



Republic of the Philippine
TARLAC STATE UNIVERSITY
Romulo Blvd., San Vicente, Tarlac City
Tel. No.: (045) 982 4630
Website: www.tsu.edu.ph

Bidding Documents

(This Bidding Documents is in conformance with the Sixth Edition of the Philippine Bidding Documents for the Procurement of Goods)

For the Project

Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education

**With an Approved Budget for the Contract (ABC) of
Four Million Seven Hundred and Eight Thousand Pesos
(₱ 4,708,000.00)**

**Invitation to Bid No. 2022-007
PhilGeps Reference No.: 8431514**

**July 2020
6th Edition**

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Glossary of Acronyms, Terms, and Abbreviations

ABC – Approved Budget for the Contract.

BAC – Bids and Awards Committee.

Bid – A signed offer or proposal to undertake a contract submitted by a bidder in response to and in consonance with the requirements of the bidding documents. Also referred to as *Proposal* and *Tender*. (2016 revised IRR, Section 5[c])

Bidder – Refers to a contractor, manufacturer, supplier, distributor and/or consultant who submits a bid in response to the requirements of the Bidding Documents. (2016 revised IRR, Section 5[d])

Bidding Documents – The documents issued by the Procuring Entity as the bases for bids, furnishing all information necessary for a prospective bidder to prepare a bid for the Goods, Infrastructure Projects, and/or Consulting Services required by the Procuring Entity. (2016 revised IRR, Section 5[e])

BIR – Bureau of Internal Revenue.

BSP – Bangko Sentral ng Pilipinas.

Consulting Services – Refer to services for Infrastructure Projects and other types of projects or activities of the GOP requiring adequate external technical and professional expertise that are beyond the capability and/or capacity of the GOP to undertake such as, but not limited to: (i) advisory and review services; (ii) pre-investment or feasibility studies; (iii) design; (iv) construction supervision; (v) management and related services; and (vi) other technical services or special studies. (2016 revised IRR, Section 5[i])

CDA - Cooperative Development Authority.

Contract – Refers to the agreement entered into between the Procuring Entity and the Supplier or Manufacturer or Distributor or Service Provider for procurement of Goods and Services; Contractor for Procurement of Infrastructure Projects; or Consultant or Consulting Firm for Procurement of Consulting Services; as the case may be, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

CIF – Cost Insurance and Freight.

CIP – Carriage and Insurance Paid.

CPI – Consumer Price Index.

DDP – Refers to the quoted price of the Goods, which means “delivered duty paid.”

DTI – Department of Trade and Industry.

EXW – Ex works.

FCA – “Free Carrier” shipping point.

FOB – “Free on Board” shipping point.

Foreign-funded Procurement or Foreign-Assisted Project– Refers to procurement whose funding source is from a foreign government, foreign or international financing institution as specified in the Treaty or International or Executive Agreement. (2016 revised IRR, Section 5[b]).

Framework Agreement – Refers to a written agreement between a procuring entity and a supplier or service provider that identifies the terms and conditions, under which specific purchases, otherwise known as “Call-Offs,” are made for the duration of the agreement. It is in the nature of an option contract between the procuring entity and the bidder(s) granting the procuring entity the option to either place an order for any of the goods or services identified in the Framework Agreement List or not buy at all, within a minimum period of one (1) year to a maximum period of three (3) years. (GPPB Resolution No. 27-2019)

GFI – Government Financial Institution.

GOCC – Government-owned and/or –controlled corporation.

Goods – Refer to all items, supplies, materials and general support services, except Consulting Services and Infrastructure Projects, which may be needed in the transaction of public businesses or in the pursuit of any government undertaking, project or activity, whether in the nature of equipment, furniture, stationery, materials for construction, or personal property of any kind, including non-personal or contractual services such as the repair and maintenance of equipment and furniture, as well as trucking, hauling, janitorial, security, and related or analogous services, as well as procurement of materials and supplies provided by the Procuring Entity for such services. The term “related” or “analogous services” shall include, but is not limited to, lease or purchase of office space, media advertisements, health maintenance services, and other services essential to the operation of the Procuring Entity. (2016 revised IRR, Section 5[r])

GOP – Government of the Philippines.

GPPB – Government Procurement Policy Board.

INCOTERMS – International Commercial Terms.

Infrastructure Projects – Include the construction, improvement, rehabilitation, demolition, repair, restoration or maintenance of roads and bridges, railways, airports, seaports, communication facilities, civil works components of information technology projects, irrigation, flood control and drainage, water supply, sanitation, sewerage and solid waste management systems, shore protection, energy/power and electrification facilities, national buildings, school buildings, hospital buildings, and other related construction projects of the government. Also referred to as *civil works or works*. (2016 revised IRR, Section 5[u])

LGUs – Local Government Units.

NFCC – Net Financial Contracting Capacity.

NGA – National Government Agency.

PhilGEPS - Philippine Government Electronic Procurement System.

Procurement Project – refers to a specific or identified procurement covering goods, infrastructure project or consulting services. A Procurement Project shall be described, detailed, and scheduled in the Project Procurement Management Plan prepared by the agency which shall be consolidated in the procuring entity's Annual Procurement Plan. (GPPB Circular No. 06-2019 dated 17 July 2019)

PSA – Philippine Statistics Authority.

SEC – Securities and Exchange Commission.

SLCC – Single Largest Completed Contract.

Supplier – refers to a citizen, or any corporate body or commercial company duly organized and registered under the laws where it is established, habitually established in business and engaged in the manufacture or sale of the merchandise or performance of the general services covered by his bid. (Item 3.8 of GPPB Resolution No. 13-2019, dated 23 May 2019). Supplier as used in these Bidding Documents may likewise refer to a distributor, manufacturer, contractor, or consultant.

UN – United Nations.

Section I. Invitation to Bid



Republic of the Philippine
TARLAC STATE UNIVERSITY
Romulo Blvd., San Vicente, Tarlac City
Tel. No.: (045) 982 4630
Website: www.tsu.edu.ph

INVITATION TO BID

For the Project

Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education

Invitation to Bid No.: 2022-007

1. The Tarlac State University, through Trust Fund – CHED Funded *intends* to apply the sum of **Four Million Seven Hundred and Eight Thousand Pesos (₱ 4,708,000.00)** to payments under the contracts for the project: **Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education**

Bids received in excess of the ABC shall be automatically rejected at bid opening.

2. The Tarlac State University now invites bids for the project: **Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education**. Delivery of the Goods is required within **ninety (90) calendar** days from the receipt of the Notice to Proceed. Bidders must have completed, within the last five (5) years prior to the date of submission and receipt of bids, a contract similar to the Project. The description of an eligible bidder is contained in the Bidding Documents, particularly, in Section II. Instructions to Bidders.
3. Bidding will be conducted through open competitive bidding procedures using a non-discretionary “pass/fail” criterion as specified in the 2016 Revised Implementing Rules and Regulations (IRR) of Republic Act (RA) 9184, otherwise known as the “Government Procurement Reform Act”.

Bidding is restricted to Filipino citizens/sole proprietorships, partnerships, or organizations with at least sixty percent (60%) interest or outstanding capital stock belonging to citizens of the Philippines, and to citizens or organizations of a country the laws or regulations of which grant similar rights or privileges to Filipino citizens, pursuant to RA 5183.

4. Interested bidders may obtain further information from **Tarlac State University** and inspect the Bidding Documents at the address given below during Tuesday to Friday from 8:00 A.M. to 5:00 P.M:

BAC Secretariat
Gender and Development Building
Tarlac State University
Romulo Blvd., San Vicente, Tarlac City
Tel. No. (045) 606-8142
Email: bacsec@tsu.edu.ph / jmamanankil@tsu.edu.ph

5. A complete set of Bidding Documents may be acquired by interested Bidders from **February 16 to March 8, 2022** from the aforementioned address upon payment of the applicable fee for the Bidding Documents, pursuant to the latest Guidelines issued by the GPPB, in the amount of ₱ 2,000.00

It may also be downloaded free of charge from the website of the Philippine Government Electronic Procurement System (PhilGEPS) and the website of the Procuring Entity, provided that Bidders shall pay the applicable fee for the Bidding Documents not later than the submission of their bids.

6. The Tarlac State University will hold a Pre-Bid Conference on **February 23, 2022 (2:00 P.M.) via Zoom Meeting. Meeting ID: 839 9703 3516 Passcode: 022459**, which shall be open to prospective bidders.
7. Bids must be duly received by the BAC Secretariat at the address below on or before **March 8, 2022 (2:00 P.M.)**. Late bids shall not be accepted.

BAC Secretariat
Gender and Development Building
Tarlac State University
Romulo Blvd., San Vicente, Tarlac City
Tel. No. (045) 606-8142
Email: bacsec@tsu.edu.ph / jmamanankil@tsu.edu.ph

8. All Bids must be accompanied by a bid security in any of the acceptable forms and in the amount stated in ITB Clause 14.
9. Bid opening shall be on **March 8, 2022 at 2:00 P.M.**, at the Business Center Audio-Visual Room, 2nd Floor, Business Center Bldg., Tarlac State University, Romulo Blvd., San Vicente, Tarlac City. Bids will be opened in the presence of the bidders' representatives who choose to attend at the address below.
10. The Tarlac State University reserves the right to reject any and all bids, declare a failure of bidding, or not award the contract at any time prior to contract award in accordance with Sections 35.6 and 41 of the 2016 Revised IRR of RA 9184, without thereby incurring any liability to the affected bidder or bidders.
11. For further information, please refer to:

Ms. Jhenna Micah A. Manankil /Ms. Maria Ysabela S. Galang
BAC Secretariat
Gender and Development Building
Tarlac State University
Romulo Blvd., San Vicente, Tarlac City
Tel. No. (045) 606-8142
Email: bacsec@tsu.edu.ph / jmamanankil@tsu.edu.ph

(SGD) DR. MARLON V. GAMIDO
BAC Chairperson

Section II. Instructions to Bidders

1. Scope of Bid

- 1.1. The Tarlac State University wishes to receive Bids for the project: **Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education**, with identification number **Invitation to Bid No. 2022-007**.
- 1.2. The procurement project (referred to herein as “Project”) is composed of one lot, the details of which are described in Section VII. Technical Specifications.

2. Funding Information

- 2.1. The GOP through the source of funding as indicated below for **2022** in the amount of **₱ 4,708,000.00**
- 2.2. The source of funding is the **Trust Fund (TF)**.

3. Bidding Requirements

- 3.1. The Bidding for the Project shall be governed by all the provisions of RA No. 9184 and its 2016 revised IRR, including its Generic Procurement Manuals and associated policies, rules and regulations as the primary source thereof, while the herein clauses shall serve as the secondary source thereof.
- 3.2. Any amendments made to the IRR and other GPPB issuances shall be applicable only to the ongoing posting, advertisement, or IB by the BAC through the issuance of a supplemental or bid bulletin.
- 3.3. The Bidder, by the act of submitting its Bid, shall be deemed to have verified and accepted the general requirements of this Project, including other factors that may affect the cost, duration and execution or implementation of the contract, project, or work and examine all instructions, forms, terms, and project requirements in the Bidding Documents.

4. Corrupt, Fraudulent, Collusive, and Coercive Practices

The Procuring Entity, as well as the Bidders and Suppliers, shall observe the highest standard of ethics during the procurement and execution of the contract. They or through an agent shall not engage in corrupt, fraudulent, collusive, coercive, and obstructive practices defined under Annex “I” of the 2016 revised IRR of RA No. 9184 or other integrity violations in competing for the Project.

5. Eligible Bidders

- 5.1. Only Bids of Bidders found to be legally, technically, and financially capable will be evaluated.
- 5.2. Foreign ownership limited to those allowed under the rules may participate in this Project.
- 5.3. Pursuant to Section 23.4.1.3 of the 2016 revised IRR of RA No.9184, the Bidder must have a SLCC that is similar to the Project, as described in the **BDS**, with a value, adjusted to current prices using the PSA’s CPI, that is at least equivalent to fifty percent (50 %) of the ABC.
- 5.4. The Bidders shall comply with the eligibility criteria under Section 23.4.1 of the 2016 IRR of RA No. 9184.

6. Origin of Goods

There is no restriction on the origin of goods other than those prohibited by a decision of the UN Security Council taken under Chapter VII of the Charter of the UN, subject to Domestic Preference requirements under **ITB** Clause 18.

7. Subcontracts

7.1. The Bidder may subcontract portions of the Project to the extent allowed by the Procuring Entity as stated herein, but in no case more than twenty percent (20%) of the Project.

The Procuring Entity has prescribed that subcontracting is not allowed

8. Pre-Bid Conference

The Procuring Entity will hold a pre-bid conference for this Project on the specified date and time and at the address indicated in paragraph 6 of the **IB**.

9. Clarification and Amendment of Bidding Documents

Prospective bidders may request for clarification on and/or interpretation of any part of the Bidding Documents. Such requests must be in writing and received by the Procuring Entity, either at its given address or through electronic mail indicated in the **IB**, at least ten (10) calendar days before the deadline set for the submission and receipt of Bids.

10. Documents comprising the Bid: Eligibility and Technical Components

10.1. The first envelope shall contain the eligibility and technical documents of the Bid as specified in **Section VIII. Checklist of Technical and Financial Documents**.

10.2. The Bidder's **SLCC** as indicated in **ITB** Clause 5.3 should have been completed **within five (5) years** prior to the deadline for the submission and receipt of bids.

10.3. If the eligibility requirements or statements, the bids, and all other documents for submission to the BAC are in foreign language other than English, it must be accompanied by a translation in English, which shall be authenticated by the appropriate Philippine foreign service establishment, post, or the equivalent office having jurisdiction over the foreign bidder's affairs in the Philippines. Similar to the required authentication above, for Contracting Parties to the Apostille Convention, only the translated documents shall be authenticated through an apostille pursuant to GPPB Resolution No. 13-2019 dated 23 May 2019. The English translation shall govern, for purposes of interpretation of the bid.

11. Documents comprising the Bid: Financial Component

11.1. The second bid envelope shall contain the financial documents for the Bid as specified in **Section VIII. Checklist of Technical and Financial Documents**.

11.2. If the Bidder claims preference as a Domestic Bidder or Domestic Entity, a certification issued by DTI shall be provided by the Bidder in accordance with Section 43.1.3 of the 2016 revised IRR of RA No. 9184.

11.3. Any bid exceeding the ABC indicated in paragraph 1 of the **IB** shall not be accepted.

11.4. For Foreign-funded Procurement, a ceiling may be applied to bid prices provided the conditions are met under Section 31.2 of the 2016 revised IRR of RA No. 9184.

12. Bid Prices

12.1. Prices indicated on the Price Schedule shall be entered separately in the following manner:

- a. For Goods offered from within the Procuring Entity's country:
 - i. The price of the Goods quoted EXW (ex-works, ex-factory, ex-warehouse, ex-showroom, or off-the-shelf, as applicable);
 - ii. The cost of all customs duties and sales and other taxes already paid or payable;
 - iii. The cost of transportation, insurance, and other costs incidental to delivery of the Goods to their final destination; and
 - iv. The price of other (incidental) services, if any, listed in e.
- b. For Goods offered from abroad:
 - i. Unless otherwise stated in the **BDS**, the price of the Goods shall be quoted delivered duty paid (DDP) with the place of destination in the Philippines as specified in the **BDS**. In quoting the price, the Bidder shall be free to use transportation through carriers registered in any eligible country. Similarly, the Bidder may obtain insurance services from any eligible source country.
 - ii. The price of other (incidental) services, if any, as listed in **Section VII. Technical Specifications**.

13. Bid and Payment Currencies

13.1. For Goods that the Bidder will supply from outside the Philippines, the bid prices may be quoted in the local currency or tradeable currency accepted by the BSP at the discretion of the Bidder. However, for purposes of bid evaluation, Bids denominated in foreign currencies, shall be converted to Philippine currency based on the exchange rate as published in the BSP reference rate bulletin on the day of the bid opening.

13.2. Payment of the contract price shall be made in Philippine Pesos.

14. Bid Security

14.1. The Bidder shall submit a Bid Securing Declaration or any form of Bid Security in the amount indicated in the **BDS**, which shall be not less than the percentage of the ABC in accordance with the schedule in the **BDS**.

14.2. The Bid and bid security shall be valid until July 6, 2022. Any Bid not accompanied by an acceptable bid security shall be rejected by the Procuring Entity as non-responsive.

15. Sealing and Marking of Bids

15.1. Each Bidder shall submit one copy of the first and second components of its Bid.

15.2. The Procuring Entity may request additional hard copies and/or electronic copies of the Bid. However, failure of the Bidders to comply with the said request shall not be a ground for disqualification.

15.3. If the Procuring Entity allows the submission of bids through online submission or any other electronic means, the Bidder shall submit an electronic copy of its Bid, which must be

digitally signed. An electronic copy that cannot be opened or is corrupted shall be considered non-responsive and, thus, automatically disqualified.

16. Deadline for Submission of Bids

16.1. The Bidders shall submit on the specified date and time and either at its physical address or through online submission as indicated in paragraph 7 of the **IB**.

17. Opening and Preliminary Examination of Bids

17.1. The BAC shall open the Bids in public at the time, on the date, and at the place specified in paragraph 9 of the **IB**. The Bidders' representatives who are present shall sign a register evidencing their attendance. In case videoconferencing, webcasting or other similar technologies will be used, attendance of participants shall likewise be recorded by the BAC Secretariat.

In case the Bids cannot be opened as scheduled due to justifiable reasons, the rescheduling requirements under Section 29 of the 2016 revised IRR of RA No. 9184 shall prevail.

17.2. The preliminary examination of bids shall be governed by Section 30 of the 2016 revised IRR of RA No. 9184.

18. Domestic Preference

18.1. The Procuring Entity will grant a margin of preference for the purpose of comparison of Bids in accordance with Section 43.1.2 of the 2016 revised IRR of RA No. 9184.

19. Detailed Evaluation and Comparison of Bids

19.1. The Procuring BAC shall immediately conduct a detailed evaluation of all Bids rated "*passed*," using non-discretionary pass/fail criteria. The BAC shall consider the conditions in the evaluation of Bids under Section 32.2 of the 2016 revised IRR of RA No. 9184.

19.2. If the Project allows partial bids, bidders may submit a proposal on any of the lots or items, and evaluation will be undertaken on a per lot or item basis, as the case maybe. In this case, the Bid Security as required by **ITB** Clause 15 shall be submitted for each lot or item separately.

19.3. The descriptions of the lots or items are indicated in **Section VII. Technical Specifications**, and the ABCs of these lots or items are indicated in the **BDS** for purposes of the NFCC computation pursuant to Section 23.4.2.6 of the 2016 revised IRR of RA No. 9184. The NFCC must be sufficient for the total of the ABCs for all the lots or items participated in by the prospective Bidder.

19.4. The Project shall be awarded as one project having several items that shall be awarded as one contract.

19.5. Except for bidders submitting a committed Line of Credit from a Universal or Commercial Bank in lieu of its NFCC computation, all Bids must include the NFCC computation pursuant to Section 23.4.1.4 of the 2016 revised IRR of RA No. 9184, which must be sufficient for the total of the ABCs for all the lots or items participated in by the prospective Bidder. For bidders submitting the committed Line of Credit, it must be at least equal to ten percent (10%) of the ABCs for all the lots or items participated in by the prospective Bidder.

20. Post-Qualification

- 20.1. Within a non-extendible period of five (5) calendar days from receipt by the Bidder of the notice from the BAC that it submitted the Lowest Calculated Bid, the Bidder shall submit its latest income and business tax returns filed and paid through the BIR Electronic Filing and Payment System (eFPS) and other appropriate licenses and permits required by law and stated in the **BDS**.

21. Signing of the Contract

- 21.1. The documents required in Section 37.2 of the 2016 revised IRR of RA No. 9184 shall form part of the Contract. Additional Contract documents are indicated in the **BDS**.

Section III. Bid Data Sheet

ITB Clause	
5.3	For this purpose, contracts similar to the Project shall be the supply and delivery of similar goods comprising the Project.
7.1	No further instructions.
12	The price of the Goods shall be quoted DDP Tarlac City, Philippines or the applicable International Commercial Terms (INCOTERMS) for this Project.
14.1	<p>The bid security shall be in the form of a Bid Securing Declaration, or any of the following forms and amounts:</p> <ul style="list-style-type: none"> a. The amount of not less than two percent (2 %) of ABC, if bid security is in cash, cashier's/manager's check, bank draft/guarantee or irrevocable letter of credit; or b. The amount of not less than five percent (5 %) of ABC if bid security is in Surety Bond.
19.3	The ABC for the project is ₱ 4,708,000.00
20.2	No further requirements.
21.2	No further requirements.

Section IV. General Conditions of Contract

1. Scope of Contract

This Contract shall include all such items, although not specifically mentioned, that can be reasonably inferred as being required for its completion as if such items were expressly mentioned herein. All the provisions of RA No. 9184 and its 2016 revised IRR, including the Generic Procurement Manual, and associated issuances, constitute the primary source for the terms and conditions of the Contract, and thus, applicable in contract implementation. Herein clauses shall serve as the secondary source for the terms and conditions of the Contract.

This is without prejudice to Sections 74.1 and 74.2 of the 2016 revised IRR of RA No. 9184 allowing the GPPB to amend the IRR, which shall be applied to all procurement activities, the advertisement, posting, or invitation of which were issued after the effectivity of the said amendment.

Additional requirements for the completion of this Contract shall be provided in the **Special Conditions of Contract (SCC)**.

2. Advance Payment and Terms of Payment

2.1. Advance payment of the contract amount is provided under Annex “D” of the revised 2016 IRR of RA No. 9184.

2.2. The Procuring Entity is allowed to determine the terms of payment on the partial or staggered delivery of the Goods procured, provided such partial payment shall correspond to the value of the goods delivered and accepted in accordance with prevailing accounting and auditing rules and regulations. The terms of payment are indicated in the **SCC**.

3. Performance Security

Within ten (10) calendar days from receipt of the Notice of Award by the Bidder from the Procuring Entity but in no case later than prior to the signing of the Contract by both parties, the successful Bidder shall furnish the performance security in any of the forms prescribed in Section 39 of the 2016 revised IRR of RA No. 9184

4. Inspection and Tests

The Procuring Entity or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Project specifications at no extra cost to the Procuring Entity in accordance with the Generic Procurement Manual. In addition to tests in the **SCC, Section IV. Technical Specifications** shall specify what inspections and/or tests the Procuring Entity requires, and where they are to be conducted. The Procuring Entity shall notify the Supplier in writing, in a timely manner, of the identity of any representatives retained for these purposes.

All reasonable facilities and assistance for the inspection and testing of Goods, including access to drawings and production data, shall be provided by the Supplier to the authorized inspectors at no charge to the Procuring Entity.

5. Warranty

6.1. In order to assure that manufacturing defects shall be corrected by the Supplier, a warranty shall be required from the Supplier as provided under Section 62.1 of the 2016 revised IRR of RA No. 9184.

6.2. The Procuring Entity shall promptly notify the Supplier in writing of any claims arising under this warranty. Upon receipt of such notice, the Supplier shall, repair or replace the

defective Goods or parts thereof without cost to the Procuring Entity, pursuant to the Generic Procurement Manual.

6. Liability of the Supplier

The Supplier's liability under this Contract shall be as provided by the laws of the Republic of the Philippines.

If the Supplier is a joint venture, all partners to the joint venture shall be jointly and severally liable to the Procuring Entity.

Section V. Special Conditions of Contract

GCC Clause	
1	<p>Delivery and Documents –</p> <p>For purposes of the Contract, “EXW,” “FOB,” “FCA,” “CIF,” “CIP,” “DDP” and other trade terms used to describe the obligations of the parties shall have the meanings assigned to them by the current edition of INCOTERMS published by the International Chamber of Commerce, Paris. The Delivery terms of this Contract shall be as follows:</p> <p>The delivery terms applicable to this Contract are delivered to Tarlac State University, Romulo Blvd., San Vicente, Tarlac City. Risk and title will pass from the Supplier to the Procuring Entity upon receipt and final acceptance of the Goods at their destination.”</p> <p>Delivery of the Goods shall be made by the Supplier in accordance with the terms specified in Section VI. Schedule of Requirements.</p>
	<p>Packaging –</p> <p>The Supplier shall provide such packaging of the Goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in this Contract. The packaging shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packaging case size and weights shall take into consideration, where appropriate, the remoteness of the Goods’ final destination and the absence of heavy handling facilities at all points in transit.</p> <p>The packaging, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract, including additional requirements, if any, specified below, and in any subsequent instructions ordered by the Procuring Entity.</p> <p>The outer packaging must be clearly marked on at least four (4) sides as follows:</p> <p>Name of the Procuring Entity Name of the Supplier Contract Description Final Destination Gross weight Any special lifting instructions Any special handling instructions Any relevant HAZCHEM classifications</p> <p>A packaging list identifying the contents and quantities of the package is to be placed on an accessible point of the outer packaging if practical. If not practical the packaging list is to be placed inside the outer packaging but outside the secondary packaging.</p>
	<p>Transportation –</p> <p>Where the Supplier is required under Contract to deliver the Goods CIF, CIP, or DDP, transport of the Goods to the port of destination or such other named place of destination in the Philippines, as shall be specified in this Contract, shall be arranged and paid for by the Supplier, and the cost thereof shall be included in the Contract Price.</p>

	<p>Where the Supplier is required under this Contract to transport the Goods to a specified place of destination within the Philippines, defined as the Project Site, transport to such place of destination in the Philippines, including insurance and storage, as shall be specified in this Contract, shall be arranged by the Supplier, and related costs shall be included in the contract price.</p> <p>Where the Supplier is required under Contract to deliver the Goods CIF, CIP or DDP, Goods are to be transported on carriers of Philippine registry. In the event that no carrier of Philippine registry is available, Goods may be shipped by a carrier which is not of Philippine registry provided that the Supplier obtains and presents to the Procuring Entity certification to this effect from the nearest Philippine consulate to the port of dispatch. In the event that carriers of Philippine registry are available but their schedule delays the Supplier in its performance of this Contract the period from when the Goods were first ready for shipment and the actual date of shipment the period of delay will be considered force majeure.</p> <p>The Procuring Entity accepts no liability for the damage of Goods during transit other than those prescribed by INCOTERMS for DDP deliveries. In the case of Goods supplied from within the Philippines or supplied by domestic Suppliers risk and title will not be deemed to have passed to the Procuring Entity until their receipt and final acceptance at the final destination.</p>
	<p>Intellectual Property Rights –</p> <p>The Supplier shall indemnify the Procuring Entity against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof.</p>
4	<p>The inspections and tests that will be conducted are: visual and sensory inspection and test.</p>

Section VI. Schedule of Requirements

The delivery date for the Goods covered by the Contract shall be within ninety (90) calendar days upon receipt of the Notice to Proceed.

Section VII. Technical Specifications

Item No.	Description
1.	<p>Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education</p> <p>Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education</p> <p>Consists of:</p> <p>Multi-technology Interactive e-Learning solution for engineering, technology and STEM with the use of different teaching tools such as text, 3D animation, video, audio and virtual simulation 1 year subscription and Unlimited Users</p> <ul style="list-style-type: none"> • Industry-based interactive learning curriculum - The curriculum is always being updated with a weekly or monthly frequency whenever there are new trends in technology in the industry, therefore produced manpower graduating from the e-Learning system will always have up-to-date industry skills. • Virtual hardware simulators - Practice real-life technical skills in a virtual environment where the same instructions on a virtual environment can be directly applied on real hardware. • Multiple teaching aids on every module – Modules use videos, animations, texts, charts, 3D models, narration, real-world examples, etc., to make the learner better understand the lesson as much as possible no matter the level of retention and strength of understanding. • Custom course creation - You can create a custom set of modules from the main curriculum library and create a custom training system, for a given student or class, or even for a specific occupation. • Seamless enrollment – Using a unique code that is assigned to the subscription license, all you have to do is send the code to email addresses of your applicants and they can enroll themselves into the e-Learning system. • Management – Monitor every individual’s learning progress enrolled in the e-Learning system, and see all of the modules they have taken, when they have started a module, when they have last opened a module, and how many quizzes they have completed. You can also generate a tabulated report of the learning progress of each individual or of an entire class, be it in a spreadsheet format or PDF. • SCORM Package Builder – You can make SCORM packages from the modules of the curriculum and integrate it into learning management systems like Electude, Moodle, Blackboard, Canvas, etc. <p>Interactive Multimedia Promotes Learning Engagement Using the best instructional design practices, Distance eLearning utilizes a wide range of interactivity to suit anyone's learning style.</p> <ul style="list-style-type: none"> • Solve Technical Calculations • Classify Items for Applications

- Identify Components
- Knowledge Checks
- Identify Sequence of Operation
- Self-Reviews

Applicable Programs/Courses

- Mechanical Engineering
- Electronics Engineering
- Electrical Engineering
- Computer Engineering
- Industrial Engineering
- Civil Engineering
- Chemical Engineering
- Mechatronics Engineering
- Marine Engineering
- Manufacturing Engineering
- Aeronautical Engineering
- Agricultural Engineering
- ALL Industrial Technology Courses
- Medical Courses
- K12 STEM & TVL
- TVET Courses

eLearning Categories

I. AUTOMATION

1. Ethernet for Mechatronics
2. Mechatronics HMI
3. Mechatronics (AB CompactLogix L32)
4. Mechatronics Profibus
5. Mechatronics Troubleshooting (AB CompactLogix L32)
6. Mechatronics Troubleshooting-AB L32
7. Mechatronics - AB CompactLogix/rsLogix 5000 (Siemens 300 Series)
8. Mechatronics - CompactLogix Ethernet/IP
9. Panelview Operator Interface - AB Controllogix
10. Mechatronics Simulation (mechasim)
11. Mechatronics Simulation (Siemens S7-300 Series)
12. Pegasus Robotics Simulation
13. Robotics and Computer Programming (AB CompactLogix L16)
14. Robotics 1
15. Mechatronics CNC Mill
16. Machine Vision Inspection Systems
17. Machine Vision Inspection Systems (AB micro800)
18. Mechatronics Troubleshooting System AB CompactLogix L16 - AB Micro820
19. Mechatronics RF Identification System (AB CompactLogix L16) Execution System - A
20. Mechatronics AB Micrologix
21. Mechatronics Barcode Identification
22. Mechatronics RF Identification System
23. Mechatronics RF Identification System
24. Tabletop Mechatronics
25. Mechatronics HMI Siemens S7-1500
26. Mechatronics Barcode Identification
27. Mechatronics Barcode Identification
28. Table-Top Mechatronics Servo Robot System
29. Table Top Smart Factory RFID/Sensors
30. Mechatronics Barcode Product Identification
31. Tabletop Smart Factory Ethernet

32. Tabletop Smart Factory Manufacturing
33. Smart Factory Barcode System Siemens S7-1500
34. Mechatronics RFID S7-1500
35. Smart Factory Vision Inspection System Siemens S7-1500
36. Smart Factory Visual Communication System Siemens S7-1500
37. Mechatronics System (Siemens S7-1500)
38. Mechatronics - Siemens S7-1500 /
Siemens STEP 7 Professional
39. Smart Factory Sensor System Siemens S7-1500, Pneumatics/Vacuum
40. Smart Factory Sensor System Siemens S7-1500, Ultrasonic
41. Smart Factory Sensor System Siemens S7-1500, Photoeye
42. Smart Factory Device Learning System Siemens S7-1500, Stack Light
43. Smart Factory Sensor System Siemens S7-1500, Electrical Current
44. Smart Factory Sensor System Siemens S7-1500, Analog Position
45. Smart Factory Sensor System Siemens S7-1500, Analog Pressure
46. Tabletop Smart Factory Visual Communications Allen-Bradley
47. Smart Factory Barcode System Allen-Bradley L16
48. Mechatronics RFID AB L16
49. Smart Factory Ethernet AB CompactLogix L16
50. Smart Factory Network Security Learning System – AB CompactLogix L16
51. Smart Factory Manufacturing Execution System - AB CompactLogix L16
52. Smart Factory Visual Communications Allen-Bradley
53. Smart Factory Sensor System Allen-Bradley L16, Pneumatics/ Vacuum
54. Smart Factory Sensor System Allen-Bradley L16, Ultrasonic
55. Smart Factory Sensor System Allen-Bradley L16, Photoeye
56. Smart Factory Device Learning System Allen-Bradley L16, Stack Light
57. Smart Factory Sensor System Allen-Bradley L16, Electrical Current
58. Smart Factory Sensor System Allen-Bradley L16, Analog Position
59. Smart Factory Sensor System Allen-Bradley L16, Analog Pressure
60. Mechatronics AB CompactLogix L32
61. Computer Control 2 (Micro820)
62. Principles of Robotics
63. Principles of Factory Automation
64. Principles of Robotics

II. ELECTRONICS

1. DC Electronic Drives
2. Portable Plc - Siemens S71200
3. Portable Plc Troubleshooting Siemens S71200
4. PLC Analog Application - ControlLogix
5. PLC ControlNet - ControlLogix
6. Mastering Programmable Controllers
7. PLC Statement List
8. PLC Analog - Siemens S7300
10. PLC Profibus - Siemens S7
11. MPC (siemens Mp277)
12. PLC Graph Programming - S7300
13. MPC - Siemens S7-300/as-i Bus
14. MPC (SIEMENS ET200pro/STEP 7)
15. Mastering Programmable Controllers
16. PLC Troubleshooting Siemens S7-300 Series
17. Programmable Controller, Siemens S7312
18. Mastering Programmable Controllers (A-B CompactLogix L16)
19. Power and Control Electronics
20. AC Motor Drives
21. AC Motor Drive Troubleshooting
22. Electrical Control Systems
23. Variable Frequency AC Drive

24. AC Electronic Drives
25. PLC Motor Control AB Micro820
26. PLC Motor Control AB Micro 810
27. Portable PLC Learning System Allen Bradley CompactLogix L16
28. Portable PLC with Troubleshooting Allen Bradley CompactLogix L16
29. PLC Troubleshooting -AB ControlLogix
30. PLC Troubleshooting -AB SLC500
31. Computer Control 1 (A-B Micro820)

III. ELECTRICAL

1. Electric Motor Control
2. AC/DC Electrical Systems
3. Electrical Control 1
4. Portable Electric Relay Control Troubleshooting
5. Electric Relay Control
6. AC/DC Electrical Systems
7. Electric Motor Control
8. Electric Motor Control Troubleshooting
9. Electrical Fabrication 1
10. Motor Braking
11. Reduced Voltage Starting
12. Electronic Sensors
13. Electronic Counter
14. SCR Speed Control
15. Electric Wiring System
16. PLC/VFD Wiring System
17. Industrial Soldering
18. Ethernet and Analog Wiring
19. Electrical Power Distribution
20. Electric Motor Control
21. Motor Troubleshooting System
22. Rotating Electric Machines
23. DC Generators
24. Wound Rotor Motor
25. Rotating Electrical Machines

IV. FLUID POWER

1. Hydraulic Troubleshooting
2. Pneumatic Troubleshooting
3. Basic Pneumatics
4. Basic Hydraulics
5. Portable Pneumatics
6. Electronic Sensors
7. Basic Hydraulics Troubleshooting
8. Basic Pneumatics Troubleshooting
9. Portable Basic Hydraulics
10. Hydraulic Maintenance
11. Intermediate Hydraulics
12. Intermediate Pneumatics
13. Electronic Sensors
14. Advanced Pneumatics
15. Advanced Hydraulics
16. Electro-Fluid Power Systems
17. Pneumatic Fitting Construction
18. Principles of Hydraulics

V. GREEN ENERGY

1. Wind Concepts
2. Turbine Electric Hub Troubleshooting

3. Turbine Generator Control Troubleshooting
4. Turbine Nacelle Troubleshooting
5. Solar Concepts
6. Solar Site Analysis
7. Alternative Energy
8. Solar Thermal Troubleshooting Open-Loop
9. Solar Thermal Troubleshooting Closed-Loop
10. Solar Thermal Installation
11. Solar PV Troubleshooting
12. Solar Grid-Tie
13. Data Acquisition
14. Solar Photovoltaic Installation

VI. LEAN MANUFACTURING

1. Lean Overview and Workplace Organization
2. Introduction to Lean
3. 5S
4. Total Productive Maintenance
5. Poka-Yoke
6. Lean Theory
7. Lean Process Flow
8. Visual Workplace
9. Standardized Work
10. Kaizen
11. Value Stream Mapping
12. Set-Up Reduction
13. Six Sigma

VII. MACHINING

1. Machine Tools 117. Pneumatic Fitting Construction
2. Machine Tools 2
3. Machine Tools 3
4. Manual Machine Tools
5. CNC Machine Tools 1
6. CNC Machine Tools 2
7. CNC Machine Tools 3 (Denford Microturn)
8. Principles of CNC
9. CNC Control
10. Principles of Turning
11. Principles of Machining Centers
12. Principles of Grinding
13. Principles of Workholding
14. Principles of Coolants and Oils
15. Principles of Gear Manufacturing
16. Principles of Tooling
17. Tooling for Turning
18. Tooling for Machining Centers
19. Tooling for Grinding
20. Tooling for Tapping

VIII. MANUFACTURING PROCESS

1. Product Finishing
2. Production Assembly
3. Split Flange Coupling Assembly
4. Electric Torque Wrench Assembly
5. Print Reading 1
6. Welding Technology 1
7. Computer-Aided Design 1 SolidWorks 2019

8. Computer Aided Design 2 SolidWorks 2019
9. Wiring Harness Assembly
10. Contamination
11. Fasteners
12. Gaskets
13. Stall Bar Assembly
14. Instrumented DC-Electric Torque Wrench Assembly
15. Computer-Aided Manufacturing 1 (Mastercam X2)
16. Blueprint Reading
17. AWS Welding Symbols on Blueprints
18. General Dimensioning and Tolerances
19. Geometric Dimensioning and Tolerancing

IX. MATERIALS

1. Plastic Mold Design
2. Manufacturing Processes 3
3. Structural Engineering 1
4. Structural Engineering 2
5. Surveying
6. Materials Engineering 1
7. Principles of Materials - Ferrous Metals
8. Principles of Materials - Non-Ferrous Metals
9. Principles of Heat Treating
10. Principles of Plastics
11. Principles of Composites
12. Principles of Ceramics

X. MECHANICAL

1. Vibration Analysis
2. Pump Systems
3. Multiple Pump
4. Turbine Pump
5. Diaphragm Pump
6. Peristaltic Tubing Pump
7. Piston Pump
8. Gear Pump
9. Magnetic Pump
10. Centrifugal Pump
11. Rigging 3
12. Mechanical Drives 4
13. Floor Standing Belt Conveyor
14. Predictive Maintenance Vibration Analysis
15. Roller Pack Machine Tool Axis
16. Plain Bearing Machine Tool Axis
17. Mechatronics Simulation
18. Pipings
19. Central Lubrication
20. Mechanical Systems 1
21. Mechanical Fabrication 2
22. Rigging Systems 1
23. Rigging Systems 2
24. Mechanical Fabrication 1
25. Mechanical Drives 1
26. Portable Mechanical Drives 2
27. Mechanical Drives 2
28. Mechanical Drives 3
29. Laser Shaft Alignment
30. Portable Laser Shaft Alignment

31. Mechanical Systems 2

XI. PROCESS CONTROL

1. Temperature Process Control
2. Data Acquisition
3. Analytical Process Control
4. Data Acquisition Systems
5. ControlLogix Process Control
6. Process Control Systems: Ultrasonic Level Measurement and Control
7. Process Control Systems: Differential Pressure Flow Measurement and Control
8. Process Visualization Control 1
9. Pressure Process Control Systems
10. Foundation Fieldbus Process Control 1
11. HART Process Control 1
12. Mastering Programmable Controllers AB CompactLogix L32
13. PLC Process Control - Siemens S7-1200
14. PLC Process Control AB CompactLogix L16
15. Process Control Systems

XII. QUALITY ASSURANCE

1. Metrology 1
2. Measurement Tools 1
3. Quality Assurance 1
4. Portable Precision Gauging 1
5. Portable Measurement Tools
6. Inspection Techniques 1
7. Surface Plates
8. Gauge Blocks
9. Test Indicators
10. Height Gauges
11. Bench Comparators
12. Optical Comparators
13. Bore Gauges
14. Air Gauges
15. Specialty Micrometers
16. Miscellaneous Inspection Instruments
17. ISO 9000 and TS 16949
18. Statistical Process Control 1
19. Statistical Process Control 2
20. Quality Control Concepts

XIII. SAFETY

1. Safety Practices and Regulations
2. Personal Protective Equipment
3. Hazardous Communication
4. Confined Spaces
5. Lockout/Tagout
6. Accident Response
7. Overhead Crane Safety

XIV. THERMAL

1. Air Conditioning / Heat Pump
2. Steam Systems
3. Thermal Systems 1
4. Environmental Applications
5. Geothermal
6. Geothermal Troubleshooting

7. Geothermal Desuperheater
8. Geothermal Troubleshooting with Desuperheater
9. Geothermal Flush Cart Learning System
10. Thermal Technology 1
11. Thermal Technology 2

XV.WORKPLACE EFFECTIVENESS

1. Enterprise Systems 1
2. Principles of Advanced Manufacturing
3. Mathematics 1
4. Trigonometry 1
5. Communication Skills
6. Conflict Resolution
7. Working in Groups

Learn through Distance e-Learning and Oxygen's Education

- Complete electronic access to all Oxygen Education's learning material, 300 courses, 1100 modules, 3300 hours of learning material Interactive multimedia eBooks
- Available 24 x 7 for total learning flexibility, anytime, Anywhere!
- Includes excellent content management system to administer quizzes, track grades, provide reporting, and much more
- Create tailored courses using any of the 1100 modules the possibilities are endless!

Minimum Requirements:

Windows devices (including Surface tablets):

Windows 10 64-bit (may function under previous versions/different operating systems, but testing & support limited to Windows 10)

8GB RAM Sound card (or onboard sound)

Video card (or onboard video) with WebGL support

64-bit Browser with WebGL 2.0 support

Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Mac devices (does NOT include iPads):

macOS 64-bit (may function under different operating systems, but testing & support limited

to 64-bit macOS)

8GB RAM Sound card (or onboard sound)

Video card (or onboard video) with WebGL support

64-bit Browser with WebGL 2.0 support

Recommended browser: Firefox

Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Chromebooks (does NOT include other tablets):

ChromeOS 64-bit

6GB RAM Sound card (or onboard sound)

Video card (or onboard video) with WebGL support

64-bit Browser with WebGL 2.0 support

Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Mobile Devices not listed above that may function properly, but are not yet supported (iPad, Galaxy Tab, Fire, etc.):

Memory 8GB RAM

Note: Determining RAM on an iPad is problematic.

As a reference, 2020 iPads (8th generation) have 3GB RAM; 2020 iPad Pro (4th generation) have 6GB RAM.

Various operating systems - under evaluation

Sound card (or onboard sound)

Video card (or onboard video) with WebGL support
64-bit Browser with WebGL 2.0 support
Broadband Internet access (mobile data/Wi-Fi/etc.) capable of 1 Mbps

"Smart Simulator for Electrical Machines Training Lifetime License which includes:"

This software should simulate a real electric motor's workbench so that the student should be able to perform the experiments in the virtual environment in a simple and almost real way, in a way very close to what he/she would do on a real equipment.

It must be conceived as a complete course in electric machines to make the student able to solve practical and real assembling problems and to work on several experiments in the virtual equipment and then perform them by submitting the electric assembled machine to different working conditions.

The software must have a 3D environment composed by a workbench with electric motor components, power modules, sensors, actuators, and instruments, and all the components should behave and look like real ones, with texture and lightening.

It must include a frame with base to fix the modules and the machines and must have a set of electric machine components, including but not limited to rotors suitable for AC and DC motors, stators suitable for AC and DC motors, electromagnetic brake, brake support with load cell for measuring the torque, coupling joint for mechanically connecting the rotor to the electromagnetic brake or other components, speed transducer for measuring the motor speed, block with rotation system to lock the motor or turns it manually by means of a crank, brush with brush holder, and supports.

The software must also provide the student with the theoretical content that is necessary to perform the experiments, and every experiment must have detailed instructions on how to assemble, wire and to perform it.

It must also include the typical modules used in electric machines experiments, including but not limited to:

- AC three-phase source,
- AC single-phase source,
- DC source,
- Wattmeters,
- Speed Meter,
- Torque Meter,
- Amperemeters,
- Voltmeters,
- Starting Rheostat with Resistive Load,
- Pole Changing Unit,
- Excitation Rheostat with Capacitive Load,
- Rotating light synchronoscope,
- Pole changing unit,
- Star/Delta starter,
- Starting rheostat and synchronizer,
- Oscilloscope.

Besides the mechanical assembly, the software must allow the student to perform the wiring, including the wiring between power supplies and the electric motor, brake, sensors and/or other devices used in each experiment, the connections on the electric motor itself, and the connections between the devices and the measurement modules.

The software must have at least 45 different experiments, including but not limited to the following topics:

- Basics concepts of an electric machine:
 - Flux produced by the poles - Main poles
 - Flux produced by the poles – Interpoles
 - Main magnetic field - Concurrent series
 - Intensity of the magnetic field
 - Induced voltage
 - Interpole Effect
 - Rotating magnetic field – three-phase and single-phase rotating fields
- Induction motors:
 - Three-phase squirrel cage motor, 2 poles, 24V Δ
 - Three-phase squirrel cage motor, 2 poles, 42V Y
 - Three-phase squirrel cage motor, 2 poles, 24V $\Delta\Delta$
 - Three-Phase squirrel cage motor, 2 poles, 42V YY
 - Three-Phase squirrel cage motor, 4 poles, 24V Δ
 - Three-Phase squirrel cage motor, 4 poles, 42V Y
 - Three-Phase Dahlander motor, 4/2 poles, 42V Δ/YY
 - Split phase motor
 - Capacitor start and run motor
 - Three-phase motor with wound rotor, 2 poles, 42V YY
 - Phase shifter
 - Induction regulator
 - Three-Phase synchronous induction motor, 2 poles, 42V Δ
- Direct current motors:
 - DC motor with separate excitation
 - DC motor with shunt excitation
 - DC motor with series excitation
 - DC motor with compound excitation, long shunt
 - DC motor with differential excitation, long shunt
 - DC motor with compound excitation, short shunt
 - DC motor with differential excitation, short shunt
- Commutator motors for alternating current:
 - Single-phase series motor
 - Repulsion motor
- Synchronous machines:
 - Winding resistance
 - No-load test, mechanical losses of the DC motor
 - No-load test, mechanical and iron losses of the alternator
 - Short-circuit characteristic
 - Short-circuit test
 - Load test
 - Parallel connection of the alternator with the mains
 - Alternator as synchronous motor
- Direct current generators:
 - Winding resistance - Armature winding
 - Winding resistance – Series and interpole windings
 - Winding resistance - Inductor winding
 - Test of the no-load motor (Swinburne)
 - No-load E.M.F.
 - Excitation characteristic
 - Separate excitation dynamo
 - Shunt excitation dynamo
 - Series excitation dynamo

□ Compound excitation dynamo

The software must guide the student through the learning process automatically by providing the above experiment proposals and, for each experiment, it must automatically verify if the student has performed the mechanical assembly and the wiring correctly, and then if so, it must allow to perform the simulation and measurement by comparing the student's measurements with the expected values for the experiment.

When the student finishes an experiment, the software must register the progress locally and in a cloud system so that the student can start the experiment using one computer, and continue somewhere else, using the same or another computer synchronizing the student's progress.

The software must have a detailed online help with text and videos made from screen recordings with the software, so that the instructions on how to use it are clear and easy to understand.

The software must be delivered always in full version with feature unlock through a cloud system so that any user can download the software from the internet where the school may provide access to users to the software features.

It must be possible to select an interface language between English, French, Spanish, and Portuguese.

"Smart Simulator for Process Control Lifetime License"

The Virtual Process Control Simulator is a software that has been developed to teach process control techniques in a unique and effective way. With this software, students can improve their individual experience on studying process control in practice. Students will be able to carry out several experiments dealing with the following topics:

- control systems, open and closed loop system,
- sensors, transducers and actuators,
- input and power signal conditioning,
- level, flow, pressure, temperature,
- error, offset, calibration, response time, ON-OFF control, hysteresis, PID controller, Proportional control (P), Proportional-Integral control (PI), Proportional Integral-Derivative control (PID).

This software will be able to reproduce the features and behaviours of the Process Control Trainer. This system can work with or without a PLC. Students can easily implement the controllers using the virtual control modules or connecting the plant to a real PLC or to a SoftPLC, such as Siemens S7-1200/1500, PLCSIM and Codesys. With this type of software, students can learn in their own rhythm and teachers have more time to support the class, manage and improve the process because – unlike any other simple simulator - it grants the following benefits:

1) **EFFECTIVE GUIDE FOR STUDENTS:** possibility to access learning topics, with theory, instructions and experiment proposals. The software includes a virtual version of the Process Control Trainer.

2) **AUTOMATIC VALIDATION OF STUDENTS' TASKS:** the software automatically verifies if the student completed successfully each task in order to allow him/her to go ahead with the next one.

3) TRACKING OF STUDENTS' PROGRESS: the teacher can verify the students' progress at any time by consulting the specific summary in the software or exporting it to a spreadsheet.

SOFTWARE DESCRIPTION

This software reproduces a process plant and signal, power, control and PLC modules. The process control laboratory is composed of two main sections: the process tank and the sump tank.

The PROCESS PLANT is designed to teach the process control principles.

The SUMP TANK includes pipelines to process water supply and to drain water out from the process plant. The PROCESS TANK (pressurized vessel) includes the following components:

- A level sensor and a metric scale suitable for measuring the water level (cm or mm).
- A float switch suitable for detecting the level of water within the pressurized tank.
- A heating element.
- A temperature sensor (PT100) and a thermometer suitable for measuring the temperature inside the process tank (°C or °F).
- A pressure sensor and a pressure gauge suitable for measuring the pressure (bar or psi).
- Four types of valves (three manually operated and a controlled one).

The SUMP TANK (water tank) and the pipelines include the following components:

- A delivery valve (the main water supply valve).
- A flow meter turbine (volumetric measuring turbine).
- A motor pump with thermal protection.
- A visual flowmeter (indicator for flow rate).
- A manually operated valve to reduce the water flow.
- A motor valve suitable for controlling the water flow.

INSTRUMENTATION AND CONTROL SECTION

The CONTROL MODULES include interface signal conditioners for sensors, power drivers for actuators and basic control logic that behaves as either a regulating device or a state-oriented device:

CHARACTERISTICS OF THE SIGNAL, POWER AND CONTROL MODULES

The process plant has an associated panel that shows the entire process diagram using standard symbols. This is very useful for students to understand the basic concepts of process control. The software is supplied with a detailed on line educational guide. Following the experiments, students will be guided step by step to learn the following activities:

- calibration of a sensor,
- obtaining the characteristic of a static process and time constant,
- control of a process by ON-OFF, Proportional, Proportional-Integral and Proportional Integral Derivative.

Through this software, teachers will be able to easily guide students in studying the principles of process control. The main objective of a basic course in process control is to make students able to solve practical and real control problems. The didactic advantage of this trainer is the possibility to investigate the behavior of each process (level, flow, temperature or pressure) or any possible relevant combination. The software guarantees a complete experience in the field of process control. Students can approach this topic starting from the basic concepts of control systems up to designing and tuning

controllers for the main four control variables in industries (level, temperature, pressure and flow). Each experiment is presented to students with its goals and the theoretical concepts necessary to understand the next steps to be taken. Simulator represents closely the main features of a process plant, so that it will be like having a real process control laboratory for each student.

CONTROL OPTIONS: PLC, SOFTPLC AND BUILT-IN CONTROL MODULES

The process plant represented by the software can be controlled using: The built-in control modules, such as OnOFF, Proportional and PID. An external PLC such as S7-1200/1500. A SoftPLC, such as PLCSIM and Codesys Control. When working with a PLC or SoftPLC, students still need to work on signal and power conditioning in the virtual environment, but instead of using control modules, students will connect the input and output normalized signals to a PLC MODULE and the PLC MODULE will handle the interface with the respective external PLC or SoftPLC.

LIST OF EXPERIMENTS

- Level sensor settings
- Characteristics of the motor of the pump
- Characteristics of the pump
- Characteristics of the static process
- Time constant of the process
- ON - OFF control of the level
- ON - OFF control of the level with "Sol Valve"
- ON - OFF control of the level with "Float Switch"
- Closed loop control of the LEVEL
 - Closed loop Proportional control of the level
 - Closed loop Proportional-Integral control of the level
 - Closed loop Proportional-Derivative control of the level
 - Closed loop Proportional-Integral-Derivative control of the level
- Closed loop control of the FLOW
 - Flow sensor
 - Closed loop Proportional control of the flow
 - Closed loop Proportional-Integral control of the flow
 - Closed loop Proportional-Derivative control of the flow
 - Closed loop Proportional-Integral-Derivative control of the flow
- Closed loop control of the TEMPERATURE
 - Temperature sensor
 - Measurement of the characteristics of the heating
 - Closed loop Proportional control of the temperature
 - Closed loop Proportional-Integral control of the temperature
 - Closed loop Proportional-Derivative control of the temperature
 - Closed loop Proportional-Integral-Derivative control of the temperature
- Pressure sensor
 - Pressure sensor as a level sensor
 - ON - OFF control of the level through the pressure sensor

DESCRIPTION OF PERFORMABLE EXPERIMENTS

This software grants the possibility to perform 27 practical experiments with progressive difficulties levels. Here follows a short description of some of the performable experiments.

Level sensor settings

From the beginning of the experiments, students will learn about different types of sensors. Students can learn how to calibrate and use a capacitive fluid level sensor in order to measure the water level and to determine the sensor characteristics. The level

transducer (L/U) is used to calibrate the level sensor for a correspondence of 1 V to 1 cm

Characteristics of the motor of the pump

The experiment is very practical because students will learn the control in PWM (Pulse Width Modulation) of a DC motor. Using a classical oscilloscope, students will analyze the control signals of the pump motor. The reference input signal of the motor is a triangular 10Vpp, while the duty cycle of the PWM is modulated from the control panel of the trainer.

Characteristics of the pump

After running this experiment, students will understand the working principle of a diaphragm pump. They will learn how to compute the flow and how to measure it using the flowmeter in order to draw the characteristic curve of the flow.

Characteristics of the static process

The main objective of this experiment is to understand how the flow will influence the rising time of the fluid level rate in a level control process. The flow transducer (f/U) is used to calibrate the flow sensor for a correspondence of 1 V output to 0.5 liters per minute.

Time constant of the process What is the time constant of a process? How do I calculate it? Students can answer these questions by performing this experiment. The time constant estimation of the water flow in the tank is made as a ratio between the input flow and the draining flow rate. This process is an example of parameter identification.

ON - OFF control of the level

What are the effects of the hysteresis on the level control? Students will find out while learning how to measure the dynamic response of the process. Students will use the capacitive level sensor to measure the water level in the process tank. This knowledge is very important because, in practical situations, one of the most widely used types of control is the ON/OFF control.

ON - OFF control of the level with the "Sol Valve"

In this experiment, students will use the knowledge acquired so far regarding the hysteresis on level control. They will measure the up and down times of the level between start and stop of the electro-valve with a hysteresis of 0%, 15% and 30%.

ON - OFF control of the level with the "Float Switch"

Students will perform a practical study to maintain constant the level in the tank using an ON-OFF level sensor and the electro valve sol valve. They will learn how to measure the water level variation in time. In order to determine the hysteresis curve for on - off control of the level, students will use the engraved mobile scale or the level sensor and float switch.

Closed loop control of the LEVEL

Closed loop Proportional control of the level

Closed loop Proportional-Integral control of the level

Closed loop Proportional-Derivative control of the level

Closed loop Proportional-Integral-Derivative control of the level

In order to study the closed loop control, students need to check first the effects of the gain on the dynamic response of the system. It is very interesting to observe the output characteristic of the PID controller for different K_p , K_d and K_i constant values. Ziegler-Nichols tuning method is used in tuning of PID controller. The student learn how to determine the PID parameters in order to obtain the controlled level.

Closed loop control of the FLOW

Flow sensor

Closed loop Proportional control of the flow

Closed loop Proportional-Integral control of the flow

Closed loop Proportional-Derivative control of the flow

Closed loop Proportional-Integral-Derivative control of flow

During this experiment, students learn how to measure the water flow rate by using the engraved scale of the direct flow meter or the turbine flow sensor. After analyzing the results in this experiment, students will be able to implement the tuning of the PID control of the system with optimum stability.

Temperature sensor

Students can learn how to measure the temperature variation in time (using the engraved thermometer scale or the temperature sensor), in order to determine and compute the characteristic curve of the PT100 sensor (RTD). The temperature transducer (u/U) is used to calibrate the temperature sensor for a correspondence of 1 V to 10 degrees Celsius.

Measurement of the characteristics of the heating

In this experiment (similar to the previous one), students will understand the working principle of a resistive temperature sensor in order to measure the temperature in the industrial process tank. Using a classical oscilloscope, students can analyze the wave form of the PWM for the heating element.

Closed loop control of the TEMPERATURE

ON - OFF control of the temperature

Closed loop Proportional control of the temperature

Closed loop Proportional-Integral control of the temperature

Closed loop Proportional-Derivative control of the temperature

Closed loop Proportional-Integral-Derivative control of the temperature

Students will learn that a temperature controller is an instrument used to control temperatures. In the temperature controller system, the controller accepts a temperature sensor as an input (such as an RTD or thermocouple) and compares the actual temperature with the required control temperature or set point. The output is then provided to a control element. After analyzing the results in this experiment, students will be able to tune properly the PID control of the system.

Pressure sensor

Students will learn how to measure the pressure, using the electronic pressure sensor or pressure gauge scale, in order to determine and compute the characteristic curve of the pressure sensor. The pressure transducer (P/U) is used to calibrate the pressure sensor for a correspondence of 1 V to 0.1 bar. The characteristic of a pressure transducer will be determined.

Pressure sensor as a level sensor

The main objective of this experiment is to measure the pressure, using the electronic pressure sensor or pressure gauge scale, in order to determine the characteristic curve of the level vs. pressure response.

ON - OFF control of the level through the pressure sensor

In this experiment, students will perform the operation of a closed loop ON-OFF control system using the pressure sensor as a level sensor. Thanks to the knowledge acquired so far about the effects of the hysteresis on the control, students will be able to control the pressure.

"Machine Automation Course Lifetime License"

SMART SIMULATOR FOR LEARNING AUTOMATION WITH PLC

This is a software that has been developed to teach industrial automation and PLC programming in a unique and effective way. With this software, students can improve their individual experience on studying industrial automation in practice. Students will be able to carry out several experiments dealing with the following topics:

- Main concepts related to logic control;
- State machine (SFC) approach;
- Electric diagram interpretation;
- Electric commands for motor engines and pneumatic systems and their interfaces to PLCs;
- Programmable logic controllers: hardware and software structure, technical characteristics and specifications, programming languages, main ladder instructions, data handling, math, numeric formats, comparisons, timers and analog interfaces.

This software works integrated to a soft PLC (not included) which can be: The Siemens PLCSIM or Codesys Control.

3D INDUSTRIAL ENVIRONMENTS TO PROVIDE REAL PRACTICAL EXPERIENCE TO STUDENTS

EFFECTIVE LEARNING WITH GUIDANCE, REAL-LIFE PROJECTS THEORY AND INSTRUCTIONS FROM BASIC TO ADVANCED STUDENT CAN LEARN AND PRACTICE FROM BASIC TO ADVANCED AUTOMATION WITH PLC

- Basic Ladder Logic
- Scaling
- Function Blocks
- Analog Handling
- Sequential Function Chart

IT INCLUDES ELECTRICAL PANEL, FAULT SIMULATION AND TROUBLESHOOTING

- Electric Panel
 - o Energy supply and protection
 - o Circuit breakers
 - o Contactors
 - o Safety relay
 - o 24Vdc
 - o Power supply
 - o PLC
 - o Interface relays,
 - o Connectors
 - o Conductors
 - o Frequency inverters

- Electric Diagram Samples

- Troubleshooting

- Replacement console
 - o Virtual multimeter
 - o Forced signals

Other Terms and Conditions:

1. Bidder must submit brochure/catalogue indicating the brand name & model of bid item/s as additional technical requirements failure to submit will be grounds for disqualification.
2. Bidder must have a training center for the testing & checking of goods by the end-user prior to delivery as well as for the pre- training to be conducted at the provider's

	<p>training center and/or via webinar/e-learning multimedia platform in compliance with IATF regulations and guidelines.</p> <p>3. Winning bidder must provide electronic copy of the training manuals, laboratory exercises, other technical documents as well as training and instructional videos.</p> <p>4. Bidder must attach pictures of their training center also pictures of aftersales training of faculty conducted at their training center and/or via webinar/ e-learning multimedia platforms as additional technical document requirements.</p> <p>5. Bidder must be an Authorized Distributor/ Reseller of the bid item/s & authorize to provide technical support & must attach documents to support such claim.</p> <p>After Sales Services:</p> <ul style="list-style-type: none"> • Free trainer’s training at supplier’s training center before the delivery of the goods. • Free Semi-Annual Re-training with certificate, on request. • Free Consultation/Seminar, on request • Free Annual product inspection, on request • Free Product demonstration, on Request • Free Seminar for Students, on request. <p>Warranty/Technical Support</p> <p>Upon acceptance, Supply, Delivery and Installation with Training of Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education: the provider/Supplier shall guarantee the good running condition of the Project within one year from the date of acceptance with Lifetime Technical Support.</p>
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Note: Bidders must state in the Statement of Compliance either “Comply” or “Not Comply” against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of “Comply” or “Not Comply” must be supported by evidence in a Bidders Bid and cross-referenced to that evidence. Evidence shall be in the form of manufacturer’s un-amended sales literature, unconditional statements of specification and compliance issued by the manufacturer, samples, independent test data etc., as appropriate. A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the Bid under evaluation liable for rejection. A statement either in the Bidders statement of compliance or the supporting evidence that is found to be false either during Bid evaluation, post-qualification or the execution of the Contract may be regarded as fraudulent and render the Bidder or supplier liable for prosecution subject to the provision of **ITB** Clause 4.

Section VIII. Bid Documents Checklist

This Bid Documents Checklist is provided to guide the Bidder in preparing his/her bid. The checklist may be used by the Bidder to verify if the Bid includes all the prescribed documents.

The Bidder, in submitting the required documents, must use the prescribed forms found in Section X. Bidding Forms. However, should a bidder choose to use a different formatting style for a required document, the bidder must ensure that the substance in the form given in Section X for that particular document is substantially captured in the equivalent document.

A. Eligibility and Technical Documents (<i>Contents of Envelope 1</i>)	
<input type="checkbox"/>	1. Photocopy of valid PhilGEPS Certificate of Registration
<input type="checkbox"/>	2. Photocopy of valid Certificate of Registration from SEC, DTI, or CDA, whichever is applicable
<input type="checkbox"/>	3. Photocopy of valid Mayor's/Business Permit
<input type="checkbox"/>	4. Photocopy of valid Tax Clearance
<input type="checkbox"/>	5. Statement of all on-going government and private contracts, including contracts awarded but not yet started, if any
<input type="checkbox"/>	6. Statement of Single Largest Completed Contract (SLCC), similar to the contract to be bid, in accordance with ITB Clause 5.3
<input type="checkbox"/>	7. Audited Financial Statements stamped "received" by the BIR or its duly accredited and authorized institutions
<input type="checkbox"/>	8. NFCC computation
<input type="checkbox"/>	9. <i>If applicable</i> , a valid Joint Venture Agreement (JVA), in case the joint venture is already in existence, or duly notarized statements from all the potential joint venture partners stating that they will enter into and abide by the provisions of the JVA in the instance that the bid is successful
<input type="checkbox"/>	10. Bid Securing Declaration or Bid Security, in the form, amount and validity period, as prescribed in ITB Clause 14.1
<input type="checkbox"/>	11. Bidder's Compliance to the Technical Specifications
<input type="checkbox"/>	12. Omnibus Sworn Statement, which shall be duly notarized
A. Financial Documents (<i>Contents of Envelope 2</i>)	
<input type="checkbox"/>	1. Financial Bid Form in the prescribed form
<input type="checkbox"/>	2. Schedule of Prices

Section IX. Bidding Forms

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B. Financial Documents

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2. Schedule of Prices	59

[Bidder's Letterhead]

[Date]

To: Tarlac State University
Re: Invitation to Bid No.

Statement of Single Largest Completed Contract Similar to the Contract to be Bid

Row 1: Name of Contract Row 2: Location	Contract Price	Row 1: Procuring Entity Row 2: Address Row 3: Contact Person/Tel. No.	Description of Goods	Date of Award	Date Completed

Attached herewith are the following documents: Contract Agreement, Notice of Award, Notice to Proceed, Official Receipt/Invoice, Certificate of Final Inspection, and Certificate of Acceptance, as evidences in support of the foregoing information.

I/We certify that the foregoing information and all of the supporting documents are true and correct.

[Signature]
[Name of Bidder or Authorized Representative]
[Position or Title]

[Bidder's Letterhead]

[Date]

To: Tarlac State University
Re: Invitation to Bid No.

NET FINANCIAL CONTRACTING CAPACITY

Based on our Income Tax Return and Audited Financial Statement for the Fiscal Year [YEAR], duly submitted to the Bureau of Internal Revenue, and which form part of our Bid, the summary of our firm's financial condition is as given below:

		Year [YEAR]
1.	Total Assets	
2.	Current Assets	
3.	Total Liabilities	
4.	Current Liabilities	
5.	Net Worth (1-3)	
6.	Net Working Capital (2-4)	

Based on the aforementioned data and the Value of Outstanding Works from the Statement of All Ongoing Government and Private Contracts, which also form part of our Bid, our Net Financial Contracting Capacity (NFCC) is:

NFCC = [(current asset minus current liabilities) (**15**)] minus [value of all outstanding or uncompleted portions of the projects under ongoing contracts including awarded contracts yet to be started coinciding with the contract to be bid].

NFCC =

I/We certify that the foregoing information and all of the supporting documents are true and correct.

[Signature]
[Name of Bidder or Authorized Representative]
[Position or Title]

Bid-Securing Declaration

Republic of the Philippines
City/Municipality Of _____) S.S.

x-----x

Invitation to Bid [*Insert reference number*]

To: **Tarlac State University**

I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Bid Security, which may be in the form of a Bid-Securing Declaration.
2. I/We accept that: (a) I/we will be automatically disqualified from bidding for any contract with any procuring entity for a period of two (2) years upon receipt of your Blacklisting Order; and, (b) I/we will pay the applicable fine provided under Section 6 of the Guidelines on the Use of Bid Securing Declaration, within fifteen (15) days from receipt of written demand by the procuring entity for the commission of acts resulting to the enforcement of the bid securing declaration under Sections 23.1(b), 34.2, 40.1 and 69.1, except 69.1 (f), of the IRR of RA 9184; without prejudice to other legal action the government may undertake.
3. I/We understand that this Bid-Securing Declaration shall cease to be valid on the following circumstances:
 - a. Upon expiration of the bid validity period, or any extension thereof pursuant to your request;
 - b. I am/we are declared ineligible or post-disqualified upon receipt of your notice to such effect, and
 - i) I/we failed to timely file a request for reconsideration or
 - ii) I/we filed a waiver to avail of said right;
 - c. I am/we are declared as the bidder with the Lowest Calculated Responsive Bid, and I/we have furnished the performance security and signed the Contract.

IN WITNESS WHEREOF, I/We have hereunto set my/our hand/s this ____ day of [*month*] [*year*] at [*place of execution*].

[*Signature*]
[*Name of Bidder's Authorized Representative*]
[*Signatory's legal capacity*]
Affiant

SUBSCRIBED AND SWORN to before me this ___ day of *[month]* *[year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. _____.

Witness my hand and seal this ___ day of *[month]* *[year]*.

[Name and Signature of Notary Public]

Serial No. of Commission _____

Notary Public for _____ **until** _____

Roll of Attorneys No. _____

PTR No. __, *[date issued]*, *[place issued]*

IBP No. __, *[date issued]*, *[place issued]*

Doc. No. ____

Page No. ____

Book No. ____

Series of ____.

[Bidder's Letterhead]

[Date]

To: Tarlac State University
 Re: Invitation to Bid No.

Compliance to the Technical Specifications

Item No.	Description	Bidder's Compliance State "Comply" below <i>if your offer is complying with the specifications, otherwise state "We are offering the same goods with the following specifications [State the complete specifications of the alternative offer]</i>
1.	<p>Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education</p> <p>Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education</p> <p>Consists of:</p> <p>Multi-technology Interactive e-Learning solution for engineering, technology and STEM with the use of different teaching tools such as text, 3D animation, video, audio and virtual simulation 1 year subscription and Unlimited Users</p> <ul style="list-style-type: none"> • Industry-based interactive learning curriculum - The curriculum is always being updated with a weekly or monthly frequency whenever there are new trends in technology in the industry, therefore produced manpower graduating from the e-Learning system will always have up-to-date industry skills. • Virtual hardware simulators - Practice real-life technical skills in a virtual environment where the same instructions on a virtual environment can be directly applied on real hardware. • Multiple teaching aids on every module – Modules use videos, animations, texts, charts, 3D models, narration, real-world examples, etc., to make the learner better understand the lesson as much as possible no matter the level of retention and strength of understanding. • Custom course creation - You can create a custom set of modules from the main curriculum library and create a custom training system, for a given student or class, or even for a specific occupation. • Seamless enrollment – Using a unique code that is assigned to the subscription license, all you have to do is send the code to email addresses of your applicants and they can enroll themselves into the e-Learning system. 	

• Management – Monitor every individual’s learning progress enrolled in the e-Learning system, and see all of the modules they have taken, when they have started a module, when they have last opened a module, and how many quizzes they have completed. You can also generate a tabulated report of the learning progress of each individual or of an entire class, be it in a spreadsheet format or PDF.

• SCORM Package Builder – You can make SCORM packages from the modules of the curriculum and integrate it into learning management systems like Electude, Moodle, Blackboard, Canvas, etc.

Interactive Multimedia Promotes Learning Engagement Using the best instructional design practices, Distance eLearning utilizes a wide range of interactivity to suit anyone's learning style.

- Solve Technical Calculations
- Classify Items for Applications
- Identify Components
- Knowledge Checks
- Identify Sequence of Operation
- Self-Reviews

Applicable Programs/Courses

- Mechanical Engineering
- Electronics Engineering
- Electrical Engineering
- Computer Engineering
- Industrial Engineering
- Civil Engineering
- Chemical Engineering
- Mechatronics Engineering
- Marine Engineering
- Manufacturing Engineering
- Aeronautical Engineering
- Agricultural Engineering
- ALL Industrial Technology Courses
- Medical Courses
- K12 STEM & TVL
- TVET Courses

eLearning Categories

I. AUTOMATION

1. Ethernet for Mechatronics
2. Mechatronics HMI
3. Mechatronics (AB CompactLogix L32)
4. Mechatronics Profibus
5. Mechatronics Troubleshooting (AB CompactLogix L32)
6. Mechatronics Troubleshooting-AB L32
7. Mechatronics - AB CompactLogix/rsLogix 5000 (Siemens 300 Series)
8. Mechatronics - CompactLogix Ethernet/IP
9. Panelview Operator Interface - AB Controllogix
10. Mechatronics Simulation (mechasim)
11. Mechatronics Simulation (Siemens S7-300 Series)
12. Pegasus Robotics Simulation

13. Robotics and Computer Programming (AB CompactLogix L16)
14. Robotics 1
15. Mechatronics CNC Mill
16. Machine Vision Inspection Systems
17. Machine Vision Inspection Systems (AB micro800)
18. Mechatronics Troubleshooting System AB CompactLogix L16 - AB Micro820
19. Mechatronics RF Identification System (AB CompactLogix L16) Execution System - A
20. Mechatronics AB Micrologix
21. Mechatronics Barcode Identification
22. Mechatronics RF Identification System
23. Mechatronics RF Identification System
24. Tabletop Mechatronics
25. Mechatronics HMI Siemens S7-1500
26. Mechatronics Barcode Identification
27. Mechatronics Barcode Identification
28. Table-Top Mechatronics Servo Robot System
29. Table Top Smart Factory RFID/Sensors
30. Mechatronics Barcode Product Identification
31. Tabletop Smart Factory Ethernet
32. Tabletop Smart Factory Manufacturing
33. Smart Factory Barcode System Siemens S7-1500
34. Mechatronics RFID S7-1500
35. Smart Factory Vision Inspection System Siemens S7-1500
36. Smart Factory Visual Communication System Siemens S7-1500
37. Mechatronics System (Siemens S7-1500)
38. Mechatronics - Siemens S7-1500 / Siemens STEP 7 Professional
39. Smart Factory Sensor System Siemens S7-1500, Pneumatics/Vacuum
40. Smart Factory Sensor System Siemens S7-1500, Ultrasonic
41. Smart Factory Sensor System Siemens S7-1500, Photoeye
42. Smart Factory Device Learning System Siemens S7-1500, Stack Light
43. Smart Factory Sensor System Siemens S7-1500, Electrical Current
44. Smart Factory Sensor System Siemens S7-1500, Analog Position
45. Smart Factory Sensor System Siemens S7-1500, Analog Pressure
46. Tabletop Smart Factory Visual Communications Allen-Bradley
47. Smart Factory Barcode System Allen-Bradley L16
48. Mechatronics RFID AB L16
49. Smart Factory Ethernet AB CompactLogix L16
50. Smart Factory Network Security Learning System – AB CompactLogix L16
51. Smart Factory Manufacturing Execution System - AB CompactLogix L16
52. Smart Factory Visual Communications Allen-Bradley
53. Smart Factory Sensor System Allen-Bradley L16, Pneumatics/ Vacuum
54. Smart Factory Sensor System Allen-Bradley L16, Ultrasonic
55. Smart Factory Sensor System Allen-Bradley L16, Photoeye
56. Smart Factory Device Learning System Allen-Bradley L16, Stack Light
57. Smart Factory Sensor System Allen-Bradley L16, Electrical Current
58. Smart Factory Sensor System Allen-Bradley L16, Analog Position
59. Smart Factory Sensor System Allen-Bradley L16, Analog Pressure
60. Mechatronics AB CompactLogix L32

61. Computer Control 2 (Micro820)
62. Principles of Robotics
63. Principles of Factory Automation
64. Principles of Robotics

II. ELECTRONICS

1. DC Electronic Drives
2. Portable Plc - Siemens S71200
3. Portable Plc Troubleshooting Siemens S71200
4. PLC Analog Application - ControlLogix
5. PLC ControlNet - ControlLogix
6. Mastering Programmable Controllers
7. PLC Statement List
8. PLC Analog - Siemens S7300
10. PLC Profibus - Siemens S7
11. MPC (siemens Mp277)
12. PLC Graph Programming - S7300
13. MPC - Siemens S7-300/as-i Bus
14. MPC (SIEMENS ET200pro/STEP 7)
15. Mastering Programmable Controllers
16. PLC Troubleshooting Siemens S7-300 Series
17. Programmable Controller, Siemens S7312
18. Mastering Programmable Controllers (A-B CompactLogix L16)
19. Power and Control Electronics
20. AC Motor Drives
21. AC Motor Drive Troubleshooting
22. Electrical Control Systems
23. Variable Frequency AC Drive
24. AC Electronic Drives
25. PLC Motor Control AB Micro820
26. PLC Motor Control AB Micro 810
27. Portable PLC Learning System Allen Bradley CompactLogix L16
28. Portable PLC with Troubleshooting Allen Bradley CompactLogix L16
29. PLC Troubleshooting -AB ControlLogix
30. PLC Troubleshooting -AB SLC500
31. Computer Control 1 (A-B Micro820)

III. ELECTRICAL

1. Electric Motor Control
2. AC/DC Electrical Systems
3. Electrical Control 1
4. Portable Electric Relay Control Troubleshooting
5. Electric Relay Control
6. AC/DC Electrical Systems
7. Electric Motor Control
8. Electric Motor Control Troubleshooting
9. Electrical Fabrication 1
10. Motor Braking
11. Reduced Voltage Starting
12. Electronic Sensors
13. Electronic Counter
14. SCR Speed Control
15. Electric Wiring System
16. PLC/VFD Wiring System
17. Industrial Soldering
18. Ethernet and Analog Wiring
19. Electrical Power Distribution

<p>20. Electric Motor Control</p> <p>21. Motor Troubleshooting System</p> <p>22. Rotating Electric Machines</p> <p>23. DC Generators</p> <p>24. Wound Rotor Motor</p> <p>25. Rotating Electrical Machines</p> <p>IV. FLUID POWER</p> <p>1. Hydraulic Troubleshooting</p> <p>2. Pneumatic Troubleshooting</p> <p>3. Basic Pneumatics</p> <p>4. Basic Hydraulics</p> <p>5. Portable Pneumatics</p> <p>6. Electronic Sensors</p> <p>7. Basic Hydraulics Troubleshooting</p> <p>8. Basic Pneumatics Troubleshooting</p> <p>9. Portable Basic Hydraulics</p> <p>10. Hydraulic Maintenance</p> <p>11. Intermediate Hydraulics</p> <p>12. Intermediate Pneumatics</p> <p>13. Electronic Sensors</p> <p>14. Advanced Pneumatics</p> <p>15. Advanced Hydraulics</p> <p>16. Electro-Fluid Power Systems</p> <p>17. Pneumatic Fitting Construction</p> <p>18. Principles of Hydraulics</p> <p>V. GREEN ENERGY</p> <p>1. Wind Concepts</p> <p>2. Turbine Electric Hub Troubleshooting</p> <p>3. Turbine Generator Control Troubleshooting</p> <p>4. Turbine Nacelle Troubleshooting</p> <p>5. Solar Concepts</p> <p>6. Solar Site Analysis</p> <p>7. Alternative Energy</p> <p>8. Solar Thermal Troubleshooting Open-Loop</p> <p>9. Solar Thermal Troubleshooting Closed-Loop</p> <p>10. Solar Thermal Installation</p> <p>11. Solar PV Troubleshooting</p> <p>12. Solar Grid-Tie</p> <p>13. Data Acquisition</p> <p>14. Solar Photovoltaic Installation</p> <p>VI. LEAN MANUFACTURING</p> <p>1. Lean Overview and Workplace Organization</p> <p>2. Introduction to Lean</p> <p>3. 5S</p> <p>4. Total Productive Maintenance</p> <p>5. Poka-Yoke</p> <p>6. Lean Theory</p> <p>7. Lean Process Flow</p> <p>8. Visual Workplace</p> <p>9. Standardized Work</p> <p>10. Kaizen</p> <p>11. Value Stream Mapping</p> <p>12. Set-Up Reduction</p> <p>13. Six Sigma</p> <p>VII. MACHINING</p>	
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1. Machine Tools 117. Pneumatic Fitting Construction
2. Machine Tools 2
3. Machine Tools 3
4. Manual Machine Tools
5. CNC Machine Tools 1
6. CNC Machine Tools 2
7. CNC Machine Tools 3 (Denford Microturn)
8. Principles of CNC
9. CNC Control
10. Principles of Turning
11. Principles of Machining Centers
12. Principles of Grinding
13. Principles of Workholding
14. Principles of Coolants and Oils
15. Principles of Gear Manufacturing
16. Principles of Tooling
17. Tooling for Turning
18. Tooling for Machining Centers
19. Tooling for Grinding
20. Tooling for Tapping

VIII. MANUFACTURING PROCESS

1. Product Finishing
2. Production Assembly
3. Split Flange Coupling Assembly
4. Electric Torque Wrench Assembly
5. Print Reading 1
6. Welding Technology 1
7. Computer-Aided Design 1 SolidWorks 2019
8. Computer Aided Design 2 SolidWorks 2019
9. Wiring Harness Assembly
10. Contamination
11. Fasteners
12. Gaskets
13. Stall Bar Assembly
14. Instrumented DC-Electric Torque Wrench Assembly
15. Computer-Aided Manufacturing 1 (Mastercam X2)
16. Blueprint Reading
17. AWS Welding Symbols on Blueprints
18. General Dimensioning and Tolerances
19. Geometric Dimensioning and Tolerancing

IX. MATERIALS

1. Plastic Mold Design
2. Manufacturing Processes 3
3. Structural Engineering 1
4. Structural Engineering 2
5. Surveying
6. Materials Engineering 1
7. Principles of Materials - Ferrous Metals
8. Principles of Materials - Non-Ferrous Metals
9. Principles of Heat Treating
10. Principles of Plastics
11. Principles of Composites
12. Principles of Ceramics

X. MECHANICAL

1. Vibration Analysis

<p>2. Pump Systems</p> <p>3. Multiple Pump</p> <p>4. Turbine Pump</p> <p>5. Diaphragm Pump</p> <p>6. Peristaltic Tubing Pump</p> <p>7. Piston Pump</p> <p>8. Gear Pump</p> <p>9. Magnetic Pump</p> <p>10. Centrifugal Pump</p> <p>11. Rigging 3</p> <p>12. Mechanical Drives 4</p> <p>13. Floor Standing Belt Conveyor</p> <p>14. Predictive Maintenance Vibration Analysis</p> <p>15. Roller Pack Machine Tool Axis</p> <p>16. Plain Bearing Machine Tool Axis</p> <p>17. Mechatronics Simulation</p> <p>18. Piping</p> <p>19. Central Lubrication</p> <p>20. Mechanical Systems 1</p> <p>21. Mechanical Fabrication 2</p> <p>22. Rigging Systems 1</p> <p>23. Rigging Systems 2</p> <p>24. Mechanical Fabrication 1</p> <p>25. Mechanical Drives 1</p> <p>26. Portable Mechanical Drives 2</p> <p>27. Mechanical Drives 2</p> <p>28. Mechanical Drives 3</p> <p>29. Laser Shaft Alignment</p> <p>30. Portable Laser Shaft Alignment</p> <p>31. Mechanical Systems 2</p> <p>XI. PROCESS CONTROL</p> <p>1. Temperature Process Control</p> <p>2. Data Acquisition</p> <p>3. Analytical Process Control</p> <p>4. Data Acquisition Systems</p> <p>5. ControlLogix Process Control</p> <p>6. Process Control Systems: Ultrasonic Level Measurement and Control</p> <p>7. Process Control Systems: Differential Pressure Flow Measurement and Control</p> <p>8. Process Visualization Control 1</p> <p>9. Pressure Process Control Systems</p> <p>10. Foundation Fieldbus Process Control 1</p> <p>11. HART Process Control 1</p> <p>12. Mastering Programmable Controllers AB CompactLogix L32</p> <p>13. PLC Process Control - Siemens S7-1200</p> <p>14. PLC Process Control AB CompactLogix L16</p> <p>15. Process Control Systems</p> <p>XII. QUALITY ASSURANCE</p> <p>1. Metrology 1</p> <p>2. Measurement Tools 1</p> <p>3. Quality Assurance 1</p> <p>4. Portable Precision Gauging 1</p> <p>5. Portable Measurement Tools</p> <p>6. Inspection Techniques 1</p> <p>7. Surface Plates</p>	
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8. Gauge Blocks
9. Test Indicators
10. Height Gauges
11. Bench Comparators
12. Optical Comparators
13. Bore Gauges
14. Air Gauges
15. Specialty Micrometers
16. Miscellaneous Inspection Instruments
17. ISO 9000 and TS 16949
18. Statistical Process Control 1
19. Statistical Process Control 2
20. Quality Control Concepts

XIII.SAFETY

1. Safety Practices and Regulations
2. Personal Protective Equipment
3. Hazardous Communication
4. Confined Spaces
5. Lockout/Tagout
6. Accident Response
7. Overhead Crane Safety

XIV.THERMAL

1. Air Conditioning / Heat Pump
2. Steam Systems
3. Thermal Systems 1
4. Environmental Applications
5. Geothermal
6. Geothermal Troubleshooting
7. Geothermal Desuperheater
8. Geothermal Troubleshooting with Desuperheater
9. Geothermal Flush Cart Learning System
10. Thermal Technology 1
11. Thermal Technology 2

XV.WORKPLACE EFFECTIVENESS

1. Enterprise Systems 1
2. Principles of Advanced Manufacturing
3. Mathematics 1
4. Trigonometry 1
5. Communication Skills
6. Conflict Resolution
7. Working in Groups

Learn through Distance e-Learning and Oxygen's Education

- Complete electronic access to all Oxygen Education's learning material, 300 courses, 1100 modules, 3300 hours of learning material
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Minimum Requirements:

Windows devices (including Surface tablets):

Windows 10 64-bit (may function under previous versions/different operating systems, but testing & support limited to Windows 10)
8GB RAM Sound card (or onboard sound)
Video card (or onboard video) with WebGL support
64-bit Browser with WebGL 2.0 support
Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Mac devices (does NOT include iPads):
macOS 64-bit (may function under different operating systems, but testing & support limited to 64-bit macOS)

8GB RAM Sound card (or onboard sound)
Video card (or onboard video) with WebGL support
64-bit Browser with WebGL 2.0 support
Recommended browser: Firefox
Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Chromebooks (does NOT include other tablets):

ChromeOS 64-bit
6GB RAM Sound card (or onboard sound)
Video card (or onboard video) with WebGL support
64-bit Browser with WebGL 2.0 support
Broadband Internet access (DSL/Cable/T1/etc.) capable of 1 Mbps

Mobile Devices not listed above that may function properly, but are not yet supported (iPad, Galaxy Tab, Fire, etc.):

Memory 8GB RAM

Note: Determining RAM on an iPad is problematic.

As a reference, 2020 iPads (8th generation) have 3GB RAM; 2020 iPad Pro (4th generation) have 6GB RAM.

Various operating systems - under evaluation

Sound card (or onboard sound)

Video card (or onboard video) with WebGL support

64-bit Browser with WebGL 2.0 support

Broadband Internet access (mobile data/Wi-Fi/etc.) capable of 1 Mbps

"Smart Simulator for Electrical Machines Training Lifetime License which includes:"

This software should simulate a real electric motor's workbench so that the student should be able to perform the experiments in the virtual environment in a simple and almost real way, in a way very close to what he/she would do on a real equipment.

It must be conceived as a complete course in electric machines to make the student able to solve practical and real assembling problems and to work on several experiments in the virtual equipment and then perform them by submitting the electric assembled machine to different working conditions.

The software must have a 3D environment composed by a workbench with electric motor components, power modules, sensors, actuators, and instruments, and all the components should behave and look like real ones, with texture and lightening.

It must include a frame with base to fix the modules and the machines and must have a set of electric machine components, including but not limited to rotors suitable for AC and DC motors, stators suitable for AC and DC motors, electromagnetic brake, brake support with load

cell for measuring the torque, coupling joint for mechanically connecting the rotor to the electromagnetic brake or other components, speed transducer for measuring the motor speed, block with rotation system to lock the motor or turns it manually by means of a crank, brush with brush holder, and supports.

The software must also provide the student with the theoretical content that is necessary to perform the experiments, and every experiment must have detailed instructions on how to assemble, wire and to perform it.

It must also include the typical modules used in electric machines experiments, including but not limited to:

- AC three-phase source,
- AC single-phase source,
- DC source,
- Wattmeters,
- Speed Meter,
- Torque Meter,
- Amperemeters,
- Voltmeters,
- Starting Rheostat with Resistive Load,
- Pole Changing Unit,
- Excitation Rheostat with Capacitive Load,
- Rotating light synchronoscope,
- Pole changing unit,
- Star/Delta starter,
- Starting rheostat and synchronizer,
- Oscilloscope.

Besides the mechanical assembly, the software must allow the student to perform the wiring, including the wiring between power supplies and the electric motor, brake, sensors and/or other devices used in each experiment, the connections on the electric motor itself, and the connections between the devices and the measurement modules.

The software must have at least 45 different experiments, including but not limited to the following topics:

- Basics concepts of an electric machine:
 - Flux produced by the poles - Main poles
 - Flux produced by the poles – Interpoles
 - Main magnetic field - Concurrent series
 - Intensity of the magnetic field
 - Induced voltage
 - Interpole Effect
 - Rotating magnetic field – three-phase and single-phase rotating fields
- Induction motors:
 - Three-phase squirrel cage motor, 2 poles, 24V Δ
 - Three-phase squirrel cage motor, 2 poles, 42V Y
 - Three-phase squirrel cage motor, 2 poles, 24V $\Delta\Delta$
 - Three-Phase squirrel cage motor, 2 poles, 42V YY
 - Three-Phase squirrel cage motor, 4 poles, 24V Δ
 - Three-Phase squirrel cage motor, 4 poles, 42V Y
 - Three-Phase Dahlander motor, 4/2 poles, 42V Δ/YY
 - Split phase motor

- Capacitor start and run motor
- Three-phase motor with wound rotor, 2 poles, 42V YY
- Phase shifter
- Induction regulator
- Three-Phase synchronous induction motor, 2 poles, 42V Δ

• Direct current motors:

- DC motor with separate excitation
- DC motor with shunt excitation
- DC motor with series excitation
- DC motor with compound excitation, long shunt
- DC motor with differential excitation, long shunt
- DC motor with compound excitation, short shunt
- DC motor with differential excitation, short shunt

• Commutator motors for alternating current:

- Single-phase series motor
- Repulsion motor

• Synchronous machines:

- Winding resistance
- No-load test, mechanical losses of the DC motor
- No-load test, mechanical and iron losses of the alternator
- Short-circuit characteristic
- Short-circuit test
- Load test
- Parallel connection of the alternator with the mains
- Alternator as synchronous motor

• Direct current generators:

- Winding resistance - Armature winding
- Winding resistance – Series and interpole windings
- Winding resistance - Inductor winding
- Test of the no-load motor (Swinburne)
- No-load E.M.F.
- Excitation characteristic
- Separate excitation dynamo
- Shunt excitation dynamo
- Series excitation dynamo
- Compound excitation dynamo

The software must guide the student through the learning process automatically by providing the above experiment proposals and, for each experiment, it must automatically verify if the student has performed the mechanical assembly and the wiring correctly, and then if so, it must allow to perform the simulation and measurement by comparing the student's measurements with the expected values for the experiment.

When the student finishes an experiment, the software must register the progress locally and in a cloud system so that the student can start the experiment using one computer, and continue somewhere else, using the same or another computer synchronizing the student's progress.

The software must have a detailed online help with text and videos made from screen recordings with the software, so that the instructions on how to use it are clear and easy to understand.

The software must be delivered always in full version with feature unlock through a cloud system so that any user can download the software from the internet where the school may provide access to users to the software features.

It must be possible to select an interface language between English, French, Spanish, and Portuguese.

"Smart Simulator for Process Control Lifetime License"

The Virtual Process Control Simulator is a software that has been developed to teach process control techniques in a unique and effective way. With this software, students can improve their individual experience on studying process control in practice. Students will be able to carry out several experiments dealing with the following topics:

- control systems, open and closed loop system,
- sensors, transducers and actuators,
- input and power signal conditioning,
- level, flow, pressure, temperature,
- error, offset, calibration, response time, ON-OFF control, hysteresis, PID controller, Proportional control (P), Proportional-Integral control (PI), Proportional Integral-Derivative control (PID).

This software will be able to reproduce the features and behaviours of the Process Control Trainer. This system can work with or without a PLC. Students can easily implement the controllers using the virtual control modules or connecting the plant to a real PLC or to a SoftPLC, such as Siemens S7-1200/1500, PLCSIM and Codesys. With this type of software, students can learn in their own rhythm and teachers have more time to support the class, manage and improve the process because – unlike any other simple simulator - it grants the following benefits:

- 1) **EFFECTIVE GUIDE FOR STUDENTS:** possibility to access learning topics, with theory, instructions and experiment proposals. The software includes a virtual version of the Process Control Trainer.
- 2) **AUTOMATIC VALIDATION OF STUDENTS' TASKS:** the software automatically verifies if the student completed successfully each task in order to allow him/her to go ahead with the next one.
- 3) **TRACKING OF STUDENTS' PROGRESS:** the teacher can verify the students' progress at any time by consulting the specific summary in the software or exporting it to a spreadsheet.

SOFTWARE DESCRIPTION

This software reproduces a process plant and signal, power, control and PLC modules. The process control laboratory is composed of two main sections: the process tank and the sump tank.

The **PROCESS PLANT** is designed to teach the process control principles.

The SUMP TANK includes pipelines to process water supply and to drain water out from the process plant. The PROCESS TANK (pressurized vessel) includes the following components:

- A level sensor and a metric scale suitable for measuring the water level (cm or mm).
- A float switch suitable for detecting the level of water within the pressurized tank.
- A heating element.
- A temperature sensor (PT100) and a thermometer suitable for measuring the temperature inside the process tank (°C or °F).
- A pressure sensor and a pressure gauge suitable for measuring the pressure (bar or psi).
- Four types of valves (three manually operated and a controlled one).

The SUMP TANK (water tank) and the pipelines include the following components:

- A delivery valve (the main water supply valve).
- A flow meter turbine (volumetric measuring turbine).
- A motor pump with thermal protection.
- A visual flowmeter (indicator for flow rate).
- A manually operated valve to reduce the water flow.
- A motor valve suitable for controlling the water flow.

INSTRUMENTATION AND CONTROL SECTION

The CONTROL MODULES include interface signal conditioners for sensors, power drivers for actuators and basic control logic that behaves as either a regulating device or a state-oriented device:

CHARACTERISTICS OF THE SIGNAL, POWER AND CONTROL MODULES

The process plant has an associated panel that shows the entire process diagram using standard symbols. This is very useful for students to understand the basic concepts of process control. The software is supplied with a detailed on line educational guide. Following the experiments, students will be guided step by step to learn the following activities:

- calibration of a sensor,
- obtaining the characteristic of a static process and time constant,
- control of a process by ON-OFF, Proportional, Proportional-Integral and Proportional Integral Derivative.

Through this software, teachers will be able to easily guide students in studying the principles of process control. The main objective of a basic course in process control is to make students able to solve practical and real control problems. The didactic advantage of this trainer is the possibility to investigate the behavior of each process (level, flow, temperature or pressure) or any possible relevant combination. The software guarantees a complete experience in the field of process control. Students can approach this topic starting from the basic concepts of control systems up to designing and tuning controllers for the main four control variables in industries (level, temperature, pressure and

flow). Each experiment is presented to students with its goals and the theoretical concepts necessary to understand the next steps to be taken. Simulator represents closely the main features of a process plant, so that it will be like having a real process control laboratory for each student.

CONTROL OPTIONS: PLC, SOFTPLC AND BUILT-INTCONTROL MODULES

The process plant represented by the software can be controlled using: The built-in control modules, such as OnOFF, Proportional and PID. An external PLC such as S7-1200/1500. A SoftPLC, such as PLCSIM and Codesys Control. When working with a PLC or SoftPLC, students still need to work on signal and power conditioning in the virtual environment, but instead of using control modules, students will connect the input and output normalized signals to a PLC MODULE and the PLC MODULE will handle the interface with the respective external PLC or SoftPLC.

LIST OF EXPERIMENTS

- Level sensor settings
- Characteristics of the motor of the pump
- Characteristics of the pump
- Characteristics of the static process
- Time constant of the process
- ON - OFF control of the level
- ON - OFF control of the level with "Sol Valve"
- ON - OFF control of the level with "Float Switch"
- Closed loop control of the LEVEL
 - Closed loop Proportional control of the level
 - Closed loop Proportional-Integral control of the level
 - Closed loop Proportional-Derivative control of the level
 - Closed loop Proportional-Integral-Derivative control of the level
- Closed loop control of the FLOW
 - Flow sensor
 - Closed loop Proportional control of the flow
 - Closed loop Proportional-Integral control of the flow
 - Closed loop Proportional-Derivative control of the flow
 - Closed loop Proportional-Integral-Derivative control of the flow
- Closed loop control of the TEMPERATURE
 - Temperature sensor
 - Measurement of the characteristics of the heating
 - Closed loop Proportional control of the temperature
 - Closed loop Proportional-Integral control of the temperature
 - Closed loop Proportional-Derivative control of the temperature
 - Closed loop Proportional-Integral-Derivative control of the temperature
- Pressure sensor
 - Pressure sensor as a level sensor
 - ON - OFF control of the level through the pressure sensor

DESCRIPTION OF PERFORMABLE EXPERIMENTS

This software grants the possibility to perform 27 practical experiments with progressive difficulties levels. Here follows a short description of some of the performable experiments.

Level sensor settings

From the beginning of the experiments, students will learn about different types of sensors. Students can learn how to calibrate and use a capacitive fluid level sensor in order to measure the water level and to determine the sensor characteristics. The level transducer (L/U) is used to calibrate the level sensor for a correspondence of 1 V to 1 cm

Characteristics of the motor of the pump

The experiment is very practical because students will learn the control in PWM (Pulse Width Modulation) of a DC motor. Using a classical oscilloscope, students will analyze the control signals of the pump motor. The reference input signal of the motor is a triangular 10Vpp, while the duty cycle of the PWM is modulated from the control panel of the trainer.

Characteristics of the pump

After running this experiment, students will understand the working principle of a diaphragm pump. They will learn how to compute the flow and how to measure it using the flowmeter in order to draw the characteristic curve of the flow.

Characteristics of the static process

The main objective of this experiment is to understand how the flow will influence the rising time of the fluid level rate in a level control process. The flow transducer (f/U) is used to calibrate the flow sensor for a correspondence of 1 V output to 0.5 liters per minute.

Time constant of the process What is the time constant of a process? How do I calculate it? Students can answer these questions by performing this experiment. The time constant estimation of the water flow in the tank is made as a ratio between the input flow and the draining flow rate. This process is an example of parameter identification.

ON - OFF control of the level

What are the effects of the hysteresis on the level control? Students will find out while learning how to measure the dynamic response of the process. Students will use the capacitive level sensor to measure the water level in the process tank. This knowledge is very important because, in practical situations, one of the most widely used types of control is the ON/OFF control.

ON - OFF control of the level with the "Sol Valve"

In this experiment, students will use the knowledge acquired so far regarding the hysteresis on level control. They will measure the up and down times of the level between start and stop of the electro-valve with a hysteresis of 0%, 15% and 30%.

ON - OFF control of the level with the "Float Switch"

Students will perform a practical study to maintain constant the level in the tank using an ON-OFF level sensor and the electro valve sol valve. They will learn how to measure the water level variation in time. In order to determine the hysteresis curve for on - off control of the level, students will use the engraved mobile scale or the level sensor and float switch.

Closed loop control of the LEVEL

Closed loop Proportional control of the level

Closed loop Proportional-Integral control of the level

Closed loop Proportional-Derivative control of the level

Closed loop Proportional-Integral-Derivative control of the level
In order to study the closed loop control, students need to check first the effects of the gain on the dynamic response of the system. It is very interesting to observe the output characteristic of the PID controller for different K_p , K_d and K_i constant values. Ziegler-Nichols tuning method is used in tuning of PID controller. The student learn how to determine the PID parameters in order to obtain the controlled level.

Closed loop control of the FLOW

Flow sensor

Closed loop Proportional control of the flow

Closed loop Proportional-Integral control of the flow

Closed loop Proportional-Derivative control of the flow

Closed loop Proportional-Integral-Derivative control of flow

During this experiment, students learn how to measure the water flow rate by using the engraved scale of the direct flow meter or the turbine flow sensor. After analyzing the results in this experiment, students will be able to implement the tuning of the PID control of the system with optimum stability.

Temperature sensor

Students can learn how to measure the temperature variation in time (using the engraved thermometer scale or the temperature sensor), in order to determine and compute the characteristic curve of the PT100 sensor (RTD). The temperature transducer (u/U) is used to calibrate the temperature sensor for a correspondence of 1 V to 10 degrees Celsius.

Measurement of the characteristics of the heating

In this experiment (similar to the previous one), students will understand the working principle of a resistive temperature sensor in order to measure the temperature in the industrial process tank. Using a classical oscilloscope, students can analyze the wave form of the PWM for the heating element.

Closed loop control of the TEMPERATURE

ON - OFF control of the temperature

Closed loop Proportional control of the temperature

Closed loop Proportional-Integral control of the temperature

Closed loop Proportional-Derivative control of the temperature

Closed loop Proportional-Integral-Derivative control of the temperature

Students will learn that a temperature controller is an instrument used to control temperatures. In the temperature controller system, the controller accepts a temperature sensor as an input (such as an RTD or thermocouple) and compares the actual temperature with the required control temperature or set point. The output is then provided to a control element. After analyzing the results in this experiment, students will be able to tune properly the PID control of the system.

Pressure sensor

Students will learn how to measure the pressure, using the electronic pressure sensor or pressure gauge scale, in order to determine and compute the characteristic curve of the pressure sensor. The pressure transducer (P/U) is used to calibrate the pressure sensor for a correspondence of 1 V to 0.1 bar. The characteristic of a pressure transducer will be determined.

Pressure sensor as a level sensor

The main objective of this experiment is to measure the pressure, using the electronic pressure sensor or pressure gauge scale, in order to determine the characteristic curve of the level vs. pressure response.

ON - OFF control of the level through the pressure sensor

In this experiment, students will perform the operation of a closed loop ON-OFF control system using the pressure sensor as a level sensor. Thanks to the knowledge acquired so far about the effects of the hysteresis on the control, students will be able to control the pressure.

"Machine Automation Course Lifetime License"

SMART SIMULATOR FOR LEARNING AUTOMATION WITH PLC

This is a software that has been developed to teach industrial automation and PLC programming in a unique and effective way. With this software, students can improve their individual experience on studying industrial automation in practice. Students will be able to carry out several experiments dealing with the following topics:

- Main concepts related to logic control;
- State machine (SFC) approach;
- Electric diagram interpretation;
- Electric commands for motor engines and pneumatic systems and their interfaces to PLCs;
- Programmable logic controllers: hardware and software structure, technical characteristics and specifications, programming languages, main ladder instructions, data handling, math, numeric formats, comparisons, timers and analog interfaces.

This software works integrated to a soft PLC (not included) which can be: The Siemens PLCSIM or Codesys Control.

3D INDUSTRIAL ENVIRONMENTS TO PROVIDE REAL PRACTICAL EXPERIENCE TO STUDENTS

EFFECTIVE LEARNING WITH GUIDANCE, REAL-LIFE PROJECTS THEORY AND INSTRUCTIONS FROM BASIC TO ADVANCED STUDENT CAN LEARN AND PRACTICE FROM BASIC TO ADVANCED AUTOMATION WITH PLC

- Basic Ladder Logic
- Scaling
- Function Blocks
- Analog Handling
- Sequential Function Chart

IT INCLUDES ELECTRICAL PANEL, FAULT SIMULATION AND TROUBLESHOOTING

- Electric Panel
 - o Energy supply and protection
 - o Circuit breakers
 - o Contactors
 - o Safety relay
 - o 24Vdc
 - o Power supply
 - o PLC
 - o Interface relays,
 - o Connectors

	<ul style="list-style-type: none"> o Conductors o Frequency inverters <ul style="list-style-type: none"> • Electric Diagram Samples <ul style="list-style-type: none"> • Troubleshooting <ul style="list-style-type: none"> • Replacement console o Virtual multimeter o Forced signals <p>Other Terms and Conditions:</p> <ol style="list-style-type: none"> 1. Bidder must submit brochure/catalogue indicating the brand name & model of bid item/s as additional technical requirements failure to submit will be grounds for disqualification. 2. Bidder must have a training center for the testing & checking of goods by the end-user prior to delivery as well as for the pre- training to be conducted at the provider’s training center and/or via webinar/e-learning multimedia platform in compliance with IATF regulations and guidelines. 3. Winning bidder must provide electronic copy of the training manuals, laboratory exercises, other technical documents as well as training and instructional videos. 4. Bidder must attach pictures of their training center also pictures of aftersales training of faculty conducted at their training center and/or via webinar/ e-learning multimedia platforms as additional technical document requirements. 5. Bidder must be an Authorized Distributor/ Reseller of the bid item/s & authorize to provide technical support & must attach documents to support such claim. <p>After Sales Services:</p> <ul style="list-style-type: none"> • Free trainer’s training at supplier’s training center before the delivery of the goods. • Free Semi-Annual Re-training with certificate, on request. • Free Consultation/Seminar, on request • Free Annual product inspection, on request • Free Product demonstration, on Request • Free Seminar for Students, on request. <p>Warranty/Technical Support</p> <p>Upon acceptance, Supply, Delivery and Installation with Training of Flexible Learning as the New Normal and Emerging Technology for an Improve and Innovative Education: the provider/Supplier shall guarantee the good running condition of the Project within one year from the date of acceptance with Lifetime Technical Support.</p>
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Attached herewith are the manufacturer’s product literature(s) and certification(s) that we are authorized to sell the goods.

We certify that the foregoing information and the supporting documents are true and correct.

[Signature]
 [Name of Authorized Signatory]
 [Position/Title of Authorized Signatory]

Omnibus Sworn Statement

REPUBLIC OF THE PHILIPPINES)
CITY/MUNICIPALITY OF _____) S.S.

AFFIDAVIT

I, [Name of Affiant], of legal age, [Civil Status], [Nationality], and residing at [Address of Affiant], after having been duly sworn in accordance with law, do hereby depose and state that:

1. **Select one, delete the other:**

- b. *If a sole proprietorship:* I am the sole proprietor or authorized representative of [Name of Bidder] with office address at [address of Bidder];
- c. *If a partnership, corporation, cooperative, or joint venture:* I am the duly authorized and designated representative of [Name of Bidder] with office address at [address of Bidder];

2. **Select one, delete the other:**

- a. *If a sole proprietorship:* As the owner and sole proprietor, or authorized representative of [Name of Bidder], I have full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached duly notarized Special Power of Attorney;
 - b. *If a partnership, corporation, cooperative, or joint venture:* I am granted full power and authority to do, execute and perform any and all acts necessary to participate, submit the bid, and to sign and execute the ensuing contract for [Name of the Project] of the [Name of the Procuring Entity], as shown in the attached [state title of attached document showing proof of authorization (e.g., duly notarized Secretary's Certificate, Board/Partnership Resolution, or Special Power of Attorney, whichever is applicable)];
3. [Name of Bidder] is not "blacklisted" or barred from bidding by the Government of the Philippines or any of its agencies, offices, corporations, or Local Government Units, foreign government/foreign or international financing institution whose blacklisting rules have been recognized by the Government Procurement Policy Board, by itself or by relation, membership, association, affiliation, or controlling interest with another blacklisted person or entity as defined and provided for in the Uniform Guidelines on Blacklisting;
4. Each of the documents submitted in satisfaction of the bidding requirements is an authentic copy of the original, complete, and all statements and information provided therein are true and correct;
5. [Name of Bidder] is authorizing the Head of the Procuring Entity or its duly authorized representative(s) to verify all the documents submitted;

6. **Select one, delete the rest:**

- a. *If a sole proprietorship:* The owner or sole proprietor is not related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;
- b. *If a partnership or cooperative:* None of the officers and members of [Name of Bidder] is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of

the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

- c. *If a corporation or joint venture:* None of the officers, directors, and controlling stockholders of *[Name of Bidder]* is related to the Head of the Procuring Entity, members of the Bids and Awards Committee (BAC), the Technical Working Group, and the BAC Secretariat, the head of the Project Management Office or the end-user unit, and the project consultants by consanguinity or affinity up to the third civil degree;

7. *[Name of Bidder]* complies with existing labor laws and standards; and

8. *[Name of Bidder]* is aware of and has undertaken the following responsibilities as a Bidder:

- a. Carefully examine all of the Bidding Documents;
- b. Acknowledge all conditions, local or otherwise, affecting the implementation of the Contract;
- c. Made an estimate of the facilities available and needed for the contract to be bid, if any; and
- d. Inquire or secure Supplemental/Bid Bulletin(s) issued for the *[Name of the Project]*.

9. *[Name of Bidder]* did not give or pay directly or indirectly, any commission, amount, fee, or any form of consideration, pecuniary or otherwise, to any person or official, personnel or representative of the government in relation to any procurement project or activity.

10. In case advance payment was made or given, failure to perform or deliver any of obligations and undertakings in the contract shall be sufficient grounds to constitute criminal liability for Swindling (Estafa) or the commission of fraud with unfaithfulness or abuse of confidence through misappropriating or converting any payment received by a person or entity under an obligation involving the duty to delivery certain goods or services, to the prejudice of the public and the government of the Philippines pursuant to Article 315 of Act No. 3815 s. 1930, as amended, or the Revised Penal Code.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of ___, 20__ at _____, Philippines.

Bidder's Representative/Authorized Signatory

SUBSCRIBED AND SWORN to before me this ___ day of *[month]* *[year]* at *[place of execution]*, Philippines. Affiant/s is/are personally known to me and was/were identified by me through competent evidence of identity as defined in the 2004 Rules on Notarial Practice (A.M. No. 02-8-13-SC). Affiant/s exhibited to me his/her *[insert type of government identification card used]*, with his/her photograph and signature appearing thereon, with no. _____ and his/her Community Tax Certificate No. _____ issued on ___ at _____.

Witness my hand and seal this ___ day of *[month]* *[year]*.

NAME OF NOTARY PUBLIC

Serial No. of Commission _____

Notary Public for _____ until _____

Roll of Attorneys No. _____

PTR No. _____ *[date issued]*, *[place issued]*

IBP No. _____ *[date issued]*, *[place issued]*

Doc. No. _____

Page No. _____

Book No. _____

Series of _____

[Bidder's Letterhead]

[Date]

FINANCIAL BID FORM

To: Tarlac State University
Re: Invitation to Bid No.

Having examined the Bidding Documents [*insert if any or delete, if none: including Bid Bulletin Numbers [insert numbers], the receipt of which is hereby duly acknowledged*], we, the undersigned, offer to [*supply/deliver/perform*] [*description of the Goods*] in conformity with the said Bidding Documents for the sum of [*total Bid amount in words and figures*] or such other sums as may be ascertained in accordance with the Schedule of Prices attached herewith and made part of this Bid.

If our Bid is accepted, we commit to deliver the goods in accordance with the delivery schedule specified in the Schedule of Requirements.

If our Bid is accepted, we undertake to provide a performance security in the form, amounts, and within the times specified in the Bidding Documents.

We agree to abide by this Bid for the Bid Validity Period specified in **ITB** Clause 14.2 and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

Until a formal Contract is prepared and executed, this Bid, together with your written acceptance thereof and your Notice of Award, shall be binding upon us.

We understand that you are not bound to accept the Lowest Calculated Bid or any Bid you may receive.

We certify/confirm that we comply with the eligibility requirements as per **ITB** Clause 5 of the Bidding Documents.

We likewise certify/confirm that the undersigned, [*for sole proprietorships, insert: as the owner and sole proprietor or authorized representative of [Bidder], has the full power and authority to participate, submit the bid, and to sign and execute the ensuing contract, on the latter's behalf for the [Name of Project] of the Tarlac State University*] [*for partnerships, corporations, cooperatives, or joint ventures, insert: is granted full power and authority by the [Bidder], to participate, submit the bid, and to sign and execute the ensuing contract on the latter's behalf for [Name of Project] of the Tarlac State University*].

We acknowledge that failure to sign each and every page of this Financial Bid Form, including the attached Schedule of Prices, shall be a ground for the rejection of our bid.

Dated this _____ day of _____ 20_____.

[signature]

[in the capacity of]

Duly authorized to sign Bid for and on behalf of _____

[Bidder's Letterhead]

[Date]

To: Tarlac State University
Re: Invitation to Bid No.

SCHEDULE OF PRICES

Item No.	Description	Qty.	Unit	Price
1.	Flexible Learning as the New Normal Emerging Technology for an Improve and Innovative Education	1	Lot	

[Signature]

[Name of Authorized Signatory]

[Position/Title of Authorized Signatory]