

## **PREPARATION OF THE Erasmus Plus DECAIR CALL FOR PROPOSALS**

### 1. Basic rules to be respected

- The supplier must include in its price list TRANSPORT to the destination
- The material purchased is exempt from VAT (see attached certificate)
- The supplier must indicate the DELIVERY TIME
- The supplier must GUARANTEE the equipment for at least 1 year (parts, commissioning and transport)

### 2. Required delivery times

2 months maximum after notification

3. The supplier must provide the Dean's office of the Engineering Faculty of the Lebanese University two sealed envelopes: one with the technical specifications of the equipment and the other one with the corresponding price not later than October 1<sup>st</sup> 2021 at 12:00 p.m.

Lebanese University P4

Technical Specifications for equipments:

**Lot #1: PIX drive-by-wire and Autonomous Driving Platform [PIX Moving] or equivalent**  
**Quantity = 1**

- 1) Software to program the vehicle and to test different scenarios (overtaking, roundabout, path planning, safe stop distance, Suspension testing,..)

The PIX platforms must support various software platforms and mainly Autoware and Apollo. Should be provided detailed manuals for the software implementation.

- Detailed user guide for open source software Apollo and Autoware
- Instruction manual for ROS development
- Technical manual for drive-by-wire chassis
- Use cases and analysis on R&D projects

- 2) Vehicle specifications

Below are the basic specifications for the vehicle to be provided:

Drive-by-wire Control	Steering, acceleration, braking, gear switch lighting
Drive and Steering	4-wheel drive, 4-wheel steering
Chassis Size(mm)	2500×1550×616 mm
Whole Chassis Torque	10.2kw
Maximum Driving Mileage	100km
Maximum Speed	40km/h (limit set by software)
Chassis Weight (battery included)	470kg
Chassis Control Protocols	CAN Bus 2.0, Speed 500k/s
Open Source Contents	Chassis CAN protocols, chassis design
Power	Fully electric (11kwh battery capacity)
Maximum Load	800kg
Gradeability	17%

- 3) Sensors: GPS, LIDAR, IMU, Encoders, and others that could be relevant for the above scenarios...

Mainly should be provided a sensor package that includes the following items:

- 16-channel LiDAR (Alternate brands: Ouster, Velodyne and Robosense)
- Integrated Inertial Navigation
- CAN Card
- Camera (FLIR BFS-PGE-16S2C-CS )
- Industrial Computing Platform (Nuvo-6108GC or Nvidia Xavier)
- Monitor (Touch Screen)
- Switch (Dahua 8-interface)
- GNSS (Dual Antenna)
- Industrial Remote (which can control the platform remotely)
- 4 Speed encoders for the 4 wheels

The platform has open protocols so that users can tune and integrate their upper applications.

4) PIX Technical Support:

provide developers with remote technical support, including:

- Failure inspection and diagnosis on chassis electronic control and related functions
- Installation guidance for sensor mounting brackets
- Guidance and reference for sensor installation positions
- Reference and instructions on chassis platform maintenance and repairing

- Providing DBC files compatible with Apollo and Autoware
- Providing remote support for Autoware installation
- Support for setting-up and debugging of Autoware on chassis platform
- Professional guidance on HD map creation targeted for Autoware platform
- Introduction for Autoware function extensions

5) Delivery: The goods are to be delivered to the following location:  
Lebanese University, Faculty of Engineering, Campus Rafic Hariri, Hadat- Lebanon.  
Tel: 961.5.463.489- 961.3.433.404

**Lot #2: Laptop for AI teaching and Robotics experimentations Quantity = 2**

1) The specifications listed below are considered as minimal specifications, the supplier may provide better performances.

<b>Processor (CPU)</b>	<b>10<sup>th</sup> generation</b> <b>Intel core i7-1165G7 (2.8 GHz, up to 4.7 GHz, 12MB cache, 4 cores)</b>
<b>Chipset</b>	Intel chipset is integrated with processor
<b>RAM</b>	8GB (1x8GB) DDR4-2666 expandable to 16GB
<b>Hard disk</b>	512GB SSD M.2
<b>Display adapter</b>	2GB RAM dedicated Nvidia GPU with compute capability of 3.5
<b>Monitor</b>	15.6" LED backlit FHD
<b>Ports</b>	<ul style="list-style-type: none"><li>- Network connector (RJ45)</li><li>- Minimum 2 x USB 3.0</li><li>- Headphone/Microphone</li><li>- HDMI</li></ul>
<b>Communications</b>	<ul style="list-style-type: none"><li>- 10/100/1000 Gigabit Ethernet</li><li>- Wireless 802.11a/b/g/n</li><li>- Bluetooth</li></ul>
<b>Sound card &amp; speakers</b>	Integrated sound card with internal speakers
<b>Keyboard &amp; input device</b>	Integrated A/L keyboard with touchpad pointing device
<b>Camera</b>	Integrated
<b>Battery</b>	3-cell battery
<b>AC power adapter</b>	AC adapter with MK power cord
<b>Carrying case</b>	Yes
<b>Operating system</b>	Free DOS
<b>Others</b>	Bladder must be a listed partner with the mother company, certificate must be provided

	Bidder must have an official service center, certificate must be provided
<b>Warranty</b>	3 years (parts and labor) onsite warranty from manufacturer (prove must be provided)

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**Lot #3: Jetson AGX Xavier Industrial Module (900-82888-0080-000) for AI teaching and Robotics experimentations or equivalent.** **Quantity = 2**

- 1) The specifications listed below are considered as minimal specifications, the supplier may provide better performances.

<b>GPU</b>	512-core Volta GPU with Tensor Cores
<b>CPU</b>	8-core ARM v8.2 64-bit CPU, 8MB L2 + 4MB L3
<b>Memory</b>	32GB 256-Bit LPDDR4x   137GB/s
<b>Storage</b>	32GB eMMC 5.1
<b>DL Accelerator</b>	(2x) NVDLA Engines
<b>Vision Accelerator</b>	7-way VLIW Vision Processor
<b>Encoder/Decoder</b>	(2x) 4Kp60   HEVC/(2x) 4Kp60   12-Bit Support
<b>Size</b>	105 mm x 105 mm x 65 mm
<b>Deployment</b>	Module (Jetson AGX Xavier)

<b>Developer Kit I/Os</b>	<b>Jetson AGX Xavier Module Interface</b>
PCIe X16	x8 PCIe Gen4/x8 SLVS-EC
RJ45	Gigabit Ethernet
USB-C	2x USB 3.1, DP (Optional), PD (Optional) Close-System Debug and Flashing Support on 1 Port
Camera Connector	(16x) CSI-2 Lanes
M.2 Key M	NVMe
M.2 Key E	PCIe x1 + USB 2.0 + UART (for Wi-Fi/LTE) / I <sup>2</sup> S / PCM
40-Pin Header	UART + SPI + CAN + I <sup>2</sup> C + I <sup>2</sup> S + DMIC + GPIOs

HD Audio Header	High-Definition Audio
eSATAp + USB3.0 Type A	SATA Through PCIe x1 Bridge (PD + Data for 2.5-inch SATA) + USB 3.0
HDMI Type A	HDMI 2.0
uSD/UFS Card Socket	SD/UFS

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