evaluation panel, plus portfolio, résumé and interview preparation.

4.8 Brief Scope of Work

PITB intends to engage suitably qualified and experienced Training Partners / Consortia for the delivery of **Training Program** aimed at developing advanced technical capabilities, globally relevant certifications, employability, freelancing and entrepreneurship skills among eligible candidates in Punjab. The selected Training Partner(s) shall be responsible for end-to-end delivery of the assigned training domains, including mobilization, candidate selection support, training delivery, certification preparation, assessment, infrastructure, employability and post-training placement / freelancing support.

(1) Training & Curriculum Delivery. Deliver training in the assigned domains/tracks as specified by PITB, in accordance with the approved curriculum, learning outcomes, duration, contact hours and assessment requirements; combine theory, hands-on practical labs and project-based learning; implement a continuous project model culminating in a capstone project and presentation; conduct regular quizzes, assignments, practical assessments and mini-projects; provide technical content, labs, tools, software and learning resources for each domain; incorporate soft skills and professional-readiness training; and deliver a mandatory freelancing and remote-work readiness component (portfolio development, professional profiles, client acquisition, pricing, negotiation, communication, project management and remote employment readiness).

(2) International Certification. Prepare trainees for at least one relevant, globally recognized industry certification for the assigned domain; align content and labs with the certification syllabus; facilitate and support certification attempts by eligible trainees; maintain certification records and report examination attempts and pass rates; and meet certification-related performance requirements specified by PITB. Responsibility for certification examination fees under Tracks 1–4 shall be specified in the RFP.

(3) Training Infrastructure & Technical Facilities. Have adequate existing and purpose-built infrastructure in the assigned cities, including at minimum: fully equipped computer laboratories with dedicated workstations; high-speed and reliable internet with redundancy; backup power; instructor presentation and demonstration facilities; specialized equipment for relevant domains (IoT/robotics kits, drones, XR equipment, GPU resources, controlled cybersecurity testing environments); adequate cloud, container, GPU and other technology environments; and safe, accessible and inclusive facilities, including

appropriate arrangements for female trainees. Declared infrastructure shall be open to inspection and verification by PITB or its authorized representatives.

(4) Learning Management System (LMS). Operate a functional and demonstrable LMS throughout the programme, giving PITB centralized and real-time visibility of trainee enrolment and attendance, content delivery, assignments and assessments, project milestones, cumulative scores, cohort-wise / city-wise / domain-wise / gender-wise performance, and trainer attendance and session delivery. The LMS shall support attendance verification and integrate with PITB systems/portals through documented APIs.

(5) Trainers & Faculty. Deploy suitably qualified and experienced trainers for each domain who possess relevant technical qualifications and industry certifications, current practical industry experience and proven training experience; be supported by qualified alternate trainers; and maintain trainer attendance and session-delivery records. PITB may verify the qualifications, experience and certifications of proposed trainers.

(6) Training Delivery & Cohort Management. Conduct bootcamps as full-time, intensive programs per the approved schedule; manage multiple cohorts as approved by PITB; maintain prescribed class sizes and lab capacity with maximum 30 trainees per class. No oversubscription is permitted; additional demand is met by adding labs, not by increasing class size; publish and adhere to approved intake and training schedules; ensure uninterrupted delivery; maintain attendance and participation records; and ensure timely completion of all training, assessments and capstone activities.

(7) Candidate Mobilization, Application & Selection Support. Support PITB through digital, campus and other outreach and marketing; awareness and mobilization campaigns in assigned regions; online application support through PITB's centralized application portal; verification and scrutiny of applicant documents; merit-based selection per PITB-approved criteria; auditable application and selection records; and achievement of agreed application-to-seat ratios, admitting only candidates who meet the approved eligibility criteria.

(8) Employability, Placement & Industry Linkages. Convert training outcomes into employment, paid internships, consulting opportunities, freelancing or entrepreneurship by establishing linkages and MoUs with technology companies, industry bodies and employers; facilitating employment and paid internships for high-performing trainees; arranging industry interaction, interviews and placement drives; aligning capstone projects with industry requirements; maintaining a graduate/employer database; providing evidence of placement outcomes; and meeting agreed placement and employability KPIs specified by PITB.

(9) Freelancing & Remote Work Enablement. Support trainees to compete in the global digital marketplace through professional portfolios, profile creation, optimization on international freelancing platforms, proposal writing, client acquisition, pricing, negotiation, client communication, project management, practical simulations and support for securing initial assignments; and track freelance profiles, engagements and earnings as evidence of outcomes.

(10) Entrepreneurship & Startup Support. Facilitate interested trainees through capstone/demo-day presentations; linkages with incubation centres, investors and industry networks; mentoring and business-development support; guidance on business models, financial planning and market entry;

support for registration, intellectual property and regulatory processes; and access to co-working, cloud or other startup resources, where applicable.

(11) Track & Trace / Outcome Monitoring. Record and update, in PITB's centralized Track and Trace system (or an approved integrated mechanism), outcome data, monitoring each applicant and trainee from application through training and post-graduation outcomes; recording employment, internship, consulting, freelancing, startup and unplaced status; with role-based access, integration with the LMS and PITB systems, city/domain/gender/cohort-wise reporting, auditable records of outcome claims, and data handled in accordance with PITB's information-security and data-protection requirements.

(12) Monitoring, Reporting & Governance. Establish a dedicated programme management structure with focal persons for PITB coordination, and provide regular progress and performance reports, cohort completion reports, intake and selection reports, attendance/assessment/certification reports, placement/freelancing/entrepreneurship outcome reports, risk and corrective-action reports, and any additional reports required by PITB. PITB or its authorized representatives may inspect facilities, monitor classes, review LMS/portal records and independently verify reported outcomes. Training Partners shall be subject to independent third-party monitoring and evaluation / validation, including pre- and post-training assessments and verification of milestones linked to payment tranches, commissioned by PITB.

(13) Overall Responsibility. The selected Training Partner shall be responsible for end-to-end implementation and successful delivery of the assigned component(s), including mobilization, infrastructure readiness, training delivery, practical learning, certification preparation, assessment, employability, freelancing, entrepreneurship support, outcome tracking, reporting and coordination with PITB, in accordance with the approved curriculum, applicable standards, timelines, performance indicators and instructions issued by PITB.

Note:

1. **The applicants are required to submit their expression of interest (EOI) and propose their own solution based on the information presented in the preceding paragraphs and their experience and international best practices. The applicant may propose additional features based on the understanding and best practices. The applicant needs to specify implementation and operational methodology in all respects, and with clear timelines and milestones.**
2. **This component of the project entails training services as outlined in the scope of work.**

5. INSTRUCTIONS TO APPLICANTS

5.1 Submission of Proposal

The EOI & Pre-Qualification Proposals, duly completed, signed, stamped and in complete conformity with EOI & PQ Document must be submitted on Punjab e-Procurement system on or before **17th November, 2026 till 1200 hours** and the proposals shall be opened at 1230 hours on the same date, as per PPRA Rules, 2014. Any proposal received through any mode other than Punjab e-Procurement system shall not be considered. In case the last date of proposal submission falls in / within the official holidays / weekends of the Purchaser, the last date for submission of the proposals shall be the next working day.

The proposals are to be prepared in English language. The applicants must provide complete information along with supporting documents. Any lapses to provide essential information may result in disqualification of the applicant.

All documents submitted by the firms should preferably be delivered in one packet/parcel for ease of handling and to avoid loss of documents. Any misleading statement(s) or information by any applicant will result into disqualification at any stage.

The Applicants can seek any clarification regarding the project, pre-qualification documents or evaluation criteria from the following:

Requests for clarification shall be submitted in writing at least seven (07) days before the last date of submission. PITB's responses shall be shared with all prospective Applicants without identifying the source of the query. A pre-EOI conference will be held on **10 November 2026 at 1100hrs** in the Committee Room, PITB.

Primary Contact

Hammad Hasan Hamdani
Additional Director General, Punjab Information Technology Board
Email: hammad.hasan@pitb.gov.pk | Ph: 042-99000000
9th Floor, Arfa Software Technology Park, 346-B, Ferozepur Road, Lahore, Pakistan.

Secondary Contact

Mr. Muhammad Rizwan Ul Haque
Joint Director (Development), Punjab Information Technology Board
Email: rizwan.haque@pitb.gov.pk**|** Ph: 042-99000000
11th Floor, Arfa Software Technology Park, 346-B, Ferozepur Road, Lahore, Pakistan.

Interested Parties should note that during the period from the receipt of the proposal and till further notice from the Primary Contact, all queries should be communicated via the Primary Contact in writing or e-mail only. In the case of an urgent situation where the Primary Contact cannot be contacted, the Interested Parties may alternatively direct their enquiries through the Secondary Contact.

Interested Parties are also required to state in their proposals the name, title, fax number and e-mail address of their authorized representative through whom all communications shall be directed until the process has been completed or terminated.

The Employer will not be responsible for any costs or expenses incurred by Interested Parties in connection with the preparation or delivery of proposals.

5.2 Joint Venture (JV) / Consortium

5.2.1 The following are minimum qualification requirements of a JV / Consortium:

- **i.** Firms/institutions registered in Pakistan, and international/foreign firms in a Joint Venture / Consortium with a local firm, having training and IT skills development practices and experience with governments or large institutions on assignments similar to the scope of work in this document, are eligible. International / foreign firms are required to form Joint Ventures / Consortia with appropriate local firms. In case of a proposal from a Joint Venture / Consortium, a JV / Consortium Agreement or MoU signed by all partners, clearly defining each partner's role and responsibilities, shall be submitted with the proposal; a formal registered JV agreement shall be required prior to signing of the contract.
- **ii.** One of the local partners of the participating Joint Venture / Consortium shall be designated the Lead Partner. If awarded the contract, the Lead Partner, on behalf of the Joint Venture / Consortium, would receive instructions and incur liabilities.
- **iii.** All partners shall be jointly and severally liable for the execution of the Contract in accordance with the agreed terms and conditions. In case of award of the Contract, the Contract Agreement shall be signed by all partners of the JV / Consortium. All the partners shall be jointly and severally liable for the execution of the project in accordance with government rules and regulations.

5.2.2 The pre-qualification of a JV/Consortium shall not qualify any of its individual partners to execute such projects individually.

5.3 Qualification Criteria

5.3.1 General

EOI-PQ will be based on all the criteria given in succeeding sections regarding the Applicant's financial soundness, experience, trainers, infrastructure and technical solution as indicated by the Applicant's responses in the forms given in this document.

5.3.2 Mandatory Basic Requirements

Only those applicants fulfilling the following basic requirements shall be considered for further evaluation (relevant documents to be attached):

1. Requirements to be fulfilled by the Applicant / Lead Partner

- **i.** Certificate of Company/Firm Registration/Incorporation under the laws of Pakistan.
- **ii.** Valid Income Tax Registration.
- **iii.** Valid Sales Tax Registration (status should be active with the relevant authority, if applicable).
- **iv.** Submission of an undertaking that the firm is not blacklisted by any provincial or federal government department, agency, organization, or autonomous body anywhere in Pakistan.
- **v.** Registration of relevant professional body in the country of registration (if applicable).
- **vi.** In case of a proposal from a Joint Venture / Consortium, a JV / Consortium Agreement or MoU to that effect, signed by all the partners shall be submitted with the proposal. However, if awarded the contract a formal registration of the Joint Venture would be required.

2. Requirements to be fulfilled by Other JV / Consortium Partners (if any)

i. Certificate of Company/Firm Registration/Incorporation under applicable laws.
ii. Valid Tax(es) Registration as applicable and relevant.
iii. Submission of a legally valid undertaking confirming that neither the firm nor any consortium partner has been blacklisted by any government organization in any country, wherever applicable.

3. Requirements to be fulfilled by Applicant / JV Partners

The Applicant must demonstrate relevant experience in implementing similar projects. In the case of a JV/Consortium, this requirement may be fulfilled by any one of its partners.

i. **Relevant Project Experience:** For the purpose of this pre-qualification, a "similar project" shall mean an IT/digital skill training programme that has been completed for a Government, development-sector organization or large institutional client, involving the delivery of in-person, hands-on training to at least **500** trainees per year. Such experience must be supported by the relevant contract and completion certificate or progress certificate issued by the client.
ii. **Minimum Annual Turnover:** Minimum average annual turnover of **PKR 500 million or above** over the last three (03) fiscal years, supported by audited financial statements.

5.3.3 Weightage / Marks

Sr. No.	Evaluation Factor	Documents/Evidence Required	Max Marks
1.	**Technical Capabilities**		**50**
	A. Geographical Coverage Availability and geographical distribution of existing training facilities/centers across the Punjab. • 2 to 5: **5 marks** • 6 to 10: **8 marks** • More than 10: **10 marks**	City-wise list of training facilities/centers with complete addresses, location map, and ownership/lease documents. **(Note:** Selected Participant(s) shall establish or arrange additional training facilities/centers in the remaining designated/assigned cities)	10
	B. Physical Infrastructure, Safety & Learning Environment: Building condition; fire safety, security, accessibility; appropriate lab layout; air conditioning; CCTV Cameras and generator backup • **1 mark** for each compliant training facility/center	Following documents for each training facility/centers: Floor plans, no. of classrooms/labs with capacity of 30 trainees per classroom/lab, facility arrangement documents, generator backup, photographs and applicable safety details.	10
	C. IT Infrastructure, Hardware Specifications & Connectivity:	Detail of hardware specifications and age, domain-specific computing requirements,	10

	Availability of modern, fully functional ergonomic workstations, with capacity of 30 trainees per classroom/lab, equipped with domain-specific workstations, dedicated internet connectivity, redundant ISP and UPS. • **01 mark** for each compliant classroom/lab.	dedicated internet connectivity, redundant ISP and UPS. (**Note:** Selected Participant(s) shall ensure following training facilities in all designated/assigned cities: Availability of modern, fully functional workstations less than three years old, with minimum Intel Core i5/i7 (10th Generation or equivalent), 16 GB RAM, SSD storage, and dedicated GPU where required for specialized domains (e.g., AI/ML, game development, and 3D/AR/VR Training facilities shall also have dedicated high-speed internet connectivity, redundant ISP connectivity, online UPS, and generator backup. CCTV cameras shall be installed in all training classrooms/labs, with continuous video recording maintained throughout training hours for monitoring, verification, and audit purposes.	
	D. <u>Similar Experience</u> Evidence of previous completed training programs of similar nature (over the last three (03) fiscal years.). Number of average trainees trained per year: • 500 to 750 trainees: **0 marks** • 751 to 1000 trainees: **05 marks** • Above 1000 trainees**: 10 marks**	Complete company/technical profile, details of the trainings and verifiable evidence of relevant experience, such as contracts/work orders, completion or performance certificates, feedback of trainees/clients, Post Training Employment details. Random check of the training records will be done, for cross verification.	10
	E. <u>Digital Technology Enablement</u> I. LMS / Learning Tool **(4 Marks)** II. Trainee Tracking & Performance Monitoring Tool **(4 Marks)** III. Digital Reporting, Data Management & Technical Support **(2 Marks)**	LMS and track-and-trace portal URLs/demo, screenshots, sample attendance/progress reports, dashboards, and details of data management and technical support.	10
2.	**<u>Financial Capacity</u>** Minimum average annual turnover of PKR 500 million or above over the last three (03) fiscal years. • 500 to 750 million: **10 marks** • 751 to 1000 million: **15 marks** • Above 1000 million: **20 marks**	Audited financial statements for the last three fiscal years, certified by an ICAP-registered chartered accountancy firm.	**20**

3.	**<u>Trainers</u>** Number of certified/technical trainers currently practicing in relevant fields, with at least three (03) years of relevant industry experience. • 20 to 29 trainers: **10 marks** • 30 to 49 trainers: **15 marks** • 50 or more trainers: **20 marks**	CVs of proposed trainers and key personnel, relevant certifications/experience evidence, proof of availability, and firm's organizational chart.	**20**
4.	**<u>Training Delivery Plan</u>** The Training Delivery Plan shall address the following criteria: 1. Mobilization and implementation readiness. **(2 marks)** 2. Cohort-wise training calendar and scheduling. **(2 marks)** 3. Curriculum delivery methodology. **(2 marks)** 4. Quality assurance and monitoring. **(2 marks)** 5. Risk management and mitigation measures. **(2 marks)**	Detailed implementation and mobilization plan, cohort-wise training calendar, curriculum delivery methodology, quality assurance framework, and risk register with mitigation measures, along with detailed presentation during the technical evaluation.	**10**
	Total		**100**

Note: To qualify for the Request for Proposal (RFP) stage, the firm must obtain an overall score of at least 80 out of 100 marks*. If less than three (03) participated bidders achieved 80 marks, then qualifying score shall be reduced to 70 out of 100 marks.*

Marks shall be awarded only on the basis of documentary evidence submitted with the proposal; claims that cannot be verified shall receive zero marks.

The applicants who have duly complied with the pre-qualification criteria will be eligible for further processing. The proposals which do not conform to the pre-qualification criteria will be rejected.

6. OTHER FACTORS

6.1 Only firms, JVs and Consortia that have been prequalified under this procedure shall be invited to bid. A firm can apply for pre-qualification either individually or as part of only one JV / Consortium. If a firm submits more than one EOI-PQ proposal, all proposals involving such firm (individually or as JV / Consortium) shall be rejected and stand disqualified.

6.2 The Purchaser may reject all proposals at any time before the acceptance of a proposal. The Purchaser shall, upon request, communicate to any Applicant the grounds for its rejection of all proposals, but shall not be required to justify those grounds. The Purchaser shall incur no liability, solely by virtue of invoking sub-rule (1) of Rule-35 of Punjab Procurement Rules, 2014 towards the Applicants. However, Applicants shall be promptly informed about the rejection of the proposals, if any (as per Rule 35 of Punjab Procurement Rules, 2014).

6.3 The Applicant shall bear all costs/expenses associated with the preparation and submission of the Proposal(s) and the Employer shall in no case be responsible/liable for those costs/expenses.

6.4 Any Applicant aggrieved by any act of PITB in the pre-qualification process may lodge a written complaint with the Grievance Redressal Committee of PITB within the time and in the manner prescribed under the Punjab Procurement Rules, 2014.

6.5 Applicants found to have engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, or having a conflict of interest, shall be disqualified and may be blacklisted in accordance with the Punjab Procurement Rules, 2014.

6.6 The results of the pre-qualification shall be communicated to all Applicants and placed on the websites of PPRA and PITB.

ANNEX-A

Letter of Application

[Letterhead paper of the Applicant, or partner responsible for a joint venture / consortium, including full postal address, telephone no., fax no., and e-mail address]

Date: _____

To: _____

[Name and address of the Employer]

Sir,

1. Being duly authorized to represent and act on behalf of _____ (hereinafter "the Applicant"), and having reviewed and fully understood all the EOI-PQ information provided, the undersigned hereby applies to be pre-qualified as Training Partner under the projects titled “Advanced Bootcamps & Freelancing Training”.
2. Attached to this letter are copies of original documents defining:
   (a) the Applicant's legal status;

   (b) the principal place of business;

   (c) the place of incorporation (for applicants who are corporations), or

   The place of registration and the nationality of the owners (for applicants who are partnerships or individually-owned firms).
3. The Client and its authorized representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents, and information submitted in connection with this proposal, and to seek clarification from our bankers and clients regarding any financial and technical aspects. This Letter of Application will also serve as authorization to any individual or authorized representative of any institution referred to in the supporting information, to provide such information deemed necessary and requested by the Employer or its authorized representative to verify statements and information provided in this proposal, or with regard to the resources, experience, and competence of the Applicant.
4. The Employer and its authorized representatives may contact the following persons for further information, if needed.

Inquiries	**Contact 1 / Telephone 1**	**Contact 2 / Telephone 2**
General and Managerial		
Personnel		
Technical		
Financial		

5. This proposal is made with the full understanding that: (a) proposals by pre-qualified applicants will be subject to verification of all information submitted for pre-qualification; and (b) the Applicant (or at least one member of its JV / Consortium).

Applicants who are not joint ventures/consortia should delete para 6 and initial the deletions.

6. We confirm that if we bid, that bid as well as any resulting contract will be: (a) entered into and signed by the same JV / Consortium which is submitting this proposal; (b) signed to legally bind all partners, jointly and severally, to execute the contract; and (c) submitted with a Joint Venture / Consortium agreement to bind all the partners to take liabilities in the event the contract is awarded to us.
7. The undersigned declare that the statements made and the information provided in the proposal are complete, true, and correct in every detail.

Signature of the Applicant

APPLICATION FORM A-1

General Information

All individual firms and each partner of a Joint Venture / Consortium applying for pre-qualification are requested to complete the information in this form. Nationality information is also to be provided for foreign owners or applicants who form part of the Joint Venture / Consortium.

#	Item	Details
1	Name of Firm	
2	Head Office Address	
3	Telephone / Contact Person (Name, Title)	
4	Fax / Email	
5	Place of incorporation/registration	
6	Year of incorporation/registration	
7	Nationality of owners (foreign owners only)	
8	Training facilities in Punjab (cities / addresses)	

APPLICATION FORM A-2

General Experience

Name of Applicant or Partner of a joint venture/consortium: _____

All individual firms and all partners of a joint venture/consortium are requested to complete the information in this form. (Repeat the table for Lead Partner and Partner Nos. 2, 3 and 4.)

JV's Lead Partner

Starting Month/Year	Ending Month/Year	Contract Name, Name & Address of Employer, Brief Description of Works Executed	Role of Applicant

Partner No. 2

Starting Month/Year	Ending Month/Year	Contract Name, Name & Address of Employer, Brief Description of Works Executed	Role of Applicant

APPLICATION FORM A-3

Similar Experience

Name of Applicant or partner of a joint venture/consortium: _____

On a separate page, using the format of Application Form A-4, each applicant or partner of a Joint Venture / Consortium is required to list all contracts of a similar nature and complexity to the contract for which the Applicant wishes to qualify, undertaken during the last five years. The information is to be summarized, using Application Form A-4, for each contract completed or under execution by the applicant or JV / Consortium partners.

APPLICATION FORM A-4

Contracts of Similar Nature and Complexity

Name of Applicant or partner of a joint venture/consortium: _____

Use a separate sheet for each contract.

#	Item	Details
1	Name of Contract / Country	
2	Name of Employer	
3	Employer Address	
4	Nature of works and special features relevant to the contract for which the Applicant wishes to prequalify (number of trainees, domains, certifications, placements)	
5	Contract Role (tick one): (a) Sole Contractor (b) Sub-Contractor (c) Partner in a Joint Venture	
6	Value of the total contract (in specified currencies) at completion, or at date of award for current contract	
7	Value in Pak Rs.	
8	Date of Award	
9	Date of Completion	
10	Contract Duration (Years and Months)	
11	Specified Requirements	

APPLICATION FORM A-5

Personnel Capabilities (Key Personnel and Trainers)

Name of Applicant: _____

For specific positions essential to contract execution, Applicants should provide the names of candidates qualified to meet the specified requirements. The data on their experience should be supplied on separate sheets of CVs.

#	Title of Position / Course	Name of Prime Candidate	Qualification / Certification	Years of Relevant Experience
1				
2				
3				

APPLICATION FORM A-6

Financial Strength

Name of Applicant or Lead Partner of a Joint Venture / Consortium: _____

Applicants, including Lead Partner of a joint venture / consortium, should provide financial information to demonstrate that they meet the specified requirements. A copy of the audited reports/balance-sheets should be attached. In case of a JV / Consortium, each partner shall complete this form.

Bank Details	**Values**
Name of bank	
Address of bank	
Telephone / Contact name and title	
Fax / Telex	

Annual Turnover – Year	**Turnover (in Pak Rupees)**	**Turnover in Millions**
1.		
2.		
3.		

Summarize actual assets and liabilities in Pak Rupees for the previous three years, based upon known commitments, projected assets and liabilities in Pak Rupees.

Financial information in Pak Rs.	**Year 1**	**Year 2**	**Year 3**
1. Total assets			
2. Current assets			
3. Total liabilities			
4. Current liabilities			
5. Profits before taxes			
6. Profits after taxes			

Firms owned by individuals, and partnerships, may submit their audit reports / balance sheets certified by a registered accountant.

ANNEX-B

DRAFT CURRICULUM

Advanced Bootcamps & Freelancing Training Program

7 Specializations/Domains | 16 Weeks per domain | Youth Bootcamp & Executives/Professionals Upskill

Draft Curriculum Prepared for Expert Review, Training Partners, TPV & Final Approval for Steering Committee

1. PROGRAM OVERVIEW

1.1 Standard Program Schedule

Duration: 4 Months (16 Weeks include Course Foundational + Instructional)

Class Days:

- Monday – Friday

Class Hours:

- 10:00 AM – 4:00 PM (Includes specialized technical training, soft skills, laboratory sessions, quizzes, assignments, and scheduled breaks) [Component 1 – Individuals]
- 5:00 PM – 9:00 PM [Component 2 – Executive/Professionals]

Format: In-person / cohort-based, project-driven instruction

1.2 Mandatory Curriculum Requirements (Applicable to All Tracks)

Every track in this component irrespective of domain must be built around the following four pillars. These are binding curriculum requirements for the RFP, not track-specific preferences.

1. Theory, Hands-On, Project in Every Unit

No module may be delivered as theory alone. Each week pairs concept delivery with a guided hands-on lab and a corresponding contribution to the running project.

2. A Single Cumulative Project

Weekly project work builds one continuous artefact across the course rather than disconnected exercises, with formal milestone checkpoints at roughly one-third intervals (approximately Week 5, Week 11 and the Week 16 capstone defense).

3. Graded Assessment Throughout

Quizzes, assignments and mini-projects feed the cumulative score that determines the trainee's employability band under Section 6.

4. Capstone Presentation & Career Readiness

Every course closes with a defended capstone before an evaluation panel, plus portfolio, Resume and interview preparation.

5. Course Foundational Week

Every track opens with a common Course Foundational Week program orientation, toolchain/environment setup, and core professional skills (communication, collaboration, time management)

1.3 Soft Skills Curriculum (Applicable to All Tracks)

Alongside the technical curriculum, every track includes a common, week-by-week Soft Skills track delivered in parallel across the full 16 weeks. Sessions are grouped into three progressive modules, sequenced to build on one another and aligned with each track's Week 5 / Week 11 / Week 16 project milestones.

Module 1: Foundational Workplace Habits (Weeks 1-5)

Module 2: Collaboration & Critical Thinking (Weeks 6-11)

Module 3: Leadership, Communication & Self-Management (Weeks 12-16)

Week-by-Week Soft Skills Plan

Week	Soft Skills Module	Session Topic	Key Learning Outcome
W1	Foundational Workplace Habits	Professionalism, Workplace Etiquette & Punctuality	Understand and apply professional conduct, etiquette and time discipline expected in a workplace or client setting.
W2		Time Management & Prioritization	Apply prioritization frameworks to manage tasks, deadlines and competing demands.
W3		Email & Business Communication Basics	Write clear, professional emails and workplace messages appropriate to audience and purpose.
W4		Active Listening & Receiving Feedback	Practice active listening techniques and respond constructively to feedback from peers and mentors.
W5		Goal Setting & Personal Accountability	Set SMART goals and demonstrate ownership of commitments and deliverables.
W6	Collaboration & Critical Thinking	Teamwork & Collaborative Problem-Solving	Collaborate effectively within a team to define and solve a shared problem.
W7		Critical Thinking & Structured Decision-Making	Apply structured frameworks to analyze problems and justify decisions with evidence.

W8		Conflict Resolution in Team Settings	Identify sources of interpersonal conflict and apply constructive resolution techniques.
W9		Cross-Functional Communication	Communicate technical concepts clearly to non-technical stakeholders and vice versa.
W10		Creative Problem-Solving & Design Thinking	Apply design-thinking principles to generate and evaluate innovative solutions.
W11		Giving & Receiving Constructive Feedback	Deliver structured, constructive feedback and respond openly to feedback within a team.
W12	Leadership, Communication & Self-Management	Public Speaking & Presentation Skills	Deliver a clear, confident presentation to a live audience with structured messaging.
W13		Leadership Fundamentals & Ownership	Apply foundational leadership behaviors and take initiative on a team task or project.
W14		Client & Stakeholder Communication (Freelancing Etiquette)	Communicate professionally with clients and stakeholders, including freelance-specific etiquette and expectation-setting.
W15		Emotional Intelligence & Self-Management	Apply self-awareness and self-regulation techniques to manage stress and workplace relationships.
W16		Interview Skills & Personal Branding	Perform confidently in mock interviews and present a personal brand and portfolio narrative.

2. SPECIALIZATION DOMAIN

2.1. AI Engineering & Intelligent Automation

Python, Machine Learning & Deep Learning, Generative AI, LLMs, AI Agents & RAG

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- AI Engineer
- Machine Learning Engineer
- GenAI / LLM Application Developer
- AI Automation / Agent Developer
- AI Solutions Engineer

Tools & Technology Stack

Python	**scikit-learn**	**TensorFlow / PyTorch**	**Hugging Face Transformers**
OpenAI / Anthropic APIs	**LangChain / LangGraph**	**Vector DBs (Pinecone/pgvector)**	**n8n / Workflow Automation**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & AI Dev Environment Setup	Foundational Week (Week 1)
Foundations: Python & ML Fundamentals	Week 2-4
Deep Learning & Applied Model Building	Week 5-8
Generative AI, LLMs & Prompt Engineering	Week 9-11
AI Agents, RAG & Intelligent Automation	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework,

Python/AI environment and tooling setup (Anaconda, VS Code, Git/GitHub, Jupyter), and foundational professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: Intelligent AI Agent Platform

In Week 2 each trainee (or small team) scopes a real-world automation problem. Every subsequent week adds a working layer to the same platform a trained ML model, a deep learning component, an LLM-powered feature, a RAG knowledge base, and finally an autonomous AI agent that automates a multi-step workflow so the Week 16 capstone is the cumulative product of the entire course.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	Foundation Checkpoint: Cleaned dataset, baseline ML model and an approved automation problem statement.
Milestone 2	Week 11	Model & GenAI Checkpoint: Deep learning model plus an LLM-powered feature (prompted/fine-tuned) integrated and evaluated.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete AI agent with RAG and automated workflow, deployed and defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
W1 - Foundational Week	Program Orientation, Professional Skills & AI Development Environment Setup	Python, Anaconda/VS Code, Git/GitHub, Jupyter	Orient to the program structure, assessment model and cumulative project approach; set up a complete Python/AI development environment; and build the core professional skills (communication, collaboration, time management) needed for the course.	Verified dev environment + personal learning plan + initial project-theme brainstorm
W2	Python Fundamentals	Python, VS Code, Git/GitHub	Set up a professional AI dev environment and	Project kickoff: problem statement +

	for AI Engineering		write clean, modular Python.	Python utility scripts
	Data Handling with NumPy & Pandas	NumPy, Pandas	Manipulate arrays and DataFrames; clean and prepare real-world datasets.	Project dataset cleaned and structured
W3	Statistics & Math Foundations for ML	NumPy, SciPy, Matplotlib	Apply probability, statistics and linear algebra concepts used in ML.	EDA and statistical summary added to project
W4	Machine Learning Fundamentals	scikit-learn	Understand supervised learning; build and evaluate regression/classification models.	Baseline ML model for project problem
W5	Model Tuning & Ensemble Methods	scikit-learn, XGBoost, GridSearchCV	Improve model performance using ensembles and hyperparameter tuning.	**★ Milestone 1: Tuned ML model integrated into project**
W6	Neural Network Foundations	TensorFlow / PyTorch	Build and train a basic neural network from scratch.	Neural network component added to project
W7	Deep Learning for Vision & Structured Data	TensorFlow / PyTorch (CNNs)	Design and train deep networks appropriate to the project's data type.	Deep learning module trained on project data
W8	Deep Learning for Sequences & NLP Basics	TensorFlow / PyTorch (RNN/LSTM), Hugging Face	Build sequence models and use pretrained transformers for NLP tasks.	NLP/sequence component integrated into project
W9	Foundations of Generative AI & LLMs	OpenAI / Anthropic APIs, Hugging Face	Understand LLM architectures and call foundation models via API.	First LLM-powered feature prototyped

W10	Prompt Engineering & Fine-Tuning	OpenAI / Anthropic APIs, Hugging Face (LoRA/PEFT)	Design robust prompts and fine-tune/adapt models for a specific task.	LLM feature refined with prompt engineering/fine-tuning
W11	LLM Application Architecture	LangChain / LangGraph	Architect multi-step LLM applications using chains and graphs.	**★ Milestone 2: LLM application layer integrated into project**
W12	Retrieval-Augmented Generation (RAG)	LangChain, Vector DBs (Pinecone/pgvector)	Build a RAG pipeline for grounded, knowledge-based responses.	RAG knowledge base added to project
W13	AI Agents & Intelligent Automation	LangChain/LangGraph, n8n, APIs	Design autonomous agents that plan, call tools and automate workflows.	Autonomous agent workflow integrated into project
W14	Deployment & Monitoring of AI Systems	FastAPI, Docker	Package and deploy the AI platform as a production-ready API with monitoring.	Project deployed as a live API
W15	Capstone Refinement & Portfolio Prep	Full Stack (Python/AI)	Refine, test and document the completed platform; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full Stack (Python/AI)	Defend the completed AI agent platform before an evaluation panel; complete mock interviews.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 problem statement is the capstone: across 16 weeks, trainees build one continuous intelligent AI platform combining classical ML, deep learning, an LLM-powered feature, a RAG

knowledge base and an autonomous agent that automates a real workflow. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative project and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to AI Engineer, ML Engineer and GenAI/Agent Developer roles
- Mock technical interviews (ML fundamentals + LLM/agent design case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
DeepLearning.AI Machine Learning / Generative AI Specialization; Microsoft Certified: Azure AI Engineer Associate	**DeepLearning.AI / Microsoft**

** The certifying or issuing body may differ based on the specific certification selected.*

2.2 Full-Stack Development & AI Test Automation

TypeScript/JavaScript, React, Node.js, APIs, Databases & AI-Powered Test Automation

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- Full Stack Developer
- Frontend Developer (React / TypeScript)
- Backend Developer (Node.js)
- QA / Test Automation Engineer
- AI-Augmented SDET (Software Development Engineer in Test)

Tools & Technology Stack

TypeScript / JavaScript (ES6+)	**React**	**Node.js / Express**	**REST & GraphQL APIs**
SQL & NoSQL Databases	**Playwright / Cypress**	**AI-Assisted Test Generation**	**Git / CI/CD**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & Web Dev Environment Setup	Foundational Week (Week 1)
Foundations: TypeScript/JavaScript & Frontend	Week 2-4
React Engineering & API-Driven Frontends	Week 5-8
Backend Engineering, APIs & Databases	Week 9-11
Test Automation & AI-Powered QA	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, Node.js/TypeScript environment and tooling setup (VS Code, Git/GitHub, npm), and foundational

professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: AI-Tested Full-Stack Web Application

In Week 2 each trainee (or small team) scopes a single web product. Every subsequent week adds a working layer to that same codebase UI, React frontend, backend API, database and, starting mid-course, a parallel automated test suite (including AI-assisted test generation) that grows alongside the application, so the Week 16 capstone ships both the product and its full test automation framework.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	Frontend Foundation Checkpoint: Responsive TypeScript/React UI approved as the project foundation.
Milestone 2	Week 11	Full-Stack Checkpoint: Backend API and database integrated and functionally complete.
Milestone 3 (Final)	Week 16	Capstone Defense: Deployed application with full automated test suite (including AI-assisted tests), defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & Web Development Environment Setup	Node.js, VS Code, Git/GitHub, npm	Orient to the program structure, assessment model and cumulative project approach; set up a complete Node.js/TypeScript development environment; and build the core professional skills (communication, collaboration, time management) needed for the course.	Verified dev environment + personal learning plan + product-idea brainstorm

W2	Modern TypeScript/JavaScript (ES6+) Fundamentals	TypeScript, JavaScript/ES6+, Git/GitHub	Write modern, type-safe JavaScript/TypeScript with ES6+ features.	Project kickoff: product scope + TypeScript utility modules
	Responsive UI Fundamentals	HTML5, CSS3, TypeScript	Build responsive, well-structured interfaces.	Project UI shell built
W3	React Fundamentals	React, TypeScript	Build type-safe, component-based UIs using props, state and events.	Project UI rebuilt as React components
W4	Advanced React: Hooks & State Management	React, Context API/Redux	Manage complex application state using hooks and global state tools.	Project state management layer added
W5	API-Driven Frontend Development	React, REST APIs, fetch/Axios	Connect React frontends to live APIs with robust data-fetching patterns.	**★ Milestone 1: Project frontend wired to mock/live API**
W6	Component Testing & Frontend Quality	Jest, React Testing Library	Write unit and component tests for frontend code.	Frontend test suite started for project
W7	Node.js & Express Fundamentals	Node.js, Express, TypeScript	Design and build RESTful APIs with Node.js and Express.	Project backend API scaffolded
W8	GraphQL & API Design	GraphQL, REST	Design and consume both REST and GraphQL APIs.	Project API layer extended with GraphQL endpoint
W9	Databases: SQL & NoSQL	PostgreSQL, MongoDB	Design schemas and perform CRUD operations across relational and document databases.	Project connected to a database with CRUD

W10	Authentication, Authorization & Security	JWT, OAuth, Express	Implement secure authentication and role-based access control.	Project secured with authentication
W11	End-to-End Testing Fundamentals	Playwright / Cypress	Write end-to-end tests that exercise full user flows.	**★ Milestone 2: E2E test suite built for project**
W12	AI-Assisted Test Generation	Playwright/Cypress + AI test-generation tools, LLM APIs	Use AI tools to generate, expand and maintain test cases.	AI-generated test cases added to project suite
W13	Test Automation Strategy & CI Integration	GitHub Actions, Playwright/Cypress	Integrate automated tests into a CI pipeline with reporting.	CI pipeline running project's full test suite
W14	Performance, Accessibility & Monitoring	Lighthouse, axe, monitoring tools	Audit and improve performance, accessibility and reliability.	Project audited and optimized
W15	Capstone Refinement & Portfolio Prep	Full Stack + QA	Refine, document and finalize the application and its test suite; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full Stack + QA	Defend the completed application and test automation framework before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 product scope is the capstone: across 16 weeks, trainees build one continuous full-stack web application in TypeScript/React/Node.js, paired with a complete AI-assisted automated test suite wired into CI. In Week 16 both are formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative project (app + test suite) is packaged into a reviewable portfolio piece
- Resume workshop tailored to Full Stack Developer and QA/Test Automation Engineer roles
- Mock technical interviews (coding + test strategy case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
ISTQB Certified Tester Foundation Level; Meta Front-End Developer Professional Certificate	**ISTQB / Meta**

** The certifying or issuing body may differ based on the specific certification selected.*

2.3 Data Science & Data Engineering

Python, SQL, Statistics, Machine Learning, Data Pipelines, Big Data & Data Warehousing

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- Data Scientist
- Data Engineer
- Analytics Engineer
- Business Intelligence / Data Analyst
- ML-Focused Data Platform Engineer

Tools & Technology Stack

Python	**SQL / PostgreSQL**	**Pandas / NumPy**	**scikit-learn**
Statistics & Hypothesis Testing	**Apache Airflow**	**PySpark / Big Data**	**Cloud Data Warehousing (Snowflake/BigQuery)**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & Data Environment Setup	Foundational Week (Week 1)
Foundations: Python, SQL & Statistics	Week 2-4
Data Science & Machine Learning	Week 5-8
Data Pipelines & Data Engineering	Week 9-11
Big Data & Cloud Data Warehousing	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, Python/SQL environment and tooling setup (Anaconda, Git/GitHub, a SQL client), and foundational professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: End-to-End Data Science & Engineering Platform

In Week 2 each trainee (or small team) selects a dataset/domain and a business question. Every subsequent week adds a working layer to the same platform statistical analysis, predictive ML model, an automated data pipeline, and finally big-data processing with a cloud warehouse so the Week 16 capstone is a complete data product built from source data to decision-ready insight.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	Analysis Foundation Checkpoint: Cleaned dataset, statistical analysis and an approved business question.
Milestone 2	Week 11	ML & Pipeline Checkpoint: Predictive model and an automated ETL/orchestration pipeline integrated and tested.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete data platform with big-data processing and a cloud warehouse, defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & Data Environment Setup	Python, Anaconda, Git/GitHub, SQL client (pgAdmin/DBeaver)	Orient to the program structure, assessment model and cumulative project approach; set up a complete Python/SQL data environment; and build the core professional skills (communication, collaboration, time management) needed for the course.	Verified dev environment + personal learning plan + candidate dataset/domain brainstorm
W2	Python for Data Science & Engineering	Python, VS Code, Git/GitHub	Write clean, modular Python for data analysis and processing.	Project kickoff: business question + Python scripts

	SQL & Relational Databases	PostgreSQL	Design schemas and write advanced SQL queries.	Project source data modeled in PostgreSQL
W3	Data Wrangling with Pandas & NumPy	Pandas, NumPy	Clean, reshape and merge real-world datasets.	Project dataset cleaned and structured
W4	Statistics & Hypothesis Testing	SciPy, statsmodels	Apply descriptive/inferential statistics and hypothesis testing to data.	Statistical analysis report added to project
W5	Exploratory Data Analysis & Visualization	Matplotlib, Seaborn	Explore and visually communicate insights from the project dataset.	**★ Milestone 1: EDA report finalized for project**
W6	Machine Learning Fundamentals	scikit-learn	Build and evaluate regression and classification models.	Baseline predictive model for project
W7	Model Tuning & Feature Engineering	scikit-learn, GridSearchCV	Improve model performance through tuning and feature engineering.	Tuned predictive model integrated into project
W8	Data Modeling & ETL Fundamentals	PostgreSQL, Python	Design dimensional models and build a basic ETL pipeline.	ETL pipeline prototype added to project
W9	Workflow Orchestration with Airflow	Apache Airflow	Schedule, monitor and orchestrate multi-step data pipelines.	Project pipeline orchestrated with Airflow DAGs
W10	Data Quality, Validation & Testing	Great Expectations, Python	Implement automated data quality checks and validation rules.	Data validation suite added to project

W11	Big Data Fundamentals with PySpark	PySpark	Process large-scale datasets using distributed computing.	**★ Milestone 2: Project batch-processing job built in PySpark**
W12	Cloud Data Warehousing	Snowflake / BigQuery	Load, model and query data at scale in a cloud data warehouse.	Project data loaded into cloud warehouse
W13	Analytics Engineering & Dashboards	dbt, BI tools (Power BI/Tableau)	Transform warehouse data and build decision-ready dashboards.	Dashboard and transformation models added to project
W14	Pipeline Monitoring, Testing & CI/CD	Airflow, GitHub Actions	Implement production-grade pipeline monitoring, testing and CI/CD.	Project pipeline monitored and CI/CD-automated
W15	Capstone Refinement & Portfolio Prep	Full Stack (Data)	Refine, document and finalize the platform; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full Stack (Data)	Defend the completed data science & engineering platform before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 business question is the capstone: across 16 weeks, trainees build one continuous data platform from cleaned source data and a predictive ML model, through an orchestrated ETL pipeline, to big-data processing and a cloud warehouse with decision-ready dashboards. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative project and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to Data Scientist, Data Engineer and Analytics Engineer roles
- Mock technical interviews (SQL + ML + pipeline-design case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
Google Advanced Data Analytics Professional Certificate; Databricks Certified Data Engineer Associate	**Google / Databricks**

** The certifying or issuing body may differ based on the specific certification selected.*

2.4 Information Security & Ethical Hacking

Networking, Linux, Cybersecurity Fundamentals, Penetration Testing, SOC Operations & Web/API Security

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- Penetration Tester / Ethical Hacker
- SOC Analyst (Tier 1/2)
- Security Operations Engineer
- Application Security (AppSec) Engineer
- Information Security Analyst

Tools & Technology Stack

Networking (TCP/IP)	**Linux**	**Nmap / Wireshark**	**Metasploit / Burp Suite**
SIEM (Splunk/ELK)	**OWASP Top 10**	**Python Scripting**	**Kali Linux**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & Security Lab Setup	Foundational Week (Week 1)
Foundations: Networking & Linux	Week 2-4
Cybersecurity Fundamentals & Defensive Security (SOC)	Week 5-8
Offensive Security & Penetration Testing	Week 9-11
Web & API Security	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, security lab setup (Kali Linux, VirtualBox/VMware, Git/GitHub), and foundational professional skills including legal/ethical boundaries of security testing, communication and time management that support success across the course.

Cumulative Project: Security Assessment & Defense Portfolio

In Week 2 each trainee (or small team) sets up a personal lab environment and target scope. Every subsequent week adds a working layer to the same portfolio network reconnaissance, SOC detection rules, a full penetration test with report, and a web/API security assessment so the Week 16 capstone is a complete, professional-grade security engagement from recon to remediation.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	Foundation Checkpoint: Lab environment built, network topology mapped, and core Linux/networking skills demonstrated.
Milestone 2	Week 11	Offensive Security Checkpoint: A full penetration test executed against the lab target with findings documented.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete security assessment report (network + web/API) with remediation plan, defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & Security Lab Environment Setup	Kali Linux, VirtualBox/VMware, Git/GitHub	Orient to the program structure, assessment model and cumulative project approach; build a personal security lab (Kali Linux in a VM); and build the core professional skills (communication, collaboration, ethics and time management) needed for the course.	Verified lab environment + personal learning plan + target-scope brainstorm

W2	Networking Fundamentals (TCP/IP, OSI Model)	Wireshark, networking labs	Understand core networking protocols and traffic analysis.	Project kickoff: lab setup + network traffic capture
	Linux Fundamentals & Administration	Linux, Bash, Kali Linux	Navigate, administer and script in a Linux environment.	Lab environment hardened and documented
W3	Cybersecurity Fundamentals & Threat Landscape	Linux, OWASP resources	Understand core security principles, threat actors and attack types.	Threat model added to project
W4	Python Scripting for Security	Python	Write Python scripts to automate security tasks.	Security automation script added to project
W5	Network Reconnaissance & Scanning	Nmap	Perform network discovery and vulnerability scanning.	**★ Milestone 1: Network reconnaissance report for project target**
W6	SOC Fundamentals & SIEM	Splunk / ELK Stack	Monitor, detect and triage security events in a SIEM.	SOC detection rules configured for project
W7	Incident Detection & Response	SIEM, Linux log analysis	Investigate and respond to simulated security incidents.	Incident response runbook added to project
W8	Vulnerability Assessment	Nessus/OpenVAS, Nmap	Identify and prioritize vulnerabilities in a target environment.	Vulnerability assessment report for project
W9	Penetration Testing Fundamentals	Metasploit, Kali Linux	Understand the penetration testing methodology and	Initial exploitation attempt documented for project

			exploit basic vulnerabilities.	
W10	Advanced Exploitation & Privilege Escalation	Metasploit, Linux/Windows privilege escalation	Escalate privileges and move laterally within a target environment.	Privilege escalation chain documented for project
W11	Penetration Test Reporting	Reporting frameworks	Document findings in a professional penetration test report.	**★ Milestone 2: Full penetration test report completed**
W12	Web Application Security (OWASP Top 10)	Burp Suite, OWASP Top 10	Identify and exploit common web application vulnerabilities.	Web app security assessment added to project
W13	API Security	Burp Suite, Postman	Assess and secure REST/API endpoints against common attack vectors.	API security assessment added to project
W14	Security Hardening & Remediation Planning	Linux hardening, security baselines	Translate findings into a prioritized remediation plan.	Remediation plan added to project report
W15	Capstone Refinement & Portfolio Prep	Full Security Toolkit	Refine, document and finalize the assessment; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full Security Toolkit	Defend the completed security assessment before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 lab scope is the capstone: across 16 weeks, trainees build one continuous security assessment portfolio network reconnaissance, SOC detection and incident response, a full penetration

test, and a web/API security review culminating in a professional report with a remediation plan. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative security assessment and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to Penetration Tester, SOC Analyst and AppSec Engineer roles
- Mock technical interviews (security scenarios + report walkthroughs) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
CompTIA Security+; Certified Ethical Hacker (CEH)	**CompTIA / EC-Council**

** The certifying or issuing body may differ based on the specific certification selected.*

2.5 Emerging Technologies: IoT, Robotics, Drones, XR (AR/VR) & Game/Interactive Technologies

Embedded Systems & IoT, Robotics, Drones, Computer Vision, XR (AR/VR) & Game Development

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- IoT / Embedded Systems Developer
- Robotics Engineer (Entry-Level)
- Drone Software / Firmware Developer
- XR (AR/VR) Developer
- Game / Interactive Technology Developer

Tools & Technology Stack

Arduino / Raspberry Pi	**C/C++ & Python**	**Sensors & Actuators**	**ROS (Robot Operating System)**
Computer Vision (OpenCV)	**Drone Flight Controllers (PX4/ArduPilot)**	**Unity / Unreal Engine**	**AR/VR SDKs (ARCore/ARKit, OpenXR)**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & Multi-Domain Toolchain Setup	Foundational Week (Week 1)
Foundations: Embedded Systems & IoT	Week 2-4
Robotics & Computer Vision	Week 5-7
Drones & Autonomous Systems	Week 8-9
XR (AR/VR) & Game/Interactive Development	Week 10-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, toolchain setup spanning embedded systems (Arduino IDE), robotics/computer vision (Python/OpenCV) and XR/game development (Unity Hub), and foundational professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: Connected Interactive & Autonomous Systems Showcase

In Week 2 each trainee (or small team) scopes a unifying theme (e.g., a smart-environment concept) that will be realized across all five emerging-tech areas. Every subsequent week adds a working piece to the same showcase an IoT sensor node, a robotics/vision component, a drone/autonomous behavior, and an XR or interactive game experience that visualizes or controls the physical system so the Week 16 capstone is one integrated, multi-domain showcase rather than five disconnected demos.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	IoT Foundation Checkpoint: Working embedded/IoT sensor node with data collection, approved as the project's physical foundation.
Milestone 2	Week 11	Robotics & Autonomy Checkpoint: Robotics/computer-vision component and a drone or autonomous behavior integrated and demonstrated.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete multi-domain showcase with an XR/game interface controlling or visualizing the physical system, defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & Multi-Domain Toolchain Setup	Arduino IDE, Unity Hub, Python, Git/GitHub	Orient to the program structure, assessment model and cumulative project approach; set up embedded (Arduino IDE), robotics/CV (Python) and XR/game (Unity	Verified multi-domain toolchain + personal learning plan + showcase-theme brainstorm

			Hub) toolchains; and build the core professional skills (communication, collaboration, time management) needed for the course.	
W2	Embedded Systems Fundamentals	Arduino / Raspberry Pi, C/C++	Set up a dev environment and program basic embedded I/O.	Project kickoff: showcase theme + first embedded sketch
	Sensors & Actuators	Arduino/Raspberry Pi, sensors (temp/motion/light), actuators	Interface sensors and actuators to collect and act on real-world data.	Sensor node built and collecting data for project
W3	IoT Connectivity & Protocols	Wi-Fi/MQTT, Raspberry Pi	Connect embedded devices to a network and publish data via MQTT.	Project sensor data published over MQTT
W4	IoT Dashboards & Cloud Integration	Node-RED / cloud IoT dashboard, Python	Visualize and store IoT data in a simple cloud/local dashboard.	**★ Milestone 1: IoT dashboard added to project**
W5	Robotics Fundamentals & ROS Basics	ROS (Robot Operating System), Python	Understand robotic system architecture and basic ROS nodes/topics.	Basic robot control node built for project
W6	Computer Vision Fundamentals	OpenCV, Python	Process images/video and detect objects or features.	Computer vision module added to project

W7	Robot Perception & Motion	ROS, OpenCV	Combine perception and motion control for simple robotic behaviors.	Vision-guided robot behavior integrated into project
W8	Drone Fundamentals & Flight Control	PX4 / ArduPilot, flight simulator	Understand drone flight control systems and basic mission planning.	Simulated drone mission scripted for project
W9	Autonomous Drone Behaviors	PX4/ArduPilot, Python (MAVSDK)	Program autonomous waypoint/behavior scripts for a drone.	**★ Milestone 2: Autonomous drone behavior integrated into project**
W10	XR Fundamentals: AR Development	Unity, AR Foundation/ARCore/ARKit	Build a basic augmented reality experience.	AR prototype visualizing project data
W11	XR Fundamentals: VR Development	Unity, OpenXR	Build a basic virtual reality experience with interaction.	VR prototype added to project
W12	Game Development Fundamentals	Unity / Unreal Engine, C#	Build core game mechanics, scenes and interactivity.	Interactive scene/game layer built for project
W13	Interactive Systems Integration	Unity, MQTT/APIs	Connect the XR/game layer to live IoT/robotics data for real-time interaction.	XR/game interface connected to live project data
W14	System Integration & Testing	Full Stack (Embedded + XR/Game)	Integrate and test all subsystems as one working showcase.	End-to-end project integration tested

W15	Capstone Refinement & Portfolio Prep	Full Stack (Embedded + XR/Game)	Refine, document and finalize the showcase; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full Stack (Embedded + XR/Game)	Defend the completed multi-domain showcase before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 showcase theme is the capstone: across 16 weeks, trainees build one continuous, integrated system spanning an IoT sensor node, a robotics/computer-vision component, an autonomous drone behavior, and an XR or interactive game interface that visualizes or controls it. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative multi-domain showcase and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to IoT, Robotics, Drone and XR/Game Developer roles
- Mock technical interviews (embedded systems + XR/game design case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
Unity Certified Associate: Game Developer; AWS IoT Core / Cisco IoT Fundamentals	**Unity / AWS or Cisco**

** The certifying or issuing body may differ based on the specific certification selected.*

2.6 DevOps Engineering

Linux, Cloud Platforms, Containers, Kubernetes, CI/CD, Infrastructure as Code & Observability

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- DevOps Engineer
- Site Reliability Engineer (SRE)
- Cloud Infrastructure Engineer
- Platform Engineer
- Build & Release / CI-CD Engineer

Tools & Technology Stack

Linux	**AWS / Azure / GCP**	**Docker**	**Kubernetes**
Terraform / IaC	**Jenkins / GitHub Actions**	**Ansible**	**Prometheus / Grafana**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & Cloud/Linux Environment Setup	Foundational Week (Week 1)
Foundations: Linux, Scripting & Networking	Week 2-4
Cloud Platforms & Infrastructure as Code	Week 5-8
Containers & Kubernetes	Week 9-11
CI/CD & Observability	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, Linux and cloud environment setup (Git/GitHub, an AWS/Azure/GCP free-tier account), and foundational professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: Cloud-Native CI/CD Platform

In Week 2 each trainee (or small team) scopes a sample application and target cloud environment. Every subsequent week adds a working layer to the same platform provisioned cloud infrastructure as code, a containerized deployment, a Kubernetes-orchestrated service, a full CI/CD pipeline, and an observability stack so the Week 16 capstone is a complete, production-style DevOps platform.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	Infrastructure Foundation Checkpoint: Cloud environment provisioned via Infrastructure as Code, approved as the project foundation.
Milestone 2	Week 11	Containerization & Orchestration Checkpoint: Application containerized and deployed on Kubernetes.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete CI/CD platform with observability stack, defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & Cloud/Linux Environment Setup	Linux VM, Git/GitHub, Cloud free-tier account (AWS/Azure/GCP)	Orient to the program structure, assessment model and cumulative project approach; set up a Linux working environment and a cloud free-tier account; and build the core professional skills (communication, collaboration, time management) needed for the course.	Verified Linux/cloud environment + personal learning plan + target-application brainstorm

W2	Linux Fundamentals & Shell Scripting	Linux, Bash, Git/GitHub	Navigate, administer and script in a Linux environment.	Project kickoff: scope + Linux/Bash automation scripts
	Networking & System Administration	Linux networking, SSH	Configure networking, users and services on Linux servers.	Project base server configured and documented
W3	Version Control & Collaboration Workflows	Git, GitHub	Apply branching strategies and collaborative Git workflows.	Project repository structured with branching strategy
W4	Cloud Fundamentals	AWS / Azure / GCP	Understand core cloud services: compute, storage, networking, IAM.	Project cloud account/environment set up
W5	Infrastructure as Code with Terraform	Terraform	Provision cloud infrastructure declaratively and repeatably.	★ **Milestone 1: Project infrastructure provisioned via Terraform**
W6	Configuration Management with Ansible	Ansible	Automate server configuration and application deployment.	Project configuration automated with Ansible
W7	Cloud Networking & Security	AWS/Azure/GCP (VPC, IAM, Security Groups)	Design secure cloud network architecture and access controls.	Project network/security architecture documented
W8	Docker & Containerization	Docker	Containerize applications and manage images/registries.	Project application containerized with Docker
W9	Kubernetes Fundamentals	Kubernetes	Deploy and manage containerized	Project deployed to a Kubernetes cluster

			workloads on Kubernetes.	
W10	Kubernetes Networking, Scaling & Storage	Kubernetes (Services, Ingress, HPA, PV)	Configure networking, autoscaling and persistent storage in Kubernetes.	Project Kubernetes deployment hardened and scaled
W11	Helm & Kubernetes Application Management	Helm, Kubernetes	Package and manage Kubernetes applications with Helm charts.	**★ Milestone 2: Project packaged as a Helm chart**
W12	CI/CD Pipelines	Jenkins / GitHub Actions	Build automated build-test-deploy pipelines.	CI/CD pipeline wired to project repo
W13	Observability: Monitoring, Logging & Alerting	Prometheus, Grafana, ELK/Loki	Instrument systems with metrics, logs and alerts.	Observability stack added to project
W14	Reliability, Cost & Security Best Practices	Cloud cost tools, security scanning	Apply SRE, cost-optimization and DevSecOps best practices.	Project reliability/cost/security review completed
W15	Capstone Refinement & Portfolio Prep	Full DevOps Toolkit	Refine, document and finalize the platform; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full DevOps Toolkit	Defend the completed CI/CD platform before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 scope is the capstone: across 16 weeks, trainees build one continuous cloud-native platform infrastructure provisioned as code, a containerized application orchestrated on Kubernetes, a full CI/CD

pipeline, and an observability stack for monitoring, logging and alerting. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative project and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to DevOps Engineer, SRE and Cloud/Platform Engineer roles
- Mock technical interviews (infrastructure design + troubleshooting case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**
Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
AWS Certified DevOps Engineer – Professional; Certified Kubernetes Administrator (CKA)	**AWS / CNCF**

** The certifying or issuing body may differ based on the specific certification selected.*

2.7 GPU Infrastructure Engineer

GPU Computing, AI Infrastructure, CUDA, Containers, Kubernetes & GPU Cluster Operations

Duration & Schedule: 4 Months (16 Weeks)

Career Outcomes

- GPU Infrastructure Engineer
- AI Infrastructure / MLOps Engineer
- HPC (High-Performance Computing) Systems Engineer
- Cloud GPU Platform Engineer
- ML Platform / Cluster Reliability Engineer

Tools & Technology Stack

Linux Systems Administration	**NVIDIA CUDA / GPU Drivers**	**Docker / NVIDIA Container Toolkit**	**Kubernetes + NVIDIA GPU Operator**
Slurm (HPC Scheduling)	**Distributed Training (NCCL/Horovod)**	**Cloud GPU Platforms (AWS/Azure/GCP)**	**GPU Monitoring (DCGM/Prometheus/Grafana)**

Program Phases

Program Phase	Weeks
Course Foundational Week: Orientation & GPU/Cloud Environment Setup	Foundational Week (Week 1)
Foundations: Linux & GPU Computing Basics	Week 2-4
CUDA, Drivers & GPU Workload Containerization	Week 5-8
Kubernetes for GPU Workloads & Cluster Orchestration	Week 9-11
Distributed Training, Monitoring & Cluster Operations	Week 12-13
Capstone Project	Week 14-16

Course Foundational Week

Before domain-specific instruction begins, every trainee completes a common Course Foundational Week: program orientation and expectations, the assessment and employability-band framework, Linux and cloud GPU environment setup (Git/GitHub, an AWS/Azure/GCP GPU account), and foundational

professional skills communication, collaboration and time management that support success across the course.

Cumulative Project: Production GPU Cluster for AI Workloads

In Week 2 each trainee (or small team) scopes a target AI workload (e.g., a model training/inference job) and a cluster environment. Every subsequent week adds a working layer to the same platform a configured GPU node with drivers/CUDA, a containerized GPU workload, a Kubernetes cluster with GPU scheduling, and distributed training with monitoring so the Week 16 capstone is a complete, production-style GPU infrastructure platform.

Checkpoint	Week	Checkpoint Focus
Milestone 1	Week 5	GPU Node Foundation Checkpoint: GPU drivers, CUDA toolkit and a working containerized GPU workload, approved as the project foundation.
Milestone 2	Week 11	Cluster Orchestration Checkpoint: Kubernetes cluster with GPU scheduling (NVIDIA GPU Operator) running the project's workload.
Milestone 3 (Final)	Week 16	Capstone Defense: Complete GPU cluster running a distributed training job with full monitoring, defended before the evaluation panel.

Week-by-Week Curriculum

Week	Topic / Focus (Theory)	Tools & Technologies (Hands-On Lab)	Learning Outcome	Cumulative Project Contribution
Foundational Week (W1)	Program Orientation, Professional Skills & GPU/Cloud Environment Setup	Linux, Git/GitHub, Cloud GPU account (AWS/Azure/GCP)	Orient to the program structure, assessment model and cumulative project approach; set up a Linux environment and a cloud GPU account; and build the core professional	Verified Linux/cloud-GPU environment + personal learning plan + target-workload brainstorm

			skills (communication, collaboration, time management) needed for the course.	
W2	Linux Systems Administration for Infrastructure	Linux, Bash, Git/GitHub	Administer and script Linux systems for infrastructure work.	Project kickoff: workload scope + Linux base setup
	GPU Computing Fundamentals	NVIDIA GPUs, nvidia-smi	Understand GPU architecture and how it accelerates AI workloads.	GPU node inventory/profile documented for project
W3	GPU Drivers & CUDA Toolkit Installation	NVIDIA drivers, CUDA Toolkit	Install and validate GPU drivers and the CUDA toolkit.	Project GPU node configured with drivers/CUDA
W4	Introduction to CUDA Programming	CUDA, C/C++	Write and run basic CUDA kernels to understand GPU compute.	Basic CUDA workload benchmarked for project
W5	Containerizing GPU Workloads	Docker, NVIDIA Container Toolkit	Build and run GPU-accelerated containers.	**★ Milestone 1: Project AI workload containerized with GPU support**
W6	AI Framework Setup on GPU (PyTorch/TensorFlow)	PyTorch / TensorFlow, CUDA	Configure and validate GPU-accelerated ML framework environments.	Project training/inference job running on GPU

W7	Cloud GPU Platforms	AWS / Azure / GCP GPU instances	Provision and manage GPU instances in the cloud.	Project workload deployed to a cloud GPU instance
W8	Storage & Networking for AI Infrastructure	High-throughput storage, networking basics	Design storage and networking for data-intensive GPU workloads.	Project storage/networking architecture documented
W9	Kubernetes Fundamentals for Infrastructure Engineers	Kubernetes	Deploy and manage containerized workloads on Kubernetes.	Project workload deployed to a Kubernetes cluster
W10	GPU Scheduling in Kubernetes	NVIDIA GPU Operator, Kubernetes	Enable and schedule GPU resources within Kubernetes.	Project Kubernetes cluster configured for GPU scheduling
W11	HPC Job Scheduling with Slurm	Slurm	Schedule and manage batch GPU jobs using Slurm.	**★ Milestone 2: Project batch job scheduled via Slurm**
W12	Distributed Training Fundamentals	NCCL / Horovod, PyTorch/TensorFlow	Configure multi-GPU/multi-node distributed training.	Distributed training job running for project
W13	GPU Cluster Monitoring & Observability	NVIDIA DCGM, Prometheus, Grafana	Instrument GPU clusters with metrics, dashboards and alerts.	Monitoring/observability stack added to project cluster
W14	Cluster Reliability, Cost & Security	Cloud cost tools, Kubernetes RBAC	Apply reliability, cost-optimization and security best	Project reliability/cost/security review completed

			practices to GPU clusters.	
W15	Capstone Refinement & Portfolio Prep	Full GPU Infrastructure Toolkit	Refine, document and finalize the cluster platform; prepare portfolio and Resume.	Finalized capstone + portfolio/Resume draft
W16	Capstone Defense & Demo Day	Full GPU Infrastructure Toolkit	Defend the completed GPU cluster platform before an evaluation panel.	**★ Milestone 3 (Final): Capstone defense + live demo**

Capstone Presentation & Career Readiness

The Week 2 workload scope is the capstone: across 16 weeks, trainees build one continuous GPU infrastructure platform a configured and containerized GPU node, a Kubernetes cluster with GPU scheduling, a scheduled batch job, and a distributed training run with full monitoring. In Week 16 it is formally defended before a panel of industry reviewers.

- Portfolio development: the cumulative project and its milestone checkpoints are packaged into a reviewable portfolio piece
- Resume workshop tailored to GPU Infrastructure Engineer, AI Infrastructure/MLOps and HPC roles
- Mock technical interviews (systems design + cluster troubleshooting case studies) with structured feedback
- Capstone defense before an evaluation panel of industry reviewers

Assessment & Completion Criteria

Assessment Component	Weight
Weekly graded labs & quizzes	**30%**
Module projects	**30%**
Capstone project & demo	**30%**

Professional presentation & code review	**10%**

Weekly quizzes, assignments and mini-project checkpoints feed a single cumulative score, which determines the trainee's employability band under Section 6.

Learners who meet all assessment thresholds, pass the milestone checkpoints and successfully defend the capstone before the evaluation panel receive a Certificate of Completion for the track, alongside a portfolio-ready capstone deliverable, Resume and interview-ready profile suitable for job applications.

Proposed Certification & Issuing Body

Proposed Certification	* Issuing Body
NVIDIA Certified Associate: AI Infrastructure and Operations; Certified Kubernetes Administrator (CKA)	**NVIDIA / CNCF**

** The certifying or issuing body may differ based on the specific certification selected.*