Università degli Studi di Udine

NUCLEO DI VALUTAZIONE D'ATENEO

Verbale riunione di mercoledì 4 giugno 2025

All'apertura dei lavori risultano:

Componenti		**Presente**	**Assente giustificato**	**Assente**
Coordinatore	Prof. Mario MINOJA	X		
Componenti	Prof. Michele BUGLIESI	X		
	Dr.ssa Alice CHIARUTTINI	X		
	Prof. Simone FURLANI	X		
	Dr.ssa Emanuela REALE	X		
	Dr. Marco RUCCI	X		
	Prof. Zeno VARANINI	X		

Coordina i lavori il prof. Mario Minoja, Coordinatore del Nucleo di Valutazione, ed esercita le funzioni di Segretario verbalizzante il prof. Simone Furlani. Il numero legale per la validità della seduta è di n. 4 componenti effettivi. La partecipazione alla riunione avviene in modalità videoconferenza (Teams).
Il prof. Minoja, verificata la presenza del numero legale, dichiara aperta la riunione alle ore 8.30 coadiuvato dal dr. Mauro Volponi, Responsabile della Direzione Pianificazione, controllo e valutazione (DIPC), ovvero la Struttura Tecnica Permanente per la misurazione della performance (STP) secondo quanto previsto dall'art. 14, commi 9 e 10, del D.Lgs. n. 150/2009 e ss.mm.ii, e dal dr. Biffi e dal dr. Gianpiero Bruno, anch'essi della DIPC.

Il Coordinatore dà, quindi, lettura dei punti dell'ordine del giorno, inviato in data 28 maggio 2025, che sono i seguenti:

1. Comunicazioni del Coordinatore.
2. Approvazione del verbale della seduta del Nucleo di Valutazione di mercoledì 21 maggio 2025.
3. Approvazione preliminare, come previsto dalle Linee guida per le proposte di corsi di studio di nuova istituzione e di revisione sostanziale dei corsi già accreditati, sul progetto di massima del corso di laurea magistrale di nuova istituzione in High performance computing and quantum (LM Data).
4. Stato dell'arte audizioni Dipartimenti calendarizzate per il 18 giugno 2025.
5. Varie ed eventuali.

Università degli Studi di Udine

NUCLEO DI VALUTAZIONE D'ATENEO

1. *Comunicazioni del Coordinatore*.

   Il Coordinatore rende nota la seguente comunicazione:

   - ✓ mercoledì 28 maggio e martedì 3 giugno 2025 hanno avuto luogo le previste riunioni della sezione didattica e della sezione ricerca del Nucleo di Valutazione nel corso delle quali è stata sviluppata un'analisi delle informazioni disponibili e utili alla gestione delle audizioni dei Dipartimenti. Con il supporto della DIPC, è stata anche effettuata un'analisi di alcuni indicatori sulla Didattica e sulla Ricerca disponibili nel Cruscotto direzionale.

2. *Approvazione del verbale della seduta del Nucleo di Valutazione di mercoledì 21 maggio 2025.*

   Il verbale, già caricato nella sezione riservata del Nucleo di Valutazione, viene approvato all'unanimità.

3. *Approvazione preliminare, come previsto dalle Linee guida per le proposte di corsi di studio di nuova istituzione e di revisione sostanziale dei corsi già accreditati, sul progetto di massima del corso di laurea magistrale di nuova istituzione in High performance computing and quantum (LM Data).*

   Il prof. Minoja introduce il punto all'Ordine del giorno e ricorda ai Componenti che, in base a quanto previsto dalle Linee guida per le proposte di corsi di studio di nuova istituzione e di revisione sostanziale dei corsi già accreditati, il 15 maggio u.s. il Presidio della Qualità ha inviato al Nucleo di Valutazione il progetto di massima inerente alla proposta di nuova istituzione di un corso di studio in High performance computing and quantum (LM Data), trasmessa dal Dipartimento di Scienze matematiche, informatiche e fisiche (DMIF). L'istituzione di tale corso di studi, in lingua inglese e in partnership con diverse università e istituzioni internazionali, è in ogni caso subordinata all'ottenimento del finanziamento da parte dell'Unione Europea.

   Il Coordinatore illustra i lavori svolti dai Componenti della Sezione Didattica del NdV nella riunione istruttoria del 28 maggio 2025. Presenta il progetto di massima pervenuto al Nucleo, unitamente alla documentazione a corredo dello stesso, e le riflessioni in merito maturate dalla Sezione medesima e recepite nella prima bozza di parere del NdV, già caricata sulla piattaforma dedicata. Il prof. Minoja lascia quindi la parola al prof. Bugliesi, membro della Sezione Didattica, che illustra nel dettaglio alcune proposte di integrazione alla prima bozza di parere del Nucleo.

   Al termine dell'intervento del prof. Bugliesi e del confronto che segue tra i presenti, il Nucleo approva il parere preliminare (cfr. Allegato n. 1 al presente verbale) richiesto dalle succitate Linee guida e dà mandato al prof. Minoja e al prof. Bugliesi di perfezionare il parere alla luce delle osservazioni emerse nel corso del confronto, prima di trasmetterlo al Magnifico Rettore, al Delegato per la Didattica e al Coordinatore del Presidio della Qualità.

4. *Stato dell'arte audizioni Dipartimenti calendarizzate per il 18 giugno 2025.*

   Il prof. Minoja presenta il punto all'Ordine del giorno e conferma ai Componenti che, in occasione della riunione del Nucleo di Valutazione in calendario per il 18 giugno p.v., che vedrà la partecipazione in presenza di tutti i Componenti del Nucleo, avranno luogo le audizioni, con la partecipazione del Coordinatore del Presidio della Qualità (PQA), del Dipartimento Politecnico di Ingegneria e architettura (DPIA) (ore 9.00) e del Dipartimento di Scienze Giuridiche (DISG) (ore 14.30).

   L'audizione del Dipartimento di Studi Umanistici e del Patrimonio Culturale (DIUM), invece, è stata calendarizzata per il mattino di martedì 9 settembre 2025.

   Come stabilito nel corso della riunione del NdV del 21 maggio u.s., il prof. Minoja ha anticipato via e-mail ai direttori dei dipartimenti che saranno oggetto di audizione una scaletta di massima degli argomenti che saranno trattati e delle persone da intervistare, specificando che il Nucleo si accosta alle audizioni con spirito di ascolto, supporto e collaborazione, con l'intento di offrire il proprio contributo nel processo di miglioramento della qualità a beneficio degli studenti e di tutti gli stakeholder. Il prof. Gasparetto, direttore del DPIA, ha risposto all'email inviando una proposta di scaletta degli interventi per la mattina del 18 giugno, che è in linea con le indicazioni fornite dal Nucleo.

   Il Nucleo prende atto e conferma la calendarizzazione delle audizioni programmate. Di seguito, interviene il dr. Volponi per precisare che i singoli componenti del NdV verranno contattati per provvedere alle questioni logistiche legate alla loro partecipazione in presenza in occasione delle audizioni del 18 giugno.

5. *Varie ed eventuali*.

   Non risultano temi da trattare in relazione a questo punto dell'ordine del giorno.

Non essendoci ulteriori argomenti da affrontare, la riunione si conclude alle ore 9.10.

IL SEGRETARIO VERBALIZZANTE
F.to Prof. Simone Furlani

IL COORDINATORE DEL NUCLEO DI VALUTAZIONE
F.to Prof. Mario Minoja

Allegato n. 1 al verbale della riunione del Nucleo di Valutazione del 4 giugno 2025

UNIVERSITÀ DEGLI STUDI DI UDINE
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NUCLEO DI VALUTAZIONE

PARERE PRELIMINARE SUL PROGETTO DI MASSIMA DI NUOVA ISTITUZIONE DEL CORSO DI LAUREA MAGISTRALE IN HIGH PERFORMANCE COMPUTING AND QUANTUM LM DATA A.A. 2026/2027

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4 giugno 2025

Direzione Pianificazione, controllo e valutazione (DIPC)

Il Nucleo di Valutazione dell'Università degli Studi di Udine, di cui al Decreto Rettorale n. 1119 del 31 ottobre 2024, è composto come di seguito:

Coordinatore
Prof. Mario MINOJA - componente interno

Sezione didattica
Prof. Michele BUGLIESI - componente esterno
Dr.ssa Alice CHIARUTTINI - rappresentante degli studenti
Prof. Simone FURLANI - componente interno

Sezione ricerca
Dr.ssa Emanuela REALE - componente esterno
Prof. Zeno VARANINI - componente esterno

Sezione amministrazione
Dr. Marco RUCCI - componente esterno

Ufficio di supporto al Nucleo di Valutazione ex lege 370/99: Direzione Pianificazione, controllo e valutazione (DIPC).
Tel ++39 0432 556290-6294; fax ++39 0432 556293; e-mail dipc@uniud.it
Sito Nucleo di Valutazione: https://nuva.uniud.it/

INDICE

1 INTRODUZIONE

A partire dall'anno accademico 2021-2022 l'Università degli Studi di Udine si è dotata, per il tramite del Presidio della Qualità (PQA), di specifiche Linee guida per le proposte di corsi di studio di nuova istituzione e di revisione sostanziale dei corsi già accreditati. Tali Linee guida prevedono una prima fase in cui i Dipartimenti dell'Ateneo interessati a proporre la nuova istituzione di un corso di studio, predispongono, sulla base di un *template standard*, un progetto di massima da trasmettere al Presidio della Qualità e, tramite questi, al Nucleo di Valutazione e agli Organi di Governo dell'Ateneo. A sua volta, il Nucleo di Valutazione procede a un'analisi dei progetti di massima di nuova istituzione di corsi di studio ricevuti e predispone le proprie osservazioni al riguardo confezionando un parere preliminare da trasmettere agli Organi di Governo al fine di supportarli nel decidere quali proposte possano passare alla fase di progettazione di dettaglio.

Tale prima fase è, dunque, funzionale a quella successiva in cui, a fronte della ricezione dei progetti di dettaglio, come previsto dalla normativa di riferimento per la nuova istituzione di un corso di studio, *ex* art. 8 comma 4 del D.Lgs. 19/2012, il Nucleo di Valutazione verifica preliminarmente se l'istituendo corso sia in linea con gli indicatori di accreditamento iniziale definiti dall'ANVUR e, in caso di esito positivo, redige una relazione tecnico-illustrativa da inserirsi nel sistema informativo e statistico del Ministero.

Nello specifico dell'Università degli Studi di Udine, il parere preliminare in oggetto riguarda il corso di laurea magistrale in High performance computing and quantum (LM Data), in lingua inglese, proposto dal Dipartimento di Scienze matematiche, informatiche e fisiche (DMIF) e che prevede il coinvolgimento di altre sette sedi universitarie. L'Ateneo di Udine sarebbe l'unico partner italiano.

Il Nucleo di Valutazione ha analizzato la documentazione, ricevuta per il tramite del Presidio della Qualità dal DMIF in data 15 maggio 2025, inerente all'istituendo corso in oggetto e consistente in:

- ✓ il documento di progettazione di massima del CdS, redatto secondo il *template standard* predisposto dal PQA;
- ✓ il documento inerente allo stato attuale della proposta per la partecipazione alla Call EU in scadenza il 27 maggio u.s.;
- ✓ la Letter of committment a firma del Magnifico Rettore dell'Ateneo di Udine.

Le sezioni che compongono il *template* che i Dipartimenti devono utilizzare per la redazione del progetto di massima, i cui contenuti il Nucleo ha analizzato, sono quelle di seguito indicate:

1. Breve descrizione del progetto formativo e delle motivazioni che lo hanno ispirato.
2. Analisi della domanda di formazione e degli sbocchi occupazionali.
3. Descrizione del progetto formativo: profili professionali e obiettivi formativi specifici.
4. Coerenza della proposta con obiettivi e offerta formativa della struttura proponente. Analisi delle iniziative concorrenti.
5. Valutazione della disponibilità di risorse da parte della struttura proponente.

2 ANALISI DELLE SEZIONI DEL *TEMPLATE*

2.1 Breve descrizione del progetto formativo e delle motivazioni che lo hanno ispirato

Per la compilazione di questa sezione, nelle Linee Guida citate si chiede al Dipartimento di fornire una breve descrizione del progetto formativo. Gli elementi da considerare sono:

- ✓ motivazioni che hanno portato alla proposta del nuovo corso di studio;
- ✓ caratteri distintivi del nuovo corso di studio;
- ✓ profili professionali e obiettivi formativi del corso di studio;
- ✓ principali sbocchi occupazionali per i laureati e collegamenti con i livelli successivi di formazione universitaria.

Osservazioni del Nucleo di Valutazione

A valle dell'analisi dei contenuti proposti dal Dipartimento di Scienze matematiche, informatiche e fisiche nella sezione in oggetto, il Nucleo di Valutazione li ritiene sostanzialmente adeguati, ancorché ravvisi l'opportunità di una revisione volta a precisare alcuni aspetti relativi al progetto formativo, alla scelta della classe di laurea e ai profili professionali e agli sbocci occupazionali.

Progetto formativo: il progetto complessivo, HPC Europe, prevede un'articolazione degli studi in cui al primo anno le home institutions offrono ai propri studenti una formazione specifica in "*core HPC architectures, system modeling and foundational algorithmic principles*", mentre al secondo anno una formazione specialistica nelle diverse aree associate ad HPC, incluse AI e Quantum Computing. Questo suggerisce di enfatizzare in modo più chiaro le competenze del Dipartimento relativamente ad HPC rispetto a quanto dichiarato al primo punto della sezione **Caratteri Distintivi**.

Classe di Laurea: La classe di Laurea LM-DATA appare coerente con la specializzazione dichiarata da UNIUD in AI, ma non con i profili professionali dichiarati, tutti relativi a HPC e Quantum. In generale, non è in linea con quanto dichiarato in più parti, laddove si dice che il corso di studio è concepito per "formare specialisti in HPC, con un focus avanzato *anche* su tecniche di AI e Computazione Quantistica". Lo stesso titolo enfatizza aspetti di formazione che, per quanto certamente connessi all'area della Data Science, non ne costituiscono i temi centrali. Si suggerisce pertanto di affinare la presentazione, fornendo maggiori elementi di raccordo tra le tematiche HPC e Data Science, già a partire dal titolo del Corso di Studi (e.g. HPC e Quantum for Data Science).

Profili Professionali: Nel paragrafo sulle motivazioni si dichiara che "il progetto selezionato dovrà formare specialisti in HPC (*High Performance Computing, n.d.r.*)" e che "Il programma sarà adattato per rispondere alle esigenze dell'industria e del mercato del lavoro". Nel paragrafo sui profili professionali due profili dei tre delineati sono di ricercatori – tant'è che poi si riconosce che "queste figure necessitano presumibilmente di proseguire gli studi con un Dottorato di Ricerca" – mentre il terzo è costituito da "Sviluppatori di software per HPC". Anche se i profili professionali sono indicati in modo più dettagliato nella sezione 3, già in questa prima sezione si potrebbero specificare meglio i profili professionali che il corso intende formare diversi da quelli dei

ricercatori, nonché in quali tipi di aziende e per quali ruoli i futuri laureati potranno essere maggiormente richiesti e valorizzati.
Il Nucleo suggerisce infine di presentare i dottorati di ricerca come opportunità anziché come necessità una volta conseguita la laurea magistrale oggetto di proposta.

2.2 Analisi della domanda di formazione e degli sbocchi occupazionali

Per la compilazione di questa sezione, nelle Linee Guida citate si chiede al Dipartimento di considerare i seguenti elementi:

- ✓ fabbisogni formativi cui il corso di studio intende rispondere;
- ✓ sbocchi occupazionali dei laureati e collegamenti con i livelli successivi di formazione universitaria.

Inoltre, nella compilazione della sezione, si chiede di illustrare l'analisi condotta dando evidenza del coinvolgimento dei diversi portatori di interessi. Il coinvolgimento può avvenire tramite contatti diretti o per mezzo dell'analisi di studi di settore o altra documentazione ritenuta rilevante. Dare evidenza del contributo dei portatori di interessi nel definire la proposta del nuovo corso di studi. Nel caso di contatti diretti è utile tenere nota degli incontri, eventualmente allegando la documentazione.
Infine, si chiede di indicare, anche ricorrendo a informazioni su iniziative formative simili, la numerosità attesa degli iscritti.

Osservazioni del Nucleo di Valutazione

Il Nucleo di Valutazione ritiene che i contenuti presentati in questa sezione contribuiscano a delineare con chiarezza il ruolo dell'Università di Udine all'interno del progetto, mettendo in rilievo le significative competenze utili ai fini della sua realizzazione e già presenti *in primis* all'interno del DMIF ma anche in altri dipartimenti. Il Nucleo suggerisce, in vista della messa a punto del progetto di dettaglio, di specificare come sarà strutturata la collaborazione con partner industriali (a cominciare, per es., dai dottorati industriali), come questi ultimi saranno selezionati e come saranno coinvolti in fase di progettazione. Il Nucleo esprime il convincimento che le imprese che potranno costituire sbocchi lavorativi per i futuri laureati siano stakeholder fondamentali del progetto di corso, e quindi la loro accurata selezione e il loro coinvolgimento strutturato e sistematico sin dall'inizio siano condizioni importanti per il suo successo.

2.3 Descrizione del progetto formativo: profili professionali e obiettivi formativi specifici

Per la compilazione di questa sezione, nelle Linee Guida citate si chiede al Dipartimento di fornire una presentazione chiara degli elementi distintivi del corso nei suoi aspetti culturali, scientifici e professionalizzanti.
Elementi da considerare:

- ✓ definizione dei profili professionali collegandoli all'analisi della domanda di formazione e agli obiettivi formativi specifici
- ✓ definizione degli obiettivi formativi specifici del corso di studio.

Inoltre, nella definizione degli obiettivi formativi specifici si chiede di considerare:

- ✓ l'analisi della domanda di formazione condotta;
- ✓ gli obiettivi formativi della classe di laurea cui il corso di studio si riferisce;
- ✓ le competenze didattiche e scientifiche presenti nel Dipartimento proponente.

Osservazioni del Nucleo di Valutazione

I profili professionali e gli obiettivi formativi specifici appaiono molto ben delineati in questa sezione. Permane anche in questa sezione il tema del raccordo tra le discipline riferite agli ambiti dell'HPC e della Data Science. Il Nucleo ribadisce inoltre l'opportunità di specificare quali tipi di aziende possano richiedere e valorizzare nel migliore dei modi i profili professionali che il corso intende formare.

2.4 Coerenza della proposta con obiettivi e offerta formativa della struttura proponente. Analisi delle iniziative concorrenti

Per la compilazione di questa sezione, nelle Linee Guida citate si chiede al Dipartimento di considerare i seguenti elementi:

- ✓ coerenza del corso di studio rispetto all'offerta formativa del Dipartimento e dell'Ateneo;
- ✓ coerenza del corso di studio rispetto al piano strategico del Dipartimento e dell'Ateneo;
- ✓ analisi delle iniziative concorrenti - nella stessa classe o comunque con obiettivi formativi simili - presenti in altre istituzioni nazionali e internazionali, con particolare riferimento alle istituzioni presenti nei territori contermini;
- ✓ elementi distintivi e punti di forza rispetto all'offerta formativa del Dipartimento/Ateneo e delle iniziative formative delle istituzioni concorrenti.

Osservazioni del Nucleo di Valutazione

I contenuti della sezione 4 sono pertinenti e ben articolati, mettendo in evidenza il "bacino" di laureati triennali dell'Ateneo dal quale potrebbero provenire i potenziali iscritti al nuovo corso, oltre che il carattere marcatamente internazionale dell'iniziativa formativa. Rimangono per altro, ad avviso del Nucleo, due aspetti che meriterebbero di essere ulteriormente sviluppati:

- quale sia il "valore aggiunto" costituito dai contenuti e dalle competenze di "Quantum Computing", che sembrano costituire l'elemento differenziante del corso in oggetto, rispetto a quelli di Intelligenza Artificiale e Data Science. Questi ultimi contenuti caratterizzano infatti l'offerta di lauree magistrali "vicine" da parte dello stesso DMIF all'interno dell'Ateneo di Udine ("Artificial Intelligence & Cybersecurity") e da parte dell'Ateneo di Trieste ("Data Science and Artificial Intelligence"). In altri termini, può essere opportuno illustrare se e come la specificità del "Quantum Computing" sia in grado di attrarre un target di potenziali studenti specifico e almeno in parte distinto da quelli interessati ai contenuti e ai corsi già offerti focalizzati su intelligenza artificiale, cybersecurity, data science;
- quali altri Atenei del Nord-Italia, oltre a quello di Trieste, offrano prodotti formativi in potenziale concorrenza con quello proposto di nuova istituzione e qual è la loro attrattività.

2.5 Valutazione della disponibilità di risorse da parte della struttura proponente

Per la compilazione di questa sezione, nelle Linee Guida citate si chiede al Dipartimento di presentare evidenze circa la disponibilità quantitativa e qualitativa di risorse atte a sostenere il nuovo corso di studi, con particolare riferimento alla disponibilità di risorse di docenza; elementi da considerare:

- ✓ dotazione e qualificazione del personale docente relativamente alla nuova iniziativa formativa (valorizzazione del legame tra competenze scientifiche dei docenti e obiettivi didattici del nuovo corso di studi);
- ✓ sostenibilità didattica del corso anche in relazione al complesso dell'offerta formativa del Dipartimento proponente;
- ✓ indicazione dei docenti di riferimento;
- ✓ eventuali collaborazioni con altri dipartimenti dell'Ateneo, con altre università e/o istituzioni ed enti nazionali e/o internazionali (specificando il livello del coinvolgimento);
- ✓ dotazione di risorse strutturali (biblioteche, laboratori, …);
- ✓ presenza di accordi internazionali, convenzioni, tirocini, soprattutto per iniziative con forte contenuto internazionale o professionalizzante.

Osservazioni del Nucleo di Valutazione

Dalla sezione 5 del progetto di massima si evince con chiarezza che il DMIF ha al suo interno le risorse necessarie, in termini di docenti di riferimento, per raggiungere i requisiti minimi del nuovo corso di laurea, oltre che un'ampia gamma di insegnamenti che potrebbero essere mutuati. Non è invece specificata la dotazione di risorse intese come laboratori e infrastrutture informatiche, la cui rilevanza appare per altro fondamentale per un corso di studi come quello proposto. Nella sezione 1 si dichiara che "L'istituzione del corso di laurea magistrale verrebbe portata a termine solo in caso di finanziamento del progetto da parte dell'EU" e che "In tal caso sarebbe previsto un budget di circa 600.000 euro che permetterebbe di coprire costi per l'istituzione di nuovi insegnamenti e altri costi di gestione (…)". Inoltre, si sottolinea che "Molti degli insegnamenti previsti sono già erogati nei nostri corsi di laurea magistrali e potranno essere mutuati". In conclusione, per quanto dalla lettura delle varie sezioni si possa evincere che il progetto di corso – se finanziato dall'Unione Europea – sia economicamente sostenibile per l'Ateneo, non viene esplicitamente dichiarato che gli investimenti e i costi necessari al suo avvio e funzionamento sarebbero coperti al 100%.

3 CONSIDERAZIONI FINALI

Il Nucleo di Valutazione, a valle dell'analisi del progetto di massima, ferme restando le proprie osservazioni riportate analiticamente nelle singole sezioni, ritiene che l'istituzione di un nuovo corso di laurea magistrale in High performance computing and quantum (LM Data) costituisca un'opportunità significativa per l'Università di Udine. Premesso che tale progetto dovrà con ogni probabilità superare un vaglio rigoroso e vincere una competizione difficile e selettiva per essere finanziato dall'Unione Europea, la sua realizzazione contribuirebbe in misura significativa all'internazionalizzazione dell'Ateneo di Udine, che si troverebbe a collaborare con altre

sette università estere e con altre istituzioni internazionali. Inoltre, la combinazione di Quantum Computing e intelligenza artificiale appare promettente e in grado di intercettare un "megatrend" di grande rilievo, quello imperniato sul rapido sviluppo delle capacità di calcolo come condizione per un pieno esplicarsi delle potenzialità dell'intelligenza artificiale. Infine, esso consentirebbe, attraverso le mutuazioni, un migliore utilizzo e valorizzazione di molte competenze e insegnamenti[1] già presenti nel DMIF e in altri dipartimenti dell'Università di Udine.

4 ALLEGATI

1. Documento di progettazione di massima del CdS, redatto secondo il *template standard* predisposto dal PQA;
2. Documento inerente allo stato attuale della proposta per la partecipazione alla Call EU in scadenza il 27 maggio u.s.;
3. Letter of committment a firma del Magnifico Rettore dell'Ateneo di Udine.

[1] Nell'ambito del DMIF sono in essere quattro lauree magistrali: Comunicazione multimediale e tecnologie dell'informazione (cod. 765), che nel 2023/2024 offriva 38 attività didattiche; Informatica (cod. 766), con 48 attività didattiche; Matematica (cod. 767), con 22 attività didattiche; Artificial Intelligence & Cybersecurity (cod. 818), con 23 attività didattiche. In totale, 131 attività didattiche.

Allegato n. 1

PROGETTO DI MASSIMA DI CORSO DI STUDIO DI NUOVA ISTITUZIONE

Classe del CdS	LM Data
Nome del CdS in italiano	High Performance Computing and Quantum
Nome del CdS in inglese	High Performance Computing and Quantum
Lingua/e del CdS	English
Modalità di erogazione	Mista

1. Breve descrizione del progetto formativo e delle motivazioni che lo hanno ispirato

Fornire una breve descrizione del progetto formativo; elementi da considerare:
- motivazioni che hanno portato alla proposta del nuovo corso di studio
- caratteri distintivi del nuovo corso di studio
- profili professionali e obiettivi formativi del corso di studio
- principali sbocchi occupazionali per i laureati e collegamenti con i livelli successivi di formazione universitaria

Motivazioni che hanno portato alla proposta del nuovo corso di studio

Il bando competitivo EU (DIGITAL-EUROHPC-JU-2024-MASTER-03) finanzia la progettazione e l'istituzione di un programma pan-europeo di Master of Science (MSc) in High Performance Computing (HPC), basato sulle conoscenze acquisite dal progetto pilota EUMaster4HPC che ha sviluppato un curriculum congiunto e istituito un programma in cui la prima coorte di studenti si è laureata con successo nel 2024. Ritenendo necessario rafforzare l'offerta formativa a livello europeo sul tema dell'HPC, l'EU ha quindi pubblicato questo nuovo bando per idee progettuali.

Nello specifico, il progetto selezionato dovrà formare specialisti in HPC, offrendo un'istruzione e una formazione avanzata focalizzata anche su tecniche di Intelligenza Artificiale e Computazione Quantistica. Il programma sarà adattato per rispondere alle esigenze dell'industria e del mercato del lavoro, garantendo che i laureati siano ben preparati ad affrontare le sfide attuali e future nel settore. L'azione dovrà portare alla realizzazione di un programma di master con portata pan-europea (joint, double o multiple degree), destinato ad accogliere oltre 100 studenti per ogni ciclo annuale, equivalente a 120 crediti ECTS e mirato a competenze avanzate e all'avanguardia richieste dalla ricerca e dall'industria in ambito HPC. Durante la durata del progetto, quattro coorti di studenti dovranno completare il programma di laurea magistrale (per questo nel budget di progetto dovranno essere riservati 3.000.000 di euro per la mobilità degli studenti (5.000-15.000 euro a studente).

In tale contesto la nostra sede è stata contattata dall'Università di Klagenfurt per partecipare al bando con un progetto che prevede il coinvolgimento dei seguenti partner accademici e di ricerca/industriali:

Sede	Nazione	Expertise/Curricula
University of Klagenfurt	Austria	Sustainable and Green High Performance Computing
Technical University of Dresden	Germania	High Performance Computing Systems Architecture and Design
Ss. Cyril and Methodius University of Skopje	Macedonia	AI Data Analytics
Kharkiv Polytechnic Institute	Ucraina	Secure High Performance Computing Intelligence
University of Amsterdam	Olanda	Software Engineering for High Performance Computing and Big Data

Tallin University of Technology	Estonia	Scientific High Performance Computing
University of Szeged	Ungheria	Modelling and Simulation of High Performance Computing
University of Udine	Italia	Quantum Computing and Artificial Intelligence
Infineon	Austria	Componenti elettroniche a semiconduttore
SEMI	Germania	Associazione dell'industria dei semiconduttori
RISE	Svezia	Istituto di ricerca svedese

Condividiamo già con l'Università di Klagenfurt il programma congiunto di laurea magistrale della classe LM 18-Informatica dal titolo Artificial Intelligence & Cybersecurity. Le competenze specifiche del nostro Ateneo sui temi dell'Intelligenza Artificiale sono dunque già note alla sede proponente. All'interno della laurea magistrale in Artificial Intelligence & Cybersecurity la sede di Udine eroga anche un insegnamento di area Quantum Computing e negli ultimi quattro anni ci siamo impegnati nell'organizzazione della scuola estiva internazionale di dottorato European Summer School on Quantum Artificial Intelligence. Per questo, oltre che sui temi legati all'Intelligenza Artificiale, il nostro coinvolgimento nel progetto verte sulla computazione quantistica.

Il progetto in linea di massima prevede che gli studenti trascorreranno il primo anno presso la sede in cui si sono immatricolati, mentre nel primo semestre del secondo anno saranno in mobilità presso una delle altre sedi del consorzio. Infine concluderanno il percorso valutando se prolungare il periodo di permanenza all'estero o rientrare nella propria sede. La scelta della sede presso cui effettuare la mobilità sarà dettata dagli interessi dei singoli studenti. Ogni sede si caratterizzerà infatti per offrire un semestre su tematiche specifiche. Queste saranno "Quantum and AI" per la sede di Udine, mentre altre sedi propongono le tematiche elencate nella tabella sopra riportata.

Riteniamo che aderire a tale proposta costituisca un'opportunità unica per acquisire visibilità e attrattività a livello internazionale. La tematica chiave di questo progetto (High Performance Computing) permetterà di coinvolgere attivamente diversi settori scientifici del Dipartimento di Scienze Matematiche, Informatiche e Fisiche e di altri Dipartimenti. Tra questi menzioniamo l'Analisi Numerica, la Ricerca Operativa, la Statistica, l'Informatica, l'Ingegneria Informatica e la Fisica.

L'istituzione del corso di laurea magistrale verrebbe portata a termine solo in caso di finanziamento del progetto da parte dell'EU. In tal caso sarebbe previsto un budget di circa 600.000 euro che permetterebbe di coprire costi per l'istituzione di nuovi insegnamenti e altri costi di gestione (un'ulteriore quota di budget è prevista per coprire la mobilità degli studenti).
Molti degli insegnamenti previsti sono già erogati nei nostri corsi di laurea magistrali e potranno essere mutuati.
Stiamo valutando anche la possibilità di coinvolgere gruppi di ricerca della SISSA attivi su tematiche di High Performance Computing.

Caratteri distintivi

Rispetto agli altri corsi di laurea magistrali erogati presso il nostro Ateneo i caratteri distintivi principali sarebbero:

1. *Le tematiche.* Le tematiche coinvolte prevalentemente per la nostra sede in questo corso di laurea internazionale sarebbero High Performance Computing, Artificial Intelligence, Quantum Computing. Al momento offriamo alcuni insegnamenti di area High Performance Computing nel percorso di laurea

magistrale nazionale in Informatica (per esempio, Computazione su Architetture Parallele), numerosi insegnamenti di area Artificial Intelligence soprattutto nel percorso di laurea magistrale internazionale in Artificial Intelligence & Cybersecurity, un insegnamento di area Quantum Computing. In funzione di complemento e formazione iniziale delle principali tematiche di cui sopra offriamo anche alcuni insegnamenti avanzati dei settori dell'Analisi Numerica, della Ricerca Operativa, della Statistica e della Fisica Relativistica e Quantistica, erogati principalmente nei corsi di laurea magistrale in Matematica e in Informatica, i cui contenuti potranno essere in futuro meglio indirizzati a supporto delle aree HPC, AI e QC.

2. *La classe di laurea.* Proponiamo l'istituzione di questo corso di laurea nella classe LM-Data. Attualmente la sede di Udine non ha altri corsi di laurea magistrale di tale classe. Analizzando i settori previsti come di base e caratterizzanti per la classe LM-Data emerge immediatamente come questi siano perfettamente allineati con la maggior parte dei settori sopra menzionati (Analisi Numerica, Ricerca Operativa, Statistica, Informatica, Ingegneria Informatica e Fisica).
3. *Il forte carattere internazionale.* Il progetto prevede il coinvolgimento di otto sedi universitarie, di cui Udine figura come unico partner italiano.

Profili professionali e obiettivi formativi del corso di studio

Come già menzionato sopra il bando finanzierà progetti per la formazione di figure professionali con competenze avanzate nelle aree della progettazione e sviluppo di architetture e sistemi in ambito High Performance Computing quali sistemi paralleli, distribuiti, dispositivi edge e anche architetture quantistiche. Gli obiettivi formativi comprendono solide basi matematiche, numerico-computazionali, di ottimizzazione e statistica per la modellazione e la simulazione di problemi complessi, capacità di analizzare le potenzialità e i limiti di diverse possibili soluzioni architetturali/algoritmiche/computazionali, competenze per lo sviluppo e l'implementazione delle soluzioni più efficaci.
Più nello specifico le figure professionali in uscita che il corso di laurea mira a formare sono:

- *Ricercatori in area HPC* in grado di affrontare sempre nuove sfide nella modellazione e analisi di dati provenienti da altri settori quali la fisica, la biologia, la chimica, la medicina, l'economia, etc.
- *Sviluppatori di software per HPC* in grado di programmare su architetture parallele sfruttando anche tecniche di Automated Reasoning e Machine Learning.
- *Quantum Developer e Quantum Research Scientists* in grado di costruire un ponte tra le tecniche della computazione classica e quella quantistica, sia al fine di risolvere con tecniche classiche problemi emergenti nella compilazione quantistica, sia al fine di sfruttare ove possibile speed-up quantistici per la risoluzione di sottoproblemi.

Principali sbocchi occupazionali per i laureati e collegamenti con i livelli successivi di formazione universitaria

Per quanto riguarda la categoria Ricercatori in area HPC e Quantum Research Scientists, queste figure necessitano presumibilmente di proseguire gli studi con un Dottorato di Ricerca. La sede di Udine offre questa possibilità sia con il Dottorato in Scienze Matematiche e Fisiche che con il Dottorato in Informatica e Intelligenza Artificiale.
Il bando EU prevede una collaborazione all'interno del progetto anche da parte di partner industriali, fornendo ulteriore garanzia di occupabilità dei laureati.

Ulteriori dettagli in merito alla proposta con particolare riferimento ad obiettivi formativi e sbocchi occupazionali sono dettagliati nel progetto che alleghiamo.

2. Analisi della domanda di formazione e degli sbocchi occupazionali

Elementi da considerare:

- fabbisogni formativi cui il corso di studio intende rispondere
- sbocchi occupazionali dei laureati e collegamenti con i livelli successivi di formazione universitaria.

Nella compilazione della sezione, illustrare l'analisi condotta dando evidenza del coinvolgimento dei diversi portatori di interessi. Il coinvolgimento può avvenire tramite contatti diretti o per mezzo dell'analisi di studi di settore o altra documentazione ritenuta rilevante. Dare evidenza del contributo dei portatori di interessi nel definire la proposta del nuovo corso di studi. Nel caso di contatti diretti è utile tenere nota degli incontri, eventualmente allegando la documentazione.

Indicare, anche ricorrendo a informazioni su iniziative formative simili, la numerosità attesa degli iscritti

Fabbisogni formativi cui il corso di studio intende rispondere

La proposta di questo corso di studio è una risposta diretta a un bando competitivo dell'Unione Europea (DIGITAL-EUROHPC-JU-2024-MASTER-03), che mira specificamente a finanziare la progettazione e l'istituzione di un programma europeo di Master of Science (MSc) in High Performance Computing (HPC). L'UE ha ritenuto necessario rafforzare l'offerta formativa a livello europeo sul tema dell'HPC. In questo caso quindi i fabbisogni formativi cui il corso di studio intende rispondere sono stati definiti dall'Unione Europea.
Il programma proposto è stato concepito per formare specialisti in HPC, con un focus avanzato anche su tecniche di Intelligenza Artificiale (AI) e Computazione Quantistica, supportato da necessari fondamenti in aree limitrofe complementari come l'Analisi Numerica, l'Ottimizzazione, la Statistica, l'Informatica, l'Ingegneria Informatica e la Fisica. L'obiettivo è adattare il programma per rispondere alle esigenze dell'industria e del mercato del lavoro, garantendo che i laureati siano ben preparati ad affrontare le sfide attuali e future nel settore.

Alleghiamo il progetto che verrà sottomesso per maggiori dettagli.

Sbocchi occupazionali dei laureati e collegamenti con i livelli successivi di formazione universitaria

Il corso di laurea magistrale mira a formare figure professionali con competenze avanzate nelle aree della progettazione e sviluppo di architetture e sistemi in ambito High Performance Computing, inclusi sistemi paralleli, distribuiti, dispositivi edge e architetture quantistiche.

Le principali figure professionali che il corso di studio intende formare sono:

- *Ricercatori in area HPC* in grado di affrontare sfide nella modellazione e analisi di dati complessi provenienti da vari settori scientifici (fisica, biologia, chimica, medicina, economia, ecc.).
- *Sviluppatori di software per HPC* capaci di programmare su architetture parallele e di utilizzare tecniche di Automated Reasoning e Machine Learning.
- *Quantum Developer e Quantum Research Scientists*, figure in grado di creare un ponte tra computazione classica e quantistica, sia per risolvere problemi di compilazione quantistica con tecniche classiche, sia per sfruttare speed-up quantistici.

Il bando EU prevede la collaborazione con partner industriali all'interno del progetto. Questo aspetto fornisce garanzia di occupabilità dei laureati, in quanto il programma è intrinsecamente legato alle esigenze e alle prospettive di impiego nel settore. Nello specifico le sedi di Udine e Klagenfurt hanno già consolidate collaborazioni con Infineon per il corso di laurea magistrale internazionale in Artificial Intelligence & Cybersecurity.

Relativamente alle tematiche HPC, trasversali a tutto il progetto, la sede di Udine può fungere come base formativa di supporto iniettando nel sistema adeguate competenze numerico-computazionali e di ottimizzazione, in grado di fornire ai futuri laureati conoscenze e capacità essenziali nella gestione di algoritmi fondamentali per la trattazione di problemi di grande dimensione che necessitano di tecniche efficienti, come ad es. le tecnologie sparse.

Relativamente al Quantum AI che caratterizzerebbe la sede di Udine nel progetto, a livello regionale numerose iniziative emergenti, che ruotano prevalentemente attorno a SISSA, ICTP, Area Science Park, Università degli Studi di Trieste, richiedono nuove competenze su tematiche legate alla computazione e comunicazione quantistica. Tra queste menzioniamo Quantum FVG, EQUIP-FVG, QuFree (notizia da quiuniud). In questo momento l'Università

degli Studi di Trieste è in grado offrire una solida formazione sui temi della Fisica Quantistica, mentre c'è ancora una lacuna nell'offerta formativa sugli aspetti di natura matematica, algoritmica e computazionale di questi nuovi strumenti. La specializzazione proposta nella sede di Udine all'interno del nuovo corso di laurea mira a colmare tale lacuna.

Per quanto riguarda le figure di Ricercatori in area HPC e Quantum Research Scientists, si prevede che queste figure necessitino presumibilmente di proseguire gli studi con un Dottorato di Ricerca. La sede di Udine offre questa possibilità attraverso i propri programmi di Dottorato in Scienze Matematiche e Fisiche e in Informatica e Intelligenza Artificiale, fornendo un percorso naturale per i laureati interessati alla carriera accademica o alla ricerca avanzata in ambito industriale.

Analisi condotta e coinvolgimento dei portatori di interessi

Il coinvolgimento dei portatori di interessi è intrinsecamente legato alla natura del progetto EU, che richiede la formazione di un consorzio di università, la collaborazione con partner industriali (come Infineon, SEMI) e istituti di ricerca (come RISE). La nostra sede è stata contattata dall'Università di Klagenfurt per partecipare a questo consorzio, il che testimonia un riconoscimento delle competenze specifiche del nostro Ateneo sui temi dell'Intelligenza Artificiale e della Computazione Quantistica.

La scuola estiva di dottorato European Summer School on Quantum AI, organizzata dai docenti del DMIF proff. Carla Piazza e Giuseppe Serra e giunta alla sua quarta edizione, permette di essere costantemente in contatto con numerosi portatori di interessi sia in ambito di ricerca che industriale su tematiche di Computazione Quantistica e Intelligenza Artificiale. Tra i relatori presenti alla scuola troviamo provenienze industriali e di enti di ricerca quali: CINECA (2022), IBM (2022, 2024), Cambridge Quantum Computing (2023), Los Alamos National Laboratories (2024), Quantinuum (2024), CERN (2024), Pasqal (2024), NASA (2025), Center for Quantum Technologies Singapore (2025), Google Quantum AI (2025).

Numerosità Attesa

Il bando prevede un'attrattività per il corso di laurea superiore ai 100 studenti all'anno complessivamente. Questo vuol dire che il target sarebbe raggiunto già con 15 studenti immatricolati in ogni sede.
Facendo un paragone a noi noto, in questo momento il corso di laurea magistrale in Artificial Intelligence & Cybersecurity è ad accesso programmato locale con 40 posti a Udine e 40 posti a Klagenfurt. Il numero di richieste di immatricolazione che riceviamo ogni anno sulla sede di Udine è superiore al centinaio.
I corsi di laurea della classe LM Data sul territorio nazionale hanno in questo momento un'attrattività molto simile, dato l'alto numero di richieste di esperti del settore Data Analisi.

3. Descrizione del progetto formativo: profili professionali e obiettivi formativi specifici

Fornire una presentazione chiara degli elementi distintivi del corso nei suoi aspetti culturali, scientifici e professionalizzanti; elementi da considerare:
- definizione dei profili professionali collegandoli all'analisi della domanda di formazione e agli obiettivi formativi specifici
- definizione degli obiettivi formativi specifici del corso di studio.

Nella definizione degli obiettivi formativi specifici considerare:
- l'analisi della domanda di formazione condotta
- gli obiettivi formativi della classe di laurea cui il corso di studio si riferisce
- le competenze didattiche e scientifiche presenti nel Dipartimento proponente

Elementi distintivi del corso di studio

Il corso di studio si distingue per diversi aspetti che lo rendono un'iniziativa unica e strategica nel panorama europeo:

- Tematiche all'Avanguardia: Il programma è centrato sull'High Performance Computing (HPC) e sui suoi legami con l'Intelligenza Artificiale (AI) e la Computazione Quantistica. Queste sono aree tecnologiche

cruciali per la competitività e l'innovazione in Europa. La sede di Udine, in particolare, apporta competenze specifiche nell'area dell'Intelligenza Artificiale e della Computazione Quantistica, consolidate attraverso insegnamenti dedicati e iniziative come la scuola estiva internazionale European Summer School on Quantum AI, giunta quest'anno alla sua quarta edizione. Infine, in funzione di complemento e formazione iniziale delle principali tematiche di cui sopra offriamo anche alcuni insegnamenti avanzati dei settori dell'Analisi Numerica, della Ricerca Operativa, della Statistica e della Fisica Relativistica e Quantistica, erogati principalmente nei corsi di laurea magistrale in Matematica e in Informatica, i cui contenuti potranno essere in futuro meglio indirizzati a supporto delle aree HPC, AI e QC.

- Classe di Laurea LM Data: L'istituzione del corso nella classe LM Data è strategica poiché i settori scientifico-disciplinari che la caratterizzano (Analisi Numerica, Ricerca Operativa, Statistica, Informatica, Ingegneria Informatica) sono perfettamente allineati con le tematiche centrali del programma. Questo permette di formare figure professionali in grado di affrontare la modellazione e l'analisi di dati complessi con calcolo ad alte prestazioni, AI e computazione quantistica.
- Carattere Pan-Europeo e Internazionale: Il corso è intrinsecamente internazionale, nato da un bando competitivo dell'Unione Europea (DIGITAL-EUROHPC-JU-2024-MASTER-03) e sviluppato da un consorzio di otto università europee. Questa collaborazione garantisce una prospettiva ampia, coprendo diverse aree disciplinari e un elevato numero di sedi straniere. La mobilità studentesca obbligatoria e finanziata dal bando tra le sedi partner è un pilastro del progetto, promuovendo lo scambio culturale e l'integrazione accademica a livello europeo.

Definizione dei profili professionali

Il corso di laurea magistrale mira a formare figure professionali altamente specializzate con competenze avanzate nella progettazione, sviluppo e ottimizzazione di architetture e sistemi in ambito HPC, inclusi sistemi paralleli, distribuiti, dispositivi edge e architetture quantistiche.

I profili professionali in uscita, collegati direttamente all'analisi della domanda di formazione e alle esigenze del mercato del lavoro europeo, includono, come già accennato:

- Ricercatori in area HPC e Scienze Computazionali: Specialisti capaci di affrontare nuove sfide nella modellazione e analisi di dati complessi in svariati settori scientifici (fisica, biologia, chimica, medicina, economia, scienze ambientali, ecc.) attraverso l'uso avanzato di tecniche computazionali ad alte prestazioni.
- Sviluppatori di Software per HPC: Ingegneri del software in grado di programmare su architetture parallele e distribuite, sfruttando tecniche di Automated Reasoning, Machine Learning e Deep Learning, ottimizzando applicazioni per sistemi ad alte prestazioni e sviluppando soluzioni cloud-native. Questo include profili come HPC Software Developer, AI Solutions Architect, DevOps/MLOps Engineer.
- Quantum Developer e Quantum Research Scientists: Figure professionali all'avanguardia in grado di operare all'intersezione tra computazione classica e quantistica. Questi specialisti sapranno utilizzare tecniche classiche (spesso basate su AI) per risolvere problemi di compilazione quantistica e sfruttare gli speed-up quantistici per la risoluzione di sottoproblemi complessi, contribuendo allo sviluppo di soluzioni ibride.
- Esperti in aree emergenti: Profili focalizzati sull'integrazione di HPC con altre tecnologie strategiche, come Secure HPC Intelligence (con competenze in cybersecurity e crittografia applicate all'HPC), Sustainable/Green HPC (con focus sull'efficienza energetica e la sostenibilità delle architetture), e la gestione di sistemi distribuiti su vasta scala (Cloud-Edge continuum). Questo comprende ruoli come Cybersecurity Analyst con esperienza in HPC, Expert in Green HPC, Cloud and Edge Integration Specialist, Data Workflow Architect.

Obiettivi formativi specifici del corso di studio

Gli obiettivi formativi specifici del corso sono stati definiti tenendo conto dell'analisi della domanda di formazione, degli obiettivi della classe di laurea LM Data e delle competenze scientifiche e didattiche presenti nel DMIF di Udine. Essi mirano a fornire agli studenti una preparazione solida e all'avanguardia che li renda professionisti pronti per le sfide del settore.

Basandosi sugli obiettivi strategici del progetto europeo (O1-O5), gli obiettivi formativi specifici includono:

- Acquisire una solida base teorica e pratica nell'HPC: Fornire competenze fondamentali nelle architetture dei sistemi HPC, nella programmazione parallela, negli algoritmi numerici e nella progettazione di software per ambienti ad alte prestazioni.

- Sviluppare competenze avanzate nell'AI e nella Data Science: Integrare concetti fondamentali di Data Science, Machine Learning e Intelligenza Artificiale per la modellazione e l'analisi di dati complessi, preparando gli studenti all'uso dell'HPC per applicazioni AI su larga scala.
- Esplorare le tecnologie quantistiche e emergenti: Fornire una comprensione approfondita della Computazione Quantistica e di altre architetture emergenti, e formare professionisti in grado di integrare queste tecnologie nei flussi di lavoro HPC del futuro.
- Applicare l'HPC a problemi reali e sfide sociali: Capacitare gli studenti nell'applicazione delle tecniche HPC, AI e Quantum a domini applicativi di alto impatto, come la medicina personalizzata, la modellazione climatica, la sicurezza informatica e altri settori industriali e scientifici, spesso in collaborazione con partner esterni.
- Sviluppare competenze trasversali e professionali: Fornire agli studenti soft skills, capacità di project management, comprensione delle implicazioni etiche e della sostenibilità nell'HPC, e competenze imprenditoriali per facilitare il loro inserimento nel mercato del lavoro e la loro crescita professionale
- Promuovere l'innovazione e la ricerca: Incoraggiare gli studenti a contribuire all'avanzamento del campo attraverso progetti di ricerca e tesi innovative, spesso svolte in collaborazione con l'industria o centri di ricerca, stimolando la creazione di prototipi e la pubblicazione di risultati.
- Vivere un'esperienza formativa europea: Garantire agli studenti un'esperienza internazionale significativa attraverso la mobilità, l'esposizione a diversi contesti accademici e culturali e l'opportunità di costruire un network europeo.

In sintesi, il progetto formativo della nuova laurea magistrale mira a formare professionisti completi, con forti competenze tecniche e scientifiche nell'HPC, AI e Quantum Computing, pronti a innovare e affrontare le sfide computazionali più complesse nei settori chiave dell'industria e della ricerca europea. La sua struttura modulare e la stretta connessione con i partner esterni, in linea con gli obiettivi del bando EU e le competenze specifiche della sede di Udine, garantiscono la pertinenza e l'eccellenza dell'offerta formativa.

Relativamente alla classe di laurea LM Data, i corsi della classe hanno come obiettivo quello di formare specialisti in grado di utilizzare tecniche matematico-statistico-informatiche all'interno di aziende e amministrazioni pubbliche e private, inclusi enti o istituti di ricerca scientifica e tecnologica, in particolare per quel che riguarda gestione, trattamento, analisi e utilizzo di grandi moli di dati, anche affiancando efficacemente esperti di specifici settori applicativi. I corsi della classe possono prevedere curricula destinati alla preparazione di esperti nel trattamento e analisi dei dati di specifici settori applicativi (di ambito fisico, chimico, biologico, sanitario, tecnologico, umanistico, economico-sociale, ecc.). La classe prevede l'acquisizione di almeno 15 CFU nei settori della Probabilità e Statistica, Analisi Numerica, Ricerca Operativa, di almeno 21 CFU nei settori dell'Informatica e dell'Ingegneria Informatica, di almeno 6 CFU in settori di etica, giurisprudenza, economia, sociologia. Numerosi docenti del DMIF ricadono in questi settori scientifici e insegnamenti di questi settori sono già offerti negli altri corsi di laurea magistrali del Dipartimento.

4. Coerenza della proposta con obiettivi e offerta formativa della struttura proponente. Analisi delle iniziative concorrenti

Elementi da considerare:
- coerenza del corso di studio rispetto all'offerta formativa del Dipartimento e dell'Ateneo
- coerenza del corso di studio rispetto al piano strategico del Dipartimento e dell'Ateneo
- analisi delle iniziative concorrenti - nella stessa classe o comunque con obiettivi formativi simili - presenti in altre istituzioni nazionali e internazionali, con particolare riferimento alle istituzioni presenti nei territori contermini
- elementi distintivi e punti di forza rispetto all'offerta formativa del Dipartimento/Ateneo e delle iniziative formative delle istituzioni concorrenti

Coerenza con l'offerta formativa del Dipartimento

Il Dipartimento DMIF eroga attualmente 1 corso di laurea triennale in Matematica L-35, 2 corsi di laurea triennali in Informatica L-31, ed un corso di laurea triennale interclasse L-31 e L-20. Tutti i laureati di questi corsi di laurea avrebbero la possibilità di accedere al nuovo corso di laurea magistrale. Come già previsto in altre sedi è possibile definire dei requisiti minimi di accesso relativamente al numero di CFU conseguiti nelle aree della Matematica, della Statistica e dell'Informatica (solitamente tra i 9 e i 12 nelle altre sedi). Non sarebbe difficile per tutti i nostri laureati triennali raggiungere tali requisiti.

Va menzionato che tra i KPI del bando EU è previsto che il 50% degli iscritti provengano da sedi esterne al consorzio. Questo da un lato limiterà la possibilità di accesso dei nostri laureati, ma dall'altro spingerà ad attrarre studenti di altre sedi italiane e straniere.
Al momento già nel corso di laurea magistrale internazionale in Artificial Intelligence & Cybersecurity superiamo ogni anno il centinaio di richieste da altre sedi. Non abbiamo motivo di credere che per il nuovo corso di laurea l'attrattività da altre sedi sarà un problema.
La proposta si differenzia dalle lauree magistrali offerte dal DMIF per:

- *Interdisciplinarità.* La nuova laurea è volta a formare figure professionali in grado di dialogare con esperti di Matematica, Informatica, Fisica che hanno competenze approfondite ognuno nel proprio specifico settore, ma anche con esperti di altre discipline che necessitano soluzioni innovative con calcolo ad alte prestazioni, tecniche di intelligenza artificiale, e computazione quantistica per l'analisi di dati complessi.
- *Internazionalizzazione.* Il DMIF ha già un programma congiunto con la sede di Klagenfurt per la laurea magistrale in Artificial Intelligence & Cybersecurity. Questo corso di laurea avrebbe una prospettiva Europea di ben più ampio respiro, sia in termini di aree disciplinari coinvolte che di numero di sedi straniere.

Coerenza con il Piano Strategico di Ateneo e Dipartimentale

All'interno del piano strategico di Ateneo per il periodo 2022-2025 la proposta si colloca nelle direzioni previste dagli obiettivi 2 "Consolidamento dei settori distintivi e qualificanti di ricerca e didattica e presidio delle aree interdisciplinari" e 3 "Integrazione della ricerca e della didattica in una dimensione internazionale". All'interno dell'obiettivo 3 in particolare l'azione 2 prevede il sostegno di una didattica internazionale, anche attraverso corsi di laurea a doppio titolo. Il nuovo corso di laurea permetterebbe di migliorare molti degli indicatori previsti per tale azione. Chiaramente i tempi di realizzazione porteranno fuori dalla finestra temporale del piano strategico di Ateneo, ma lo stesso bando EU dimostra come l'interesse verso questi obiettivi non potrà che restare alto.

Anche il Piano Strategico Dipartimentale del DMIF è in fase conclusiva. Relativamente alla didattica il piano non prevede nuove istituzioni. È interesse del DMIF aumentare gli iscritti ai propri corsi di laurea magistrali. Questa proposta è in linea con tale obiettivo. Come descritto sopra il progetto si differenzia nettamente dalle altre proposte magistrali del DMIF e perciò non entrerà in conflitto con queste.

Analisi delle iniziative concorrenti ed elementi distintivi

Relativamente alle iniziative concorrenti, la classe di laurea LM Data è di recentissima istituzione e per tale motivo numerose iniziative sono state recentemente attivate su tutto il territorio nazionale. La più vicina di queste è la laurea magistrale Data Science and Artificial Intelligence di Trieste. Tale laurea è stata istituita come evoluzione di una precedente laurea magistrale interateneo che vedeva coinvolto anche il DMIF per l'Ateneo di Udine.
La presente proposta differisce dalla laurea di Trieste trattandosi di un programma congiunto con più sedi straniere, mentre la laurea di Trieste vede coinvolti solo partner nazionali. Le tematiche di area Quantum costituirebbero un'ulteriore sostanziale differenza rispetto al corso di laurea di Trieste che attualmente prevede quattro curricula (Foundations of AI and ML, Data Science and AI for Industry and Cyber-Physical System, Data Science and AI for Health and Life Sciences, Data Science and AI for Economy and Society), nessuno dei quali specifico su Quantum. Inoltre, grazie al semestre di mobilità e all'offerta di alcuni insegnamenti on-line (modalità mista) gli iscritti al nuovo corso di laurea potranno beneficiare delle competenze specifiche delle altre sedi del consorzio che nuovamente si differenziano dalle proposte dei quattro curricula di Trieste (si faccia riferimento alla tabella nella sezione 1 che riporta i curricula proposti dalle sedi del consorzio).

5. Valutazione della disponibilità di risorse da parte della struttura proponente

Nella compilazione della sezione, presentare evidenze circa la disponibilità quantitativa e qualitativa di risorse atte a sostenere il nuovo corso di studi, con particolare riferimento alla disponibilità di risorse di docenza; elementi da considerare:

- dotazione e qualificazione del personale docente relativamente alla nuova iniziativa formativa (valorizzazione del legame tra competenze scientifiche dei docenti e obiettivi didattici del nuovo corso di studi)

- sostenibilità didattica del corso anche in relazione al complesso dell'offerta formativa del Dipartimento proponente

- indicazione dei docenti di riferimento

- eventuali collaborazioni con altri dipartimenti dell'Ateneo, con altre università e/o istituzioni ed enti nazionali e/o internazionali (specificando il livello del coinvolgimento)

- dotazione di risorse strutturali (biblioteche, laboratori, …)

- presenza di accordi internazionali, convenzioni, tirocini, soprattutto per iniziative con forte contenuto internazionale o professionalizzante

Dotazione e qualificazione del personale docente

Sono attualmente in servizio presso il DMIF:

- 5 docenti di area Analisi Numerica (4 a tempo indeterminato e 1 RTD-B)
- 2 docenti di area Ricerca Operativa (1 a tempo indeterminato e 1 RTT)
- 45 docenti di area Informatica e Ingegneria Informatica (39 a tempo indeterminato, 3 RTD-B e 3 RTD-A)

Sostenibilità didattica

I docenti del DMIF erogano già nelle lauree magistrali del DMIF insegnamenti relativi alle tematiche previste nel nuovo corso di laurea che potrebbero essere mutuati. In particolare, menzioniamo a titolo non esaustivo ai seguenti insegnamenti (corsi di laurea):

- Quantum Computing and Communication (LM Artificial Intelligence & Cybersecurity)
- Foundation of Neural Networks (LM Artificial Intelligence & Cybersecurity)
- Automated Reasoning (LM Artificial Intelligence & Cybersecurity)
- Deep Learning (LM Artificial Intelligence & Cybersecurity)
- Advanced Data Base Systems (LM Artificial Intelligence & Cybersecurity)
- Advanced Algorithms (LM Artificial Intelligence & Cybersecurity)
- Distributed Systems (LM Artificial Intelligence & Cybersecurity)
- Programmazione su Architetture Parallele (LM Informatica)
- Advanced Data Science (LM Informatica)
- Algoritmi Numerici e Applicazioni (LM Informatica)
- Ricerca Operativa e Statistica Applicata (LM Informatica)
- Informatica Diritto e Società (LM Informatica)
- Data Visualization (LM Informatica)
- Analisi delle Serie Storiche (LM Matematica)
- Ottimizzazione Combinatoria (LM Matematica)
- Modelli e Algoritmi per le Decisioni (LM Matematica)
- Statistica I e Statistica II (LM Matematica)
- Laboratorio di Matematica Computazionale (LM Matematica)
- Metodi Numerici per Equazioni Differenziali (LM Matematica)
- Teoria e Metodi di Approssimazione (LM Matematica)
- Sistemi Dinamici Applicati (LM Matematica)
- Fisica Moderna (LM Matematica)
- Relatività generale avanzata e fisica della gravità (LM Matematica)
- Struttura delle reti complesse (LM CMTI)

Il progetto è stato descritto durante il Consiglio di Dipartimento DMIF del 7 maggio 2025, prospettando anche possibili mutuazioni di insegnamenti.

Relativamente all'area della Statistica che afferisce al DIES il progetto è stato illustrato brevemente al prof. Vidoni.

Sempre relativamente all'erogazione degli insegnamenti il progetto prevede che le sedi metteranno a disposizione insegnamenti online condivisi, entro i limiti previsti per i corsi di laurea in modalità mista.

I laboratori del DMIF hanno già all'attivo numerose collaborazioni in ambito industriale che si prestano ad individuare attività di tirocinio su tematiche High Performance Computing e Data Analysis. Infineon, gli interlocutori industriali che partecipano alla scuola European Summer School on Quantum AI e il laboratorio di simulazioni classiche e quantistiche del DMIF permetteranno di delineare tirocini in area Quantum AI.

Docenti di riferimento

Al momento il DMIF ha le risorse necessarie per il raggiungimento dei requisiti dei propri corsi di laurea. Inoltre, alcuni docenti del DMIF sono docenti di riferimento di corsi di laurea di altri dipartimenti.
Senza nulla togliere né ai corsi di laurea del DMIF né ai corsi di laurea di altri dipartimenti, risultano attualmente disponibili 3 docenti a tempo indeterminato, di cui 2 completamente disponibili e 1 messo in sovrannumero in una triennale del DMIF.
Questo consente di raggiungere il requisito previsto di 3 docenti per i corsi di laurea magistrali internazionali (il 50% dei docenti di riferimento può essere messo dall'altra sede straniera).
Pare inoltre che in questo specifico caso essendo coinvolte più sedi straniere il requisito scenderebbe ulteriormente ad 1 docente di riferimento.

Collaborazioni Internazionali

Ci sembra superfluo ripetere qui tutto quanto detto sopra riguardo al carattere internazionale del progetto.
Aggiungiamo solo che parte del finanziamento servirebbe per lo svolgimento di incontri tra i docenti delle sedi, a beneficio anche di nuove collaborazioni di ricerca.

Risorse Strutturali

Il progetto che verrà presentato prevede per la sede di Udine un budget di:

- 500.000 euro per spese del personale
- 50.000 euro per spese di viaggio dei docenti
- 10.000 euro per attrezzature
- 25.000 euro per altre spese
- 37.000 euro di costi indiretti

Inoltre, una quota del budget del progetto è riservata alla mobilità degli studenti.

Altre Informazioni Utili

Il progetto è già stato condiviso con il Rettore Prof. Roberto Pinton che ha firmato la lettera necessaria per la partecipazione al bando. È stato inoltre condiviso con il Delegato per l'Internazionalizzazione Prof. Giorgio Alberti, con il Delegato per la Didattica Prof. Agostino Dovier, con il futuro rettore Prof. Angelo Montanari.

Allegato n. 2

Call: DIGITAL-EUROHPC-JU-2024-MASTER-03

(European Master Programme for HPC)

Topic: DIGITAL-EUROHPC-JU-2024-MASTER-03

Type of Action: DIGITAL-JU-CSA

(DIGITAL JU Coordination and Support Actions)

Proposal number: 101255080

Proposal acronym: HPC-Europe

Type of Model Grant Agreement: DIGITAL Action Grant Budget-Based

Table of contents

Proposal ID **101255080**

Acronym **HPC-Europe**

1 - General information

Field(s) marked * are mandatory to fill.

Topic	DIGITAL-EUROHPC-JU-2024-MASTER-03	Type of Action	DIGITAL-JU-CSA
Call	DIGITAL-EUROHPC-JU-2024-MASTER-03	Type of Model Grant Agreement	DIGITAL-AG

Acronym: HPC-Europe

Proposal title: Advancing Skills, Innovation, and Industry Readiness

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months: 72

Fixed keyword 1: Education and Training

Fixed keyword 2: High-performance computing (HPC)

Free keywords: Artificial Intelligence, Quantum Computing, Student Mobility, Joint Curriculum

Abstract *

For Europe, the world of High Performance Computing (HPC) is an apparent paradox. HPC Innovation and research have raced ahead, but the human resources needed to manage and commercialize such a leap, have lagged. Europe needs skilled professionals to turn its technological advances into global HPC dominance and deliver greater economic and societal advantages to its people. The HPC-Europe+ consortium proposes an internationally competitive Master of Science program, capable of delivering the manpower Europe needs to jettison itself into the HPC future. Through its central anchor of strong industry collaboration, HPC-Europe+ will deliver graduates with specializations in AI, quantum computing, and sustainable technologies, but thoroughly grounded in the core HPC competencies—such as parallel programming and system architecture. Its leading industry partners ensure that HPC-Euro+ graduates will leave equipped to drive Europe forward- via real-world projects, internships, and dual-supervised theses. A decentralised HPC-Europe is a more robust, secure and resilient digital Europe. To that end our dedicated financial support lowers barriers to entry, encouraging diverse participation, especially from underrepresented groups. The mandated student mobility across at least two European countries helps to redress the current sparse incidence of HPC infrastructure and talent pools in under-represented geographies of Europe. Building on the EUMaster4HPC pilot, our modular curriculum facilitates continuous learning through micro-credentials, while a strong emphasis on inclusivity, rigorous quality assurance, and open-access educational resources ensures a leading and internationally competitive academic experience. The HPC-Europe+ program will deliver Europe the HPC specialists it needs at all stages of the HPC value chain, ensuring Europe stays at the forefront of HPC and digital global leadership.

Remaining characters 79

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under any EU programme, including the current call? ○ Yes ◉ No

Please give the proposal reference or contract number.
Previously submitted proposals should be with either 6 or 9 digits.

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Declarations

Field(s) marked * are mandatory to fill.

1) We declare to have the explicit consent of all applicants on their participation and on the content of this proposal. *	☒
2) We confirm that the information contained in this proposal is correct and complete and that none of the project activities have started before the proposal was submitted (unless explicitly authorised in the call conditions). *	☒
3) We declare: - to be fully compliant with the eligibility criteria set out in the call - not to be subject to any exclusion grounds under the EU Financial Regulation 2018/1046 - to have the financial and operational capacity to carry out the proposed project. *	☒
4) We acknowledge that all communication will be made through the Funding & Tenders Portal electronic exchange system and that access and use of this system is subject to the Funding & Tenders Portal Terms and Conditions. *	☒
5) We have read, understood and accepted the Funding & Tenders Portal Terms & Conditions and Privacy Statement that set out the conditions of use of the Portal and the scope, purposes, retention periods, etc. for the processing of personal data of all data subjects whose data we communicate for the purpose of the application, evaluation, award and subsequent management of our grant, prizes and contracts (including financial transactions and audits). *	☒

The coordinator is only responsible for the information relating to their own organisation. Each applicant remains responsible for the information declared for their organisation. If the proposal is retained for EU funding, they will all be required to sign a declaration of honour.

False statements or incorrect information may lead to administrative sanctions under the EU Financial Regulation.

2 - Participants

List of participating organisations

#	Participating Organisation Legal Name	Country	Role	Action
1	UNIVERSITAET KLAGENFURT	AT	Coordinator	
2	INFINEON TECHNOLOGIES AUSTRIA AG	Austria	Partner	
3	UNIVERSITA DEGLI STUDI DI UDINE	Italy	Partner	
4	Ss. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE	MK	Partner	
5	NATIONAL TECHNICAL UNIVERSITY KHARKIV POLYTECHN	Ukraine	Partner	
6	UNIVERSITEIT VAN AMSTERDAM	NL	Partner	
7	SEMI EUROPE GMBH	DE	Partner	
8	RISE RESEARCH INSTITUTES OF SWEDEN AB	SE	Partner	
9	TECHNISCHE UNIVERSITAET DRESDEN	DE	Partner	
10	TALLINNA TEHNIKAÜLIKOOL	EE	Partner	
11	SZEGEDI TUDOMANYEGYETEM	HU	Partner	
12	INFINEON TECHNOLOGIES DRESDEN GMBH& CO KG	DE	Associated	

Organisation data

PIC	Legal name
999836813	*UNIVERSITAET KLAGENFURT*

Short name: UNI-KLU

Address

Street UNIVERSITAETSSTRASSE 65-67

Town KLAGENFURT

Postcode 9020

Country Austria

Webpage www.uni-klu.ac.at

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	14/12/2015 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Department of Information Technology ☐ not applicable

☐ Same as proposing organisation's address

Street: Universitaetsstr. 65-67

Town: Klagenfurt

Postcode: 9020

Country: Austria

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UNI-KLU**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Dr

Gender ○ Woman ◉ Man ○ Non Binary

First name **Dragi**

Last name **Kimovski**

E-Mail **dragi.kimovski@aau.at**

Position in org. Senior Scientist

Department Department of Information Technology ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Universitaetsstr. 65-67

Town Klagenfurt

Post code 9020

Country Austria

Website https://itec.aau.at/

Phone +43 463 2700 3658

Phone 2 +43 463 2700 3603

Other contact persons

First Name	Last Name	E-mail	Phone
Doris	Bach	doris.bach@aau.at	*+43 463 2700 9281*
Martina	Steinbacher	martina@itec.aau.at	*+43 463 2700 3603*
Barbara	Gaggl	digital-eurohpc-support@technikon.com	*+xxx xxxxxxxxx*
Verena	Stranner	verena.stranner@aau.at	*+43 463 2700 3669*
Klaus	Schoeffmann	klaus.schoeffmann@aau.at	*+43 463 2700 3620*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **IFAT**

PIC	Legal name
999705087	*INFINEON TECHNOLOGIES AUSTRIA AG*

Short name: IFAT

Address

Street SIEMENSSTRASSE 2

Town VILLACH

Postcode 9500

Country Austria

Webpage www.infineon.com/austria

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	19/03/1999 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Talent and Collaborative Projects ☐ not applicable

☒ Same as proposing organisation's address

Street: SIEMENSSTRASSE 2

Town: VILLACH

Postcode: 9500

Country: Austria

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **IFAT**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Mrs

Gender ◉ Woman ○ Man ○ Non Binary

First name **Martina**

Last name **Wolfgruber**

E-Mail **martina.wolfgruber@infineon.com**

Position in org. Head of Talent and Collaborative projects Austria

Department Talent and Collaborative projects ☐ Same as organisation name

☒ Same as proposing organisation's address

Street SIEMENSSTRASSE 2

Town VILLACH

Post code 9500

Country Austria

Website www.infineon.com/austria

Phone +43 5 1777 2132

Phone 2 *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Dunja	Suttnig	dunja.suttnig@infineon.com	*+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UNIUD**

PIC	Legal name
999899281	*UNIVERSITA DEGLI STUDI DI UDINE*

Short name: UNIUD

Address

Street VIA PALLADIO 8

Town UDINE

Postcode 33100

Country Italy

Webpage www.uniud.it

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	08/08/1977 - no
SME self-assessment	unknown
SME validation sme	08/08/1977 - no

Departments carrying out the proposed work

Department 1

Department name: Department of Mathematics, Computer Science and Physics ☐ not applicable

☐ Same as proposing organisation's address

Street: via delle Scienze, 206

Town: Udine

Postcode: 33100

Country: Italy

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UNIUD**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Not applicable

Gender ○ Woman ◉ Man ○ Non Binary

First name **Giuseppe**

Last name **Serra**

E-Mail **giuseppe.serra@uniud.it**

Position in org. Associate Professor

Department Department of Mathematics, Computer Science and Physics ☐ Same as organisation name

☐ Same as proposing organisation's address

Street via delle Scienze, 206

Town Udine

Post code 33100

Country Italy

Website https://ailab.uniud.it/giuseppeserra/

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Phone 2 +39 0432 558419

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UKIM**

PIC	Legal name
999588493	*Ss. CYRIL AND METHODIUS UNIVERSITY IN SKOPJE*

Short name: UKIM

Address

Street	BLVD GOCE DELCEV 9
Town	SKOPJE
Postcode	1000
Country	North Macedonia
Webpage	www.ukim.edu.mk

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is unknown (small- and medium-sized enterprise) for the call.

SME self-declared status	unknown
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Faculty of Electrical Engineering and Information Technologies ☐ not applicable

☐ Same as proposing organisation's address

Street: Rugjer Boshkovikj No. 18

Town: Skopje

Postcode: 1000

Country: North Macedonia

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UKIM**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Ms

Gender (•) Woman ( ) Man ( ) Non Binary

First name **Bojana**

Last name **Velickovska**

E-Mail **bojanav@feit.ukim.edu.mk**

Position in org. Assistant Professor

Department Faculty of Electrical Engineering and Information Technologies ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Rugjer Boshkovikj No. 18

Town Skopje

Post code 1000

Country North Macedonia

Website https://feit.ukim.edu.mk/en/

Phone + 389 2 3099 177

Phone 2 *+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **NTU KHPI**

PIC	Legal name
984498009	*NATIONAL TECHNICAL UNIVERSITY KHARKIV POLYTECHNICAL INSTITUTE*

Short name: NTU KHPI

Address

Street KIRPICHOVA STREET 2

Town KHARKIV

Postcode 61002

Country Ukraine

Webpage www.kpi.kharkov.ua

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	02/11/1995 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Department of Software Engineering and Management Intelligent Tec ☐ not applicable

☒ Same as proposing organisation's address

Street: KIRPICHOVA STREET 2

Town: KHARKIV

Postcode: 61002

Country: Ukraine

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **NTU KHPI**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Prof.

Gender ◉ Woman ○ Man ○ Non Binary

First name **Natalia**

Last name **Chernova**

E-Mail **natalia.chernova@khpi.edu.ua**

Position in org. Associate Professor

Department Department of Software Engineering and Management Intelligent Technologies ☐ Same as organisation name

☒ Same as proposing organisation's address

Street KIRPICHOVA STREET 2

Town KHARKIV

Post code 61002

Country Ukraine

Website www.kpi.kharkov.ua

Phone +380958287074

Phone 2 *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Olga	Cherednichenko	olga.cherednichenko@khpi.edu.ua	*+380677547944*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UvA**

PIC	Legal name
999985708	*UNIVERSITEIT VAN AMSTERDAM*

Short name: UvA

Address

Street SPUI 21

Town AMSTERDAM

Postcode 1012WX

Country Netherlands

Webpage www.uva.nl

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	06/12/2023 - no
SME self-assessment	unknown
SME validation sme	04/07/2008 - no

Departments carrying out the proposed work

Department 1

Department name: Informatics Institute ☐ not applicable

☐ Same as proposing organisation's address

Street: Science Park 900

Town: Amsterdam

Postcode: 1098XH

Country: Netherlands

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **UvA**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Dr

Gender ◯ Woman ◉ Man ◯ Non Binary

First name **Zhiming**

Last name **Zhao**

E-Mail **z.zhao@uva.nl**

Position in org. Associate professor

Department Informatics Institute ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Science Park 900

Town Amsterdam

Post code 1098XH

Country Netherlands

Website https://www.uva.nl/

Phone 0031641265121

Phone 2 *+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **SEMI**

PIC	Legal name
905107583	*SEMI EUROPE GMBH*

Short name: SEMI

Address

Street HELMHOLTZSTR 2-9

Town BERLIN

Postcode 10587

Country Germany

Webpage www.semi.org

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	31/12/2019 - yes
SME self-assessment	31/12/2019 - yes
SME validation sme	unknown

Departments carrying out the proposed work

No department involved

Department name *Name of the department/institute carrying out the work.* ☒ not applicable

☐ Same as proposing organisation's address

Street *Please enter street name and number.*

Town *Please enter the name of the town.*

Postcode *Area code.*

Country *Please select a country*

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **SEMI**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Mrs

Gender ◉ Woman ○ Man ○ Non Binary

First name **Victoria**

Last name **Cummings**

E-Mail **vcummings@semi.org**

Position in org. Senior Manager EU Projects

Department SEMI EUROPE GMBH ☒ Same as organisation name

☒ Same as proposing organisation's address

Street HELMHOLTZSTR 2-9

Town BERLIN

Post code 10587

Country Germany

Website https://www.semi.org/eu

Phone +49 30 3030 8077 ☒0

Phone 2 *+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **RISE**

PIC	Legal name
999613422	*RISE RESEARCH INSTITUTES OF SWEDEN AB*

Short name: RISE

Address

Street BRINELLGATAN 4

Town BORAS

Postcode 501 15

Country Sweden

Webpage www.ri.se

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	no
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	23/12/2021 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Smart Hardware ☐ not applicable

☐ Same as proposing organisation's address

Street: Isafjordsgatan 22

Town: Kista /Stockholm

Postcode: 164 29

Country: Sweden

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **RISE**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Dr

Gender ○ Woman ◉ Man ○ Non Binary

First name **Madhav**

Last name **Mishra**

E-Mail **madhav.mishra@ri.se**

Position in org. Senior Scientist

Department Smart Hardware/Nano-Technology ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Isafjordsgatan 22

Town Kista

Post code 164 29

Country Sweden

Website https://www.ri.se/en/person/madhav-mishra

Phone +46 10 228 42 69

Phone 2 *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Sagar	Mistry	sagar.mistry@ri.se	*+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **TUD**

PIC	Legal name
999897729	*TECHNISCHE UNIVERSITAET DRESDEN*

Short name: TUD

Address

Street HELMHOLTZSTRASSE 10

Town DRESDEN

Postcode 01069

Country Germany

Webpage http://www.tu-dresden.de/

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	17/01/2022 - no
SME self-assessment	unknown
SME validation sme	11/06/1999 - no

Departments carrying out the proposed work

Department 1

Department name: Institute of Computer Engineering ☐ not applicable

☒ Same as proposing organisation's address

Street: HELMHOLTZSTRASSE 10

Town: DRESDEN

Postcode: 01069

Country: Germany

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **TUD**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Prof.

Gender ◯ Woman ◉ Man ◯ Non Binary

First name **Jerónimo**

Last name **Castrillón Mazo**

E-Mail **jeronimo.castrillon@tu-dresden.de**

Position in org. Head of Chair of Compiler Construction, Dean of Studies Computer Science

Department TECHNISCHE UNIVERSITAET DRESDEN ☒ Same as organisation name

☒ Same as proposing organisation's address

Street HELMHOLTZSTRASSE 10

Town DRESDEN

Post code 01069

Country Germany

Website https://tu-dresden.de/ing/informatik/die-fakultaet/dekanat

Phone +49 351 463-427

Phone 2 *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Lars	Bernard	lars.bernard@tu-dresden.de	*+xxx xxxxxxxxx*
Katja	Böttcher	katja.boettcher@tu-dresden.de	*+49 351 463 39740*
Friederieke	Noack	friederieke.noack@tu-dresden.de	*+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **TalTech**

PIC	Legal name
999842536	*TALLINNA TEHNIKAÜLIKOOL*

Short name: TalTech

Address

Street EHITAJATE TEE 5

Town TALLINN

Postcode 19086

Country Estonia

Webpage www.taltech.ee

Specific Legal Statuses

Legal person	yes
Public body	yes
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	31/12/2015 - no
SME self-assessment	31/12/2015 - no
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: HPC Centre at IT College ☐ not applicable

☐ Same as proposing organisation's address

Street: Raja 4C

Town: Tallinn

Postcode: 12616

Country: Estonia

Department 2

Department name: Department of Software Science ☐ not applicable

☐ Same as proposing organisation's address

Street: Akadeemia street 15a

Town: Tallinn

Postcode: 12618

Country: Estonia

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **TalTech**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Mrs

Gender (•) Woman ( ) Man ( ) Non Binary

First name **Sirja**

Last name **Sulakatko**

E-Mail **sirja.sulakatko@taltech.ee**

Position in org. Director

Department IT College

☐ Same as organisation name

☐ Same as proposing organisation's address

Street Raja 4C

Town Tallinn

Post code 12616

Country Estonia

Website https://taltech.ee/en/itcollege

Phone +37253460478

Phone 2 *+xxx xxxxxxxxx*

Other contact persons

First Name	Last Name	E-mail	Phone
Sven	Nõmm	sven.nomm@taltech.ee	*+37258540632*
Lauri	Anton	lauri.anton@taltech.ee	*+3726285868*
Juhan-Peep	Ernits	juhan.ernits@taltech.ee	*+3726202326*
Triin	Mölder	triin.molder@taltech.ee	*+3725049201*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **USZ**

PIC	Legal name
999840014	*SZEGEDI TUDOMANYEGYETEM*

Short name: USZ

Address

Street DUGONICS TER 13

Town SZEGED

Postcode 6720

Country Hungary

Webpage www.u-szeged.hu

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	yes
International organisation	no
Secondary or Higher education establishment	yes
Research organisation	yes

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	15/02/2022 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: Department of Software Engineering ☐ not applicable

☐ Same as proposing organisation's address

Street: Arpad ter 2.

Town: Szeged

Postcode: 6720

Country: Hungary

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **USZ**

Main contact person

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to step - Manage your related parties of the submission wizard and save the changes.

Title Dr

Gender ○ Woman ◉ Man ○ Non Binary

First name **Attila**

Last name **Kertesz**

E-Mail **keratt@inf.u-szeged.hu**

Position in org. associate professor

Department Department of Software Engineering ☐ Same as organisation name

☐ Same as proposing organisation's address

Street Arpar ter 2.

Town Szeged

Post code 6720

Country Hungary

Website https://www.inf.u-szeged.hu/~keratt/

Phone +3662544558

Phone 2 *+xxx xxxxxxxxx*

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

Short name **IFD**

PIC	Legal name
996701288	*INFINEON TECHNOLOGIES DRESDEN GMBH& CO KG*

Short name: IFD

Address

Street KONIGSBRUCKER STRASSE 180

Town DRESDEN

Postcode 01099

Country Germany

Webpage www.infineon.com

Specific Legal Statuses

Legal person	yes
Public body	no
Non-profit	no
International organisation	no
Secondary or Higher education establishment	no
Research organisation	no

SME Data

Based on the below details from the Participant Registry the organisation is not an SME (small- and medium-sized enterprise) for the call.

SME self-declared status	03/12/2015 - no
SME self-assessment	unknown
SME validation sme	unknown

Departments carrying out the proposed work

Department 1

Department name: HPC Centre at IT College ☐ not applicable

☐ Same as proposing organisation's address

Street: Raja 4C

Town: Tallinn

Postcode: 12616

Country: Estonia

Department 2

Department name: Department of Software Science ☐ not applicable

☐ Same as proposing organisation's address

Street: Akadeemia street 15a

Town: Tallinn

Postcode: 12618

Country: Estonia

Links with other participants

Type of link	Participant

Application forms

Proposal ID **101255080**

Acronym **HPC-Europe**

3 - Budget

?

No.	Name of beneficiary	Country	Role	Personnel costs - without volunteers/ EUR	Subcontracting costs/ EUR	Purchase costs - Travel and subsistence/ EUR	Purchase costs - Equipment/ EUR	Purchase costs - Other goods, works and services/ EUR	Financial support to third parties/ EUR	Internally invoiced goods and services EUR	Indirect costs/ EUR	Total eligible costs/ EUR	Ineligible costs/ EUR	Total estimated project costs and contributions/ EUR	Funding rate	Maximum EU contribution to eligible costs/ EUR	Requested EU contribution to eligible costs/ EUR	Max grant amount/ EUR	Income generated by the project/ EUR	In kind contributions/ EUR	Financial contributions/ EUR	Own resources/ EUR	Total estimated project income/ EUR
1	Universitaet Klagenfurt	AT	Coordinator	890 000	0	75 200	25 325	75 250	3 000 000	0	284 604.25	4 350 379.25	0	4 350 379.25	100	4 350 379.25	4 350 379.25	4 350 379.25	0.00	0.00	0.00	0.00	4 350 379.25
2	Infineon Technologies Austria Ag	AT	Partner	379 995	0	0	15 000	183 600	0	0	40 501.65	619 096.65	0	619 096.65	100	619 096.65	619 096.65	619 096.65	0.00	0.00	0.00	0.00	619 096.65
3	Universita Degli Studi Di Udine	IT	Partner	500 000	0	50 250	10 000	45 100	0	0	42 374.50	647 724.50	0	647 724.50	100	647 724.50	647 724.50	647 724.50	0.00	0.00	0.00	0.00	647 724.50
4	Si. Cyril And Methodius University In Skopje	MK	Partner	300 000	0	50 000	10 000	10 000	0	0	25 900.00	395 900.00	0	395 900.00	100	395 900.00	395 900.00	395 900.00	0.00	0.00	0.00	0.00	395 900.00
5	National Technical University Kharkiv Polytechnical Institute	UA	Partner	200 000	0	50 000	10 000	110 000	0	0	25 900.00	395 900.00	0	395 900.00	100	395 900.00	395 900.00	395 900.00	0.00	0.00	0.00	0.00	395 900.00
6	Universiteit Van Amsterdam	NL	Partner	454 900	0	50 000	10 000	41 000	0	0	38 913.00	594 813.00	0	594 813.00	100	594 813.00	594 813.00	594 813.00	0.00	0.00	0.00	0.00	594 813.00
7	Semi Europe Gmbh	DE	Partner	250 000	0	50 000	0	110 000	0	0	28 700.00	438 700.00	0	438 700.00	100	438 700.00	438 700.00	438 700.00	0.00	0.00	0.00	0.00	438 700.00
8	Rise Research Institutes Of Sweden Ab	SE	Partner	300 000	0	50 000	10 000	10 000	0	0	25 900.00	395 900.00	0	395 900.00	100	395 900.00	395 900.00	395 900.00	0.00	0.00	0.00	0.00	395 900.00
9	Technische Universitaet Dresden	DE	Partner	700 000	0	50 000	35 000	45 000	0	0	58 100.00	888 100.00	0	888 100.00	100	888 100.00	888 100.00	888 100.00	0.00	0.00	0.00	0.00	888 100.00
10	Tallinna Tehnikaulikool	EE	Partner	450 000	0	50 000	35 000	45 000	0	0	40 600.00	620 600.00	0	620 600.00	100	620 600.00	620 600.00	620 600.00	0.00	0.00	0.00	0.00	620 600.00
11	Szegedi Tudomanyegyetem	HU	Partner	500 000	0	50 000	25 000	35 000	0	0	42 700.00	652 700.00	0	652 700.00	100	652 700.00	652 700.00	652 700.00	0.00	0.00	0.00	0.00	652 700.00
12	Infineon Technologies Dresden Gmbh&Co Kg	DE	Associated	0	0	0	0	0	0	0	0.00	0.00	0	0.00	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Total	4 924 895	0	525 450	185 325	709 950	3 000 000	0	654 193.40	9 999 813.40	0	9 999 813.40		9 999 813.40	9 999 813.40	9 999 813.40	0.00	0.00	0.00	0.00	9 999 813.40

4 - Other questions

Ethics Issues Table

1. Human embryonic stem cells and human embryos			Page
Does this activity involve human embryonic stem cells (hESCs)?	○ Yes	◉ No	
Does this activity involve the use of human embryos?	○ Yes	◉ No	
2. Humans			**Page**
Does this activity involve human participants?	○ Yes	◉ No	
Does this activity involve interventions (physical also including imaging technology, behavioural treatments, tracking and tracing etc.) on the study participants?	○ Yes	◉ No	
3. Human cells / tissues			**Page**
Does this activity involve the use of human cells or tissues (not covered by section 1)?	○ Yes	◉ No	
4. Personal data			**Page**
Does this activity involve processing of personal data?	◉ Yes	○ No	20
Does it involve the processing of special categories of personal data (e.g. sexual lifestyle, ethnicity, genetic, biometric and health data, political opinion, religious or philosophical beliefs)?	○ Yes	◉ No	
Does it involve processing of genetic, biometric or health data?	○ Yes	◉ No	
Does it involve profiling, systematic monitoring of individuals, or processing of large scale of special categories of data or intrusive methods of data processing (such as, surveillance, geolocation tracking etc.)?	○ Yes	◉ No	
Does this activity involve further processing of previously collected personal data (including use of preexisting data sets or sources, merging existing data sets)?	◉ Yes	○ No	20
Is it planned to export personal data from the EU to non-EU countries?	◉ Yes	○ No	20

North Macedonia and Ukraine are not EU member states; however, as associated countries, they are required to adhere to EU guidelines. Notably, North Macedonia has fully implemented the GDPR. As the coordinating institution, we require all consortium partners to strictly follow the GDPR compliance strategy outlined in Work Package 1 (WP1).

The data will include personal information of the students required for completing the mobility, such as age, passport number, and address.

Is it planned to import personal data from non-EU countries into the EU or from a non-EU country to another non-EU country?	◉ Yes	○ No	20

In cases where data is imported in the EU—specifically from North Macedonia and Ukraine—the handling of students' personal data will remain fully compliant with the GDPR. The data may include sensitive information such as age, passport number, address, and other relevant personal details.

Does this activity involve the processing of personal data related to criminal convictions or offences?	○ Yes	◉ No	
5. Animals			**Page**
Does this activity involve animals?	○ Yes	◉ No	

6. Non-EU countries			Page
Will some of the activities be carried out in non-EU countries?	◉ Yes	○ No	14-18
Ukraine, North Macedonia			
In case non-EU countries are involved, do the activities undertaken in these countries raise potential ethics issues?	○ Yes	◉ No	
It is planned to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	○ Yes	◉ No	
Is it planned to import any material (other than data) from non-EU countries into the EU or from a non-EU country to another non-EU country? *For data imports, see section 4.*	○ Yes	◉ No	
Is it planned to export any material (other than data) from the EU to non-EU countries? *For data exports, see section 4.*	○ Yes	◉ No	

7. Environment, health and safety			Page
Does this activity involve the use of substances or processes that may cause harm to the environment, to animals or plants (during the implementation of the activity or further to the use of the results, as a possible impact)?	○ Yes	◉ No	
Does this activity involve the use of substances or processes that may cause harm to humans, including those performing the activity (during the implementation of the activity or further to the use of the results, as a possible impact)?	○ Yes	◉ No	

8. Artificial intelligence			Page
Does this activity involve the development, deployment and/or use of Artificial Intelligence-based systems? *if yes, detail in the self-assessment whether that could raise ethical concerns related to human rights and values and detail how this will be addressed.*	◉ Yes	○ No	14-18

9. Other ethics issues			Page
Are there any other ethics issues that should be taken into consideration?	○ Yes	◉ No	

I confirm that I have taken into account all ethics issues above and that, if any ethics issues apply, I will complete the ethics self-assessment as described in the guidelines How to Complete your Ethics Self-Assessment ☒

Ethics Self-Assessment

Ethical dimension of the objectives, methodology and likely impact

The HPC-Europe+ Master Programme places strong emphasis on ethical responsibility, research integrity, and gender equality, recognizing these as foundational pillars for high-quality and inclusive education and research in high-performance computing and related digital technologies. WP1, which leads overall project coordination, is also responsible for the implementation, monitoring, and continuous improvement of the ethics and gender equality framework throughout the project's lifecycle.

The programme does not involve sensitive data collection or direct experimentation with human subjects; however, ethical vigilance is critical in areas such as student data protection, industry collaboration, and the use of AI and HPC tools in scientific and industrial applications. All partners will strictly adhere to the General Data Protection Regulation and national privacy regulations where applicable.

Any data shared for administrative, pedagogical, or research purposes will follow protocols ensuring lawful, fair, and transparent processing, as well as purpose limitation, data minimization, and confidentiality.

HPC-Europe+ integrates ethics by design principles. Partners will receive clear guidance and documentation on ethical standards, aligned with: The European Code of Conduct for Research Integrity, The Charter of Fundamental Rights of the European Union, The European, Convention on Human Rights, and the Horizon Europe's requirements on ethics and research integrity.

A dedicated task within WP1 will oversee the ethics and gender equality framework, ensuring that all teaching, research, and mobility activities respect ethical norms and industry collaborations are based on transparent, non-exploitative relationships are met.

Any AI-related curriculum or training fosters awareness of algorithmic fairness, bias mitigation, and responsible HPC-AI integration.

In terms of gender equality, HPC-Europe+ commits to closing gender gaps in the HPC talent pipeline. The consortium will implement and monitor a comprehensive Gender Equality Plan, including: (1) gender-balanced selection procedures for students, speakers, and mentors,
(2) awareness workshops and campaigns to address implicit bias and promote inclusive academic cultures, (3) the collection of gender-disaggregated data to track progress and report annually, (4) collaboration with universities and external networks to promote female participation in STEM and HPC, with a specific focus on underrepresented regions in Europe.

Moreover, the programme will promote diversity in student cohorts, not only by gender but also by geographic, socio-economic, and disciplinary background. Activities will align with Open Science and Open Access principles, ensuring that ethical and inclusive practices extend to the broader digital and scientific ecosystem.

All partners in the HPC-Europe+ consortium are committed to maintaining high ethical standards and fostering an inclusive environment where innovation, education, and research can thrive responsibly and equitably.

Remaining characters 1942

Compliance with ethical principles and relevant legislation

The project will define a detailed procedure for compliance with all ethical and relevant legal requirements under WP1, Task 1.3, as outlined in the text above.

Remaining characters 4840

Security issues table

1. EU Classified Information (EUCI)[2]			Page
Does this activity involve information and/or materials requiring protection against unauthorised disclosure (EUCI)?	○ Yes	◉ No	
Does this activity involve non-EU countries which need to have access to EUCI?	○ Yes	◉ No	
2. Misuse			**Page**
Does this activity have the potential for misuse of results?	○ Yes	◉ No	
3. Other Security Issues			**Page**
Does this activity involve information and/or materials subject to national security restrictions? If yes, please specify: (Maximum number of characters allowed: 1000)	○ Yes	◉ No	
Are there any other security issues that should be taken into consideration? If yes, please specify: (Maximum number of characters allowed: 1000)	○ Yes	◉ No	

Security self-assessment

The project does not involve any security-related concerns.

Remaining characters 4941

[2]According to the Commission Decision (EU, Euratom) 2015/444 of 13 March 2015 on the security rules for protecting EU classified information, "European Union classified information (EUCI) means any information or material designated by an EU security classification, the unauthorised disclosure of which could cause varying degrees of prejudice to the interests of the European Union or of one or more of the Member States".

[3]Classified background information is information that is already classified by a country and/or international organisation and/or the EU and is going to be used by the project. In this case, the project must have in advance the authorisation from the originator of the classified information, which is the entity (EU institution, EU Member State, third state or international organisation) under whose authority the classified information has been generated.

[4]EU classified foreground information is information (documents/deliverables/materials) planned to be generated by the project and that needs to be protected from unauthorised disclosure. The originator of the EUCI generated by the project is the European Commission.

TECHNICAL DESCRIPTION (PART B)

COVER PAGE

PROJECT	
Project name:	Advancing Skills, Innovation, and Industry Readiness
Project acronym:	HPC-Europe+
Coordinator contact:	Dragi KIMOVSKI, UNI-KLU

TABLE OF CONTENTS

#@APP-FORM-DEP@#
#@PRJ-SUM-PS@# [This document is tagged. Do not delete the tags; they are needed for the processing.]

PROJECT SUMMARY

Project summary
See Abstract (Application Form Part A).

#§PRJ-SUM-PS§# #@REL-EVA-RE@# #@PRJ-OBJ-PO@#

1. RELEVANCE

1.1 Objectives and activities

Objectives and activities

Describe how the project is aligned with the objectives and activities as described in the Call document.

How does the project address the general objectives and themes and priorities of the call? What is the project's contribution to the overall Digital Europe Programme objectives?

High Performance Computing (HPC) has come a long way since the advent of the first commercial supercomputer, the Cray CDC 6600, in the 1960s. The CDC 6600 was capable of performing around 3 megaflops (3 million floating-point operations per second), a ground-breaking achievement at the time that revolutionized scientific research and engineering. In stark contrast, today's most advanced smartphone processors can achieve up to 2.5 teraflops (2.5 trillion floating-point operations per second) — roughly 833,000 times faster. Although these monumental increases in performance have reshaped our technological landscape, modern applications still demand even greater computational capabilities. The rapid evolution of complex tasks, which produce an immense amount of data, means that even our current high-performance systems sometimes struggle to meet their growing needs.

Modern applications in today's digital age require vast computational resources. From Large Language Models) LLMs that drive next-generation AI to sophisticated medical applications enabling personalized healthcare, from complex weather simulations enhancing climate forecasting to advanced industrial simulations optimizing manufacturing processes — the scope and scale of these challenges necessitate state-of-the-art HPC infrastructures. This is all under the ominous cloud of growing global geo-political and economic rivalries, with each region trying to dominate and control the sphere of HPC resources, Quantum and AI. Never has there been a more vital time to foster and accelerate Europe's skills and capacity in HPC and its associated industries and technologies.

Europe is home to numerous companies and organisations for development of new hardware and semiconductor technologies, such as Infineon and SEMI, that rely heavily on HPC to maintain competitive advantages and drive innovation. However, despite Europe's strong research foundation in HPC, a critical gap exists in its educational offerings. While HPC research thrives, the scarcity of dedicated master's programmes in HPC leaves many industries struggling to find the skilled professionals they need to create the real economic value and competitive advantage critical for Europe. According to the ECSA - Skills Strategy Survey 2024, 9% of the respondents globally report the need for quantum related skills and quantum moved to 6th place and AI to 1st place in terms of the skills with the most impact at the market. Furthermore, as stated in the Future of the European competitiveness the EU is losing ground in research and development (R&D) and in the creation of innovative tech companies with global reach and pan-European action is needed to speed up innovations.

This shortage is particularly pronounced in regions of Europe that are under-represented in terms of HPC infrastructure, such as East and South-east Europe. In these areas, where advanced HPC systems are sparse, industries face an even greater challenge: the lack of a local talent pool equipped with the advanced skills necessary to both develop and harness HPC technologies effectively. Addressing this discrepancy is essential — not only to empower industry sectors with the computational prowess needed for innovation but also to ensure a more balanced, decentralised and therefore potentially safer and robust distribution of technological resources centres and expertise, across the continent.

Building on the insights from the EUMaster4HPC pilot project, HPC-Europe+ establishes a high-quality, internationally competitive Master of Science programme in High-Performance Computing. While incorporating core HPC topics such as system architecture, efficient operation, and advanced software development, HPC-Europe+ also offers dedicated tracks in Artificial Intelligence and emerging paradigms like quantum and sustainability. The programme's modular curriculum integrates theoretical foundations with practical applications, aligning closely with the EuroHPC Virtual Academy's micro-credential framework to facilitate continuous learning and the easy adoption of modules into other MSc courses across Europe.

A defining feature of HPC-Europe+ is its robust connection to industry. Students engage in real-world research and industrial activities through guest lectures, hands-on training sessions, and joint projects with leading European HPC systems and technology centres. Industry experts are involved in curriculum design and internships and contribute to at least one full-semester course segment, ensuring that theoretical instruction is continually reinforced by practical problem-solving experiences. Moreover, master's theses are

conducted in collaboration with research institutions and industrial partners, further bridging the gap between academia and the labour market.

The programme also emphasizes a pan-European identity through its mobility scheme. Students are required to study in at least two different European countries, supported by dedicated financial grants that lower barriers to relocation. This structure not only enriches the academic experience by exposing students to multiple HPC environments but also promotes the exchange of best practices and diverse academic cultures. Collaboration agreements among participating universities ensure a harmonized ECTS system, unified eligibility criteria, and high academic standards across the board.

Quality assurance and sustainability are key priorities in HPC-Europe+. Regular feedback loops involving industry leaders, academic experts, and student evaluations guide continuous improvements. Teaching materials and online courses are shared in an open repository under permissive licenses, encouraging broader engagement and longevity. This open-access approach underlines the programme's commitment to inclusivity, further demonstrated by targeted outreach initiatives aimed at attracting students from under-represented regions. Through European student fairs, social media channels, and partnerships with local academic institutions, HPC-Europe+ fosters a diverse and dynamic cohort that mirrors the multifaceted challenges and opportunities in HPC today.

Lastly, the programme specifically targets under-represented regions within Europe while continuing to maintain and enhance contributions from all participating regions with a specific focus on women participation.

In essence, HPC-Europe+ is designed to equip the next generation of HPC professionals with advanced technical expertise, industry-driven skills, and a truly European perspective. The program builds upon the foundation and achievements of EUMaster4HPC, expanding its reach through a broader consortium of strong European partners. By attracting a new generation of talented students and fostering closer links between academia and industry, it aims to create a vibrant, future-oriented ecosystem for HPC and AI education, including additional state-of-the-art topics, such as energy-efficient computing, quantum computing, and neuromorphic computing. By offering a rigorous, flexible, and inclusive educational framework, it addresses the urgent need for a robust HPC workforce — one capable of driving innovation, supporting industrial modernization, and ensuring Europe's continued leadership in the global digital landscape. Therefore, the main contributions of the project are:

1. **Development of a Modular, Energy-Efficient Curriculum Integrating HPC, Cloud, Edge, and Quantum Computing:** Building on the foundational work of EUMaster4HPC, HPC-Europe+ offers a flexible, modular two-year master's programme (120 ECTS), closely aligned with the EuroHPC Virtual Academy's Skill Tree and micro-credential system. The curriculum addresses core HPC competencies—such as parallel programming, system architecture, and performance optimisation—with an emphasis on energy-efficient computing practices. Advanced modules include AI integration, sustainable cloud and edge computing solutions, quantum computing, and neuromorphic technologies, directly contributing to Europe's security and societal well-being. This unique programme weaves high-performance computing into real-world application domains, delivering a fresh, master-level perspective on HPC education.
2. **Enhancing Europe's Security and Prosperity through AI and Industry Collaboration:** HPC-Europe+ establishes robust partnerships with leading European HPC companies, research institutes, and SMEs to strengthen Europe's digital sovereignty and societal resilience. The consortium is anchored by four industry leaders in HPC and semiconductors technologies, ensuring a robust, hands-on link to the commercial sector. Industry partners contribute a minimum of 6 ECTS through co-designed courses, guest lectures, mentorship, and practical labs, facilitating real-world applications in sectors crucial for Europe's security, economic prosperity, and social welfare. Students engage directly through industry-supervised research projects, internships, and dual-supervision master's theses, significantly boosting Europe's talent pipeline and enhancing career attractiveness in strategic sectors.
3. **Innovative Pan-European Mobility Framework for Enhanced Inclusivity:** The programme mandates a structured mobility component, requiring students to study in at least two different European countries both at a university and in companies, fostering intercultural dialogue, inclusivity, and pan-European cohesion. HPC-Europe+ dedicates at least EUR 3,000,000 in mobility grants aligned with ERASMUS+ standards to mitigate financial barriers and attract high-performing students from diverse backgrounds, thereby reinforcing Europe's collective well-being and inclusive educational environment.
4. **Quality Assurance, Certification, and Accessible Digital Resources:** A comprehensive quality assurance framework ensures consistent academic excellence, pedagogical innovation, and adherence to EuroHPC Virtual Academy standards across partner institutions. Regular evaluation cycles, transparent feedback mechanisms, and open-licensed digital educational resources facilitate broad accessibility, enhancing Europe's collective digital skills base and security posture. HPC-Europe+ awards joint or multiple degrees under clearly defined bilateral agreements, guaranteeing seamless ECTS compatibility, tuition fee waivers, and effortless student mobility.
5. **Commitment to Inclusivity, Outreach, and Long-term Sustainability:** HPC-Europe+ implements a targeted outreach strategy aimed explicitly at underrepresented groups and regions, with particular focus on promoting women in STEM. Outreach methods include participation in national and international student fairs, interactive workshops, podcasts, and strategic use of social

media. Consortium partners actively leverage their institutional networks for programme promotion. The sustainability of HPC-Europe+ is secured through its integration into existing institutional academic portfolios, supported by clear criteria for onboarding additional universities, structured course mapping mechanisms, and a commitment to ongoing collaboration, thereby solidifying Europe's inclusive, secure, and prosperous digital future.

This proposal positions our master programme as a transformative educational initiative that addresses both current and future needs of the HPC sector in Europe, paving the way for a new generation of experts capable of leading the continent's technological advancements.

The project aims to establish Europe as a global leader in High-Performance Computing through a comprehensive Master's study program, enhancing its competitiveness in the digital economy. It targets five key objectives based on the I-SMART criteria, covering the sustainable development, deployment, and optimization of next-generation HPC systems, including quantum and non-Von Neumann architectures. A fifth objective integrates these competencies into a unified European HPC education framework for HPC popularization, media exposure and job acquirement. The continuous evaluation and refinement of each objective through industry collaborations, interdisciplinary research, and students support ensure alignment with European digital strategies and global technological leadership.

Obj. O1	**Create a sustainable European Master's programme for Europe's security and well-being.**
Impact	• **Equip graduates with HPC and digital transformation skill**s to drive innovation in European industries. • **Strengthen Europe's competitiveness and security** through cutting-edge research and expertise.
Specific	**Objective:** The Master's program will equip students with advanced HPC skills, digital transformation expertise, and hands-on experience in system deployment and optimization. By integrating industry-driven coursework, practical training, and real-world case studies, graduates will be prepared to address Europe's growing demand for HPC specialists, ensuring a strong and competitive digital workforce that supports industrial modernization and innovation.
Measurable	• Increased pool of HPC experts. • Specially trained experts based on the requirements of the European industry
Achievable	• **KPI-1.1: 90% of graduates** secure relevant positions in HPC, digital innovation, or AI-driven sectors within **six months** after graduation. • **KPI-1.2: At least 3 dedicated industry seminars/workshops per academic year** led by European HPC experts.
Relevant	**Stakeholders:** Industry, Academia, Government, Society. **Relation to Call Objective**: Pan-European MSc Programme in HPC.
Timebound	Expected graduation of the first Cohort by M32 in line with EU needs for AI excellence.

Obj. O2	**Empower students through highly adaptable modular curricula, targeted European-wide mobility schemes, and an advanced online learning hub specifically designed to stimulate innovation, creativity, and expertise.**
Impact	• Provide modular curricula for HPC computing • Position Europe as a **leader in next-gen HPC through** innovation in system design and **energy-efficient exascale** computing. • Integrate **industry-tested prototypes and breakthrough technologies** to drive advancements. • **Boost economic growth** and global competitiveness. • Provide a **hub with free online courses in HPC**
Specific	**Objective:** Students will gain in-depth knowledge of designing, benchmarking, and optimizing next-generation HPC systems, including energy-efficient exascale architectures. The program will foster innovation through collaborative research, industry partnerships, and access to cutting-edge infrastructure, ensuring Europe remains at the forefront of HPC technology development and competitive in the global market. The program will offer a set of open courses both in person and online through a courses hub.
Measurable	• Reduced time for demonstrable innovations. • Collaborative research with industry.

Achievable	• **KPI-2.1: Create new curricula where at least 50% of student projects** result in demonstrable innovations or prototypes validated by external industry reviews, peer-reviewed publications, or collaborative patents. • **KPI-2.2: Establishment of at least 2 testbeds/laboratory prototypes** developed in partnership with industry each academic year. • **KPI-2.3: Preparation of 20 essential online free courses for HPC** and its application
Relevant	**Stakeholders:** Industry, Academia **Relation to Call Objective**: Improved Industry Alignment and Modular Studies.
Timebound	Expected improved potential for innovation by M24

Obj. O3	**Drive forward application-oriented, industry-aligned HPC research initiatives, explicitly focusing on Quantum Computing and Artificial Intelligence addressing Europe's strategic security priorities and societal needs.**
Impact	• **Enhancing Europe's capability to tackle societal challenges** by applying HPC in real-world scenarios such as personalized medicine. • **Fostering a resilient innovation ecosystem** by strengthening collaboration between academia, research institutes, and industry. • **Driving sustainable economic growth** while improving public health and environmental outcomes across Europe.
Specific	**Objective:** The program will emphasize the role of HPC in driving breakthroughs in AI, personalized medicine, climate science, and advanced materials research. By engaging in interdisciplinary collaborations and hands-on projects, students will develop the expertise to apply HPC solutions to critical societal challenges, strengthening Europe's position as a hub for high-impact, data-driven innovation.
Measurable	• Number of master thesis in collaboration with other research areas • Cross disciplinary projects
Achievable Acceptable	• **KPI-3.1: 70% of master's theses** incorporate real-world applications in AI, medicine, or related fields, demonstrated via collaborative projects with research centres or industry partners. • **KPI-3.2: At least 4 cross-disciplinary collaborative projects** initiated each year, resulting in demonstrable digital innovations.
Relevant	**Stakeholders:** Industry, Healthcare, Society. **Relation to Call Objective**: Robust collaboration between Industry and Academia.
Timebound	Expected completion of first cross-discipline projects by M36

Obj. O4	**Foster Europe's technological autonomy and resilience by creating a robust and secure teaching infrastructure essential for safeguarding Europe's future.**
Impact	• **Positioning Europe's Universities at the forefront of the next technological revolution** by introducing emerging computational paradigms like quantum and neuromorphic computing. • Fostering expertise in providing federation from the **HPC to the Edge with support for AI for safe Europe.** • Driving transformative breakthroughs across multiple sectors while **securing a long-term strategic advantage globally.**
Specific	**Objective:** Students will gain expertise in emerging computational paradigms, including quantum computing, neuromorphic architectures, and specialized accelerators, preparing them to integrate these technologies into future HPC workflows. This forward-looking approach will ensure Europe remains a leader in disruptive computing technologies, enabling groundbreaking advancements in high-performance and energy-efficient computing.
Measurable	• Integration of novel courses for quantum and neuromorphic computing
Achievable	• **KPI-4.1: 30% of coursework** and final projects involve quantum computing, neuromorphic systems, or hybrid HPC approaches, validated through project evaluations and external review panels. • **KPI-4.2:** At least **1 dedicated module per semester focused on emerging architectures**, supported by collaboration with leading European research labs.
Relevant	**Stakeholders:** Industry, Academia, Governments **Relation to Call Objective**: Novel modular specialisations with high mobility.
Timebound	First specialisation for Quantum computing offered by M12

Obj. O5	**Digital Learning Infrastructure for modernizing and Strengthening Europe's Global Competitiveness in HPC through Strategic Partnerships and Collaborative Training**
Impact	• **Creating a pan-European network of HPC excellence** through strategic academic, industrial, and research partnerships. • **Promoting international mobility, joint research, and collaborative innovation** to strengthen Europe's leadership in digital transformation. • Building a resilient ecosystem that **accelerates technological adoption** and industrial growth across the continent. • **Accelerate industrial modernization** and improve global market positioning.
Specific	**Objective:** The program will create a diverse Europe-wide network of academic institutions, research centers, and industry leaders to provide students with international training opportunities, joint research initiatives, and industry-driven education. By fostering collaboration and mobility, this objective will enhance Europe's leadership in HPC, ensuring sustained innovation, economic growth, and digital sovereignty.
Measurable	• Strategic partnerships • HPC popularization • Students support • HPC Courses and Master thesis Hub
Achievable	• **KPI-5.1:** Establish at least 5 strategic partnerships with European HPC research centres, industry leaders, and technology innovators. • **KPI-5.2:** Ensure that 90% of students participate in internships, collaborative research, or mobility programs with partner organizations during the course of their studies. • **KPI-5.3:** Host an annual European HPC symposium as a platform for sharing research findings and fostering further collaboration. • **KPI-5.4:** Publicize HPC by creating YouTube Podcast channel and, a TikTok feed.
Relevant	**Stakeholders:** Public, Students, Industry, Governments **Relation to Call Objective**: Meet labour market needs, promote outreach and diversity and ensure collaboration across Europe.
Timebound	Creating of Job Hub by M24, Opening of social media accounts and creating content by M16

1.1.1 Curricula overview

We propose a novel joint master study programme, HPC-Europe+, which significantly extends beyond the initial scope of the EUMaster4HPC initiative by directly addressing regional disparities in High-Performance Computing expertise. The programme specifically targets underrepresented regions within Europe, which have higher relative growth potential in terms of student recruitment and industry-academia collaboration, while continuing to maintain and enhance contributions from all participating regions. This programme, illustrated in Figure 1, comprises a rigorous two-year curriculum with 120 ECTS, clearly structured into four semesters, each delivering 30 ECTS credits.

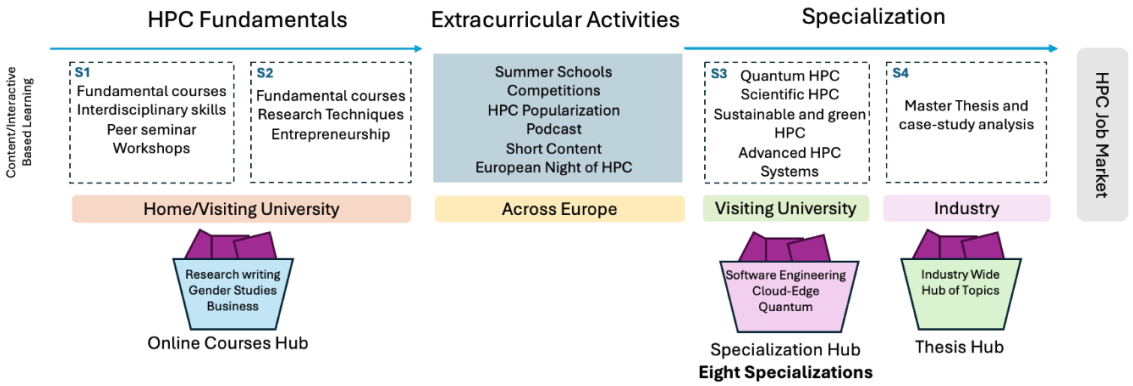

Figure 1: Overview of the Study Program

1.1.1.1 Year One: HPC Fundamentals and Local Integration

In the first year, students enrol at their respective home universities, engaging initially in core HPC courses such as HPC architectures, advanced system modelling, parallel computing, and foundational algorithmic principles. To facilitate unified and consistent learning outcomes across all consortium partners, an Online Learning Hub will be established. This hub provides students access to shared digital resources, including lecture recordings with open access (available on online digital platform), structured tutorials, reading

materials, and interactive online forums, fostering collaborative learning across borders. Complementing traditional teaching methods, students participate in peer-led seminars, where they collaboratively solve problems and critically evaluate each other's solutions, thus reinforcing their understanding through active self-assessment. Dedicated hands-on workshops further solidify these theoretical foundations by providing practical exposure to contemporary HPC tools and platforms.

In the second semester, the curriculum broadens to incorporate essential skills for academic and professional success, including research methodologies, academic writing, and entrepreneurship. These courses are developed and executed in close collaboration with local industry partners, thus ensuring relevance and practicality. The entrepreneurial education particularly aims at nurturing critical soft skills and an innovative mindset, preparing students comprehensively to face the evolving demands of the European labour market. During this phase, students will also leverage the Online Learning Hub to access supplemental resources, industry lectures, and entrepreneurial case studies, thereby enriching their local educational experience with diverse European perspectives.

Although students are required to undertake mobility during the third semester for specialisation purposes, the HPC-Europe+ programme also offers optional mobility in the second semester. This additional opportunity allows students to attend foundational HPC courses at partner universities, further enhancing their educational experience and intercultural competencies.

1.1.1.2 Year Two: Modular Specialisation and European Mobility

The second year is explicitly structured to emphasize specialisation and transnational mobility across the consortium universities in Europe. During the third semester, students select from a series of specialisation tracks offered by the partner institutions. These tracks include cutting-edge fields such as Quantum HPC, HPC for AI applications, HPC for Biomedical and Natural Sciences, alongside core EUMaster4HPC modules like performance analysis, HPC system architecture, and advanced software development. To ensure seamless integration and interoperability across institutions, an online Specialisation Hub is provided, where students have centralised access to shared modules, pre-recorded specialised lectures, virtual labs, and industry-hosted webinars. This hub not only facilitates mobility but also ensures consistent quality standards aligned with the EuroHPC Virtual Academy's micro-credential framework.

In the fourth semester, students focus on their master's theses, conducted in partnership with industrial and academic entities. These projects are co-supervised via a dedicated online Master Thesis Hub, which offers structured mentoring, regular progress evaluations, industry engagement forums, and virtual collaboration tools. This innovative approach ensures systematic guidance and close alignment of thesis work with industry requirements, effectively preparing students for direct employment. The semester culminates in the opportunity for direct entry into the labour market through the newly established HPC Master Job Hub, connecting students with industry stakeholders and facilitating employment opportunities directly linked to their thesis projects.

1.1.1.3 Extracurricular and Outreach Activities

Throughout the entire programme, students are actively encouraged to participate in various extracurricular activities designed to enhance their educational experience, expand their professional network, and promote broader HPC awareness. These include summer schools organised by leading HPC institutions, international HPC competitions, and dedicated popularisation initiatives. The programme also leverages modern media platforms such as podcasts, webinars, and short-form digital content on social media, attracting a diverse range of prospective students and increasing public awareness about HPC's societal and economic importance. Special attention is given to outreach activities targeting underrepresented groups, particularly women and students from regions with traditionally low HPC adoption.

The HPC-Europe+ programme comprehensively addresses the objectives outlined by the Digital Europe Programme call, establishing a robust, modular, and adaptable pan-European MSc programme. It ensures high academic standards, long-term sustainability, and effective integration of academic and industrial expertise through structured mobility, extensive industry collaboration, strategic partnerships, and the innovative use of dedicated online hubs. By focusing specifically on fostering advanced digital skills, diversity, AI for health, and integrated cloud-to-edge-to-supercomputing knowledge, HPC-Europe+ actively contributes to Europe's broader digital technology supply chain objectives and ensures sustainable European leadership in the global digital economy.

In addition, as part of the extracurricular activities and outreach efforts, students and teachers will collaboratively develop a set of courses that will be made publicly available online.

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1.2 Contribution to long-term policy objectives, policies and strategies — Synergies

Contribution to long-term policy objectives, policies and strategies — Synergies

Describe how the project contributes to long-term policy objectives of the call's domain/area and to the relevant policies and strategies, and how it is based on a sound needs analysis in line with the activities at European and national level.

What challenge does the project aim to address?

The objectives should be specific, measurable, achievable, relevant and time-bound within the duration of the project.

The proposed HPC-Europe+ Master Programme is strategically designed to align closely with key long-term objectives defined by the Digital Europe Programme, effectively addressing critical challenges in Europe's digital transformation, innovation capability, and advanced skills development. Central to the programme is the development of a high-quality, modular MSc curriculum, building upon the successful foundations of the EUMaster4HPC initiative. Through targeted educational pathways, HPC-Europe+ trains specialists in High-Performance Computing, Artificial Intelligence, quantum computing, and neuromorphic architectures, ensuring graduates can actively contribute to strategic European initiatives such as AI Factories, Destination Earth, sectorial data spaces, and the broader Apply AI Strategy, as summarized in Table 1

Table 1: Contribution to long-term policies

Objective Name	Short Description	HPC-Europe+ Objectives	How?
AI Factories under EuroHPC JU	Support the implementation of AI Factories, including acquiring AI-optimal and energy-efficient supercomputers.	O1, O5	HPC-Europe+ will contribute by training skilled professionals in HPC, AI, quantum, and neuromorphic computing, who will be essential for the effective utilization of AI Factories and the development of AI-optimal supercomputers.
Destination Earth Initiative	Advance climate adaptation and disaster risk management through integration and deployment of new Digital Twins.	O1, O2, O3, O4	By offering advanced training in HPC and related fields, HPC-Europe+ will produce experts capable of developing and utilizing the sophisticated simulations and data analysis required for climate adaptation and disaster risk management within the Destination Earth initiative.
Sectorial Common Data Spaces	Deploy secure, energy-efficient federated cloud-to-edge infrastructure for accessible data spaces supporting AI Factories.	O4	The curriculum includes topics relevant to secure and efficient data handling, preparing graduates to contribute to the deployment and effective use of sectorial common data spaces and AI Factories.
Apply AI Strategy	Accelerate AI adoption in Europe, including Generative AI, health applications, virtual worlds, and enforcement of the AI Act.	O3, O4	HPC-Europe+ directly addresses this by offering specialized tracks in AI and related technologies, fostering the development of AI applications across various sectors, and ensuring a workforce capable of navigating and contributing to the evolving AI landscape in Europe.
European Digital Innovation Hubs (EDIHs)	Support private and public organizations across Europe in digital transformation via EDIHs.	O5	The program supports the EDIHs by providing them with access to a skilled talent pool that is equipped with the latest HPC and AI knowledge. Additionally, the program directly collaborates with industries ensuring a workforce ready to drive digital transformation.
Excellence in Digital Education	Enhance education institutions' capacity to attract talent through advanced technology academies and programs.	O1, O5	HPC-Europe+ aims to enhance digital education by creating a high-quality, internationally competitive MSc program in HPC, which includes specialized tracks and a strong emphasis on industry collaboration, making it an attractive option for talented students.
Pan-European Digital Transformation	Promote cross-national cooperation through multi-country projects and European Digital Infrastructure Consortia (EDICs).	O1, O3, O5	By requiring students to study in at least two different European countries, the mobility scheme fosters cross-national cooperation and supports the goals of pan-European digital transformation.

Recognizing the critical role of AI Factories within the EuroHPC Joint Undertaking, HPC-Europe+ actively supports this initiative by preparing skilled professionals adept at utilizing and optimizing AI-optimal and energy-efficient supercomputers. Graduates will possess practical experience and theoretical knowledge crucial for operating advanced AI infrastructures and driving innovations across sectors. To further strengthen

this alignment, HPC-Europe+ maintains direct contacts and active collaboration with existing and planned AI Factories in Austria and Italy, ensuring the curriculum remains industry-relevant and responsive to evolving technological demands.

In support of the Destination Earth Initiative, which aims to enhance Europe's capacity for climate adaptation and disaster risk management through sophisticated digital twins, HPC-Europe+ equips students with competencies in computational modelling, data analytics, and simulation technologies essential for creating and managing complex environmental and climate simulations. This capability directly addresses the need for advanced data-driven decision-making tools at the core of Europe's climate strategy.

The programme also supports the deployment of secure, energy-efficient federated cloud-to-edge infrastructures, crucial for sectorial common data spaces that facilitate widespread adoption of AI solutions. HPC-Europe+ students gain expertise in secure data handling, distributed computing architectures, and system efficiency, thereby enabling graduates to effectively contribute to the design and operation of interoperable data spaces across sectors such as healthcare, manufacturing, and public services.

HPC-Europe+ aligns seamlessly with Europe's Apply AI Strategy by offering specialized tracks focused explicitly on AI development, generative AI applications, digital health, virtual worlds, and regulatory compliance with the EU AI Act. This targeted educational approach ensures graduates can immediately contribute to accelerating AI adoption across Europe while responsibly navigating the regulatory landscape.

Additionally, HPC-Europe+ actively supports the mission of European Digital Innovation Hubs (EDIHs) by cultivating a talent pool equipped with advanced digital skills necessary for regional and national digital transformation initiatives. The programme’s robust industry collaboration framework, including internships, industry-led master theses, and real-world case studies, positions students as key resources for EDIHs and their networked organizations across Europe.

To strengthen Europe's global competitiveness in digital education, HPC-Europe+ emphasizes quality assurance, innovative pedagogy, and practical training in emerging technologies. By integrating peer-led learning, entrepreneurship courses, and interdisciplinary approaches, the programme attracts talented students from diverse backgrounds, significantly enhancing the reputation and excellence of partner institutions and supporting Europe's strategic objective of becoming a global leader in advanced digital education.

Moreover, HPC-Europe+ significantly contributes to pan-European digital transformation through its mandatory student mobility scheme, requiring study periods in at least two European countries. This structure encourages cross-national cooperation, facilitates cultural and knowledge exchanges, and promotes regional inclusivity. By specifically addressing underrepresented regions, such as Eastern and Southeastern Europe, the programme actively reduces disparities in HPC expertise and supports Europe's cohesive digital development.

To guarantee smooth student mobility and qualification recognition across partner countries, HPC-Europe+ maintains active engagement with national accreditation bodies such as Austria’s Federal Ministry of Education, Science, and Research, Italy’s Ministry of Education, Universities and Research, North Macedonia’s Higher Education Accreditation Board, Bulgaria’s National Evaluation and Accreditation Agency, Ukraine’s Ministry of Education and Science, and the Netherlands’ Accreditation Organisation (NVAO). Adhering rigorously to the European Credit Transfer and Accumulation System (ECTS) standards, HPC-Europe+ ensures mutual recognition of credits and qualifications, promoting a seamless educational experience for students across Europe.

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1.3 Digital technology supply chain

Digital technology supply chain

Explain to what extent the project would reinforce and secure the digital technology supply chain in the EU.

⚠ *This criterion might not be applicable to all topics — for details refer to the Call document.*

The European digital supply chain will be directly supported and strengthened by the HPC-Europe+ Master Programme, particularly in the critical technology domains outlined by the Digital Europe Programme, such as Artificial Intelligence, Quantum Computing, High-Performance Computing, and the Cloud-Edge continuum. By providing specialized education and targeted skills development, the project explicitly addresses key priorities highlighted in the official Digital Europe policy document, available here.

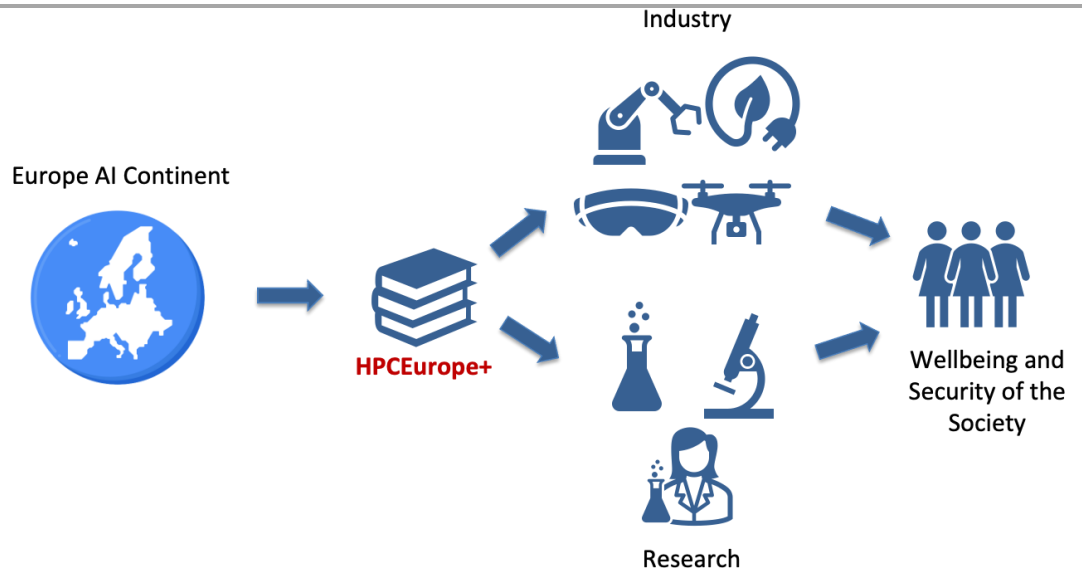

Figure 2: HPC-Europe+ within the digital supply chain

As depicted in Figure 2, HPC-Europe+ will play a key role in positioning Europe as the AI continent by training a new generation of specialists in High Performance Computing for Quantum and AI applications. By bridging academia, research, and industry, the programme will deliver highly skilled professionals capable of driving innovation across sectors such as automation, sustainable technology, and life sciences. This will not only boost Europe's industrial and research capabilities but also contribute to the well-being and security of European society through smarter technologies and scientific advancements.

Specifically, the HPC-Europe+ programme contributes substantially to five central pillars of the European digital supply chain:

1. **Enhance digital skills:** The programme directly enhances Europe's capacity for developing and maintaining advanced digital skills. Recognizing that a well-trained workforce is the backbone of digital sovereignty, HPC-Europe+ prioritizes training in high-demand technological areas including AI, Quantum Computing, HPC, and Cloud-to-Edge infrastructure. Students graduating from this programme will possess deep expertise in computational modelling, AI algorithms, quantum technologies, secure data handling, and distributed computing architectures. This aligns precisely with the Digital Europe Programme's strategic objectives of fostering excellence in digital skills and preparing Europe's workforce for the challenges of an increasingly digitalized global economy.
2. **Women in Digital:** HPC-Europe+ actively promotes inclusion and diversity in the European digital landscape, specifically addressing the Digital Europe Programme's emphasis on increasing participation of women in digital sectors. The programme implements targeted outreach initiatives and supportive learning environments designed to significantly improve gender balance within advanced technology fields. By actively promoting the enrolment and retention of women, HPC-Europe+ directly supports the EU's policy goal of achieving a more inclusive and diverse digital talent pool.
3. **AI for Health:** The HPC-Europe+ programme explicitly supports the strategic European initiative "AI for Health". By providing dedicated curricular tracks that integrate HPC and AI for biomedical and health applications, graduates will be equipped with the necessary skills to drive innovation in personalized medicine, healthcare optimization, and AI-driven diagnostics. This aspect of the curriculum aligns with the EU's broader health-related ambitions outlined in the Digital Europe Programme, ensuring that Europe remains at the forefront of global healthcare innovation through digital technology.
4. **AI Continent:** The programme contributes to positioning Europe as a cohesive digital continent. Through its mandatory mobility scheme, students gain cross-national experiences across multiple European countries, fostering regional cooperation, cultural exchange, and transnational knowledge transfer. This structural element enhances European cohesion and directly contributes to the Digital Europe Programme's objective of reinforcing Europe as a unified digital ecosystem.
5. **Synergy with Cloud-Edge continuum:** HPC-Europe+ supports the critical technological objective of creating a secure, energy-efficient continuum from Cloud-to-Edge computing extending to supercomputing infrastructures. By offering specialized training on federated cloud systems, edge computing platforms, and state-of-the-art HPC and supercomputing technologies, the programme ensures graduates can effectively design, implement, and operate these advanced infrastructures. This expertise is essential for ensuring data sovereignty, secure AI deployments, and robust digital infrastructures, thereby directly addressing a central goal of Europe's digital strategy.

1.4 Financial obstacles

Financial obstacles

Describe to what extent the project can overcome financial obstacles such as the lack of market finance.

⚠ *This criterion might not be applicable to all topics — for details refer to the Call document.*

The consortium partners currently offer multiple successful Master's programmes in fields such as Artificial Intelligence (AI), Quantum Computing, Security and Robotics, each consistently attracting cohorts of over 100 students per programme annually. These programmes have established proven financial and operational models, primarily supported by national governments. Funding is typically allocated based on the number of active students who achieve a minimum of 16 ECTS per semester, ensuring a stable and predictable financial structure.

In addition to public funding, consortium universities actively collaborate with industry partners who provide supplementary financial support, either through direct sponsorship agreements or student scholarships. Such industry engagement not only enhances financial stability but also ensures that the programmes remain closely aligned with market demands and industry needs.

Given the established financial frameworks and operational experience, the consortium does not foresee significant financial risks associated with the introduction of the HPC-Europe+ Master's programme. Infrastructure and staffing capacities across all partner universities are sufficient to support the implementation and operation of the proposed curriculum. Moreover, the new HPC programme will benefit from existing infrastructure, specialised laboratories, and experienced academic staff who currently support similar advanced technological studies.

Additionally, in several consortium countries, including Austria, and Bulgaria, higher education, especially at the Master's level, is publicly funded and provided tuition-free to students. This further reinforces the stability of the consortium’s financial model, ensuring broad accessibility and sustained enrolment. As a result, the financial contributions requested from the European Union under this call will be fully sufficient to cover additional costs related specifically to programme implementation, European student mobility, and curriculum development in HPC.

Further detailed information regarding specific financial allocations, planned budget expenditures, and comprehensive financial justifications can be found in the accompanying Budget Overview and in Section 4 of this proposal document.

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2. IMPLEMENTATION

2.1 Maturity

Maturity

Explain the maturity of the project, i.e. the state of preparation and the readiness to start the implementation of the proposed activities.

The HPC-Europe+ Master Programme is built on a solid academic and institutional foundation, with all consortium partners already offering relevant master's-level education in HPC and related fields, including Quantum Computing and AI. This enables immediate implementation of the proposed programme.

Several partners currently offer fully accredited master’s programmes or specialisations directly aligned with the planned tracks. For instance, UNI-KLU provides a specialisation in Parallel and Distributed Systems, which forms the backbone of the HPC track. Moreover, it also provides a joint master’s programme with UNIUD on “AI and Cybersecurity”, which already contains foundational courses on artificial intelligence and machine learning and provides an established transnational collaboration platform. UNIUD runs an advanced programme in Quantum Computing and AI, while NTU KHPI offers a cutting-edge curriculum for AI—a unique bridge between two strategic technology domains. UKIM and TUD bring deep expertise in HPC systems, architecture, and education. More specifically, UKIM has an established academic background in Electrical Engineering and HPC, and offers a Master’s in Data Science, while TUD is internationally recognized for its excellence in HPC infrastructure and its popular, research-driven programme in system architecture and large-scale computing, including their deep collaboration with Max Planck institute. TalTech, extends on top of these offerings, with an excellent master program for computer science and full HPC centre. Lastly, UvA already offers a well-established programme in High-Performance Computing and Big Data, providing a solid foundation in scalable data processing and computational methods. From industry aspects, Infineon, a leading semiconductor company with extensive expertise in processor manufacturing, will support the consortium by facilitating industry contacts, providing expert lecturers, offering internships, supporting thesis projects, and assisting with dissemination activities. Finally, SEMI, as a prominent association of semiconductor producers and a key enabler of HPC infrastructure, will contribute critical hardware insights and spearhead dissemination efforts. From the associate partners RISE will provide multiple online courses to strengthen the relation with the AI Factories initiative.

Most partners also already offer bachelor's programmes (some already with enrolled international students) that provide that foundation and perfectly fit to an HPC joint master's follow-up, as shown in Table 2:

Table 2: Number of enrolled students in computer science with specialisations in distributed and parallel systems in the current programmes

Partner	Programme	Enrolled Students	New Entrants/ Year
UNI-KLU	Robotics and Artificial Intelligence	300+	180+
UNI-KLU	Information Technology	60+	20+
UNI-KLU	Angewandte Informatik (DE)	320+	80+
UNIUD	Computer Science	120+	50+
UNIUD	Artificial Intelligence and Cybersecurity	80+	40+
UKIM	Data Science in Electrical Engineering and Information Technologies	20+	10+
UKIM	Dedicated Computer Systems	20+	5
NTU KHPI	Software Engineering	45+	20
NTU KHPI	Computer Science and Intelligent Systems	40+	20
UvA	Software engineering	140	80+
UvA	System and network engineering	50+	30
TUD	Computer Science	200+	50+
TUD	Distributed Systems Engineering (track)	70+	20+
TUD	Media Informatics	50+	10+
TUD	Computational Modelling and Simulation	320+	100+
TalTech	Computer Science	50+	30+
TalTech	Information Technology	600+	342
USZ	Computer Science	100+	40+

The consortium also builds upon direct experience from the EUMaster4HPC initiative, which piloted a pan-European approach to master's education in HPC. From that programme, several lessons have been integrated into HPC-Europe+:

- A modular, micro-credential-based curriculum aligned with the EuroHPC Skill Tree ensures both consistency and flexibility across institutions.
- A strong mobility framework—from home university to specialisation hub to industry placement—enhances internationalisation and real-world readiness.
- A dedicated digital learning platform is included from the outset, supporting both delivery and credential tracking, addressing gaps identified in the previous programme.
- Peer-driven outreach and communication, such as podcast production and student-led science content, is embedded in the curriculum to promote engagement and visibility.

In addition to curricular strengths, the consortium brings significant experience in extracurricular and enrichment activities. Partners have a track record of organising high-impact events, summarized in Table 3.

Table 3: Extracurricular events organized by the consortium partners

Event	Partner	Topic
COST Summer School in HPC	UNI-KLU	HPC
BILAI PhD Summer School 2025	UNI-KLU	Hybrid AI
Site visits for students	IFAT	AI
Site visits for students	IFD	HPC
Master Class 2024	IFAT	AI
Winter School 2024	IFAT	Quantum
Master Class 2023	IFAT	Quantum
Summer School 2020	IFAT	Machine learning
Summer School on Quantum AI	UNIUD	Quantum AI computing
Winter School 2022	UKIM	e-Health and Pervasive Technologies
Summer School 2022	UKIM	Human Factors in Pervasive Health
Winter School 2023	UKIM	Trustworthy AI
Summer School (yearly for the past 5 years)	UKIM	Digital Image Processing
ENVRI summer school 2017-2022	UvA	Data management, cloud computing and HPC in environmental and earth science
UvA/HPC training program	UvA	HPC and big data
Yearly ScaDS.AI Summer Schools since 2015	TUD	AI and Big Data
ISC Student Cluster Competition 2025 participation	TUD	HPC, Benchmarking
Conference of PhD Students in Computer Science (bi-yearly)	USZ	Computer Science, including HPC, Cloud and AI

These activities not only enhance student learning but also promote HPC as an exciting, applied field, helping build a European HPC culture from the ground up.

All necessary academic, administrative, and mobility structures are already under development or in place. Credit recognition, co-supervision agreements, and content delivery models are being harmonised across the consortium to ensure a seamless, high-quality learning experience. A team of experienced faculty and technical staff is fully prepared to implement the programme from the first year. Beyond establishing a robust framework, our consortium significantly advances the field of High-Performance Computing by integrating cutting-edge specialisations in Quantum HPC, AI-driven HPC, and sustainable HPC solutions across the cloud-edge continuum, positioning our graduates at the forefront of Europe's digital transformation.

The HPC-Europe+ is a mature, high-readiness initiative that builds on established programmes, tested models from EUMaster4HPC, and a committed network of institutions with deep domain expertise and educational innovation capacity. The project is fully prepared to start upon approval.

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2.2 Implementation plan and efficient use of resources

Implementation plan

Show that the implementation work plan is sound by explaining the rationale behind the proposed work packages and how they contribute to achieve the objectives of the project.

Explain the coherence between the objectives, activities, planned resources and project management processes.

Show how the project integrates, builds on and follows up on any pre-existing work or EU funded projects. Provide details (including architecture and deliverables) about pre-existing technical solutions.

The HPC-Europe+ Master Programme is a two-year (120 ECTS) curriculum that provides a comprehensive education in High-Performance Computing (HPC). The programme offers foundational knowledge in the first year and advanced specialisations in the second year, capitalising on the strengths of each consortium partner. This section outlines the programme structure, specialisation tracks, partner roles, mobility framework, and alignment with EuroHPC Academy standards.

2.2.1 Implementation Plan

The implementation is structured into two main phases corresponding to Year 1, focused on HPC fundamentals, and Year 2, encompassing the specialisations.

2.2.1.1 Year One – HPC Fundamentals

In the first year, students acquire essential HPC knowledge and skills, aligned with EuroHPC's HPC Skill Tree micro-credentials. All partner institutions will build upon their existing master's programmes in computer science to deliver a harmonised HPC fundamentals curriculum. Each university will offer a shared set of foundational modules to ensure consistent core competencies across the consortium. These modules include Parallel Programming, HPC Architectures, Numerical Algorithms, Software Engineering, Introduction to AI, Mathematics and Statistics, as well as complementary courses in Data Science and essential soft skills.

The curriculum is divided into several categories:

- **Core HPC Modules**: Cover parallel algorithms and programming, computer architecture, mathematical and statistical methods for HPC, and software engineering. Topics include **multicore and distributed architectures, MPI/OpenMP/Parallel programming, numerical linear algebra, and scientific computing algorithms**, which bring 26 ECTS. These map directly to EuroHPC's "Parallel Programming," "Computer Architecture," and "Mathematics and Statistics" skill tree micro-credentials.
- **Data Science & AI Foundations**: Introduces fundamental concepts in data management, machine learning, and AI, laying the groundwork for HPC+AI specialisations, bringing 10 ECTS.
- **Transversal Skills:** Develops soft skills and research techniques in line with EuroHPC guidelines, such as scientific writing, ethics in computing, project management, and innovation/entrepreneurship (e.g., "RRI, Open Data, IPR" and "Creating Technology-Based Ventures"). These correspond to micro-credentials like "HPC Ethics" and "Soft Skills for HPC", and count for 10 ECTS.
- **Hands-on Training:** Practical sessions on university or national HPC clusters, where students apply profiling tools and run parallel applications, ensuring practical skills in line with EuroHPC Academy standards, bringing 4 ECTS.
- **Industry Lecture Series:** The consortium will regularly organize hybrid seminars featuring invited industry experts, providing practical insights and real-world applications. These sessions will be recorded and published online as open-access resources, enhancing the programme's visibility, accessibility, and industry relevance. The industry lecture series will bring at least 6 ECTS.

- **Entrepreneurship**: Students can attend foundational economics and business courses available at their respective universities' faculties of economics with a total of 2 ECTS.
- **Mobility Preparation**: At the end of Year 1, students select a specialisation and the corresponding host university for Year 2. A summer school—hosted at a mobility hub—brings together all students for hands-on workshops and an introduction to the specialisations, supporting community building and easing the mobility transition. While third-semester mobility is mandatory for specialisation, students can optionally pursue second-semester mobility to attend foundational HPC courses at partner universities.
- **Extracurricular Activities & Peer Seminars:** Students engage in local or consortium-supported workshops where they produce HPC-related podcasts and short media content, promoting HPC awareness. These activities encourage peer-to-peer learning and international knowledge sharing, and count for 2 ECTS.

2.2.1.2 Year Two – Specialisation at Consortium Hubs

In Year 2, students relocate to a designated specialisation hub different from their Year 1 institution. Each specialization consists of 30 ECTS of coursework and a 30 ECTS thesis. The project will offer the following specialization tracks based on the expertise of the partners:

- **High Performance Quantum Computing – UNIUD**
  This specialization covers the intersection of HPC and Quantum Computing in both directions. Students learn to use AI for optimizing quantum systems and apply quantum techniques to enhance machine learning algorithms with usage and development of modern HPC infrastructures and algorithms.

Table 4: Specialisation on High Performance Quantum Computing

Specialisation Name	**High Performance Quantum Computing**
Short Description	In this specialisation, students explore the powerful convergence of HPC, AI, and Quantum Computing. Emphasising the dual interplay between AI and Quantum technologies, the curriculum is designed to equip students with advanced competencies that push the boundaries of computational science. On the AI for Quantum side, students leverage both symbolic and sub-symbolic AI techniques—enabled by HPC infrastructure—to address complex challenges in quantum compilation, including circuit minimisation, as well as the efficient mapping and routing of logical to physical qubits. Conversely, within the Quantum for AI domain, students gain hands-on experience with cutting-edge quantum-enhanced machine learning algorithms that promise breakthroughs in scalability, performance, and inference—advances made possible through tight integration with HPC platforms.
Credits (ECTS)	30
Preliminary List of Courses	1. Foundations of Neural Networks for HPC 2. Foundations of Quantum Computing 3. Automated Reasoning on HPC Infrastructure 4. Deep Learning 5. Quantum Computing
Skills and Outcomes	• Design and implement HPC-driven solutions • Address design challenges in compiling quantum algorithms for real quantum hardware integrated in HPC systems • Develop and deploy scalable quantum computing solutions • Integrate classical and quantum machine learning techniques
Career Paths	• Expert of Classical/Quantum ML • Deep Learning/AI Expert • HPC Software Developer, Quantum Compilation • Quantum and HPC research scientist • Quantum and HPC Algorithms Specialist • Quantum Information and Error Correction Theorist

- **High-Performance AI Data Analytics – UKIM**
  Centred on Artificial Intelligence and High-Performance Data Analytics, this specialisation provides a deep dive into the intersection of AI and HPC technologies. Students will explore advanced topics such as federated and distributed neural network training, GPU-accelerated computing using frameworks like CUDA and OpenCL, and the architectural design of scalable, large-scale AI systems deployed on multi-node HPC clusters. Graduates will gain hands-on expertise in deploying AI workloads on cutting-edge HPC infrastructures, acquiring the critical

skills needed to design, scale, and optimise next-generation AI applications in research and industry.

Table 5: Specialisation on HPC for Artificial Intelligence

Specialisation Name	**High Performance AI Data Analytics**
Short Description	This specialisation equips students with the skills to design, scale, and deploy advanced systems and AI applications using modern HPC infrastructures. Through a combination of courses in parallel and distributed machine learning, deep learning, virtualisation, and data engineering, students will gain hands-on expertise in developing AI solutions that are both computationally efficient and production ready. The programme bridges theoretical foundations with practical tools aligned to emerging industry and research demands.
Credits (ECTS)	30
Preliminary List of Courses	1. High Performance Computing 2. Artificial Intelligence and Deep Learning 3. Parallel and Distributed Machine Learning 4. Advanced Virtualization Concepts and DevOps 5. Data Warehouse and Purpose-built Data
Skills and Outcomes	• Design and implement AI workflow which utilise parallel and distributed computing paradigms • Deploy and maintain scalable AI systems • Design and manage data pipelines for ingestion, transformation, and storage of large-scale datasets. • Apply critical thinking and problem-solving in the design and deployment of intelligent systems. • Understand ethical implications and responsible AI practices, especially in large-scale deployments.
Career Paths	• HPC-AI System Engineer • AI Solutions Architect • HPC Application Specialist for AI • AI Research Engineer • Big Data & Analytics Engineer • DevOps/MLOps Engineer

- **Sustainable and Green HPC – UNI-KLU**
  This specialisation focuses on sustainable and energy-efficient High-Performance Computing, equipping students with the skills to design, deploy, and manage environmentally conscious HPC solutions. Emphasis is placed on green computing practices, including energy-aware workload scheduling, carbon footprint monitoring, and the optimisation of resource utilisation across heterogeneous infrastructures. Students will also gain expertise in orchestrating complex scientific workflows across HPC, Cloud, and Edge environments, enabling seamless integration and adaptive scaling while minimising environmental impact.

Table 6: Specialisation on Sustainable and green HPC

Specialisation Name	**Sustainable and Green HPC**
Short Description	This specialisation prepares students to design and optimise HPC systems with a strong focus on sustainability and energy efficiency. Students will develop advanced skills in performance modelling, energy-aware workload management, and big data processing, while mastering tools and frameworks such as MPI, OpenMP, Spark, and Hadoop in the context of modern HPC infrastructures. A key emphasis is placed on workflow orchestration across HPC, Cloud, and Edge environments, tackling real-world challenges related to scalability, heterogeneity, and resource efficiency in data-intensive applications. The curriculum integrates core principles of green computing, including power-aware scheduling, carbon footprint analysis, and sustainable software engineering practices tailored for HPC environments.
Credits (ECTS)	30
Preliminary List of Courses	1. Workflow Design and Performance Analysis 2. Green Parallel Computing 3. Cloud and Edge Computing 4. Sustainable Big Data Analytics 5. Software Engineering for sustainable HPC

Skills and Outcomes	• Performance analysis and optimisation of HPC and big data workflows, including energy profiling and sustainability metrics • Integration of Cloud and Edge computing within HPC environments using tools such as Kubernetes and container-based orchestration • Parallel processing techniques and autotuning with MPI/OpenMP for energy-efficient execution on heterogeneous systems • Advanced big data analytics using Spark and Hadoop in HPC contexts, optimised for low energy consumption and resource efficiency • Workflow orchestration and green software engineering for scalable, sustainable systems, leveraging SLURM, workflow managers, and energy-aware scheduling.
Career Paths	• Expert in Green HPC and Big Data Performance Optimisation • HPC Software Engineer with a focus on energy-efficient computing • Cloud and Edge Integration Specialist for HPC Environments • Data Workflow Architect for Scalable and Sustainable Systems • Performance Analyst for Scientific and Industrial High-Performance Computing

- **Advanced HPC Systems Architecture and Design – TUD**
  A strong focus is on the development, evaluation, and optimization of highly parallel programs, including approaches for software-hardware co-design for energy-efficient computing. Students will develop skills in measuring, critically analyzing and optimizing efficiency and performance (e.g., with tools like Score-P and Vampir). They will also learn the use of high-level synthesis tools and their fundamental underpinnings, and high-level design and programming frameworks for HPC workloads (e.g., based on Python frameworks and modern domain-specific languages). TU Dresden's collaboration with the Max Planck Institute (MPI), the Helmholtz Zentrum Dresden-Rossendorf (HZDR), and the German Aerospace Center (DLR) enables students to apply their knowledge to scientific codes. Students who specialize in HPC architecture benefit not only from state-of-the-art HPC systems, but also from TU Dresden's investment in non-traditional architectures like Quantum Computing and highly-parallel event-based computer designs.

Table 7: Advanced HPC Systems Architecture and Design

Specialization name	**Advanced HPC Systems Architecture and Design**
Short description	This specialisation prepares students on the fundamentals of system architectures, parallel system design, HPC application frameworks and tooling methodologies for advanced HPC systems, including trends in modern exascale architectures, deployment and design of accelerators like GPUs, FPGAs and other emerging computing architectures. A strong focus is on tracing, monitoring, and (automatic) program optimizations, and software-hardware co-design for energy-efficient computing. Students will develop skills in state-of-the-art visualization and tracing tools such as Vampir and Score-P, in the use of high-level synthesis tools and their fundamental underpinnings, and high-level design and programming frameworks for HPC workloads (e.g., based on Python frameworks and modern domain-specific languages). The curriculum integrates core principles of the HPC technology stack, reaching from hardware level over compiler to the software interfaces but also integrates performance engineering from experiment design to tools-based approaches.
Credits (ECTs)	30
Preliminary list of courses	1. Research in Computer Engineering 2. Highly Parallel Programming of GPUs 3. Performance Analysis of computing Systems 4. Programming and hardware design for reconfigurable systems 5. Current Topics in Compiler Construction
Skills and outcomes	• Expertise in high-performance computing (HPC) engineering, encompassing the entire process from hardware design to software development, with a strong emphasis on computer engineering principles to ensure optimal system integration and performance. • Conducting performance analysis through comprehensive experiment design and the application of tools-based approaches, enabling the evaluation and enhancement of application performance in computational environments. • Leveraging accelerator-based parallelism, including traditional General-Purpose Graphics Processing Units (GPGPUs) and emerging

	technologies such as Field-Programmable Gate Arrays (FPGAs), to maximize computational efficiency and performance • Knowledgeable in compiler construction with a focus on abstractions for parallelism and high-level compiler transformations. • Experienced in hardware/software co-design with a focus on reconfigurable systems, facilitating the development of integrated solutions that optimize both hardware and software components for improved adaptability and performance.
Career paths	• Full-stack HPC Specialist with a focus on computer engineering. • Performance Engineer, designing performance measuring workflows and tools and improving existing HPC applications. • Technology Strategist, advising working groups and HPC centres on which hardware fits used software. • Software Engineer with a focus on HW/SW-co-designed applications that use existing hardware resources efficiently. • Research Scientist in Emerging Computing Technologies, who explores and develops cutting-edge technologies in HPC, parallel computing, and reconfigurable systems.

- **Secure HPC Intelligence – NTU KHPI**
  This specialisation explores the powerful convergence of High-Performance Computing, Security and Artificial Intelligence, equipping students with the skills to build and scale intelligent systems on cutting-edge computational infrastructures. Key topics include scalable deep learning, distributed AI model training, AI infrastructure design on HPC clusters, and the optimisation of AI workloads using parallel computing frameworks such as CUDA, MPI, and OpenMP with focus on security and cryptography.

Table 8: Specialization on Secure HPC Intelligence

Specialisation Name	**Secure HPC Intelligence**
Short Description	This specialisation focuses on integrating Artificial Intelligence with High-Performance Computing. Students gain advanced skills in scalable AI algorithm design, optimisation of machine learning workflows for HPC environments, and the application of AI to complex scientific, engineering, and cybersecurity challenges. The curriculum also includes key topics in security and cryptography, preparing graduates to develop secure, high-performance intelligent systems. Graduates are equipped for leading roles in research and industry at the intersection of AI, HPC, and digital trust.
Credits (ECTS)	30
Preliminary List of Courses	1. AI-Driven Scientific Computing 2. Scalable Machine Learning on High-Performance Systems 3. Deep Learning Optimization and Acceleration 4. High-Performance Computing for Large-Scale Cybersecurity Analytics 5. Cryptography and Secure Computation in HPC Environments
Skills and Outcomes	• Design and implement scalable AI solutions optimized for HPC environments • Build secure and resilient AI systems, including defence against adversarial attacks and implementation of privacy-preserving methods • Collaborate on interdisciplinary projects combining AI, HPC, and domain-specific knowledge
Career Paths	• Machine Learning Engineer (with HPC focus) • Cybersecurity Analyst with HPC Expertise • HPC AI Researcher (Scientific Computing / Security / Systems)

- **Software Engineering for HPC and BigData - UvA**
  This specialisation offers extended knowledge in software engineering for High-Performance Computing to prepare students for designing and managing scalable, secure, and HPC and cloud-native systems. With a strong foundation in parallel and distributed systems, cloud computing, DevOps, and data-intensive applications, students gain both theoretical knowledge and practical experience.

Table 9: Specialization on Software Engineering for HPC and BigData

Specialization name	**Software Engineering for HPC and BigData**

Short description	This specialization offers a unique blend of High Performance Computing, Big Data, and modern Software Engineering practices. Designed for students aiming to build scalable, secure, and HPC and cloud-native applications, the programme combines foundational knowledge in parallel and distributed systems, including scheduling orchestration and deployment, considering security, DevOps, and data-intensive computing. Students gain both theoretical understanding and hands-on experience through practical labs, team projects, and real-world use cases. The minor prepares participants to effectively design, implement, and manage advanced computing systems at scale, bridging the gap between data engineering and software engineering in the cloud era.
Credits (ECTs)	30
Preliminary list of courses	1. Security of Systems and Networks 2. Parallel Systems and Virtualization 3. High Performance Computing and Big Data 4. DevOps and Cloud-based Software 5. Web Services and Parallel Cloud-Based Systems
Skills and outcomes	• Design and deploy secure, cloud-native, and scalable distributed systems • Apply HPC and Big Data tools to solve computational and data-intensive problems • Develop and automate infrastructure using DevOps and Infrastructure-as-Code principles • Analyse and troubleshoot complex system architectures and applications • Collaborate in multidisciplinary teams on cloud and HPC-enabled software projects
Career paths	• Cloud Software Engineer • DevOps Engineer • Big Data Engineer • Research software engineer • HPC Systems Developer • Distributed Systems Specialist • Cybersecurity Engineer for Cloud Systems

- **Scientific High Performance Computing - TalTech**
  This specialisation is designed for students aiming to pursue careers in academia or research and development institutions. It provides in-depth knowledge of the European digital supply chain and equips students to contribute to the advancement of novel HPC approaches and their application in scientific discovery and innovation.

Table 10: Specialization on Scientific High Performance Computing

Specialization name	**Scientific High Performance Computing**
Short description	This specialisation offers students a broad exploration of modern HPC applications and techniques across multiple domains. It combines advanced courses in scientific computing, environmental big data processing, and computer vision with new modules in GPU programming and large multi-modal models. Designed to encourage experimentation and interdisciplinary thinking, the programme optionally culminates in a capstone project to connect the diverse skills acquired. Students gain a foundation in scalable computing technologies applicable to real-world scientific, industrial, and research challenges.
Credits (ECTs)	30
Preliminary list of courses	1. Scientific Computing 2. Large-Scale Intelligent Environmental Sensing: Theory and Practice 3. Computer Vision (Deep Learning focus) 4. GPU Programming with CUDA 5. Large Multi-modal Models (LMMs)

Skills and outcomes	• Design and analyse numerical methods for scientific computing problems • Collect, process, and analyse data from distributed environmental sensing systems • Use, train, modify and fine-tune deep learning models for image analysis • Implement high-performance solutions using CUDA for GPU-based computation • Understand, fine-tune, and deploy LMMs in HPC environments • Optionally: Integrate knowledge from diverse domains into a unified capstone project
Career paths	• Scientific Computing Specialist • Environmental Data Engineer • Software Developer for Applied Computer Vision • HPC Software Engineer (CUDA) • AI Researcher (LMMs and Deep Learning) • HPC Generalist / Research Software Engineer

- **Modelling and Simulation of HPC - USZ**
  This specialisation is designed for students aiming to pursue careers in academia or research and development institutions. It provides in-depth knowledge of simulation approaches, techniques and tools for distributed HPC systems.

Table 11: Specialization on Modelling and Simulation of HPC

Specialization name	**Modelling and Simulation of HPC**
Short description	This specialisation offers students a broad introduction of modern, decentralized HPC simulation approaches and techniques. The design and operation of efficient Edge/Fog and Cloud systems can have significant financial implications, as they can only be operated economically by fine-tuning a large number of parameters and resource management algorithms. Therefore, various simulation solutions are widely used by researchers to realistically model and cost-effectively test these systems. Students gain both theoretical understanding and hands-on experience through practical labs and team projects through modelling real-world use cases.
Credits (ECTs)	30
Preliminary list of courses	1. Simulation of the Edge-to-Cloud Continuum 2. Simulation of Blockchain systems and applications 3. Simulation of IoT and Workflow applications 4. Distributed AI techniques for HPC 5. Data protection in Cloud-based applications
Skills and outcomes	• Design and analyse methods for Cloud-based system management • Design, develop and optimize IoT and Workflow application scheduling • Design and analyse data management methods for HPC and Cloud • Design and analyse integration possibilities of Blockchain, Quantum and AI techniques • Integrate knowledge of managing related distributed paradigms
Career paths	• Cloud Software Engineer • HPC Systems Architect • HPC Systems Developer • Cybersecurity Analyst with HPC Expertise • Distributed Systems Specialist

Each specialisation may include mini-projects or capstone experiences. For example, students in the Quantum HPC track may develop hybrid algorithms, while those in the Systems Architect track might design prototype clusters.

2.2.1.3 Year Two – Master Thesis Hub

The final semester is dedicated to a 30 ECTS Master's thesis, typically completed as a collaborative research project or internship. The project will create a hub and a related website where all master thesis will be published, and the students will be able to decide to the thesis locally or to use again a mobility option:

- **Project Hosting**: Students conduct their thesis at an industry partner, supercomputing centre, or research institute within or affiliated with the consortium. For instance, a student from the AI track

may join a LLM development company; a System Architect student may collaborate with a supercomputing centre.
- **Thesis Coordination**: UNI-KLU serves as primary thesis coordinators, leveraging their networks to supervise projects. UKIM will coordinate thesis placements in Southeastern Europe by working with regional IT firms and HPC initiatives.
- **Supervision Model**: Each student is co-supervised by a university faculty member and an external mentor from the host organisation, ensuring academic depth and industry relevance.
- **Mobility**: Students are encouraged to relocate to the host organisation for 3 months. Remote or hybrid arrangements are available when needed.

By graduation, students will have produced a thesis and often a software artifact or publication relevant to HPC practice, addressing EuroHPC's emphasis on real-world impact.

2.2.1.4 Mobility and Hub Structure

The programme follows a three-phase mobility model:

- **Mobility Hub 1 – Home University**: Year 1 is spent at the student's entry institution. A shared set of courses in each partners curriculum ensures all students are equally prepared for Year 2.
- **Mobility Hub 2 – Specialisation University**: Year 2 is spent at a different partner university aligned with the chosen specialisation. Admission considers student preferences and capacity.
- **Mobility Hub 3 – Industry/Research Partner**: During the thesis phase, students may relocate again to an industry or research partner. Coordinated by Infineon, these placements offer hands-on HPC experience. This third mobility echoes Erasmus+ values and often leads to employment opportunities.

To support mobility, UNI-KLU will coordinate logistics, credit transfers, and agreements. Cohort-wide events such as orientation sessions, summer schools, and mid-programme workshops will reinforce community, learning, and networking.

This structured mobility ensures every student benefits from academic, international and professional experience.

2.2.1.5 Admission and Enrolment Criteria

To join HPC-Europe+, applicants must satisfy both local and programme-wide requirements:

- **Academic Background**: A completed Bachelor's degree in a STEM field (e.g., Computer Science, Engineering, Physics, Mathematics). Applicants must show evidence of relevant coursework and technical aptitude.
- **Programming Skills**: At least two university-level courses in programming (e.g., Python, C/C++), algorithms, or data structures.
- **Mathematics Proficiency**: At least four university courses in topics such as calculus, linear algebra, statistics, probability, numerical methods, or optimisation.
- **Language Requirements**: English proficiency at minimum CEFR level B2, prior studies in English, native-level proficiency.
- **Mobility Requirement**: All students must be willing and able to relocate to a second university in another European country in Year 2. Mobility is a core element of the programme.

2.2.1.6 Application Procedure

Admission is based on a two-step process:

1. **Application to a Home University**: Candidates apply to one of the consortium's partner universities. They must meet that university's local admission criteria and deadlines.
2. **Application to the HPC-Europe+ Programme**: Simultaneously, candidates apply to the central HPC-Europe+ selection committee, submitting the following:
    - Curriculum Vitae (CV)
    - Motivation Letter explaining interest in HPC and the programme
    - Academic Transcripts
    - Proof of English proficiency (as above)
    - Copy of Passport or ID

Final admission is contingent on acceptance by one of the awarding universities. Applicants are advised to track application deadlines carefully for both steps.

2.2.1.7 Application Procedure

The project aims to implement a comprehensive, secure, and user-friendly digital platform to manage student mobility processes at UNI-KLU. This system will support the complete lifecycle of student exchanges — from application to financial disbursement — including visa support where required. It is designed to minimize the administrative burden for partner institutions while offering an intuitive application process for students.

The mobility management platform will include a range of integrated features to support transparency, usability, and legal compliance:

- A step-by-step guidance system to navigate the mobility application process.

- An eligibility assessment module to ensure applicants meet institutional and program-specific requirements.
- Integration of Know Your Customer (KYC) software to verify identities and facilitate legal compliance, thereby streamlining approval workflows.

To prevent fraud and ensure adherence to EU administrative standards, the platform will incorporate a rigorous digital verification process, inspired by established procedures in the banking sector. This includes:

- Validation of identity documents**,** such as passports, national ID cards, and official student identification from the sending institution (KYC software)
- Verify bank account ownership through submission of official documentation (e.g. account confirmation letters or recent bank statements).

These verification steps are embedded in the digital workflow to ensure security, trustworthiness, and transparency across all processes. The system will include secure payment functionalities with end-to-end encryption, fully integrated within the digital platform. This ensures that all financial transactions, including the disbursement of mobility grants, are handled safely and are protected against misuse or unauthorized access.
Students will receive mobility grants as lump-sum payments, following the model established by the Erasmus+ mobility program. The disbursement will occur in two instalments:

- 50% as an advance payment, prior to the start of the mobility period.
- 50% after successful completion of the agreed mobility activity.

In cases of cancellation or early termination, predefined conditions and reimbursement clauses will apply. These are designed to ensure a fair, transparent, and legally sound handling of financial exceptions.

2.2.1.8 Work packages and use of resources

HPC-Europe+ is structured into seven Work Packages (WPs), each contributing to the design, implementation, and long-term sustainability of the Master programme. The interaction and flow among the work packages is illustrated in Figure 3. The programme design follows a modular and iterative development approach inspired by best practices in transnational education and insights gained from the EUMaster4HPC pilot.

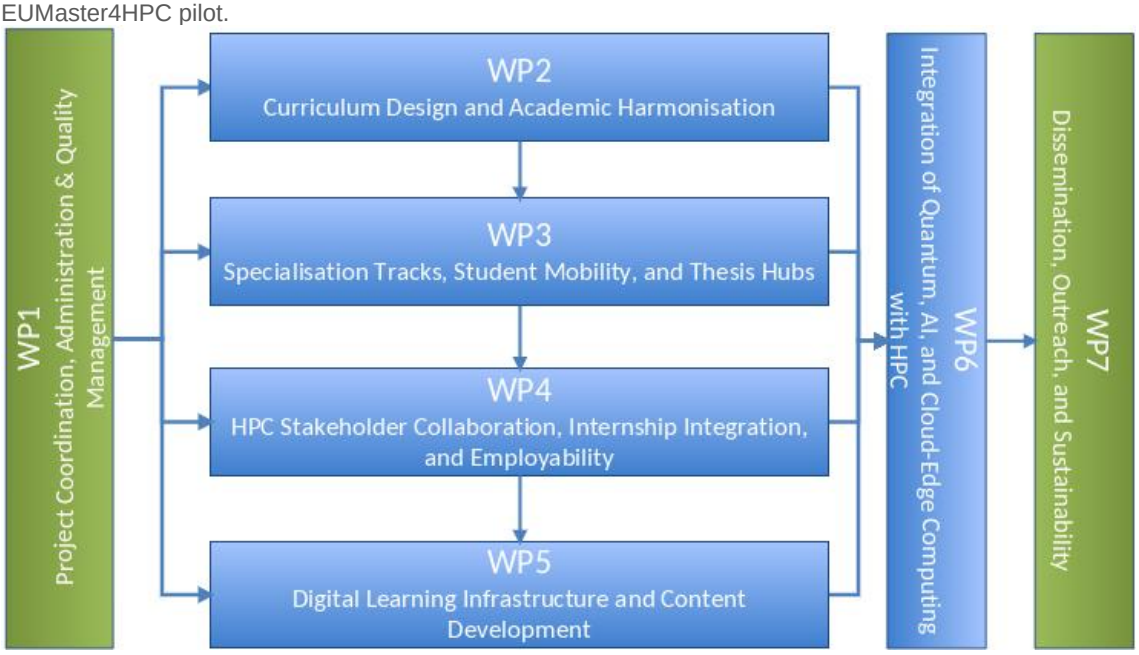

Figure 3: Overview of work packages

The overarching goal is to implement a harmonised, micro-credential-based European Master's programme in HPC that combines academic depth, specialisation flexibility, real-world applications, and cross-border mobility.

Each WP is led by a consortium partner with domain expertise and proven experience, ensuring cohesion between academic development, digital delivery, student mobility, and stakeholder engagement.

WP1 Project Coordination, Administration & Quality Management (UNI-KLU) oversees project coordination, legal and financial administration, and quality assurance. It ensures smooth collaboration among partners, manages risk, supports ethical and inclusive practices, and monitors student mobility and enrolment progress.

WP2 Curriculum Design and Academic Harmonisation (UKIM) leads the design and harmonisation of the two-year curriculum, including core modules, specialisation tracks, learning outcomes, and EuroHPC-aligned micro-credentials. It also defines assessment methods, credit recognition, and supports cross-border accreditation.

WP3 Specialisation Tracks, Student Mobility, and Thesis Hubs (TUD) manages the core "home → specialisation → thesis" student mobility framework. It coordinates student transitions, develops European Thesis Hubs, and provides support services, including relocation assistance and community-building events. It will bring the strong experience in HPC and connection with Max Planck institute,

WP4 HPC Stakeholder Collaboration, Internship Integration, and Employability (UvA) engages HPC industry and research stakeholders to offer internships, joint thesis supervision, and mentorship. It supports employability through job market alignment, job profile mapping, and the launch of the HPC Master Job Hub.

WP5 Digital Learning Infrastructure and Content Development (NTU KHPI) develops and maintains the digital learning platform, delivering hybrid-ready teaching content, virtual HPC labs, and micro-credential tracking. It enables modular, cross-institutional teaching and student-driven content creation.

WP6 Coordination and Integration of Specialisation Tracks in Emerging HPC Domains (UNIUD) coordinates and harmonises specialisation tracks across partner institutions in emerging HPC domains such as quantum computing, AI, and cloud-edge integration. It ensures curricular consistency, mobility compatibility, and shared teaching assets.

WP7 Dissemination, Outreach, and Sustainability (SEMI) leads dissemination, outreach, and long-term sustainability efforts. It drives programme visibility, supports recruitment across Europe, and ensures alignment with EuroHPC initiatives through strategic integration and alumni engagement.

The project follows a milestone-driven development and implementation cycle:

- **MS1: Core Curriculum and Mobility Blueprint (M6)**
  WP2 and WP3 define the common Year 1 programme, initial specialisation tracks, and mobility agreements. WP5 begins content onboarding for the digital platform.
- **MS2: Specialisation and Curriculum Design (M12)**
  The milestone focuses on the integration of the specialisations across the partners and finalises Year 2 tracks with micro-credential alignment. It further provides formal definition of the master program and the specialisations with yearly updates.
- **MS3: First Programme Cohort Launched (M18)**
  The first student intake begins. WP3 manages mobility logistics, and WP4 engages industry partners for early internship and thesis planning. WP6 initiates high-visibility outreach campaigns.
- **MS4: Industry-Integrated Master Thesis Phase (M30)**
  WP3 and WP4 finalise student placements in Industry/Research Thesis Hubs. Dual mentorship models are fully operational. WP6 gathers early feedback on outcomes and alignment with employer needs.
- **MS5: Sustainable Digital Platform and Roadmap (M36)**
  WP5 compiles lessons learned and presents a strategic roadmap for the long-term continuation of the HPC-Europe+ programme. As part of this milestone, the project provides a sustainable digital platform supporting online and hybrid course delivery for all enrolled students, as well as for external learners interested in studying HPC through freely accessible, modular content.
- **MS6: Integration of Emerging Technologies in HPC (M39)**
  This milestone establishes the integration of emerging technologies—including Quantum Computing, Artificial Intelligence, Cloud, and Edge Computing—into the HPC curriculum, ensuring that specialised modules and teaching materials reflect cutting-edge trends and industry demands.
- **MS7: First Cohort Graduated (M48)**
  The first group of students completes the full two-year programme. WP3 and WP4 assess outcomes from mobility and industry collaboration. WP6 collects graduate data, employment pathways, and alumni feedback to support broader programme validation and marketing.

This workplan reflects a coordinated and iterative approach to building and scaling a sustainable, high-quality European Master in HPC. With strong foundations in institutional expertise and lessons learned from previous initiatives, HPC-Europe+ is primed to deliver real impact from the start and evolve with the needs of the HPC ecosystem in Europe.

Project management, quality assurance and monitoring and evaluation strategy

Describe the measures planned to ensure that the project implementation is of high quality and completed in time.

Describe the methods to ensure good quality of monitoring, planning and control activities.

Describe the evaluation methods and indicators (quantitative and qualitative) to monitor and verify the outreach and coverage of the activities and results. The indicators proposed to measure progress should be specific, measurable, achievable, relevant and time-bound.

The effective and transparent coordination of the HPC-Europe+ Master Programme will be ensured through a multi-layered project management structure, combining academic, administrative, and industry oversight. UNI-KLU will lead the coordination efforts and oversee the execution of all project-related activities in close cooperation with the consortium partners.

To ensure strategic alignment and high-quality delivery, a **Steering Committee** will be established, composed of experts from **higher education, research, and industry**. This committee will serve as an independent advisory and supervisory body, providing guidance on implementation, curriculum alignment, student experience, and sustainability strategy. The Steering Committee will convene at least once per

semester and will review project progress based on key performance indicators (KPIs), deliverables, and institutional data.

Steering Committee Members

Table 12: Steering Committee

Name	Institution/Company	Domain/Expertise	Role
Prof. Thomas Fahringer	University of Innsbruck	HPC Optimisation	Master studies adviser
Prof. Jesus Carretero	University of Madrid	HPC Architectures	Specialisations adviser
Vladislav Golyanik	Max-Planck	Quantum Computing and AI	Quantum integration adviser
Prof. Rob van Nieuwpoort	University of Leiden	HPC, GPU and distributed systems	Distributed Systems adviser
Prof. Plamenka Borovska	Technical University of Sofia	HPC Architectures	Inclusivity adviser

In line with the KPIs defined in Section 1 of the proposal, the project will monitor performance against the following indicators:

- **KPI-1.1**: Number of enrolled students per academic year
- **KPI-1.2**: Student diversity and geographical representation
- **KPI-2.1**: Percentage of courses delivering micro-credentials
- **KPI-3.2**: Number of successfully completed internships or thesis projects in industry/research settings
- **KPI-4.1**: Number of students who decided to do specialisation in quantum computing, AI and Cloud-Edge integration with HPC
- **KPI-5.1**: Outreach effectiveness, including engagement in podcasts, competitions, and public dissemination

Consortium partners will be required to submit semesterly data on:

- Enrolment numbers
- Course attendance and exam pass rates
- Participation in extracurricular activities (e.g., summer schools, hackathons, outreach events)

This data will be compiled and reviewed by the Steering Committee. If significant issues or deviations are identified (e.g., low enrolment, high drop-out rates, delayed activities), the **project coordinator** will be required to elevate the matter, and mitigation actions will be jointly agreed upon with the affected partners and relevant WP leaders.

In parallel, an **Industry Outreach Committee** will be formed, composed of representatives from companies affiliated with the consortium. This group will specifically monitor:

- The quality and relevance of industry engagement
- Internship and thesis placement effectiveness
- Impact of outreach activities toward employers and prospective students

This dual-governance approach ensures that both the **academic integrity** and **labour market alignment** of the HPC-Europe+ programme are continuously assessed and refined.

Table 13: Industry Outreach Committee

Name	Company	Domain
Padima Penmatsa	Intel	Hardware Engineer
Alexandre Ulisses	MOG	Video Analysis
Souvik Sengupta	Ionos	Cloud Infrastructure
Carlos Rubia	Agilia Center	Infrastructure provider
Roberta Turra	Cineca	HPC Provider
Brigitte Bach	AIT	Technology Provider

Cost effectiveness and financial management *(n/a for prefixed Lump Sum Grants)*

Describe the measures adopted to ensure that the proposed results and objectives will be achieved in the most cost-effective way.

Indicate the arrangements adopted for the financial management of the project and, in particular, how the financial resources will be allocated and managed within the consortium.

⚠ *Do NOT compare and justify the costs of each work package, but summarize briefly why your budget is cost effective.*

The project will implement a hybrid financial model, combining centralized coordination led by UNI-KLU with the strategic utilisation of existing infrastructures, educational programmes, and resources available within the consortium. This approach ensures cost-effectiveness and reduces financial and administrative overhead. Furthermore, the project will actively engage with multiple industry partners through open collaboration models, leveraging in-kind contributions to further optimise resource allocation and enhance impact.

Centralized Financial Coordination

- **Cost-Reimbursement Model**: The programme operates under a cost-reimbursement model with UNI-KLU as the central financial authority. UNI-KLU manages the overall budget, ensures compliance with funding rules, and distributes funds to partner universities efficiently.
- **Decentralized Budget Management:** Each partner university independently manages its allocated staff budget, maintaining local accountability. This autonomy is balanced by overarching guidelines from UNI-KLU to keep spending aligned with the consortium's financial plan.
- **Shared Costs Oversight**: Common expenses – especially those related to student mobility – are coordinated by UNI-KLU. Central oversight of these shared costs prevents duplicate administrative efforts at each university and ensures funds are used in the most cost-effective way.

Leveraging Existing Infrastructure

- **Integration into Existing Programmes**: Instead of creating new degree programmes from scratch, HPC-Europe+ is implemented as a specialisation or track within already accredited master's degrees at each partner institution. This build-on-existing approach minimizes the need for new administrative structures and accelerates programme roll-out.
- **Reduced Overhead**: By using the current master-level infrastructure (courses, faculty, facilities), the programme avoids significant new expenditures. Partners can immediately offer the HPC-Europe+ curriculum, resulting in lower start-up costs and faster deployment compared to establishing entirely new programmes.

Streamlined Student Mobility Funding

- **Central Funding for Mobility**: To encourage student exchanges and collaboration, mobility costs (travel, relocation grants, etc.) are covered and managed centrally by UNI-KLU. This unified approach ensures every student in the programme receives consistent support for mobility opportunities.
- **Efficiency and Consistency**: Centralizing mobility funds eliminates duplicate administrative procedures across multiple universities. It simplifies logistics, speeds up reimbursements, and guarantees efficient allocation of funds, making student mobility financially feasible and hassle-free for both students and partner institutions.

Industry Partnerships and In-Kind Support

- **Industry-Coordinated Thesis Projects:** The programme partners with industry sponsors to co-develop student thesis projects. Companies provide access to existing research infrastructure, expert mentorship, and real-world problem topics. This collaboration means no additional research funds are needed for thesis work, and students gain practical experience that boosts their employability.
- **HPC Master Job Hubs**: In collaboration with industry sponsors, HPC Master Job Hubs are established to connect students with internships and employment pathways. These hubs offer in-kind contributions such as mentorship, training resources, and potential job placements. By leveraging industry support, the programme reduces its financial burden while enhancing outcomes for students (through networking and career opportunities) and increasing the programme's overall impact and visibility.

Oversight and Transparency

- **Steering Committee Reviews:** A Steering Committee, representing all consortium members and external experts, conducts regular reviews of expenditures and budget usage. These periodic audits ensure that spending remains aligned with the programme's objectives, and that cost-effectiveness is continuously achieved throughout the project's duration.
- **Clear Reporting Obligations:** All partners follow strict reporting guidelines for their expenses. Financial reports are collected and monitored centrally by UNI-KLU. This transparency and accountability framework builds trust among consortium members and the funding body, ensuring funds are managed responsibly and according to the grant's requirements.

Critical risks and risk management strategy

Describe critical risks, uncertainties or difficulties related to the implementation of your project, and your measures/strategy for addressing them.

Indicate for each risk (in the description) the impact and the likelihood that the risk will materialise (high, medium, low), even after taking into account the mitigating measures.

Note: *Uncertainties and unexpected events occur in all organisations, even if very well-run. The risk analysis will help you to predict issues that could delay or hinder project activities. A good risk management strategy is essential for good project management.*

Risk No	Description	WP No	Proposed risk-mitigation measures
1	Lower-than-expected student enrolment in the first intake. Despite strong academic design and industry support, initial enrolment may fall short due to factors such as limited awareness, perceived difficulty of HPC subjects, or mobility requirements deterring applicants. i) impact: medium ii) likelihood: low	**WP1**	Increase marketing activities and use our vast network of partners in HPC to attract a larger number of students across the whole consortium.
2	Incompatibility between academic systems and complications in national accreditation. i) impact: high ii) likelihood: low	**WP2**	Early involvement of accreditation experts and use of Bologna standards in designing the programme.
3	Incoherent structure of the modular programme not allowing cross recognition of the modules. i) impact: medium ii) likelihood: medium	**WP2**	Prepare a clear plan for the modules and specialisation and clarification of all potential issues in advance.
4	Mobility and travel issues for the students, including visa problems or expensive accommodation. i) impact: medium ii) likelihood: medium	**WP3**	We will establish a centralized support point for students to help them with mobility issues and organizing the travel and stay.
5	Problems with providing timely statistic on the number of enrolled students and their success with the courses. i) impact: low ii) likelihood: low	**WP3**	Provide full support to all partner institutions in the data gathering process and further in the aggregation of students data by introducing a centralized statistic system in UNI-KLU.
6	Issues with finding appropriate mentors in the industry. i) impact: medium ii) likelihood: low	**WP4**	Create a shared system across the consortium where all master thesis topic and possible mentors and supervisors can be listed.
7	Limited partnership with industry and infrastructure providers. i) impact: high ii) likelihood: low	**WP4**	Use already established contacts and connections to reach larger number of stakeholders and improve the collaboration with the industry.
8	Hosting organization and support funding of digital learning infrastructure in the post-project period. i) impact: low ii) likelihood: low	**WP5**	Initiate a centralized support point for creating a digital learning infrastructure based on one of the consortium members (university/company).
9	Security attacks, such as Denial of Service, on the courses platform. i) impact: low ii) likelihood: low	**WP5**	Deploy the platform on highly distributed Cloud and Edge infrastructure.
10	Difficulties finding teachers that can cover the special courses in quantum and AI computing. i) impact: high ii) likelihood: low	**WP6**	Contact industry partners with a lot of experience in the area to provide specialised courses and attract more teachers from the specific areas.
11	Issues in the promotion and dissemination of the programme across different channels. i) impact: high ii) likelihood: low	**WP7**	Improved plan with dissemination channels mostly used by students and young population with a focus on popular social and science media.

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2.3 Capacity to carry out the proposed work

Consortium cooperation and division of roles (if applicable)

Describe the participants (Beneficiaries, Affiliated Entities and Associated Partners, if any) and explain how they will work together to implement the project. How will they bring together the necessary expertise? How will they complement each other?

In what way does each of the participants contribute to the project? Show that each has a valid role and adequate resources to fulfil that role.

***Note:** When building your consortium you should think of organisations that can help you reach objectives and solve problems.*

The HPC-Europe+ consortium brings together a highly complementary and geographically diverse group of institutions with deep expertise in High-Performance Computing, Artificial Intelligence, Quantum Computing, and industry-relevant education, as depicted in Table 14. Collectively, the partners have the proven capacity to deliver a modular, scalable, and innovative European Master's programme that meets the evolving needs of science, industry and society.

Several academic partners—including UNI-KLU, UKIM, NTU KHPI, UvA, and TUD—bring strong and complementary expertise in core HPC education and research. These institutions lead curriculum development, digital infrastructure deployment, and mobility implementation, ensuring the foundational and specialised components of the programme are aligned with state-of-the-art computational science.

Specialisation in Quantum HPC is well-supported by UNIUD and UvA, with further contributions from NTU KHPI, ensuring that emerging technologies are integrated into the curriculum. For AI integration with HPC, several partners—including UvA, UNIUD, NTU KHPI, and UKIM—bring academic and applied research excellence that enables scalable, performance-optimised machine learning training on HPC systems.

The programme's entrepreneurial and business dimensions are driven by IFAT/IFD, which has expertise in innovation management and high-tech entrepreneurship. This ensures that students not only gain technical depth but are also equipped with critical skills to transfer HPC innovations to market and drive economic impact.

Industry relevance is secured through the active involvement of IFAT/IFD, RISE, and SEMI, which contribute real-world use cases, stakeholder engagement, and internship opportunities. These partners also support the co-supervision of thesis projects and contribute to the development of the HPC Master Job Hub, enhancing employability and responsiveness to market needs.

Inclusivity and diversity are fundamental pillars of the programme. Institutions like ECSP Europe, SEMI, and IFAT/IFD play a key role in promoting inclusive participation, supporting underrepresented regions, and fostering gender balance across student cohorts and academic leadership.

This well-balanced mix of technical, pedagogical, industrial, and social expertise ensures the consortium is fully capable of delivering a world-class, future-proof, and sustainable European Master's programme in HPC. The coordinated structure of the work packages, aligned with partner strengths, maximises efficiency, scalability, and long-term impact.

Table 14: Consortium expertise

Partner Acronym	HPC	Quantum	AI	Business and Entrepreneurship	Industry Know-How	Simulations
UNI-KLU	x		x			
IFAT/IFD	x			x	x	
UNIUD		x	x			
UKIM	x		x			
NTU KHPI	x		x			
UvA	x	x	x			
SEMI				x	x	x
RISE		x	x	x	x	
TUD	x	x	x			x
TalTech	x		x			x
USZ	x		x			x

2.3.1 Consortium cooperation and division of roles

The consortium has allocated responsibilities according to proven expertise so that each institution contributes where it delivers the greatest added value to the HPC-Europe+ Master.

UNI-KLU coordinates the entire project. It administers all legal, financial, and contractual matters, operates the internal quality-assurance and risk-management system, guarantees GDPR and ethical compliance,

and implements the consortium-wide Gender & Inclusivity Action Plan that governs recruitment, events, and reporting.

Infineon Technologies AG supports the consortium with an industrial insight. Its engineers deliver guest lectures, co-supervise master theses, validate the market relevance of specialisation modules and thesis topics, and contribute use-case material to the Specialisation and Thesis Hubs.

UNIUD ensures the coherence of all specialisation tracks. It maps partner expertise, sets a shared ECTS and mobility framework for the third semester offer, coordinates the development of reusable teaching assets in emerging HPC domains, including Quantum AI, and oversees the issue of EuroHPC-aligned micro-credentials.

UKIM designs and harmonises the academic offer. It develops the common first-year core, leads the definition of second-year specialisation tracks, aligns every module with EuroHPC micro-credentials, and prepares the credit-transfer, assessment, and accreditation dossiers that make mobility and multi-site delivery possible.

NTU KHPI provides the digital learning backbone. It builds and maintains the central online platform, integrates virtual HPC laboratories and automated credit tracking, produces a library of pre-recorded lectures and quizzes, and documents innovative pedagogy for the programme's annual learning-technology report.

UvA anchors the industry interface. It establishes and animates the HPC Stakeholder Hub, negotiates and oversees internships, coordinates the co-supervision model for thesis projects, maps evolving workforce needs, and operates the HPC Master Job Hub—an online platform for vacancies, CV tools, and employer networking.

SEMI leads dissemination, outreach, and sustainability. It develops the programme's visual identity and website, delivers outreach campaigns in schools and under-represented regions, channels results to EuroHPC and Digital-Europe platforms, and drafts the post-grant sustainability roadmap that will keep the Master running beyond project funding.

RISE contributes advanced AI expertise. It links the consortium to European AI factories, authors online AI-for-HPC courses, mentors students combining HPC with machine-learning workloads, and supports the design of AI-enriched specialisation pathways.

TUD orchestrates student mobility. It matches each student to a specialisation hub and thesis host, manages the European Thesis Hub network, issues learning-agreement templates that secure ECTS recognition, runs the mobility help-desk for visas, housing, and integration, and organises summer schools and cohort-building workshops.

TalTech delivers a full specialisation in Scientific HPC. It designs laboratory-intensive modules leveraging its supercomputing facilities, hosts incoming students for that track, and helps draft the operational guidelines for all specialisation hubs in close collaboration with UNIUD and TUD.

USZ delivers a full specialization in modelling and simulation of HPC systems. It designs modules based on specific simulation tools of Cloud, Fog, IoT and Blockchain systems and applications.

Finally, every partner—academic, industrial, or research-oriented—contributes to dissemination through local info-days, social-media takeovers, press releases, and alumni spotlights, ensuring that the programme speaks with one coherent European voice while reaching the broadest possible audience of future HPC specialists.

Project teams and staff

Describe the project teams and how they will work together to implement the project.

List the staff included in the project budget (budget category A) by function/profile (e.g. project manager, senior expert/advisor/researcher, junior expert/advisor/researcher, trainers/teachers, technical personnel, administrative personnel etc. — use the same profiles as in the detailed budget table, if any (n/a for prefixed Lump Sum Grants)) and describe briefly their tasks.

Name and function	Organisation	Role/tasks/professional profile and expertise
Dragi Kimovski	UNI-KLU	Project coordinator/ Parallel and Distributed Computing
Klaus Schöffmann	UNI-KLU	Teaching coordinator/ Computer Vision and Artificial Intelligence
Martina Steinbacher	UNI-KLU	Project manager / Administrative management
Konstantin Schekotihin	UNI-KLU	WP Lead and Communication / Artificial Intelligence on parallel infrastructures
Martina Wolfgruber	IFAT	Industry Communication / human resources, programme manager
Daniel Valtiner	IFAT	Industry Lectures / Semiconductor technologies
Nico Steinhauser	IFAT	Student Attraction / Semiconductors for HPC

Uwe Gaebler	IFD	Master Thesis Coordination at Infineon / Semiconductors and AI
Minuth Lina-Marie	IFD	Talent Acquisition / Semiconductors
Giuseppe Serra	UNIUD	WP 6 Lead / Quantum computing
Carla Piazza	UNIUD	Specialisation lead / Teaching coordinator
Daniel Denkovski	UKIM	Specialisation lead / Information theory and wireless communication
Bojana Velichkovska	UKIM	WP 2 lead / Parallel processing and machine learning
Olga Cherednichenko	NTU KHPI	WP 5 Lead / Professors in Computer Science
Natalia Chernova	NTU KHPI	Curator of academic mobility programs / Complex socio-economic systems management
Zhiming Zhao	UvA	WP 4 lead / Distributed software engineering
Adam Belloum	UvA	Specialisation lead / Parallel and distributed workflows optimisation
Victoria Cummings	SEMI	Dissemination lead / Eu affaires and policies for chips
Jatin Mendiratta	SEMI	Dissemination officer / Lead of marketing
Madhav Mishra	RISE	AI and Quantum Integration lead / Researcher in AI and Quantum
Jeronimo Castrillon	TUD	WP3 lead / High-level programming frameworks and emerging computer architectures
Robert Schöne	TUD	Senior Researcher, Lecturer / Computer Architecture and HPC
Matthias Lieber	TUD	Senior Researcher / Data-intensive HPC
Rene Jäkel	TUD	Administrative director of the Center for Information Services and HPC
Ivo Sbalzarini	TUD	Chair for Scientific Computing for Systems Biology
Sabine Roller	TUD	Chair of Software Engineering for Product Virtualization (with DLR)
Michael Färber	TUD	Chair of Scalable Software Architectures for Data Analytics
Jaanus Kaugerand	TalTech	Senior researcher, Specialization lecturer / Large-Scale Intelligent Environmental Sensing: Theory and Practice
Jeffrey Andrew Tuhtan	TalTech	Associate professor, Specialization lecturer / Large-Scale Intelligent Environmental Sensing: Theory and Practice
Heiko Jens Herrmann	TalTech	Senior researcher, Specialization lecturer / Scientific computing
Juhan Ernits	TalTech	Computer Science programme manager, Specialization lecturer / Computer vision
Attila Kertesz	USZ	Specialisation lead / Modelling and Simulation of HPC
Andras Markus	USZ	Specialisation lecturer / Modelling and Simulation of HPC

Outside resources (subcontracting, seconded staff, etc)

If you do not have all skills/resources in-house, describe how you intend to get them (contributions of members, partner organisations, subcontracting, etc.) and for which role/tasks/professional profile/expertise

If there is subcontracting, please also complete the table in section 4.

The consortium possesses comprehensive expertise in all areas outlined in the proposal and does not require external resources.

Consortium management and decision-making (if applicable)

Explain the management structures and decision-making mechanisms within the consortium. Describe how decisions will be taken and how regular and effective communication will be ensured. Describe methods to ensure planning and control.

***Note:** The concept (including organisational structure and decision-making mechanisms) must be adapted to the complexity and scale of the project.*

The *HPC-Europe+ Master's Programme* is governed by a multi-level management structure designed to ensure transparency, effective coordination, and broad participation across the consortium. The structure, as depicted in Figure 4, has been adapted to reflect the complexity and European scale of the initiative,

ensuring that both academic quality and industrial relevance are sustained throughout the programme's lifecycle.

At the core of the governance model is the **Steering Committee**, which provides strategic oversight and makes high-level decisions related to programme direction, quality assurance, resource allocation, and long-term sustainability. It includes representatives from all partner institutions and ensures consensus-based decision-making.

Four key bodies report to the Steering Committee:

- **Academic Board**: Responsible for the academic integrity of the programme, including curriculum development, quality assurance, and coordination of teaching across partner universities.
- **Industry Outreach Committee**: Ensures strong collaboration with the HPC industry and supports the programme's visibility and relevance in the broader innovation ecosystem. The committee provides input on skills requirements, helps identify internship and thesis opportunities, and facilitates industry participation in teaching and mentoring.
- **Mobility & Specialisation Committee**: Oversees student mobility, ensures consistency across specialisation tracks, and supports students in planning their academic pathways.
- **Master Thesis Hub Coordination**: Facilitates collaboration between academic and industrial supervisors, manages topic matching, and coordinates support structures for student theses across institutions.

Beneath the Academic Board, **Local Programme Coordinators** serve as the operational leads at each university, ensuring effective local implementation, coordinating with teaching staff, and providing a direct communication channel between students and central governance bodies.

The **Master Thesis Hub** is a particularly strategic component. It connects **academic** and **industry supervisors** to guide students in conducting thesis work that is both academically rigorous and practically relevant. This structure not only supports students' transition into the workforce but also enables companies and universities to co-shape the next generation of HPC specialists.

Communication, Planning, and Control

Regular communication is ensured through monthly virtual coordination meetings, quarterly Steering Committee reviews, and biannual all-partner assemblies. Shared collaboration tools (e.g. project management platforms, shared calendars, and digital repositories) will be used to facilitate continuous exchange.

To ensure efficient planning and control, the consortium will apply standard project management practices, including detailed annual work plans, milestone tracking, and periodic risk assessments. Each committee will provide regular updates to the Steering Committee, ensuring that issues are identified and addressed in a timely manner.

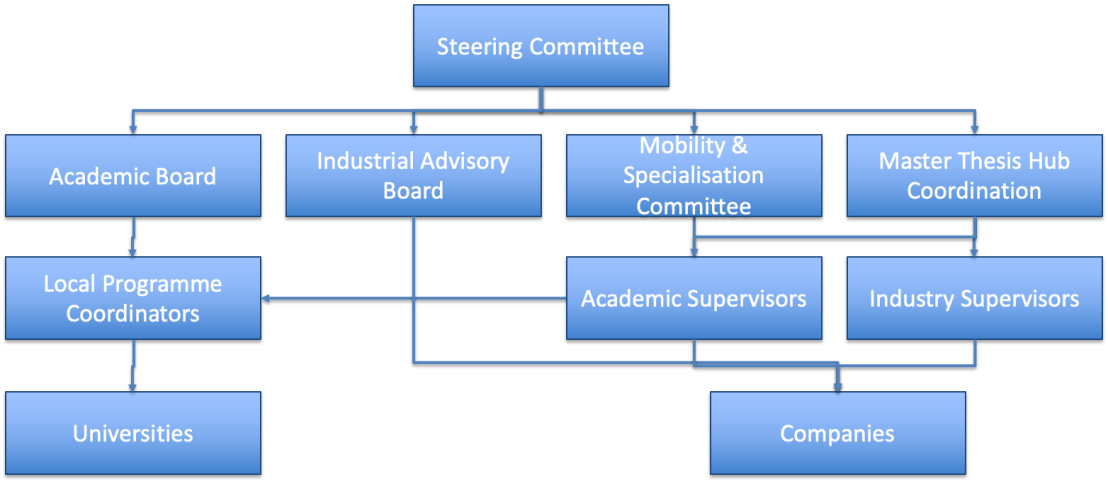

Figure 4: Decision-making structure

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3. IMPACT

3.1 Expected outcomes and deliverables — Dissemination and communication

Expected outcomes and deliverables

Define and explain the extent to which the project will achieve the expected impacts listed in Call document.

The HPC-Europe+ project aims to significantly enhance Europe's competitiveness, industrial resilience, and societal well-being by establishing a world-class joint Master's programme in High-Performance Computing (HPC) with a strong emphasis on Artificial Intelligence (AI) and data-intensive technologies. Through a broad and diverse consortium of academic and industrial partners from across Europe - including Austria, Estonia, Germany, Belgium, Hungary, Italy, North Macedonia, Sweden, the Netherlands, and Ukraine (Figure 5) - the programme leverages regional strengths in high-performance computing, artificial intelligence, quantum computing, hardware innovation, and semiconductor technologies to create a unified and future-proof educational framework. This strategic initiative addresses the growing demand for highly qualified professionals and fosters the development of scalable and energy-efficient HPC applications aligned with the EU's Digital Decade[1] and Green Deal objectives. By promoting multilateral mobility, industrial mentorship, and access to advanced digital skills across all regions, including those with low HPC penetration, the programme establishes a truly inclusive, innovative, and sustainable European digital education ecosystem.

The project is designed to translate the objectives of the Digital Compass and EuroHPC Joint Undertaking into tangible actions by **establishing a pan-European** Master's program. This initiative aims to **contribute to supply of skilled and educated workforce in HPC area,** thereby contributing to the growth and development of this critical field and support Europe to compete in the field of HPC, AI, Semiconductors and other critical areas.

Building upon the foundation laid by the original EUMaster4HPC program, HPC-Europe+ seeks to ***complement and enhance*** its predecessor by focusing on key areas:

1. ***Curriculum Excellence:*** The project will support the development of high-quality curricula that reinforce the excellence of EU higher education, bridging the gap between academic programs and the needs of the HPC industry. Development and harmonization of the Curriculum based on the EuroHPC Skill Tree will contribute to this area (WP2) and with special emphasis on specific specialisations (WP6).
2. ***Industry-Academia Collaboration:*** The project will strengthen cooperation between higher education institutions and the private sector across Europe, contributing to the expansion of educational offerings and the growth of a skilled HPC workforce. This will be supported in the project by integrating industry perspective and lectures in the official Curricula as well as fostering collaboration by establishing HPC Hubs (WP4)
3. ***Topic Expansion*****:** The project will expand the scope of the HPC specialisation to encompass emerging and strategically important technologies for Europe's wellbeing and competitiveness, including Artificial Intelligence, Quantum Computing, and Cloud and Edge Computing.
4. ***Geographical Expansion:*** The project will prioritize the inclusion of underrepresented EU regions, fostering a more comprehensive and diverse geographical coverage. Careful section of Partners in HPC-Europe+ project contributes to this area.
5. ***Inclusivity and Diversity:*** HPC-Europe+ will place a strong emphasis on promoting education and opportunities for underrepresented groups, with a specific focus on women, thereby ensuring a more inclusive and equitable HPC ecosystem. Promotion of gender balance and inclusivity is incorporated in all activities of the project. It is also presented as separate task within WP1.
6. ***Student Mobility Framework:*** By establishing a robust student mobility framework, HPC-Europe+ will facilitate the creation of Thesis and internship Hubs, as well as opportunities for internships, thereby enhancing the overall student experience and promoting cross-cultural exchange. The significance of this task is demonstrated in the proposal via designation of separate WP (3) which deals with Student mobility.

The strong industry representation, complementary expertise, geographical coverage, student mobility framework, and synergy among HPC-Europe+ consortium members will collectively ensure the achievement of the project's objectives and the expected impacts outlined in the Call. By leveraging these strengths, HPC-Europe+ is poised to make a meaningful contribution to the development of a skilled and diverse HPC workforce in Europe.

[1] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

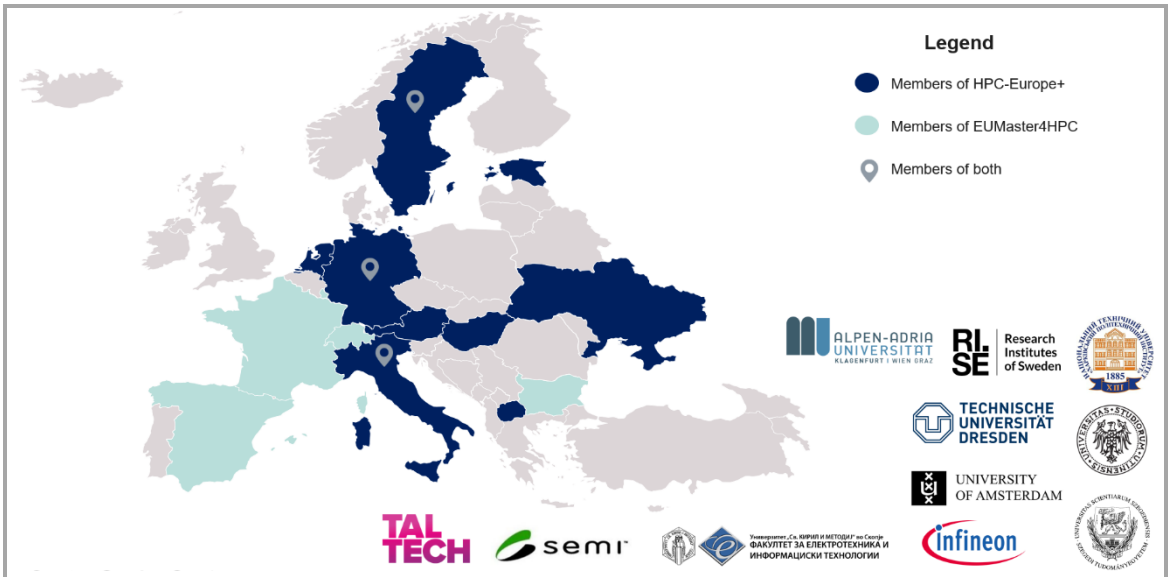

Figure 5: Map of Europe mapping countries covered by EUMaster4HPC vs. countries covered by HPC-Europe+

Throughout the duration of the project, the partners will be actively engaged in fostering harmonization and mutual recognition, by recognizing the offered programs and courses internally based on the local laws, thereby laying the groundwork for a cohesive and unified approach. Notably, with over 1,100 students already enrolled at the participating awarding Universities, the HPC-Europe+ project is well-positioned to successfully deliver the new program to attract new students from whole Europe, thereby ensuring a seamless and effective roll-out. Therefore, the project partners address in this proposal the following outcomes in relation to the expected impact:

- **Outcome 1** - A quality, internationally competitive MSc programme in HPC across the Union with measurable key performance indicators and addressing requirements and needs of the European industry

Project contribution	Impact on EU HPC landscape
• Conduct a comprehensive gap analysis—review current HPC degree offerings and labour-market forecasts, identify unmet competencies, and adapt the curriculum to close those gaps. • Launch a next-generation HPC master's programme with specialised tracks in AI-accelerated computing, quantum technologies, and advanced parallel / distributed systems integration.	HPC-Europe+ will launch an innovative curriculum that builds on traditional HPC specialisation while seamlessly integrating emerging technologies such as quantum computing and artificial intelligence. The programme also broadens its scope to high-impact application domains—including molecular biology, medicine, cybersecurity, and public wellbeing—meeting Europe's most urgent scientific and societal needs. Furthermore, the strong involvement of industry partners in the project will facilitate a rapid transfer of knowledge.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Number of applications	List of applications (students)	At least 600	30	100	120	130	150	100
Number of enrolments	List of enrolments (students)	At least 500	30	100	100	100	100	100
Curriculum	1.Number of different tracks available in the programme including 2. Number of possible options for mobility (combinations of universities in	9	9	9	9	9	9	9

	first and second year)							
Statistics on the intake of students	1.Intake from outside the participating universities 2.Intake of students from other universities	At least 50%	30%	40%	50%	50%	50%	50%

- **Outcome 2** - Advancing European expertise and leadership for HPC by improved coordination and increased availability of educational activities on HPC

Project contribution	Impact on EU HPC landscape
• Pan-European coverage, including countries that are not in the initial project. • On-line learning platform with public access content	HPC-Europe+ unites a diverse network of new partners from across Europe—including organisations that were not part of the original consortium—greatly expanding its reach. This broader collaboration platform will catalyse continent-wide synergies, ultimately boosting the pipeline of high-performance computing specialists and researchers throughout Europe. By decentralising HPC skills and resources we create a more resilient and robust HPC network for Europe.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Outreach and dissemination	Number of events attended to reach students (student and job fairs, introductory presentations, seminars etc.)	41	6	9	8	6	6	6
	Number of students reached by medium (events, internet, social media, recommendation etc.).	554.000	84.000	90.000	90.000	90.000	90.000	100.000

- **Outcome 3** - Skilled workforce and a large number of new specialists, in particular from underrepresented groups, trained in the use possessing advanced skills of current and future generation HPC and HPC-related technologies and application, making them highly qualified professionals capable of designing, optimizing, and implementing complex computational solutions ready to be employed by the European industry.

Project contribution	Impact on EU HPC landscape
Focus on engagement of underrepresented groups (Women, LGBTQ+, etc)	The HPC ecosystem in Europe—and worldwide—remains heavily male-dominated. Our project will address this imbalance by intentionally deploying outreach strategies designed to attract more women and other under-represented groups. Key actions include targeted social-media campaigns, partnerships with diversity-focused organisations, and dedicated events that spotlight female and minority voices in HPC.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Diversity (geographical, backgrounds, gender)	Statistics on enrolled and applied diverse students in %	45%	30%	40%	50%	50%	50%	50%

- **Outcome 4** - Increased competitiveness and innovation by contributing to the development of a more skilled and knowledgeable HPC workforce, which would enhance the competitiveness and innovation potential of European companies and research institutions.

Project contribution	Impact on EU HPC landscape
• Grow Europe's pool of HPC specialists. • Expand the ranks of application-oriented HPC experts who drive innovation in the EU's priority domains (e.g., health, climate, security, and AI).	The objective of expanding Europe's pool of HPC specialists is to boost the competitiveness of European companies and strengthen the EU's economic position relative to other global players. To achieve this, the programme is designed to deliver highly skilled HPC experts across the entire HPC supply chain—including future high-end researchers, system architects, manufacturing and integration specialists, system exploitation and optimisation professionals, and experts in quantum HPC and AI. This comprehensive approach ensures that Europe develops a resilient and well-rounded HPC workforce capable of driving innovation at every stage of the HPC ecosystem.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Experts in EU priority domains	Alumni database and tracking after graduation	At least 400	0	0	100	100	100	100

- **Outcome 5** - Transfer of knowledge between academia and industry, ensuring that theoretical concepts are effectively applied in practical contexts.

Project contribution	Impact on EU HPC landscape
• Industry lectures in Curriculums • Interactive visits of students to industry sites • Short content media dissemination • Summer schools	Facilitating knowledge transfer will strengthen collaboration between academia and industry. Because the consortium draws on a wide network of academic and industrial partners, it can tap these contacts to deepen cooperation and arrange dedicated workshops, matchmaking sessions, and other joint events.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Number of partnerships with employers offering different opportunities students of the MSc programme	1.Relevant internships 2.Student projects 3.Job opportunities	At least 500	30	100	100	100	100	100
Statistics on the portfolio of MSc theses	Number of theses completed at academic institutions, public organizations and private companies – list of students per organisations	At least 450	28	90	90	90	90	90

- **Outcome 6** - A new generation of researchers equipped to tackle grand challenges in various fields, driving advancements in HPC, also addressing pressing societal challenges, such as climate modelling, drug discovery, and healthcare optimization, through advanced computational methods.

Project contribution	Impact on EU HPC landscape
Create cutting-edge master's specialisations that fuse artificial intelligence, quantum computing, edge and cloud, with advanced modelling and simulation, equipping students to tackle complex challenges in healthcare and scientific computing.	Europe still trails the global leaders in quantum technologies and artificial intelligence. By leveraging the EU's world-class high-performance computing (HPC) ecosystem, we will accelerate advances in AI and other emerging technologies, helping Europe close this innovation gap.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Employment rate within a emerging topic	Number of students employed in R&D on Academia in 50%	30%	0%	0%	30%	30%	30%	30%

- **Outcome 7** - Collaboration between universities and institutions across Europe to promote the exchange of best practices, educational resources, and teaching methodologies.

Project contribution	Impact on EU HPC landscape
• Student mobility • Seminars • Workshops and summer schools • Staff mobility and creating of joint study programmes between universities.	The project will foster closer collaboration among the consortium's universities and associate partners to develop joint study programmes, creating a well-connected European academic network that guarantees consistent quality and makes degree recognition straightforward.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
Number with partnerships with EuroHPC hosting entities offering different opportunities students of the MSc programme	1.Relevant internships 2.Student projects 3.Job opportunities	530	30	100	100	100	100	100
Summer schools and seminars	Number of cross-university summer schools and seminars	5	1	1	1	1	1	1

- **Outcome 8** - Increased mobility and employability by facilitating the recognition and validation of HPC skills and qualifications across Europe, making it easier for HPC professionals to move between different countries and for employers to compare and assess the qualifications of potential candidates.

Project contribution	Impact on EU HPC landscape
Define clear certification and accreditation pathways and leverage the project's Master Thesis Hub to connect graduates with potential employers—providing sustained career support well beyond graduation.	Clear certification pathways and integrated HPC specialisations among the partner institutions will streamline diploma recognition, enabling companies across Europe to hire graduates with confidence in their quality and with minimal bureaucratic hurdles.

KPI from the call document	Description & Monitoring tool	Total Value	Y1	Y2	Y3	Y4	Y5	Y6
KPIs on the programme's accreditation status and recognition from relevant accrediting bodies	Number of universities that recognize the program	At least 7 with a possibility to extend with associate universities	7	7	7	7	7	7

Dissemination and communication of the project and its results

If relevant, describe the communication and dissemination activities, activities (target groups, main messages, tools, and channels) which are planned in order to promote the activities/results and maximise the impact. The aim is to inform and reach out to society and show the activities performed, and the use and the benefits the project will have for citizens

Clarify how you will reach the target groups, relevant stakeholders, policymakers and the general public and explain the choice of the dissemination channels.

Describe how the visibility of EU funding will be ensured.

⚠ *In case your proposal is selected for funding, you will have to provide a more detailed plan for these activities (dissemination and communication plan), within 6 months after grant signature. This plan will have to be periodically updated; in line with the project progress.*

Effective dissemination is essential to the success of the HPC-Europe+ project, ensuring that its impact reaches not only academic and industry stakeholders but also the next generation of digital professionals, pioneers and researchers. Tailored tools and resources aimed at students play a critical role in this outreach. These include engaging digital content, interactive platforms, webinars, and accessible learning materials that help demystify high-performance computing (HPC) and promote awareness of its relevance in modern digital infrastructure and economies. By implementing communications tools aimed specifically at students and a younger audience more broadly, HPC-Europe+ can ensure that it can reach out to this important target audience. Such outreach strengthens the visibility of the project, supports capacity-building in digital skills, and contributes to the creation of a sustainable talent pipeline for Europe's digital future.

All partners have robust experience in visibility, communication and dissemination: educational partners are all skilled in valorisation in EU funded projects (Digital Europe/Erasmus/Horizon), with dissemination teams

and tools. Our Industry representatives have impressive marketing, visibility and outreach capacity that will be put to use for the widest visibility possible of the project. On the other hand, our university partners will be pivotal for reaching the academic and student audiences to support project piloting and uptake. In addition to such strong internal capacity of the consortium, associated partners are well positioned to support visibility, impact and sustainability of HPC-Europe+:

As work package leader for dissemination, SEMI will coordinate dissemination efforts to ensure maximum outreach and impact, leveraging its status as the most representative industry association for electronics and microelectronics in Europe. SEMI will disseminate project results throughout the 4,000+ SEMI members, leverage partners networks and connect HPC-Europe+ to the Pact for Skills Network. During the proposal drafting, SEMI prepared a draft of the **Dissemination and Outreach Plan (D7.1)** to define the scope and all operational aspects related to the communication, external visibility and dissemination activities of the HPC-Europe+ project. Partners will finalise the Valorisation Plan by month 6, consisting of the following sections, each outlining dissemination and outreach activities.

1. Objectives of Dissemination and Exploitation

This section outlines the overarching aims of the dissemination and exploitation strategy, including enhancing external visibility, ensuring widespread awareness of project outcomes, fostering stakeholder engagement, and supporting the uptake and long-term sustainability of results.

2. Target Audiences and Stakeholder Engagement

This section identifies the key stakeholders relevant to the project, such as industry, academia, students, and the general public. It describes how engagement strategies will be tailored to the interests and needs of each target group, with consideration given to sectoral and geographical relevance.

3. Key Messages and Value Proposition

This section defines the core messages to be communicated, focusing on the significance and potential impact of project results. It articulates the value proposition for each audience segment, highlighting how the project outcomes address their specific needs or challenges.

4. Communication and Dissemination Channels

This section details the platforms, tools, and formats that will be employed to reach identified audiences, including but not limited to websites, newsletters, social media, publications, events, and stakeholder workshops. Where appropriate, communication means will be matched to the preferences of each target group.

5. Monitoring and Impact Assessment

This section explains how the effectiveness of dissemination and exploitation efforts will be measured. It includes indicators such as reach, engagement, feedback, and uptake, and outlines mechanisms for adapting the strategy based on interim results.

Communication and dissemination activities will be carried out using online and offline channels.

The online communication and dissemination activities are divided into 5 categories:

1. Project website and platform
2. Social media strategy
3. Mass Media
4. Links to partners' and APs' websites
5. Newsletters / mailing list

1. The project website are one of the project's milestones. Partners estimate that 10,000 visitors/year will access it. Over the entire project period, at least 100,000 unique views are expected. Website traffic will primarily be driven through backlinks from social media platforms (e.g., announcements of deliverables, webinar/event promotion, written content hosted on the project website, and referral to the website for more specific information). The website will act as the primary hub for dissemination activities and will be updated continuously to drive repeated visitors, for example as users are first directed to the website for the announcement of an event, prompted to return for the final agenda, and again for the post-event report. Partners will be encouraged to include links to the project website in their own communications on the project to diversify the audience engaged (i.e., academic (both professors and students) audience from university partners, industry audience from industry partners).

2. Social Media Strategy: The HPC-Europe+ consortium intends to base its dissemination strategy on social media by mobilising resources such as LinkedIn, Facebook and YouTube/Instagram or exploiting each partner's social media profile. Through this strategy, the consortium aims to reach at least 10,000 people annually and 100,000 throughout the project. Average project engagement on LinkedIn, for example, can be anticipated at roughly 100 page views per month which will make the target of 100,000 a reasonable stretch goal to incentivize regular activity on social media and the diversification of channels to reach different audiences than the 'classic' professional audience addressed through LinkedIn. For example, this project is a good candidate for dissemination through Instagram and YouTube which as more traditionally

young people / student facing platforms, but which requires a different form of content versus LinkedIn. For the professional audience, graphics and engaging/interactive captions promoting engagement through reactions or comments will be prioritized while the Instagram/YouTube strategy will lean on short form video content as the primary method of engagement.

3. Mass Media: Partners will also be able to engage Mass Media (Online new and media outlets, press releases, long-form video, podcasts, webinars) through the implementation of the project, reaching at least 20,000 people in aggregate

4. Partners' Websites: All project partners (and associated partners) will publish news and information about their participation in HPC-Europe+ on their official web pages. The partners estimate that, in total, the unique visits to their site will reach at least 20,000 unique visits. Over the whole project, the HPC-Europe+ consortium aims to reach 200,000 visits.

5. Mailing lists: each partner has its own database of contacts for targeted mailings, and those will be used to disseminate about HPC-Europe+, with approximately 40,000 contacts / year. Partners will disseminate a newsletter to all contacts annually with the goal of 160,000 contacts throughout the project.

Offline dissemination will be carried out through the following means of dissemination:

1- HPC-Europe+ events
2- Third Parties' events
3- Targeted written material

The dissemination activities for these categories will take place as follows.

1. HPC-Europe+ events: partners will organise events promoting the project, which will take place in different countries represented in the project. These events will have different formats such as conferences, seminars or workshops with the involvement of key stakeholders. Each partner responsible for organising an event will specify the date, venue, programme, speakers, and participants to be invited. In some cases, several partners collaborate in the organisation of a single event (e.g. when several partners come from the same country). This decision is dictated by the desire to optimise efforts and amplify the reach of such events by involving multiple stakeholders and uniting different networks. Several events have already been foreseen at this stage:

HiPEAC: Within the HiPEAC network, we will organise a series of events and workshops in which consortium members take an active role. HiPEAC's ecosystem fosters knowledge exchange between academia and industry, ensuring that the programme's results are disseminated effectively across both sectors. At least 6 such events will be organized over the lifetime of the project.

- SEMICON Europa: SEMICON Europa is the largest EU electronics platform connecting industry leaders across the entire supply chain, including the participation of industry, policy makers and education/training sector. The event is held typically in November of each year, with +8.000 attendees; HPC-Europ + will be promoted during a dedicated session in the program, at least 5 such events will be carried out during the duration of the project.

- SEMI Industry Summits: SEMI organises industry and technology specific Summits over the year: those are 2-day events attracting +2.000 representatives of industry and training in a specific segment. At least 5 such events will be carried out during the duration of the project across at least 3 different countries.

The HPC-Europe+ consortium calculated that approximately 50 people will attend each event. A crucial purpose of the HPC-Europe+ events will be to present to the stakeholders the results achieved during the project implementation.

2. Third Parties' events: Partners will participate in other organisations' events (conferences, workshops, seminars) pertaining to electronics and microelectronics industry and education. At these events, partners will present – and represent – the HPC-Europe+ project to the public. Partners estimate that they will attend at least 2 events per year and that, on average, there will be about 20 participants at each event. Considering that the project duration is 72 months and there are x consortium partners, a total of **people** will be reached (11 partners * 2 events/year * 20 attendees * 6 years = 2640 people). These events may include those organized under the Industrial Alliance for Processors and Semiconductor Technologies, ChipsJU, the Pact for Skills, or related projects.

3. Targeted written material; Partners will publish at least 2 written materials annually, which will be published in the form of reports to the public, press releases or newsletters or articles in the trade/industry or education. This category encompasses all forms of mass media intended for offline dissemination and may include brochures or flyers printed for dissemination at events, printed reports, publications in newspapers/journals, and similar physical media.

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3.2 Competitiveness and benefits for society

Competitiveness and benefits for the society

Describe the extent to which the project will strengthen competitiveness and bring important benefits for society

The proposed international joint Master's programme in High-Performance Computing (HPC) with a focus on Artificial Intelligence (AI) will contribute significantly to Europe's competitiveness and societal well-being. By addressing the growing demand for highly-qualified professionals in the converging domains of HPC, AI, and data-intensive technologies, the programme will directly strengthen Europe's position in the global digital and industrial landscape.

Through a carefully composed consortium of academic and industrial partners from Austria, Estonia, Germany, Hungary, Italy, North Macedonia, Sweden, The Netherlands, and Ukraine, the programme utilises a wide geographic and cultural diversity. This pan-European collaboration enables the integration of regional strengths and specializations -- from high-performance computing and artificial intelligence and quantum computing to hardware development and semiconductor innovation -- into a unified, high-quality educational framework. The inclusion of strong partners from the semiconductor sector further enhances the programme's ability to address Europe's strategic technological priorities and industrial resilience.

The programme's reach and scope will promote cohesion across different European regions by ensuring access to advanced digital skills, particularly in countries with currently lower HPC penetration. It fosters multilateral knowledge exchange and cultural integration, establishing a truly inclusive and sustainable digital education ecosystem.

HPC serves as a cornerstone in numerous domains, facilitating scientific discovery, technological innovation, and societal advancement. By enabling the analysis of vast datasets, training of advanced machine learning models, the simulation of complex systems, and the resolution of computationally intensive problems, HPC transcends the limitations of traditional computing paradigms. Prominent applications of HPC include advancing biomedical research and drug discovery, enhancing the accuracy of weather forecasting and climate modelling, optimizing the design of safer and more efficient transportation systems, and expediting the development of renewable energy technologies.

The HPC-Europe+ Programme serves as a pivotal initiative to enhance the European Union's competitiveness on the global stage by cultivating the next generation of specialists in high-performance computing and its innovative applications. This program addresses strategic priorities across diverse sectors, fostering expertise in areas such as deep learning, large-scale optimization, and advanced reasoning. Furthermore, it anticipates the integration of emerging paradigms, including but not limited to, quantum computing, to empower European industries in designing state-of-the-art products, optimizing manufacturing processes, and accelerating time-to-market, thereby sustaining a competitive advantage in international markets.

Aligned with the objectives outlined in the EU's Strategic Research and Innovation Agenda (https://ecssria.eu/2025), the program is meticulously designed to meet the labour market's demand for a highly skilled workforce. By doing so, it establishes a robust foundation for the EU's digital transformation, ensuring that the region remains at the forefront of technological innovation and industrial leadership.

Furthermore, the program is intricately aligned with other European Union initiatives in the HPC domain, such as the AI Factories initiative (https://digital-strategy.ec.europa.eu/en/policies/ai-factories) and national HPC clusters, which focus on the education and upskilling of practitioners employed in EU industries. Participants in the HPC-Europe+ will have the unique opportunity to collaborate with stakeholders from the AI Factories, thereby acquiring practical experience and enhancing their professional trajectories. Moreover, the program's industrial partners will actively contribute by providing access to their computational infrastructures, datasets, and domain expertise. This collaboration will support students in conducting cutting-edge research and advancing the development of novel HPC hardware and software solutions. Such efforts are pivotal in strengthening the European Union's strategic autonomy, minimizing dependency on external technologies, and safeguarding technological sovereignty in an increasingly competitive global landscape.

The HPC-Europe+ Programme significantly contributes to addressing critical societal challenges by leveraging high-performance computing to drive transformative progress. It equips graduates with advanced skills, enabling breakthroughs in climate modelling, renewable energy optimization, and sustainable practices to combat climate change. The program's focus on AI and quantum computations fosters innovation in healthcare by advancing biomedical research, disease modelling, and drug discovery, addressing the needs of an aging population. Furthermore, the program strengthens societal resilience by addressing cybersecurity challenges, misinformation detection, and critical infrastructure protection, while also fostering social inclusion through equitable access to HPC education. These multifaceted contributions align with the EU's Strategic Research and Innovation Agenda, positioning the program as a cornerstone for addressing global challenges and advancing societal well-being.

3.3 Environmental sustainability and contribution to European Green Deal goals

Environmental sustainability and contribution to European Green Deal goals

Describe the extent to which the project will contribute to environmental sustainability and in particular to European Green Deal goals

This might not be applicable to all topics — for details refer to the Call document.

The HPC-Europe+ programme supports the European Green Deal's goals by integrating environmental sustainability into its high-performance computing curriculum, research, and innovation activities. Aligned with COM (2019) 6402, the programme equips students with the skills to apply energy-efficient computing to climate science, renewable energy, biodiversity modelling, and circular economy solutions. Through training in energy-aware algorithms, sustainable HPC infrastructure, and climate-related modelling, students contribute to Europe's twin transition—green and digital.

HPC-Europe+ addresses the EU's climate neutrality goal by teaching optimisation techniques that reduce computing energy consumption, fostering the development of low-carbon digital solutions. Students apply HPC in modelling clean energy systems, such as solar and wind simulations or smart grid management, aligning with the Green Deal's clean energy transition and Digital Europe Programme objectives. The programme also promotes circularity in digital infrastructure through topics like green supercomputing, waste heat reuse, and hardware sustainability—echoing the Circular Economy Action Plan.

Moreover, students work on HPC-driven climate and ecosystem models, contributing to biodiversity strategies and initiatives like Destination Earth and BioDT. By combining HPC with AI and data analytics, graduates are prepared to deliver science-based solutions for climate mitigation and ecological protection. Embedded in the EuroHPC ecosystem, the programme directly supports the EU's call for advanced digital skills to power sustainable innovation. HPC-Europe+ thus plays a vital role in training experts who leverage computing for a more sustainable, climate-resilient, and digitally empowered Europe.

#§IMP-ACT-IA§#

[2] https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vl4cnhyp1ort

#@WRK-PLA-WP@#

4. WORK PLAN, WORK PACKAGES, ACTIVITIES, RESOURCES AND TIMING

4.1 Work plan

Work plan

Provide a brief description of the overall structure of the work plan (list of work packages or graphical presentation (Pert chart or similar)).

The working plan for HPC-Europe+ is organised into seven clearly defined Work Packages (WPs), structured to systematically address the design, implementation, and sustainability aspects of the Master programme. Each WP contributes specific objectives and activities, forming a coherent and interconnected workflow, ensuring efficient and coordinated progression from conceptualisation through sustainable deployment (Figure *6*). Below we provide description of each WP:

- WP1 (Project Coordination, Administration & Quality Management), led by the UNI-KLU, manages administrative, financial, legal, and ethical aspects, ensuring coordinated actions across all partners and maintaining compliance with quality standards.
- WP2 (Curriculum Design and Academic Harmonisation), coordinated by the UKIM, develops a modular, harmonised curriculum integrating core, specialised, and transversal skills aligned with EuroHPC guidelines.
- WP3 (Specialisation, Student Mobility, and Thesis Hubs), managed by TUD, organises structured student mobility and thesis projects, fostering practical experiences with industry and research integration.
- WP4 (HPC Stakeholder Collaboration, Internship Integration, and Employability), led by the UvA, builds partnerships with HPC stakeholders, facilitating internships and enhancing employability through industry alignment.
- WP5 (Digital Learning Infrastructure and Content Development), coordinated by NTU KHPI, establishes digital learning platforms, develops educational content, and supports innovative teaching methods, underpinning curricular and specialisation activities.
- WP6 (Coordination and Integration of Specialisation Tracks in Emerging HPC Domains), led by the UNIUD, harmonises advanced specialisations across institutions, focusing on emerging domains like quantum computing, AI, and cloud-edge integration.
- WP7 (Dissemination, Outreach, and Programme Sustainability), led by SEMI, ensures programme visibility, engages diverse student populations, and develops long-term sustainability strategies linked to EuroHPC and broader European initiatives.

WP1 coordinates overall project management and ensures seamless collaboration across all WPs. WP2 focuses on curriculum design and, in cooperation with WP3 and WP6, delivers the comprehensive study programme. WP6 specifically designs the specialisations in emerging technologies required by WP2 and WP3, ensuring the curriculum aligns with the latest industry and academic trends. Additionally, WP2 collaborates with WP5 to develop educational content for the digital platform. WP4, in conjunction with WP3, establishes specialisation hubs, maintains active industry engagement to improve student employability, and facilitates strong connections with industry partners and other stakeholders. Finally, WP7 leverages outputs from all work packages to effectively disseminate project results, enhancing visibility and attracting a diverse student audience.

Figure 6: HPC-Europe+ Pert chart

4.2 Work packages, activities, resources and timing

WORK PACKAGES

Work packages

This section concerns a detailed description of the project activities.

*Group your activities into work packages. **A work package means a major sub-division of the project**. For each work package, enter an objective (expected outcome) and list the activities, milestones and deliverables that belong to it. The grouping should be logical and guided by identifiable outputs.*

Projects should normally have a minimum of 2 work packages. WP1 should cover the management and coordination activities (meetings, coordination, project monitoring and evaluation, financial management, progress reports, etc.) and all the activities which are cross-cutting and therefore difficult to assign to another specific work package (do not try splitting these activities across different work packages). WP2 and further WPs should be used for the other project activities. You can create as many work packages as needed by copying WP1.

For very simple projects, it is possible to use a single work package for the entire project (WP1 with the project acronym as WP name).

Work packages covering financial support to third parties (⚠ only allowed if authorised in the Call document) must describe the conditions for implementing the support (for grants: max amounts per third party; criteria for calculating the exact amounts, types of activity that qualify (closed list), persons/categories of persons to be supported and criteria and procedures for giving support; for prizes: eligibility and award criteria, amount of the prize and payment arrangements).

⚠ *Enter each activity/milestone/output/outcome/deliverable only once (under one work package).*

⚠ *Ensure consistency with the detailed budget table/calculator (if applicable). (n/a for prefixed Lump Sum Grants)*

Objectives

List the specific objectives to which the work package aims to achieve.

Activities and division of work (WP description)

Provide a concise overview of the work (planned tasks). Be specific and give a short name and number for each task.

*Show who is participating in each task: Coordinator (COO), Beneficiaries (BEN), Affiliated Entities (AE), Associated Partners (AP), indicating **in bold** the task leader.*

Add information on other participants' involvement in the project e.g. subcontractors, in-kind contributions.

Note:

In-kind contributions: In-kind contributions for free are cost-neutral, i.e. cannot be declared as cost. Please indicate the in-kind contributions that are provided in the context of the work package.

The Coordinator remains fully responsible for the coordination tasks, even if they are delegated to someone else. Coordinator tasks cannot be subcontracted.

If there is subcontracting, please also complete the table below.

Milestones and deliverables (outputs/outcomes)

***Milestones** are control points in the project that help to chart progress (e.g. completion of a key deliverable allowing the next phase of the work to begin). Use them only for major outputs in complex projects, otherwise leave the section empty. Please limit the number of milestones by work package.*

Means of verification are how you intend to prove that a milestone has been reached. If appropriate, you can also refer to indicators.

Deliverables *are project outputs which are submitted to show project progress (any format). Refer only to major outputs. Do not include minor sub-items, internal working papers, meeting minutes, etc. Limit the number of deliverables to max 10-15 for the entire project. You may be asked to further reduce the number during grant preparation.*

For deliverables such as meetings, events, seminars, trainings, workshops, webinars, conferences, etc., enter each deliverable separately and provide the following in the 'Description' field: invitation, agenda, signed presence list, target group, number of estimated participants, duration of the event, report of the event, training material package, presentations, evaluation report, feedback questionnaire.

For deliverables such as manuals, toolkits, guides, reports, leaflets, brochures, training materials etc., add in the 'Description' field: format (electronic or printed), language(s), approximate number of pages and estimated number of copies of publications (if any).

For each deliverable you will have to indicate a due month by when you commit to upload it in the Portal. The due month of the deliverable cannot be outside the duration of the work package and must be in line with the timeline provided below. Month 1 marks the start of the project and all deadlines should be related to this starting date.

The labels used mean:

Public — fully open (⚠ automatically posted online on the Project Results platforms)

Sensitive — limited under the conditions of the Grant Agreement

EU classified — RESTREINT-UE/EU-RESTRICTED, CONFIDENTIEL-UE/EU-CONFIDENTIAL, SECRET-UE/EU-SECRET under Decision 2015/444. For items classified under other rules (e.g. national or international organisation), please select the equivalent EU classification level.

Work Package 1

Work Package 1: Project Coordination, Administration & Quality Management			
Duration:	M1 - M72	**Lead Beneficiary:**	1-UNI-KLU

Objectives

- Coordinate all partners and project activities related to students enrollment and mobility support
- Manage legal, financial, and administrative processes related to the master program
- Ensure quality assurance and risk mitigation
- Guarantee compliance with ethical and data protection standards
- Promote inclusivity and gender balance in project activities and students enrollment

Activities and division of work (WP description)

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	

T1.1	Project Governance and Communication	Set up and manage the project's governance structures and steering committee. This task establishes the Steering Committee (or equivalent governing board), defining the roles and responsibilities of all partners and stakeholders in the project. Clear communication pathways are formalized so that information flows efficiently between the coordinator, work package leaders, and partners. WP1 will organize the schedule of governance meetings (e.g. kick-off, steering committee meetings, General Assembly if applicable) and ensure decisions are documented.	**UNI-KLU** IFAT	COO BEN	No
T1.2	Legal and Financial Coordination	Handle the legal, contractual, and financial management of the project. This task covers the distribution of the project budget to partners, tracking of expenditures, and preparation of periodic financial reports. UNI-KLU, as the coordinator, will ensure that all spending is in line with the agreed budget and that partners provide necessary financial documentation on time. Compliance with funding regulations is paramount – WP1 will coordinate any audits or financial reviews required. On the legal side, T1.2 maintains the Consortium Agreement and any partner contracts, ensuring all partners adhere to their commitments.	**UNI-KLU** IFAT, TUD	COO BEN	No
T1.3	Risk Management and Quality Assurance	Develop and implement the project's risk management strategy and quality assurance (QA) protocols. Under this task, WP1 will create an Internal Quality Assurance Plan detailing procedures for reviewing deliverables, maintaining quality standards, and performing internal evaluations. Key Performance Indicators (KPIs) and milestones will be defined to measure progress objectively. The WP1 team will schedule a mid-term internal evaluation (around the project's halfway point) to assess outcomes against targets and recommend course corrections if necessary. In parallel, a Risk Register will be kept, listing potential risks (scientific, technical, managerial, or financial) along with their likelihood and impact.	**UNI-KLU** IFAT, UvA, USZ	COO BEN	No

T1.4	Meetings, Milestone Tracking, and Internal Reporting on Students Enrolment and Mobility	Coordinate all regular project meetings, track milestones, including student admission, and manage internal documentation on the master program using shared tools. WP1 will organize the logistics and agendas of consortium meetings – including kick-off meetings, monthly or bi-monthly online coordination calls, quarterly technical meetings, and annual all-hands meetings. Each meeting will be documented with minutes and action items. A central timeline of project milestones and deliverables is maintained by WP1 to ensure every work package knows its deadlines and dependencies. OwnCloud will serve as the main collaboration and document-sharing platform for the consortium, ensuring version control and secure access. Regular internal progress reports will also be collected.	**UNI-KLU** IFAT, UNIUD, UKIM, RISE, TUD, TalTech IFD	COO BEN AP	No
T1.5	Ethics, Data Protection, and Accessibility Compliance	Ensure that the master program and the project in general complies with all relevant ethical standards, data protection regulations, and accessibility requirements. WP1 will oversee compliance with GDPR, maintain data protection protocols, and promote accessibility in all project deliverables. An Ethics Compliance Report or checklist will be compiled, and institutional ethics boards consulted as needed.	**UNI-KLU** IFAT	COO BEN, AP	No
T1.6	Inclusivity and Gender Balance Monitoring	Monitor and promote gender balance and inclusivity within the project team and activities, and the enrolled students. WP1 will develop a Gender and Inclusivity Action Plan, collect participation data, and support strategies to increase diversity in project roles, events, and student recruitment.	**UNI-KLU** IFAT, NTU KHPI, SEMI	COO BEN, AP	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification

MS1	Core Curriculum and Mobility Blueprint	1	UNI-KLU	WP1 in coordination with WP2 and WP3 define the common Year 1 programme, initial specialisation tracks, and mobility agreements. WP5 begins content onboarding for the digital platform.		M9	Publishing of the first call for enrolment
Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D1.1	Impact analysis report and Quality assurance plan	1	UNI-KLU	R	PU	M12	Assessment of programme outcomes, including student reach and graduate employability. Internal QA protocols and risk mitigation plans including mid-term and final evaluations.
D1.2	Mobility funding report	1	UNI-KLU	R	PU	M72	Financial support report covering relocation and mobility grants per country.

Work Package 2

Work Package 2: Curriculum Design and Academic Harmonisation			
Duration:	M1 – M72	**Lead Beneficiary:**	4-UKIM
Objectives			
• Design a harmonised European Master's curriculum in HPC. • Ensure the curriculum is modular and spans two years. • Co-create the curriculum through collaboration between European universities and industry experts. • Base the curriculum on the EuroHPC Skill Tree.			

- Align with the goals of the EUMaster4HPC initiative.
- Address industry requirements and emerging technological trends.

Activities and division of work (WP description)

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T2.1	Design of core curriculum (Year 1) including transversal and entrepreneurial skills	This task will focus on developing the first-year curriculum aimed to provide a core foundation in HPC across the consortium. The programme will build upon the existing EUMaster4HPC and partners' master programmes in computer science to obtain a universal curriculum that matches emerging technology and industry demands. Moreover, accent will be placed on integration of transversal and entrepreneurial skills as part of the core courses where applicable or as standalone units.	**UKIM** UNI-KLU NTU KHPI, UvA, TalTech, TUD, USZ, UNIUD	BEN COO BEN	No
T2.2	Definition of specialisation tracks (Year 2) and learning outcomes	This task will focus on the design of the second-year curriculum, where each partner in the consortium will provide advanced specialisation track(s). The definition of these tracks will reflect partners' expertise and experience, as well as current high-demand HPC application areas supplied by industry. Each track will aim to build expertise, while maintaining compatibility with the overall programme architecture. Similar to T2.1, each course will clearly state prerequisites, learning outcomes, assessment methods and ECTS credits.	**USZ** UNI-KLU UKIM, NTU KHPI, UvA, TalTech, TUD, IFAT, SEMI	BEN COO BEN	No
T2.3	Alignment of all courses with EuroHPC micro-credentials	This task ensures that all courses in the Master's programme align with EuroHPC micro-credential standards to enhance flexibility, visibility, and relevance for lifelong learning. It will begin with a review of EuroHPC criteria—such as modularity, defined learning outcomes, and workload transparency—followed by adjustments to course design where needed.	**TUD** UNI-KLU UKIM	BEN COO BEN	No

T2.4	Definition of assessment methods, credit transfer framework, and diploma supplement	This task will establish a coherent and interoperable framework for student assessment, credit recognition, and qualification documentation across the consortium. Regarding assessment methods, the consortium will define shared principles and methodologies based on European standards and guidelines for quality assurance in higher education. Emphasis will be placed on incorporating both formative and summative methods in alignment with learning outcomes, which will reflect the technical and applied nature of HPC education.	**UNIUD,** UKIM	BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS2	Specialisation and cirriculum design	2	UKIM	Formal definition of the master program and the specialisations with yearly updates.	M12	Cross-validation among partners

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D2.1	Curriculum and course catalogue	2	UKIM	R	PU	M12	Annual curriculum update including core and specialisation modules, learning outcomes, and mobility options.
D2.2	Academic framework with Coherent modular structure and competency-based approach	2	IFAT	R	PU	M24	A joint academic framework adopted across all partner universities, where the curriculum will be organised into well-defined modules that build progressively on each other, with each module

							explicitly linked to specific learning.

Work Package 3

Work Package 3: Specialisation Tracks, Student Mobility, and Thesis Hubs			
Duration:	M6 - M72	**Lead Beneficiary:**	9-TUD

Objectives

- Coordinate academic and logistical transitions across the "home → specialisation → industry" mobility model of the HPC-Europe+ Master Programme.
- Ensure smooth placement of students into Year 2 specialisation hubs and Semester 4 thesis host organisations.
- Oversee the design and implementation of Thesis Hubs to support industry- and research-integrated final projects, fostering international exposure and industry relevance.

Activities and division of work (WP description)

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T3.1	Coordination of Specialisation and Thesis Hubs	In close collaboration with WP6, WP3 manages the mapping of students to specialisation tracks based on academic background, preferences, and hub capacity. This includes creating a transparent and fair matching process, aligned with admission and capacity planning of each host institution.	**TUD**, RISE	BEN	No
T3.2	Design and Implementation of Industry/Research Thesis Hubs	Develop and operationalise a distributed network of Thesis Hubs across Europe. These hubs will serve as structured interfaces between academic institutions and industry/research partners, facilitating co-supervised, real-world thesis projects.	**IFAT** UNI-KLU TUD	BEN COO BEN	No

T3.3	Mobility Governance: Guidelines, Agreements, and Recognition	Develop a comprehensive set of guidelines for learning agreements, ECTS recognition, academic progress tracking, and administrative coordination. These will align with Bologna Process principles and ensure compliance across all jurisdictions.	**TUD**, UvA, TalTech	BEN	No
T3.4	Student Support Services for Mobility and Integration	Provide personalised support structures for students relocating to a new country, including guidance on visa procedures, housing, insurance, and cultural adaptation. Establish a centralised mobility helpdesk at TUD in collaboration with WP1.	**UNI-KLU** TUD, IFAT	COO BEN	No
T3.5	Organisation of Community-Building Events	Coordinate annual summer schools, winter workshops, and cohort-wide peer events that promote social cohesion, intercultural exchange, and academic collaboration. These events also serve to onboard students to the specialisation phase and prepare them for thesis work.	**SEMI**, TUD, IFAT, UNIUD, NTU KHPI, USZ	BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS3	First Programme Cohort Launched	3	TUD	The first student intake begins. WP3 manages mobility logistics, and WP4 engages industry partners for early internship and thesis planning. WP6 initiates high-visibility outreach campaigns.	M18	Number of enrolled students

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D3.1	Integrated Specialisation and Thesis Placement Framework	3	TUD	R	PU	M9	A robust, transparent system for managing student mobility between the home university,

							specialisation hub, and thesis host.
D3.2	European Thesis Hub Network	3	UKIM	R	PU	M24	A distributed infrastructure of industry and research partners offering high-quality, co-supervised thesis projects. Includes operational guidelines, supervision models, and mobility options (on-site, hybrid, or remote) aligned with academic and labour market needs.
D3.3	Student Mobility and Engagement Programme	3	TalTech	R	PU	M16	A comprehensive student support package including relocation assistance, administrative help, integration guides, and structured peer activities (e.g. summer schools, workshops, intercultural training).

Work Package 4

Work Package 4: HPC Stakeholder Collaboration, Internship Integration, and Employability			
Duration:	M3 - M72	**Lead Beneficiary:**	6-UvA
Objectives			
• Build strong partnerships with a diverse set of HPC stakeholders, including industry, supercomputing centres, research labs, and infrastructure providers • Facilitate internship opportunities that provide hands-on experience in real-world HPC environments • Enable joint thesis supervision and mentorship involving both academic and external experts • Support knowledge exchange and foster collaboration between academia and external HPC actors • Enhance employability by aligning educational outcomes with evolving workforce needs in HPC			

Activities and division of work (WP description)					
Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T4.1	Establish and coordinate HPC Stakeholder Hubs	We will invite key stakeholders, starting with the ones being contacted during preparation phase, to discuss the governance structure and plan for the HPC Stakeholder Hub three months after the project kick-off. A management structure for the HPC Stakeholder Hub will be established. Key stakeholders from academia, industry, and research infrastructures (e.g., life watch and Green digits) will be invited, and regular meetings will be scheduled.	UvA UNI-KLU	BEN COO	No
T4.2	Plan and integrate internships into the curriculum in collaboration with WP3 and WP6	T4.2 will closely collaborate with the partners in WP3 and WP6 to develop an internship plan that is integrated into the curriculum. This plan will consider the structure of learning paths as well as the areas of specialization of the partners involved. The management structure for internships and the evaluation criteria will be established based on the program's exit qualifications.	**UvA**, IFAT, UKIM, NTU KHPI	BEN	No
T4.3	Develop a co-supervision model and mentorship programme	T4.3 will coordinate the development of the co-supervision model and mentorship programme for internship. A list of the co-supervisors and mentors will be identified and approved by the exam committee of the master program. The evaluation criteria for internship will be developed based on the curriculum with consultation of the co-supervisors and mentors.	**UvA**, UNIUD, RISE	BEN	No
T4.4	Map HPC workforce needs and future job profiles	Via the HPC stakeholder Hub, we will regular discuss the needs from job market and define the job profiles for the graduates. The job profiles will also be used to refine the knowledge areas and skills described in the exit qualification of the program.	**TalTech,** UvA, IFAT	BEN	No

T4.5	Create the HPC Master Job Hub (online employment support platform)	A HPC master job hub will be established with the support from the HPC stakeholder hub. The HPC master Job Hub will continuously publish the job opportunities from the academic, industrial and research infrastructure communities, and help students prepare for the CV development and job interviews. The Job hub will also create the social media, e.g., LinkedIn group, to improve its visibility in the networks of the stakeholders.	**USZ,** UvA, IFAT, TUD	BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS4	Industry-Integrated Master Thesis Phase	4	UvA	WP3 and WP4 finalise student placements in Industry/Research Thesis Hubs. Dual mentorship models are fully operational. WP6 gathers early feedback on outcomes and alignment with employer needs.	M30	Number of contacted external industry leaders in HPC

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D4.1	HPC Stakeholder Hub Establishment and Governance Plan.	4	UvA	R	PU	M18	Establish the HPC Stakeholder Hub, including its governance structure, stakeholder network, and schedule of regular engagement meetings.
D4.2	HPC Workforce Needs Mapping and HPC Master Job Hub Launch	4	UvA	R	PU	M30	Map evolving HPC workforce needs and job profiles, and launch the HPC Master Job Hub as an online employment support platform with job listings, career preparation tools, and

							stakeholder engagement channels.

Work Package 5

Work Package 5: Digital Learning Infrastructure and Content Development			
Duration:	M3 - M72	**Lead Beneficiary:**	5-NTU KHPI
Objectives			
• Develop and maintain a digital learning environment supporting modular, cross-institutional teaching, and integration of micro-credentials and peer-generated content. • Promote the digital learning platform with regular courses updates			
Activities and division of work (WP description)			

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T5.1	Development of online courses (pre-recorded lectures, labs, quizzes) and hybrid delivery models	Develop a comprehensive and standardised set of teaching materials to be used across core and specialised modules. This task involves the systematic design, organisation, and integration of instructional resources — such as lecture slides, course notes, reading lists, case studies, assessments, and multimedia content — to ensure consistency in content quality, structure, and learning outcomes across different courses and instructors.	**TalTech** UNI-KLU NTU KHPI, UNIUD, UvA, RISE, TUD, USZ	BEN COO BEN	No
T5.2	Design, deployment, and operation of the central HPC-Europe+ Digital Platform	Develop, launch, and manage a centralised digital platform to support HPC-Europe+ activities. This involves designing a robust, scalable, and user-friendly architecture; deploying core services and tools for collaboration, data sharing, and resource access; and ensuring continuous, secure operation and maintenance.	**NTU KHPI**, IFAT, UKIM,	BEN	No

T5.3	Certification mechanisms and integration with the EuroHPC Skill Tree	Design and implement certification processes aligned with the EuroHPC Skill Tree to validate and recognise HPC-related skills and competencies. This includes developing assessment criteria, certification levels, and digital badges, ensuring full integration with the EuroHPC framework for skills development.	**NTU KHPI** UNI-KLU UvA	BEN COO BEN	No
T5.4	Student-led content (e.g., podcasts, explainers, outreach materials) integrated into the platform	Facilitate the creation of student-led content such as podcasts, video explainers, and outreach materials to be integrated into the central digital platform. This includes providing guidelines, tools, and support for content development, ensuring alignment with platform standards and educational goals.	**SEMI** UNI-KLU IFAT, NTU KHPI	BEN COO BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS5	Sustainable Digital Platform and Roadmap	5	NTU KHPI	WP5 compiles lessons learned and presents a strategic roadmap for the long-term continuation of the HPC-Europe+ programme. As part of this milestone, the project provides a sustainable digital platform supporting online and hybrid course delivery for all enrolled students, as well as for external learners interested in studying HPC through freely accessible, modular content.	M36	Number of daily visitors of the platform

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D5.1	Digital platform for courses materials and students led content	5	NTU KHPI	R	PU	M18	Description of the platform and its deployment modules, including all

							available courses, and students led materials
D5.2	Integration with EuroHPC Skill Tree	5	NTU KHPI	R	PU	M24	Integrate the EuroHPC Skills Tree in the digital platform and allow designation of skills and badges

Work Package 6

Work Package 6: Coordination and Integration of Specialisation Tracks in Emerging HPC Domains			
Duration:	M6 – M72	**Lead Beneficiary:**	3-UNIUD

Objectives

- Harmonise and coordinate specialised third-semester HPC tracks across partner universities.
- Focus on emerging HPC domains such as quantum computing, AI, and cloud-edge integration.
- Ensure curricular alignment and support student mobility between institutions.
- Develop shared teaching materials, demonstrators, and student-led content to maintain quality and interoperability.

Activities and division of work (WP description)

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T6.1	Mapping and harmonisation of specialisation tracks	Collect and compare existing specialisation offers across partner institutions (Quantum HPC, HPC for AI, HPC & Edge, etc.) Define a common framework for curriculum components, ECTS alignment, and mobility compatibility	**UNIUD** UNI-KLU NTU KHPI, TUD	BEN COO BEN	No

T6.2	Joint development of shared modules and teaching assets	Collaboratively design and develop shared content in hybrid HPC domains offered by select institutions, which are critical to multiple specialisations. In coordination with WP5, create modular teaching components, such as online lectures, labs, and simulations, that are reusable across tracks and universities.	**UNIUD**, UvA, USZ	BEN	No
T6.3	Coordination of cross-institutional delivery and student mobility	Support joint teaching, visiting lecturer exchanges, and co-supervised seminars Facilitate mobility pathways between universities offering complementary expertise and facilities.	**UNIUD**, IFAT, TalTech	BEN	No
T6.4	Monitoring, quality assurance, and student engagement	Implement systems to track student participation, performance, and cross-specialisation engagement. Gather feedback to continuously improve the coordination and integration model	**TalTech,** UNIUD, IFAT,	BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS6	Integration of Emerging Technologies in HPC	6	UNIUD	This milestone establishes the integration of emerging technologies—including Quantum Computing, Artificial Intelligence, Cloud, and Edge Computing—into the HPC curriculum, ensuring that specialised modules and teaching materials reflect cutting-edge trends and industry demands.	M39	Number of developed courses in emerging fields for HPC

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D6.1	Specialisations Hub and Framework	6	UNIUD	R	PU	M14	A harmonised framework for third-semester specialisations across eight partner institutions.

D6.2	Specialisation monitoring	6	UNIUD	R	PU	M60	Established monitoring system that tracks student participation, performance, and cross-specialisation engagement

Work Package 7

Work Package 7: Dissemination, Outreach, and Sustainability			
Duration:	M1 - M72	**Lead Beneficiary:**	7-SEMI

Objectives

- Raise awareness of the HPC-Europe+ programme and attract diverse student cohorts from across Europe, with a focus on underrepresented regions.
- Ensure long-term sustainability through integration with EuroHPC, the EuroHPC Virtual Academy, and broader European digital innovation ecosystems.
- Adhere to Open Access principles to maximise the visibility and accessibility of project outputs.
- Monitor impact through KPIs such as website traffic, outreach activity numbers, and social media engagement.

Activities and division of work (WP description)

Task No (continuous numbering linked to WP)	Task Name	Description	Participants		In-kind Contributions and Subcontracting (Yes/No and which)
			Name	Role (COO, BEN, AE, AP, OTHER)	
T7.1	Programme branding and marketing	Development of programme branding, website, and comprehensive communication strategy, including adherence to Open Access practices. A Communication Materials Pack (social media templates, flyers, and press release formats) will be developed early in the project to support partner outreach efforts.	**SEMI** UNI-KLU IFAT, UKIM, RISE, TUD	BEN COO BEN	No

T7.2	Outreach and engagement	Outreach campaigns targeting students, schools, and underrepresented regions, using multimedia content (videos, podcasts, webinars, infographics) to maximize engagement.	**TalTech,** SEMI, UvA, IFAT, RISE	BEN	No
T7.3	Dissemination	Dissemination of project results to EuroHPC bodies, academia, and industry stakeholders through articles, events, social media, and public platforms.	**SEMI,** IFAT, UNIUD	BEN	No
T7.4	Integration with the EuroHPC Virtual Academy	Integration with the EuroHPC Virtual Academy and alignment with Digital Europe Programme efforts, ensuring training content feeds into larger European talent strategies.	**USZ,** SEMI, IFAT, NTU KHPI	BEN	No
T7.5	Sustainability road map	Development of a sustainability roadmap covering governance structures, long-term hosting, funding models, curriculum updates, and potential links with Erasmus+, Marie Skłodowska-Curie Actions, and regional innovation hubs.	**SEMI**, IFAT, USZ	BEN	No

Milestones and deliverables (outputs/outcomes)

Milestone No (continuous numbering not linked to WP)	Milestone Name	Work Package No	Lead Beneficiary	Description	Due Date (month number)	Means of Verification
MS7	**First Cohort Graduated**	7	SEMI	The first group of students completes the full two-year programme. WP3 and WP4 assess outcomes from mobility and industry collaboration. WP6 collects graduate data, employment pathways, and alumni feedback to support broader programme validation and marketing.	M48	Number of graduated students

Deliverable No (continuous numbering linked to WP)	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month number)	Description (including format and language)
D7.1	Dissemination and Outreach Strategy	7	SEMI	R	PU	M9	Detailed engagement plan with KPIs and an annual outreach activity calendar

D7.2	Alumni Community Framework and First Engagement Report	7	RISE	R	PU	M12	Establishment of an alumni network platform, tracking of alumni career development, and proposals for alumni mentorship and continued involvement.
D7.3	Interim Dissemination and Outreach Reports	7	SEMI	R	PU	M18, 36, 54	Reports at M18, M36, and M54, surveying how key KPIs are being met, identifying gaps, and proposing adjustments to improve outreach effectiveness.
D7.4	Final Dissemination and Outreach Report	7	SEMI	R	PU	M72	Comprehensive final report summarizing all dissemination and outreach activities, results against KPIs, lessons learned, and recommendations for future activities.

Estimated budget — Resources

Participant	Costs *(n/a for Lump Sum Grants)*									
	A. Personnel	B. Subcontracting	C.1 Travel and subsistence	C.2 Equipment	C.3 Other goods, works and services	D.1 Financial support to third parties	D.2 Internally invoiced goods and services	D.3 PAC procurement costs *(for PAC Grants for Procurement)*	E. Indirect costs	Total costs

UNI-KLU	120 PMs	890.000,00 EUR	0,00 EUR	75.200,00 EUR	25.325,00 EUR	75.250,00 EUR	530 Grants	3.000.000,00 EUR	0,00 EUR	0,00 EUR	284.604,25 EUR	4.350.379,25 EUR
IFAT	42 PMs	379.995,00 EUR	0,00 EUR	0,00 EUR	15.000,00 EUR	183.600,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	40.501,65 EUR	619.096,65 EUR
UNIUD	83 PMs	500.00,00 EUR	0,00 EUR	50.250,00 EUR	10.000,00 EUR	45.100,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	42.374,50 EUR	647.724,50 EUR
UKIM	60 PMs	300.000,00 EUR	0,00 EUR	50.000,00 EUR	10.000,00 EUR	10.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	25.900,00 EUR	395.900,00 EUR
NTU KHPI	80 PMs	200.000,00 EUR	0,00 EUR	50.000,00 EUR	10.000,00 EU	110.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	25.900,00 EUR	395.900,00 EUR
UvA	47 PMs	454.900,00 EUR	0,00 EUR	50.000,00 EUR	10.000,00 EUR	41.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	38.913,00 EUR	594.813,00 EUR
SEMI	28 PMs	250.000,00 EUR	0,00 EUR	50.000,00 EUR	0,00 EU	110.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	28.700,00 EUR	438.700,00 EUR
RISE	40 PMs	300.000,00 EUR	0,00 EUR	50.000,00 EUR	10.000,00 EUR	10.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	25.900,00 EUR	395.900,00 EUR
TUD	97 PMs	700.000,00 EUR	0,00 EUR	50.000,00 EUR	35.000,00 EUR	45.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	58.100,00 EUR	888.100,00 EUR
TalTech	69 PMs	450.000,00 EUR	0,00 EUR	50.000,00 EUR	35.000,00 EUR	45.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	40.600,00 EUR	620.600,00 EUR
USZ	100 PMs	500.000,00 EUR	0,00 EUR	50.000,00 EUR	25.000,00 EUR	35.000,00 EUR	0	0,00 EUR	0,00 EUR	0,00 EUR	42.700,00 EUR	652.700,00 EUR
Total	766 PMs	4.924.895,00 EUR	0,00 EUR	525.450,00 EUR	185.325,00 EUR	709.950,00 EUR	530 Grants	3.000.000 EUR	0,00 EUR	0,00 EUR	654.193,40 EUR	9.999.813,40 EUR
For Lump Sum Grants, see detailed budget table/calculator (annex 1 to Part B; *see* Portal Reference Documents).												

Staff effort (n/a for Lump Sum Grants)

Staff effort per work package

Fill in the summary on work package information and effort per work package.

WP No	Work Package Title	Lead Participant No	Lead Participant Short Name	Start Month	End Month	Person-Months
1	Project Coordination, Administration & Quality Management	1	UNI-KLU	M1	M72	67
2	Curriculum Design and Academic Harmonisation	4	UKIM	M1	M72	113
3	Specialisation Tracks, Student Mobility, and Thesis Hubs	9	TUD	M6	M72	148
4	HPC Stakeholder Collaboration, Internship Integration, and Employability	6	UvA	M3	M72	111
5	Digital Learning Infrastructure and Content Development	5	NTU KHPI	M3	M72	108
6	Coordination and Integration of Specialisation Tracks in Emerging HPC Domains	3	UNIUD	M6	M72	88
7	Dissemination, Outreach, and Sustainability	7	SEMI	M1	M72	131
					Total Person- Months	766

Staff effort per participant

Fill in the effort per work package and Beneficiary/Affiliated Entity.
Please indicate the number of person/months over the whole duration of the planned work.
*Identify the work-package leader for each work package by showing the relevant person/month figure in **bold**.*

Participant	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	Total Person-Months
UNI-KLU	30	30	20	10	10	10	10	120
IFAT	8	5	9	4	3	2	11	42
UNIUD	3	5	5	5	5	50	10	83
UKIM	3	40	0	5	5	0	7	60
NTU KHPI	3	5	5	5	45	5	12	80
UvA	5	0	7	30	0	0	5	47
SEMI	3	0	0	0	0	0	25	28
RISE	3	3	12	12	0	0	10	40
TUD	3	0	60	7	5	5	17	97
TalTech	3	10	15	15	10	4	12	69
USZ	3	15	15	18	25	12	12	100
Total Person-Months	67	113	148	111	108	88	131	766

Subcontracting (n/a for prefixed Lump Sum Grants)

Subcontracting

Give details on subcontracted project tasks (if any) and explain the reasons why (as opposed to direct implementation by the Beneficiaries/Affiliated Entities).

Subcontracting — Subcontracting means the implementation of 'action tasks', i.e. specific tasks which are part of the EU grant and are described in Annex 1 of the Grant Agreement.

***Note:** Subcontracting concerns the outsourcing of a part of the project to a party outside the consortium. It is not simply about purchasing goods or services. We normally expect that the participants have sufficient operational capacity to implement the project activities themselves. Subcontracting should therefore be exceptional.*

Include only subcontracts that comply with the rules (i.e. best value for money and no conflict of interest; no subcontracting of coordinator tasks).

Work Package No	Subcontract No (continuous numbering linked to WP)	Subcontract Name (subcontracted action tasks)	Description (including task number and BEN/AE to which it is linked)	Estimated Costs (EUR)	Justification (Why is subcontracting necessary?)	Best-Value-for-Money (How do you intend to ensure it?)
N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other issues: *If subcontracting <u>for the entire project</u> goes beyond 30% of the total eligible costs, give specific reasons.*				N/A		

Purchases and equipment

Purchase costs (travel and subsistence, equipment and other goods works and services)

Details for major cost items (needed if costs declared under 'purchase costs' are higher than 15% of the claimed personnel costs).
Start with the most expensive cost items, down to the 15% threshold.

Participant 1:	UNI-KLU			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel	1,5,7	Consortium meetings, dissemination activities, summer Schools	75.200 €
Specialized software licenses, cloud-based services, maintenance services for hardware, data storage solutions, consumables and	Other goods, works and services	1,5,7	These costs are foreseen to establish and maintain the successful implementation of the project. Audit costs	58.300 €

technical components, Audit costs				
			Total	**133.500 €**
Participant 2:	IFAT			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Design and Production of Promotion Materials, Participation in Career Fairs, Webinars, Audit costs	Other goods, works and services	3,11	Design and Production of Promotion Materials, Participation in Career Fairs, Job Application Coaching Services, Student Networking Events, Technical Webinars – all costs are aligned with the project´s objectives; Auditing costs	57.000 €
			Total	**57.000 €**
Participant 3:	UNIUD			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,6,7	Consortium meetings, dissemination activities, summer Schools	50.250 €
Specialized software licenses, Promotion Materials, Disseminations costs, Audit costs	Other goods, works and services	6,7	creation, printing, and distribution of promotional materials, dissemination and communication of the project's results and activities to a wider audience; Auditing costs for project reports	24.750 €
			Total	**75.000 €**
Participant 4:	UKIM			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,2,7	Consortium meetings, dissemination activities, summer Schools	45.000 €
			Total	**45.000 €**
Participant 5:	NTU KHPI			

Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,7	Consortium meetings, dissemination activities, summer Schools	30.000 €
			Total	**30.000 €**
Participant 6:	UvA			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,7	Consortium meetings, dissemination activities, summer Schools	50.000 €
Specialized software licenses, Promotion Materials, Disseminations costs, Audit costs	Other goods, works and services	4,7	creation, printing, and distribution of promotional materials, dissemination and communication of the project's results and activities to a wider audience; Auditing costs for project reports	18.235 €
			Total	**68.235 €**
Participant 7:	SEMI			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Specialized software licenses, Promotion Materials, Disseminations costs, Audit costs	Other goods, works and services	7	creation, printing, and distribution of promotional materials, dissemination and communication of the project's results and activities to a wider audience; Auditing costs for project reports	37.500 €
			Total	**37.500 €**
Participant 8:	RISE			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,7	Consortium meetings, dissemination activities, summer Schools	45.000 €

			Total	**45.000**
Participant 9:	TUD			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,3,7	Consortium meetings, dissemination activities, summer Schools	50.000 €
Enhancement of the existing computational infrastructure, including GPUS and CPUS	Equipment	3,7	Equipment costs refer to the expansion and upgrade of the existing high-performance computing (HPC) infrastructure necessary for the successful implementation of the proposed project	35.000 €
Specialized software licenses, Promotion Materials, Disseminations costs, Audit costs	Other goods, works and services	3,7	creation, printing, and distribution of promotional materials, dissemination and communication of the project's results and activities to a wider audience; Auditing costs for project reports	20.000 €
			Total	**105.000 €**
Participant 10:	TalTech			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)
Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,3,7	Consortium meetings, dissemination activities, summer Schools	50.000 €
Specialized software licenses, Promotion Materials, Disseminations costs, Audit costs	Other goods, works and services	7	creation, printing, and distribution of promotional materials, dissemination and communication of the project's results and activities to a wider audience; Auditing costs for project reports	17.500 €
			Total	**67.500 €**
Participant 11:	USZ			
Cost item name	Category	WP(s)	Explanations	Costs (EUR)

Project Meetings – Travel for Participation in Summer Schools and Dissemination Activities	Travel and subsistence	1,7	Consortium meetings, dissemination activities, summer Schools	50.000 €
Enhancement of the existing computational infrastructure, including GPUS and CPUS	Equipment	2,3,7	Equipment costs refer to the expansion and upgrade of the existing high-performance computing (HPC) infrastructure necessary for the successful implementation of the proposed project	25.000 €
			Total	**75.000 €**
			Total purchase costs > 15% (all participants)	738.735 €
			Remaining purchase costs < 15% (all participants)	681.890 €
			Total purchase costs (all participants)	1.420.625 €

Equipment with full-cost option

For calls where full-capitalised costs are exceptionally eligible for listed equipment (see Call document), indicate below the equipment items for which you request the full-cost option, and justify your request. Ensure consistency with the budget details provided in the previous table.

Equipment Name	Description (including WP, task number and BEN/AE to which it is linked)	Estimated Costs (EUR)	Justification (why is reimbursement at full-cost needed?)	Best-Value-for-Money (how do you intend to ensure it?)
N/A	N/A	N/A	N/A	N/A

Other cost categories

Other cost categories (financial support to third parties, internally invoiced goods and services, etc)

Complete the table below for each participant that would like to declare costs under other costs categories (e.g. financial support and internally invoiced goods and services), irrespective of the percentage of personnel costs.

Participant 1:	UNI-KLU

Cost category	Explanations	Costs (EUR)
Financial support to third parties	UNI-KLU will serve as the centralized point for awarding mobility grants to students. As detailed in the proposal, UNI-KLU will establish a secure payment system integrated with a robust Know Your Customer (KYC) validation process for all transactions. Consequently, mobility payments will be managed centrally, covering all 530 grants allocated within this category.	3.000.000,00 EUR
Internally invoiced goods and services	N/A	N/A

Timetable

Timetable (projects of more than 2 years)

Fill in cells in beige to show the duration of activities. Repeat lines/columns as necessary.

***Note:** Use actual calendar years and quarters. In the timeline you should indicate the timing of each activity per WP. You may add additional columns if your project is longer than 6 years.*

ACTIVITY	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Task 1.1																								
Task 1.2																								
Task 1.3																								
Task 1.4																								
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Task 1.6																								
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Task 6.3																							
Task 6.4																							
Task 7.1																							
Task 7.2																							
Task 7.3																							
Task 7.4																							
Task 7.5																							

#§WRK-PLA-WP§#

#@ETH-ICS-EI@#

5. OTHER

5.1 Ethics

Ethics *If the Call document contains a section on ethics, the ethics issues and measures you intend to take to solve/avoid them must be described in Part A.*
See Application Form Part A.

#§ETH-ICS-EI§# #@SEC-URI-SU@#

5.2 Security

Security *The security issues and the measures you intend to take to solve/avoid them must be described in Part A.* ***Note:** Beneficiaries must ensure that their projects are not subject to national/third country security requirements that could affect the implementation or put into question the award of the grant (e.g. technology restrictions, national security classification, etc).*
See Application Form Part A.

#§SEC-URI-SU§# #@DEC-LAR-DL@#

6. DECLARATIONS

Double funding	
Information concerning other EU grants ⚠ *Please note that there is a strict prohibition of double funding from the EU budget (except under EU Synergies actions).*	**YES/NO**
We confirm that to our best knowledge none of the projects under the action plan as a whole or in parts have benefitted from any other EU grant *(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc)*. If NO, explain and provide details.	Yes
We confirm that to our best knowledge none of the projects under the action plan as a whole or in parts are (nor will be) submitted for any other EU grant *(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc)*. If NO, explain and provide details.	Yes

Financial support to third parties (if applicable) *If in your project the maximum amount per third party will be more than the threshold amount set in the Call document, justify and explain why the higher amount is necessary in order to fulfil your project's objectives.*
Not applicable

#§DEC-LAR-DL§#

ANNEXES

LIST OF ANNEXES

Standard
Detailed budget table/Calculator (annex 1 to Part B) — *mandatory for certain Lump Sum Grants (see Portal Reference Documents)*
CVs (annex 2 to Part B) — *not applicable*
Annual activity reports (annex 3 to Part B) — *not applicable*
List of previous projects (annex 4 to Part B) — *mandatory, if required in the Call document*

Special
Other annexes (annex 5 to Part B) — *mandatory, if required in the Call document*

LIST OF PREVIOUS PROJECTS

List of previous projects
Please provide a list of your previous projects for the last 4 years.

Participant	Project Reference No and Title, Funding programme	Period (start and end date)	Role (COO, BEN, AE, OTHER)	Amount (EUR)	Website (if any)
INFINEON	METIS - 612339 ERASMUS+	2019-2023	BEN	€ 227 000	https://www.metis4skills.eu
INFINEON	BRIDGES5.0 01069651 - HORIZON EUROPE	2023-2026	BEN	€ 251 000	https://bridges5-0.eu/
INFINEON	GreenChips-EDU – 101123309 DIGITAL EUROPE	2023-2027	BEN	€ 758 000	https://www.tugraz.at/projekte/greenchips-edu/home
INFINEON	ECS-Academy 101110124 - ERASMUS+	2023-2027	BEN	€ 224 000	https://chipsacademy.eu/
INFINEON	SEISMEC-101135884 - HORIZON EUROPE	2024-2027	BEN	€ 303 000	https://seismec.eu/
INFINEON	Chips of Europe - 101158501 - DIGITAL-2023-SKILLS_04_SEMICONDUCTORS	2024-2028	BEN	€ 445 013	https://chipsofeurope.eu/
INFINEON	Achieve 101190015 - DIGITAL-2023-SKILLS-05-SPECIALEDU	2024-2028	BEN	€ 112 885	
UNIKLU	Articonf, Horizon 2020	2019 -2022	BEN	€ 700 000	https://articonf.eu/
UNIKLU	DataCloud, Horizon 2020	2021 -2023	BEN	€ 500 000	https://datacloudproject.eu/
UNIKLU	Athena, Christian Doppler Forschungsgesellschaft	2021 - 2024	BEN	€ 7 000 000	https://athena.itec.aau.at/
UNIKLU	GraphMassivizer,No 825134, Horizon 2020	2023 -2025	BEN	€ 1 000 000	https://articonf.eu/
UNIKLU	Aspide, EuroHPC/Horizon 2020	2018-2022	BEN	€ 450 000	aspide-project.eu
RISE	PoweriezD, KDT- JU 101096884	2023-2025	BEN	€ 72.752.837 €	https://powerized.eu/
SEMI	METIS Erasmus+	2019 - 2023	BEN	3,988,878	www.metis4skills.eu
SEMI	MADEin4, ECSEL	2019-2022	BEN	€29.382.452	https://madein4.eu/
SEMI	ECOVEM Erasmus+	2020-2024	BEN	€3.990.321	https://ecovem.eu/
SEMI	IMOCO4.E, ECSEL	2021-2024	BEN	€31.051.318	https://www.imoco4e.eu/
SEMI	ECSA Erasmus+	2023-2027	BEN	€3.998.663	https://chipsacademy.eu
SEMI	ECDA Erasmus+	2024-2027	BEN	€1.499.000	https://diversityinchips.eu/
SEMI	RESCHIP4EU, Digital Europe	2024-2028	BEN		https://www.eitdigital.eu/eu-collaborations/reschip4eu/

SEMI	HiCONNECTS, ChipsJU	2023-2025	BEN		https://www.hiconnects.org/
USZ	METASTRA,Horizon	2023-2028	BEN	€ 5 087 742,50	https://www.metastraproject.eu/
USZ	OMD, ITEA	2022-2024	BEN		https://itea4.org/project/omd.html
USZ	FogBlock4Trust (TRUBLO), Eu Subgrant	2021-2023	BEN	€ 75 000	https://www.trublo.eu/fogblock4trust/
USZ	E-MUSE, EU ETN	2021-2024	BEN	€ 3 901 305,60	https://www.itn-emuse.com/
UvA	ENVRI-Hub Next, Horizon Europe	2024-2026	BEN	€ 360.000	https://envri.eu/envri-hub-next/
UvA	LTER-LIFE, Dutch research council	2022-2031	BEN	€ 1.100 000	https://lter-life.nl/en
UvA	EVERSE, Horizon Europe	2024-2027	BEN	€ 370.000	https://everse.software/
UvA	BlueCloud 2026, Horizon Europe	2023-2026	BEN	€ 100.000	https://blue-cloud.org/about-blue-cloud-2026
UvA	CLARIFY, Horizon 2020	2019-2023	BEN	€ 450.000	https://cvblab.webs.upv.es/clarify-project.eu/
UvA	ENVRI-FAIR, Horizon 2020	2019-2023	BEN	€ 500.000	https://envri.eu/the-envri-fair-project/
TalTech	EuroCC2, EuroHPC JU	2023-2025	BEN	€ 350.000	https://www.eurocc-access.eu/about-us/the-projects/
UKIM	WideHealth - 952279 Horizon 2020	2021-2023	COO	€ 899 707,50 €	https://widehealth.eu/
UKIM	UbiLAB Erasmus+	2021-2023	COO	€ 150.847,50	https://ubilab.feit.ukim.edu.mk/
UKIM	GoToTwin IPA ADRION	2021-2027	COO	€ 1.709.812,68	https://gototwin.interreg-ipa-adrion.eu/
UNIUD	FarmScan Field Analysis via Remote Monitoring and Sustainable, Compostable Agricultural Nodes	2025-2028	BEN	€ 135.000	https://www.uniud.it/it/ricerca/progetti-e-iniziative/progetti-finanziati/horizon-europe/farmscan
UNIUD	Social Sciences Participatory Research-Action for Preparedness in Risk Management for Disasters and Health Emergencies in Europe's Cities	2024-2027	BEN	€ 345.000	https://cordis.europa.eu/project/id/101168315/
UNIUD	FIXIT - Scaled FerroelectrIc X-bars for AI-driven sensors and actuaTors	2023-2027	BEN	€ 206.000	https://cordis.europa.eu/project/id/101135398
UNIUD	KICSTARTH2 - Accelerating Sustainable Hydrogen Uptake Through Innovation and Education	2023-2024	BEN	€ 181.000	https://eit-hei.eu/projects/kicstarth2/
UNIUD	ATTOSWITCH - Dirac cold-source transistor technologies towards attojoule switching	2024-2027	BEN	€ 290.000	https://cordis.europa.eu/project/id/101135571

UNIVERSITÄT KLAGENFURT

PROF. DR. PETER SCHLÖGL
VICE-RECTOR FOR TRANSFER, COOPERATION & UNIVERSITY LIFELONG LEARNING

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Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **University of Klagenfurt** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students of the joint HPCMasterPlus Project enrolled at other consortium universities, in alignment with our shared goal of equitable and inclusive access to education across Europe.

Klagenfurt, 09.05.2025

.....

Prof. Dr. Peter Schlögl
Vice-Rector for Transfer, Cooperation & University Lifelong Learning
University of Klagenfurt

Name Martina Wolfgruber
Department HR
Phone +43 5 1777 0
Fax +43

Email martina.wolfgruber@infineon.com
Internet www.infineon.com/austria

Our sign
Date 08.05.2025

To whom it may concern

Ref: Letter of Commitment

HPCMasterPlus – European Master's Programme in High Performance Computing

As a partner in the HPCMasterPlus consortium, Infineon Technologies Austria AG affirms its full commitment to supporting the development, implementation, and promotion of the joint Digital Europe Project for the European Master's Programme in High Performance Computing.

We commit to:

- Actively disseminating the programme through our institutional channels, including our website, social media, internal communications, and through our press and publication office.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an industry Partner, we additionally commit to:

- Ensuring transparent and effective collaboration with all consortium partners.
- Providing industry perspective and insights to all consortium partners as per request.

Sincerely yours,

Signed by:
Sabine Herlitschka
C253DF16985B4CA...

DI Dr. Sabine Herlitschka MBA
Chief Executive Officer

Signed by:
227DE15A2884420...

Joerg Eisenschmied
Chief Financial Officer

UNIVERSITÀ
DEGLI STUDI
DI UDINE
IL RETTORE

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, the **University of Udine** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students of the joint HPCMasterPlus Project enrolled at other consortium universities, in alignment with our shared goal of equitable and inclusive access to education across Europe.

University of Udine

Roberto Pinton
Chancellor

Signature Pinton Roberto

Firmato digitalmente da
Pinton Roberto
Data: 2025.05.08
12:26:14 +02'00'

Udine, 06.05.2025

REPUBLIC OF NORTH MACEDONIA
"Ss. CYRIL AND METHODIUS" UNIVERSITY IN SKOPJE
FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGIES

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, the **Faculty of Electrical Engineering and Information Technologies** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

29.4.2025

Faculty of Electrical Engineering and Information Technologies, Ss. Cyril and Methodius University
Vladimir Atanasovski, PhD
Dean

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **National Technical University "Kharkiv Polytechnic Institute"** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

Gennadiy KHRYPUNOV
Vice-rector for Scientific-and-Pedagogical Work
National Technical University "Kharkiv Polytechnic Institute"
April 30, 2025

UNIVERSITY OF AMSTERDAM
Faculty of Science (FNWI)

Prof. dr. Paul Groth
Informatics Institute (IvI)
Director Graduate School of Informatics
Science Park 904
1098 XH Amsterdam
P.O. Box 94323
1090 GH Amsterdam
The Netherlands

Subject: Letter of commitment
Date: 12 May 2025

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **University of Amsterdam** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.
We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

If the project is accepted, we additionally commit to:

- Market the master program and support the students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

Prof. Dr. Paul Groth
University of Amsterdam
Graduate School of Informatics

12 May 2025

SEMI Europe
Haus D, Etage 3
Helmholtzstr. 2-9
10587 Berlin, Germany

Tel: +49 30 303080770
semieurope@semi.org
www.semi.org

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, SEMI Europe affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminate the programme through our institutional channels, including our website, social media, and internal communications.
- Promote the programme within our academic and professional networks to ensure broad outreach and visibility.

Signature

SEMI Europe
Victoria Cummings
Senior Manager, EU Projects
29 April 2025

Contact person RISE
Madhav Mishra
Smart Hardware
+46 73 079 26 69
madhav.mishra@ri.se

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **RISE Research Institutes of Sweden AB** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the program within our academic and professional networks to ensure broad outreach and visibility.

Yours sincerely,

Madhav Mishra, PhD
Senior Scientist

RISE Research Institutes of Sweden AB
Smart Hardware – Nano Technology

TECHNISCHE UNIVERSITÄT DRESDEN

DRESDEN concept

European Project Center

Technische Universität Dresden, 01062 Dresden

EPC European Project Center

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"Joint Research Activities"
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E-mail: katja.boettcher@tu-dresden.de

To whom it may concern

Date: 30.04.2025

Letter of Commitment
HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **TUD Dresden University of Technology** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

i.A.

TUD Dresden University of Technology
Christian GEHRHARDTS
Head of Office, authorised to sign by Chancellor Dipl.-Oek. Jan Gerken
30 April 2025

TALLINN UNIVERSITY OF TECHNOLOGY

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **Tallinn University of Technology** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

Mihkel Läänelaid
Head of Research Administration Office

Tallinn, 05.05.2025

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19086 Tallinn, Estonia
Registry code 74000323

Phone +372 620 2002
E-mail info@taltech.ee
www.taltech.ee

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, **University of Szeged** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

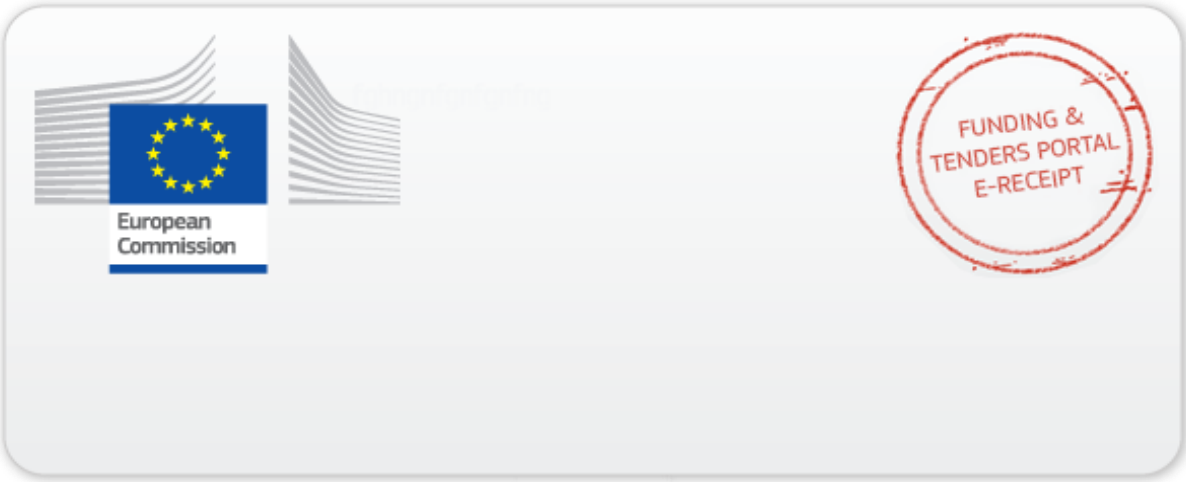
As an awarding institution, we additionally commit to:

- Waiving tuition fees for students enrolled in the joint HPCMasterPlus Project, in alignment with our shared goal of equitable and inclusive access to education across Europe.

Universtiy of Szeged:

.....	.....
László Rovó, Dr.	Judit Fendler, Dr.
Rector	Chancellor

Szeged, 05 May, 2025



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Allegato n. 3

UNIVERSITÀ DEGLI STUDI DI UDINE

IL RETTORE

Letter of Commitment

HPCMaster+ – European Master's Programme in High Performance Computing

As a partner in the HPCMaster+ consortium, the **University of Udine** affirms its commitment to supporting the joint Proposal for the European Master's Programme in High Performance Computing as part of the DIGITAL-EUROHPC-JU-2024-MASTER-03 call.

We commit, if the proposal is accepted, to:

- Actively disseminating the programme through our institutional channels, including our website, social media, and internal communications.
- Promoting the programme within our academic and professional networks to ensure broad outreach and visibility.

As an awarding institution, we additionally commit to:

- Waiving tuition fees for students of the joint HPCMasterPlus Project enrolled at other consortium universities, in alignment with our shared goal of equitable and inclusive access to education across Europe.

University of Udine

Roberto Pinton
Chancellor

Signature

Udine, 06.05.2025