

Kathmandu University
School of Engineering
Department of Chemical Science and Engineering

Tender/Bid Document

for

**Supply, Delivery, Installation, Performance-Verification, Training, and
Maintenance of
Laboratory Equipments/Setups/Trainers for Chemical Engineering**

September 2017

Kathmandu University
Dhulikhel, Kavre
Nepal
Tel: 977-11-661399
Email: procurement@ku.edu.np

Tender Notice

Sealed tenders are hereby invited from **reputed** local or international suppliers/manufacturers of **related** laboratory equipments/setups/trainers for the Supply, Delivery, Site-Installation, Training, and Maintenance of Laboratory Equipments/Setups for Chemical Engineering. Tender document may be purchased from Kathmandu University, Dhulikhel, Kavre, Nepal by depositing non-refundable bid document price NRs. 1000/- in favour of Nepal Investment Bank Account (Saving AC No.005001030250009) of Kathmandu University.

All rights related to the Tender Process and Tender Award Process will remain with Kathmandu University. The tender may be awarded to successful bidder on whole or on package basis.

Tender/bid submission duration: **6-10 October 2017**

Detail about tender may be found at the Website of Kathmandu University, www.ku.edu.np.

A. Description of the Laboratory Equipments/Setups/Trainer Required

Kathmandu University, School of Engineering, Department of Chemical Science and Engineering intends to establish the laboratories primarily for training of Bachelor of Engineering students in Chemical Engineering with equipments/set-ups/trainers having functional capabilities to fulfil the study or training objectives as described. The equipments/set-ups/trainers shall also function to train students in other related disciplines of science and engineering and conduct basic research and project work of students.

Each laboratory indicated shall consist of indicated equipments/setups/trainers and form separate “**Package**” in this tender call.

Package 1: Heat Transfer Lab

The lab is planned to have the following units with functionalities that fulfil the objectives as described.

1. Bench cooling tower unit

Objective

- To study effect of air and water flow rate on the performance of cooling tower
- To study effect of cooling load on performance of cooling tower
- To study effect of packing density and height on performance of cooling tower
- To do mass and energy balance across air and water streams

2. Laboratory pasteurization unit

Objective

- To Measure the effects of different process conditions on product quality
- To arrest activity of enzyme and yeast

3. Evaporator unit

Objective

- To study single and double effect evaporator phenomenon
- To compare economies for single effect and double effect evaporation
- To compare economies for forward, backward and parallel feed condition

4. 3 phase separator unit

Objective

- To study the effect of varying operating conditions on separation
- To study effect of flow rate on emulsion
- To study the effect of continuous phase medium on droplet size and separation

Package 2: Process Dynamics and Control Lab

The lab is planned to have the following units with functionalities that fulfil the objectives as described.

1. Pressure control, level control and temperature control trainer

Objective

- To study the open loop or manual control
- To study the proportional control
- To study the two modes (P+I) control
- To study the two modes (P+D) control
- To study the three mode (PID) control
- To study the tuning of controller (Open loop method) using Zeigler-Nichols method.
- To study the stability of the system using the BODE PLOT.

2. Control valve characteristics studies

Objective

- Inherent Characteristics of Control Valve.
- Installed Characteristics of Control Valve.
- Flow Co-efficient (C_v) of Control Valve.
- Hysteresis of Control valve.

3. PID controller characteristics trainer

Objective

- To study the open loop or manual control
- To study the proportional control
- To study the two modes (P+I) control
- To study the two modes (P+D) control
- To study the three mode (PID) control
- To study the tuning of controller (Open loop method) using Zeigler-Nichols method.
- To study the stability of the system using the BODE PLOT.
- Auto Tuning

4. Two tank interacting and non-interacting system trainer

Objective

- To obtain experimentally the step response and to compare the experimental and theoretical responses for interacting and non-interacting systems

5. Time constant for manometer and thermometer trainer

Objective

- Study of step response for first and second order system for manometer and thermometer or thermo-well
- Study of sinusoidal response for manometer and thermometer

6. Process control rig

Objective

- To demonstrate the process control technology using temperature, flow rate and filling level control systems

Package 3: Mass Transfer Lab

The lab is planned to have the following units with functionalities that fulfil the objectives as described.

1. Distillation unit for batch and continuous process

Objective

- To study the operation of an 8-sieve –tray distillation column separating the alcohols from water at partial and total reflux conditions at varying feed tray locations and feed temperature.
- To do detail mass and energy balance involving vapor – liquid equilibrium
- To determine pressure drop over the distillation column for various boil up rates.
- To study the flooding phenomenon in column and determine overall efficiency of column at various boil up rates

2. Liquid – liquid extraction unit

Objective

- To do mass balance and calculate the mass transfer coefficient
- To study the effect of changes in aqueous and organic liquid flow rate
- To measure inlet and outlet concentrations in the aqueous phase

3. Gas absorption unit

Objective

- To study the basic principles of the absorption of a gas into a liquid using a packed column
- To determine loading and flooding points
- To demonstrate the physical and chemical absorption and gas desorption
- To determine mass transfer coefficient
- To investigate the effectiveness of CO₂ absorption in pure water and in aqueous solution

4. Vapor- liquid equilibrium unit

Objective

- To determine the vapor- liquid equilibrium curve for wide range of binary mixture
- To determine mass transfer coefficient

5. Crystallization unit

Objective

- To evaluate the crystallization efficiency and crystallization kinetics
- To study the effect of agitation rate and cooling rate
- To do mass and energy balance
- To understand principles of crystallization

6. Tray and vacuum drier

Objective

- To study the drying phenomenon
- To plot drying rate curve
- To study different level and types of moisture

Package 4: Chemical Reaction Engineering Lab

The lab is planned to have the following units with functionalities that fulfil the objectives as described.

1. Batch Flow Reactor

Objective

- To study the progress of a Chemicals reaction and determine the kinetic parameters.
- To determine the effect of temperature on Reaction Rate Constant.

2. Isothermal PFR

Objective

- Saponification Reaction study in Isothermal Plug Flow Reactor.
- To determine Reaction Rate Constant and effect of temperature on it.

3. Adiabatic Batch Reactor

Objective

- To study the hydrolysis of acetic anhydride with water in presence of an acid catalyst (H_2SO_4).
- To predict the degree of conversion from time-temperature data.

4. RTD studies in PFR

Objective

- To plot RTD curve
- to determine the dispersion number

5. Condensation polymerization setup

Objective

- To study the kinetics of Condensation Polymerization in a Batch Reactor under isothermal condition.
- To calculate the rate constant and extent of reaction with and without acid catalyst.

6. Catalytic bed reactor

Objective

- To demonstrate the principles of packed bed catalysis
- Determination of steady-state and unsteady-state kinetics of a packed-bed catalytic reactor
- Performance comparison of a chemical catalyst (protonated cationic exchange resin) with a biological catalyst (immobilized enzyme)
- Effect of catalyst particle size on the Thiele modulus and the effectiveness factor (quantification of the competitive effects that occur between reaction kinetics and mass transfer inside the catalytic particle)
- Effect of flow rate, temperature and feed concentration on steady state conversion
- Tracer studies to characterize fluid flow within the reactors

7. Stirred tank reactor in series

Objective

- To investigate dynamic behavior and chemical reaction of stirred tank reactors in series
- To study the effect of step input change
- To study the response to an impulse change
- To study the influence of flow rate and time constant

TERMS AND CONDITIONS:

1. The bidder should be either Original Equipment Manufacturer (O.E.M) or authorized Dealer.
2. All prices shall be quoted in Nepali NPR, INR or USD. The language of the bid should be English.
3. The bidder must mention the price schedule inclusive of unit prices, total prices with the country of origin of the goods to be supplied.
4. It is mandatory to provide the manufacturer specification, technical details and delivery schedule for all the items.
5. The prices quoted must be FOB or CIF Kathmandu for international bidders. For local bidders, the price quoted must be for delivery of goods at Kathmandu University, Dhulikhel inclusive of all applicable taxes.
6. Bidder shall deposit 5% of the total bid as EMD/Bid-Bond in favour of Kathmandu University.
7. Successful bidder shall deposit 5% of the total contract amount as Performance Bond.
8. Proper documented bids must be sent through courier service by international bidders, which must reach to Kathmandu University by the deadline. Local bidders must submit the bid in person at Kathmandu University, Dhulikhel.
9. Kathmandu University will not consider any bid that arrives after the deadline for submission of bids. Any bid received by the university after the deadline for submission of bids shall be declared late, rejected.
10. Rates/quotations must be valid for 90 days.
11. Incomplete/conditional bids will not be acceptable.
12. The University reserves the right to accept or reject the bid or reject the entire bid anytime without thereby incurring any liability to the bidders.
10. The University shall award the contract to the bidders whose offer has been evaluated based on the technical merit and economy provided that the bidder is determined to be qualified to perform the contract satisfactorily.
11. Bidder shall submit the following documents as applicable (along with the bid):
 - a. A copy of firm registration certificate
 - b. A copy of business registration certificate

- c. A copy of VAT / PAN registration certificate
 - d. A copy of tax clearance certificate / tax return submission evidence for the most recent closed fiscal year.
 - e. Written declaration made by the bidder with a statement that the bidder has never been indulged in any litigation and has never been blacklisted by any organization
 - f. Manufacturing license or manufacturer authorization for dealership.
 - g. Technical specification and functional capability of the offered goods.
 - h. Product catalogue or brochure
 - i. Previous supply history to clients if available
12. The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Purchaser shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
13. Information relating to the examination, evaluation, comparison, and post-qualification of bids, and recommendation of contract award, shall not be disclosed to bidders or any other persons not officially concerned with such process until publication of the Contract Award.
14. Any effort by a Bidder to influence the Purchaser in the examination, evaluation, comparison, and post-qualification of the bids or contract award decisions may result in the rejection of its Bid.
15. The bid document may be amended by the University which will be considered addendum.
16. **Terms of Payment:** Terms of payment shall be stated by the bidder. Preferred payment to international bidder is letter of credit.

Payment shall be issued against bank guarantee.

17. Delivery:

For goods supplied locally:

The supplier shall deliver the goods to the purchaser using their own resources.

For goods supplied from abroad.

Upon shipment, the Supplier shall notify the Purchaser and the Insurance Company by telex or fax the full details of the shipment, including Contract number, description of Goods, quantity, the vessel, the bill of lading number and date, port of loading, date of shipment, port of discharge, etc. The Supplier shall send the following documents to the Purchaser, with a copy to the Insurance Company:

- a Two copies of the Supplier's invoice showing the description of the Goods, quantity, unit price, and total amount;
- b Original and copies of the negotiable, clean, on-board bill of lading marked "freight prepaid" and two copies of non-negotiable bill of lading;

- c Two copies of the packing list identifying contents of each package;
- d Insurance certificate;
- e Manufacturer's or Supplier's warranty certificate;
- f Inspection certificate, issued by the nominated inspection agency, and the Supplier's factory inspection report; and
- g Certificate of origin

The Purchaser shall receive the above documents at least one week before arrival of the Goods at the port or place of arrival and, if not received, the Supplier will be responsible for any consequent expenses

17. Warranty:

- a. The supplier must mention the warranty of the goods to be supplied very clearly.
- b. The Supplier must warrant that all the Goods are new, unused, and of the most recent or current models, and that they incorporate all recent improvements in design and materials, unless provided otherwise in the Contract.
- c. Supplier further should warrant that goods shall be free from defects arising from any act or omission or arising from design, materials and workmanship, under normal use in the conditions prevailing in Nepal.
 - d. Unless otherwise specified in the bidding documents or contract, the warranty shall remain valid for twelve (12) months or more after the Goods, have been delivered to and accepted at the final destination or for eighteen (18) months or more after the date of shipment from the port or place of loading in the country of origin, whichever period concludes earlier.
- e. Supplier shall, within the warranty period specified in the contract, expeditiously repair or replace the defective Goods or parts thereof, at no cost to the Purchaser.

18. Testing and Training

Testing and training of the equipment/setup/trainer should be carried out either by the supplier representative or should invite one of the purchaser representatives to the factory.

19. For clarification purpose and technical requirements the contact detail is :

Dr. Rajendra Joshi
Coordinator
Department of Chemical Science and Engineering
Kathmandu University
Dhulikhel
Phone: +977-9801370074
E-mail: rajendra.joshi@ku.edu.np

Bidder Information Form

[The Bidder shall fill in this Form in accordance with the instructions indicated below. No alterations to its format shall be permitted and no substitutions shall be accepted.]

Date: *[insert date (as day, month and year) of Bid Submission]*

Page _____ of _____ pages

<p>1. Bidder's Legal Name <i>[insert Bidder's legal name]</i></p>
<p>2. In case of JV, legal name of each party: <i>[insert legal name of each party in JV]</i></p>
<p>3. Bidder's actual or intended Country of Registration: <i>[insert actual or intended Country of Registration]</i></p>
<p>4. Bidder's Year of Registration: <i>[insert Bidder's year of registration]</i></p>
<p>5. Bidder's Legal Address in Country of Registration: <i>[insert Bidder's legal address in country of registration]</i></p>
<p>I.6. Bidder's Authorized Representative Information Name: <i>[insert Authorized Representative's name]</i> Address: <i>[insert Authorized Representative's Address]</i> Telephone/Fax numbers: <i>[insert Authorized Representative's telephone/fax numbers]</i> Email Address: <i>[insert Authorized Representative's email address]</i></p>

Bid Submission Form

[The Bidder shall fill in this Form in accordance with the instructions indicated No alterations to its format shall be permitted and no substitutions shall be accepted.]

Date: *[insert date (as day, month and year) of Bid Submission]*

Invitation for Bid No.: *[insert No]*

To: *[insert complete name of Purchaser]*

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda No.: *[insert the number and issuing date of each Addenda];*

- (b) We offer to supply in conformity with the Bidding Documents and in accordance with the Delivery Schedules specified in the Schedule of Requirements the following Goods and Related Services *[insert a brief description of the Goods and Related Services];*

- (c) The total price of our Bid, excluding any discounts offered in item (d) below, is: *[insert the total bid price in words and figures];*

- (d) The discounts offered and the methodology for their application are:

Discounts: If our bid is accepted, the following discounts shall apply. *[Specify in detail each discount offered and the specific item of the Schedule of Requirements to which it applies.]*

Methodology of Application of the Discounts: The discounts shall be applied using the following method: *[Specify in detail the method that shall be used to apply the discounts];*

- (e) Our bid shall be valid for the period of time from the date fixed for the bid submission deadline and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

- (f) If our bid is accepted, we commit to obtain a performance security for the due performance of the Contract;
- (g) We have no conflict of interest.
- (h) Our firm, its affiliates or subsidiaries—including any subcontractors or suppliers for any part of the contract—has not been declared ineligible by the Bank, under laws or official regulations.
- (i) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed.
- (j) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.

Signed: *[insert signature of person whose name and capacity are shown]*

In the capacity of *[insert legal capacity of person signing the Bid Submission Form]*

Name: *[insert complete name of person signing the Bid Submission Form]*

Duly authorized to sign the bid for and on behalf of: *[insert complete name of Bidder]*

Dated on _____ day of _____, _____ *[insert date of signing]*

Price, Delivery and Completion Schedule - Related Services

Date: _____
Page N _____ of _____

1	2	3	4	5	6	7
Service N	Description of Services	Country of Origin	Delivery Date at place of Final destination	Quantity and physical unit	Unit price and currency	Total Price per Service (Col. 5 x 6 or estimate)
<i>[insert number of the Service]</i>	<i>[insert name of Services]</i>	<i>[insert country of origin of the Services]</i>	<i>[insert delivery date at place of final destination per Service]</i>	<i>[insert number of units to be supplied and name of the physical unit]</i>	<i>[insert unit price per item]</i>	<i>[insert total price per item]</i>
Total Price: Related Services						

Name of Bidder: *[insert complete name of Bidder].*

Signature of Bidder: *[signature of person signing the Bid]*

Date: *[insert date]*

1. Contract Agreement Template

[The successful Bidder shall fill in this form in accordance with the instructions indicated]

THIS CONTRACT AGREEMENT is made

the *[insert: **number**]* day of *[insert: **month**]*, *[insert: **year**]*.

BETWEEN

- (1) *[insert complete name of Purchaser], a [insert description of type of legal entity, for example, an agency of the Ministry of ... of the Government of { insert name of Country of Purchaser }, or corporation incorporated under the laws of { insert name of Country of Purchaser }] and having its principal place of business at [insert address of Purchaser] (hereinafter called “the Purchaser”), and*
- (2) *[insert name of Supplier], a corporation incorporated under the laws of [insert: country of Supplier] and having its principal place of business at [insert: address of Supplier] (hereinafter called “the Supplier”).*

WHEREAS the Purchaser invited bids for certain Goods and ancillary services, viz., *[insert brief description of Goods and Services]* and has accepted a Bid by the Supplier for the supply of those Goods and Services in the sum of *[insert Contract Price in words and figures]* (hereinafter called “the Contract Price”).

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall constitute the Contract between the Purchaser and the Supplier, and each shall be read and construed as an integral part of the Contract:
 - (a) This Contract Agreement
 - (b) General Conditions of Contract
 - (c) Technical Requirements (including Schedule of Requirements and Technical Specifications)
 - (d) The Supplier’s Bid and original Price Schedules
 - (e) The Purchaser’s Notification of Award
 - (f) *[Add here any other document(s)]*

3. This Contract shall prevail over all other Contract documents. In the event of any discrepancy or inconsistency within the Contract documents, then the documents shall prevail in the order listed above.
4. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Goods and Services and to remedy defects therein in conformity in all respects with the provisions of the Contract.
5. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the Goods and Services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of *Iraq* on the day, month and year indicated above.

For and on behalf of the Purchaser

Signed: *[insert signature]*

in the capacity of *[insert title or other appropriate designation]*

in the presence of *[insert identification of official witness]*

For and on behalf of the Supplier

Signed: *[insert signature of authorized representative(s) of the Supplier]*

in the capacity of *[insert title or other appropriate designation]* in the

presence of *[insert identification of official witness]*