Tender Documents for the Supply of **Civil Engineering Lab Equipment**

To

### KU College of Engineering & Technology



**Kakatiya University**

**Warangal *–* 506 009**

**Telangana State**

**TENDER NOTIFICATION**

Sealed tenders are invited for the supply of Civil Engineering laboratory equipment for KU College of Engineering & Technology. Detailed tender documents with specifications, terms and conditions etc., can be had from the website [www.kakatiya.ac.in](http://www.kakatiya.ac.in/). The last date for receipt of the tender is 2-04-2019.

PRINCIPAL

Dated: 14-03-2019

**No. 189/KUCE&T/2019**

**KAKATIYA UNIVERSITY**

**Warangal *–* 506 009, Telangana**



**Tender Summary**

|  |  |
| --- | --- |
| Tender Number | **1166/KUCE&T/2019** Dated: **06**- **03-2019** |
| Amount of EMD (Rs.) | 2.5 % of the quoted value |
| Tender Document Cost (Rs.) | Rs.5000/- (D.D.in favour of Principal, KU College  of Engineering & Technology, Warangal- 506009, Telangana State, India) |
| (Downloadable one) |
| Bid Submission | **2-4-2019** |
| Bid Outer Cover opening | **3-4-2019 (after 5.00 PM)** |
| Bid opening (Technical) | Will be decided on the day of opening. |

**PRINCIPAL**

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1. Introduction
2. Invitation for Bids
3. Instruction to Tenderers
4. Terms and Conditions of the Tender
5. Technical Specifications
6. Bid Proposal Performance

### Introduction

**Kakatiya University** was established on 19th August, 1976 in the combined State of Andhra Pradesh to fulfill the aspirations of the Telangana people for higher education. The founding of the University was in fact a historic event in the sense that heralded a new era in the realms of higher education of this region. The erstwhile Post-Graduate Centre of Osmania University was upgraded and named *“*Kakatiya University*”* for residential teaching, research and affiliation. The development of the University over the years has been gradual but impressive. The University was initially accredited with B+ grade by the NAAC in 2002 and reaccredited with A grade in 2009 and 2017.

The University is now offering programmes in Engineering, Pharmacy, Law, Computer Science, Business Management, Education, Science, Arts, Commerce, Oriental courses in the University, constituent and affiliated colleges located in three districts of Northern Telangana State, viz., Warangal, Khammam and Adilabad. In addition, the School of Distance Learning and Continuing Education (SDLCE) is offering a large number of programme through distance mode. Further, the University is vibrant with research activities carrying out the projects sponsored by various funding agencies like UGC, DST, CSIR, ICSSR, AICTE, ICHR, DBT, etc. Now, Kakatiya University is about to cross the milestone of forty (40) years and is poised to achieve greater academic excellence with dedication and commitment in the years to come.

# INVITATION FOR BIDS

1. This invitation to the tenderer is for the supply of the Laboratory Equipment for Civil Engineering to Kakatiya University College of Engineering & Technology, Gundla Singaram, Hanamkonda,Warangal District – 506 009, Telangana State.
2. Tenderers are advised to study the tender document carefully. Submission of tender shall be deemed to have been carried out after careful study and examination of the tender document with full understanding of its implications.
3. Sealed offers prepared in accordance with the procedures enumerated in the instructions to Tenderers (3) clause 1 should be submitted to the office of

### The Principal, KU College of Engineering & Technology, Kakatiya University, Gundla Singaram, Hanamkonda, Dist. Warangal – 506 009 (Telangana State) not later than the time laid down, at the address given in the schedule for invitation to tender under Clause 6.

|  |  |
| --- | --- |
| 4**.** | **All bids must be accompanied by an Earnest Money Deposit (EMD) of 2.5% of the** |
|  | **quoted value of all the instruments, and D.D. of Rs. 5000/- towards document cost** |

### (Download one) in favour of The Principal, KU College of Engineering &Technology Warangal (Separate D.D. for Document Cost and EMD & Separate Bid for each Laboratory Equipment).

5. This tender document is not transferable.

5. Schedule for invitation to tender

|  |  |
| --- | --- |
| **Last date for submission of**  **bid documents** | **2-4-2019** |
| **Date till which the Bid is Valid** | **180 days from the date of submission** |
| **Venue of submission of Bid documents** | **Office the Principal ,**  **KU College of Engineering & Technology,**  **Gundla Singaram, Kakatiya University, Warangal-506 009. (TS)** |

1. Tender through e-mail/fax will not be considered. **Tender form without the Commercial bid will not be considered.**

**Note:** The University shall not be responsible for any postal delay about nonreceipt/non delivery of documents.

**3. INSTRUCTIONS TO TENDERERS**

### Introduction

1. **Bid Submission Procedure**

Two-Cover-System is to be followed for this tender, i.e., (a) Technical Bid in a separate Cover and (b) Commercial Bid in a separate Cover.

* 1. Technical and Commercial Bid by the Tenderer(s) should be placed in two separate envelopes super-scribed with separate bid titles as follows:
     1. Technical Bid (2 copies) with **EMD amount and document cost**.
     2. Commercial Bid (2 copies).

Tender without the Commercial Bid will be rejected.

### Tender should be submitted separately for each Laboratory.

* 1. The tenderers have to qualify for the commercial bid.
  2. Please note the price should be mentioned only in the Commercial Bid.
  3. Item-wise-pricing should be given in the commercial bid as per the format specified.
  4. All the documents, viz., Technical Bid and Commercial Bid prepared as above are to be kept in two sealed covers super-scribed with Tender Number, Due Date, Name of Laboratory, and **“Do not open before, 3-4-2019 s**hould be specified.
  5. The cover thus prepared should also indicate **clearly the name and address of the Tenderer.**

P.S.: In case, fine tuning of technical specifications are required, the University Reserves the Right to Ask for Revised Technical Bid. In the absence of revised Commercial Bid,t he original shall be held valid.

### Cost of Tender

* 1. The Tenderer shall bear all costs associated with the Preparation and Submission of Bid, including cost of presentation for the purposes of clarification of the Bid.
  2. If so desired by the University and University will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Tendering Process.

1. The Tenderer is expected to examine all instructions, forms, terms and specifications in the Tender Document. Failure to furnish all information required in the Tender Document or Submission of a bid not substantially responsive to the Tender Document in every respect will be at the Tenderer’s risk and may result in the rejection of the Bid.

### Clarification of Tender Document

A prospective Tenderer requiring any clarification of the Tender Document May notify the University in writing at the University’s mailing address.

The University will respond in writing to any request for clarification of The Tender Document, received. Written copies of the University response (including and explanation of the query, but without identifying the source of inquiry) will be given to all prospective Tenderers who have received the Tender Documents.

### Amendment of Tender Document.

* 1. At any time the University may for any reason, whether at its own initiative or in response to a clarification requested by a prospective Tenderer, modify the Tender Document by an amendment.
  2. The amendment will be notified in writing or by fax or email or cable to all prospective Tenderers who have received the Tender Documents and will be binding on them.
  3. In order to afford prospective Tenderers reasonable time in which to take the amendment into account in preparing their bids, the University may, at its discretion, extend the last date for the receipt of Bids.

### Preparation of Bids

* 1. **Language of Bids**

The Bids prepared by the Tenderer and all correspondence and documents relating to the bids exchanged by the Tenderer and the University shall be written in English.

### Documents Comprising the Bids

The Bids prepared by the Tenderers shall comprise of following components:

### AnnexureA:

**Sl.No**

1

2

3

### Eligibility Criteria

The Tenderer must have reputed dealing Electrical equipment for the last five years.

The Tenderer Company must have a valid latest Income-Tax Certificate.

EMD – 2.5% of the quoted value

### Requisite Document

Qualifying data duly filled in as per relevant Proforma provided in the bid proposal that the Tenderer is eligible to bid and is qualified to perform the contract, if its bid is accepted (Proforma)

Copy of Latest Valid Income Tax Clearance Certificate / PAN Certificate.**(Not Necessary for foreign companies)** DD in Favour of

The Principal, **KU College of Engineering & Technology, Warangal** –

506 009 – Telangana State – India

1. Cost of the Tender document (For each instrument)

Rs. 5000/- (D.D.in favour of The Principal

**KU College of Engineering & Technology, Warangal** – 506 009 – Telangana State – India

1. The Tenderer must submit proposal sheet as per terms of the Tender document certifying that they accept all terms and Conditions of the Tender Document
2. Is the Tenderer a Public/Private Limited Company having its Corporate/Head Office in Telangana State and a local direct office either in Hyderabad or Warangal?
3. Are they authorized for the equipment quoted by the Manufacturer?

Bid Proposal sheet duly filled in, signed and complete in all Aspects. (Proforma -I)

Address, Contact Person,

Phone/Fax/Email of all Directors

along with PAN / IEC / VAT /TAN/TIN Service

Tax Details. Registration No along

With Date of Registration is to be provided. Letter of authorization from the Manufacturer

### Technical Bid shall consist of following:-

|  |  |
| --- | --- |
| 1 | Technical Details |
| 2 | Name & Designation of the person responding to the tender |
| 3 | Name& Designation of person for contact |

1. **Commercial Bid shall consist of the following: -**

|  |  |
| --- | --- |
| 1 | Commercial Deviations |
| 2 | Commercial Bid |

* 1. Bid prices duly filled, signed and complete as per the Price Schedule on the prescribed Quotation Proforma (Proforma-IV). The Tenderer shall indicate the firm prices, the Terms of Reference of which are given in the Technical Specifications. Two Soft copies of deviations in the specified format given in Proforma-IV.
  2. Commercial Deviations from the terms and conditions and specifications as specified in the Bidding Documents (Proforma-V). Two Soft copies of deviations in the specified format given in Proforma-V. The University reserves the right to carry out the capability assessment of the Tenderers and is not bound to place order on the lowest bidder. The University’s decision shall be final in this regard.

1. **Terms and Conditions of the Tender**
   1. **DELAY IN THE VENDOR’S PERFORMANCE & PENALTY**

4.1(a) Delivery of the Goods and performance of Services shall be made by the Vendor in accordance with the time schedule specified by the purchaser in this schedule of requirement.

4.1(b) An unexcused delay by the vendor in the performance of its delivery obligations shall render him liable to any or all of the following penalties: Imposition of liquidated damage and termination of this order for default.

### PROFESSIONAL PRACTICE

The Tenderer shall adhere to professional engineering and consulting standards recognized by international professional bodies and shall observe sound management, technical and engineering practices. It shall employ appropriate advanced technology and safe and effective equipment, machinery, material and methods. The Tenderer shall always act in respect of any matter relating to this contract, as faithful advisors to the University and shall, at all times, support and safeguard the University’s legitimate interests in any dealings with the third party.

### USE OF CONTRACT DOCUMENTS AND INFORMATION

**4.3(a)** The Tenderer shall not, without the University’s prior written consent, disclose the

contract or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of University in connection there with to any person other than a person employed by the Tenderer in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.

**4.3(b)** The Tenderer shall not without the purchaser’s prior written consent,make use of any document or information.

**4.3(c)** Any document other than the contract itself shall remain the property of the University and shall be returned (in all copies) to the University on completion of the tenderers performance under the contract if so required by the University.

### EARNEST MONEY & SECURITY DEPOSIT:

Vendor/Tenderer(s) shall deposit EMD along with the tender document in the form of Bank Demand Draft in favour of the Principal, KU College of Engineering & Technology, Warangal. Tenders without Earnest Money will be rejected.

### SCHEDULE OF PAYMENT:

* + 1. Payment will be made only after the installation of the items and after issue of certificate by the Committee.
    2. VAT / Sales Tax, Services Tax and Octroi shall be paid on actual, as applicable.
    3. Tenderer should specify the TAN /PAN/TAN/TIN.
    4. All payments shall be released within thirty (30) days from the date of submission of bills in triplicate to the Principal, Kakatiya University College of Engineering & Technology, Gundla Singaram, Warangal – 506009.

### WARRANTY PERIOD AND MAINTENANCE SERVICES:

The Vendor will be responsible for the comprehensive maintenance (free of charge) during the warranty period of 36 months for Equipments (Active components) after the implementation at Kakatiya University College of Engineering & Technology, Gundla Singaram, Warangal – 506 009.

### PRICES

The prices quoted for the Items/Services shall be firm throughout the period of contract & this contract will be valid up to the date of final payment to the supplier and shall not be subject to any upward modification whatsoever. The rates should be quoted for CIP at sites. The commercial bids must be on the prescribed format as given in this document.

### TAXES AND DUTIES

The Tenderer shall be entirely responsible for all taxes, duties, license fees, Octroi, etc. incurred until delivery of the ordered Goods to the purchaser. However, VAT / Sales Tax, Surcharge, Professional / Service Tax, Octroi in response of the transaction between the purchaser and the Tenderer shall be payable extra by the purchaser if so stipulated in the notification award.

### INSURANCE

The Tenderer shall be responsible for all the Goods supplied under the contract and these shall be fully insured against loss or damage incidental to manufacture or acquisition transportation, storage, delivery, and installation, commissioning and running.

### TENDERERS PERSONNEL

The Tenderer shall employ and provide such qualified and experienced personnel as required to perform the services under the contract.

### CONFIDENTIALITY

The Tenderer and their personnel shall not, either during the term disclose any proprietary or confidential information relating to the services, contract or the University’s business or operations without the prior written consent of the University.

### FORCE MAJEURE

Notwithstanding the provisions of the tender, the Tenderer shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that it’s delay in performance or other failure to perform its obligations under the contract is the result of an event of Force Majeure.

**4.12(a)** For purposes of this Clause, "Force Majeure" means an eventbeyond the control of the Tenderer and not involving the Tenderer and not involving the Tenderer's fault or negligence and not foreseeable. Such events may include, but are not restricted to, acts of the University, either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

**4.12(b)** If a Force Majeure situation arises, the Tenderer shall promptly notify the University in writing of such conditions and the cause thereof. Unless otherwise directed by the University in writing, the Tenderer shall continue to perform its obligations under this order as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event, the University may terminate its order by giving a written notice of minimum 30 days to the Tenderer, if as a result of Force Majeure, the Tenderer being unable to perform a material portion of the services for a period of more than 60days.

* 1. The University reserves the right to accept or reject any Tender in whole or in part without assigning any reason therefore.
  2. The University is under no obligation to accept the lowest Tender.

### OTHER CONDITIONS

**4.15(a)** All disputes, differences, claims and demands arising under orpursuant to or touching the contract shall be referred to the sole arbitrator of the **Principal**, Kakatiya University College of Engineering & Technology, Warangal – 506 009. The award of the sole arbitrator shall be final and binding on both the parties under the provisions of the arbitration Act, 1940 or by statutory modification re-enactment thereof for the time being in force. Such arbitration shall be held at Warangal Jurisdiction only.

**4.15(b)** In all matters and disputes arising there under, the appropriate Courts at Warangal Jurisdiction shall have jurisdiction to entertain and try them.

**4.15(c)** Reputed manufacture/ Authorized dealers /Registered Contract or have EA/ESA Certificate with validity

### Detailed Technical Specifications

**Please refer Annexure - I.**

|  |  |  |
| --- | --- | --- |
| **6. Bid Proposal Proforma** |  |  |
| **Proforma–I** |  |  |
| **BID PROPOSAL SHEET** |  |  |
| Tenderer’s Proposal Reference No. & Date | | : |
| Tenderer’s Name & Address |  | : |
| Person to be contacted |  | : |
| Designation |  | : |
| Telephone No. | Email Id. : | Fax No : |
| To: |  |  |
| Principal. |  |  |
| KU College of Engineering & Technology  Kakatiya University |  |  |
| Warangal – 506 009 |  |  |

**Subject: Proposal for supply of equipment**

Dear Sir,

**1.0** We, the undersigned Tenderers, having read and examined in detail the specifications and all bidding documents in respect of supply of equipment do hereby purpose to provide Hardware & Technical Services as specified in the bidding document.

### PRICE AND VALIDITY

* 1. All the prices mentioned in our proposal are in accordance with the terms as specified in bidding documents. All the prices and other terms and conditions of this proposal are valid for a period of 180 calendar days from the date of opening of the bids.
  2. We do hereby confirm that our bid prices include all taxes including Income Tax & Professional Tax.
  3. We have studied the Clauses relating to Indian Income Tax and hereby declare that if any Income Tax, Surcharge on Income Tax and any other Corporate Tax is altered under the law, we shall pay the same.

### EARNEST MONEY

We have enclosed the earnest money (2.5% of the quoted value) and cost of the tender document (Rs.5000/-) in the form of Bank Demand Draft of

. It is liable to be forfeited in accordance with the provisions of tender document.

### DEVIATIONS

We declare that all the services shall be performed strictly in accordance with the Technical specifications and other tender document except the deviations as mentioned in the Technical deviation Proforma (Proforma - IV). Further, we agree that additional conditions, if any, found in the proposal documents, other than those stated in deviations Proforma, shall not be given effect to.

### BID PRICING

We further declare that the prices stated in our proposal are in accordance with your terms & conditions in the bidding document

### QUALIFYING DATA

We confirm having submitted in qualifying data as required by you in your tender Document. In case you require any further information/ documentary proof in this regard before evaluation of our bid, we agree to furnish the same in time to your satisfaction.

**4.0** We hereby declare that our proposal is made in good faith, without collusion or fraud and the information contained in the proposal is true and correct to the best of our knowledge &belief.

Thanking you,

Yours Sincerely,

(Signature)

Date: Name:

Place: Designation:

Business Address: Seal

### Proforma -II

**PARTICULARS OF TENDERER(S)**

TENDERER’S PARTICULARS FOR TENDER NO.

|  |  |  |
| --- | --- | --- |
| 1. | Name of the Tenderer : |  |
| 2. | Address of the Tenderer : |  |
|  |  |  |
| 3. | Year of Establishment : |  |
| 4. | Name of the affiliated firms (if any) : |  |
| 5. | Tenderer’s proposal number & date : |  |
| 6. | Name & address of the officer : |  |
|  | to whom all references shall be |  |
|  | made regarding this tender. |  |
| 7. | Annual turnover of the firm for the |  |
|  | last year and name of the |  |
|  | Institutions / Universities where the network |  |
|  | has been established. (separate list of |  |
|  | Institutions Universities may be furnished) |  |
| 8. | Contact Person/ Address/Telephone Nos. |  |
|  | of the office who will be responsible for |  |
|  | Executing this project. |  |
| 9. | Earnest Money Deposited: |  |

DD NO/ Bank Details Telex:

Telephone:

Fax No:

As of this date the information furnished in all parts of this form is accurate and true to the best of my knowledge.

|  |  |  |  |
| --- | --- | --- | --- |
| **Witness:** |  |  |  |
| Signature |  | Signature |  |
| Name |  | Name | \_ |
| Designation |  | Designation\_ | |
| Address |  | Address | \_ |

|  |  |  |  |
| --- | --- | --- | --- |
| Company |  | Company | |
| Date |  | Date |  |

Company Seal

(With name & designation

Of the person signing the tender)

### Proforma - III

**TECHNICAL DEVIATIONS**

**Subject: Technical Deviations.**

Dear Sir,

Following are the Technical deviations & variations from the expectations to the specifications. These deviations and variations are exhaustive. Except these deviations and variations, the entire equipment shall be provided as per your specifications and documents. A soft copy of the format should be submitted duly filled in, on the CD. In case of any variation between the soft and hard copy versions, the Principal, Kakatiya University, Warangal – 506 009 will consider the hard copy version.

|  |  |  |  |
| --- | --- | --- | --- |
| S.NO | Clause. No | Page No | Statement of Deviations and Variations |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Date Signature

Place Name

Seal

### Proforma-IV PRICE SCHEDULE

Please fill in all the fields of the format.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl.No | Item | Qty | Total Price in | Total Price in Words |
| Figures (Rs) | (Rs) |
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Date Signature

Place Name

Seal

# Performa - V COMMERCIAL DEVIATIONS

**Subject: Commercial Deviations**

## Dear Sir,

Following are the Commercial deviations & variations from the exceptions to the specifications of hardware. These deviations and variations are exhaustive. Except these deviations and variations shall be provided as per your specifications and documents.

|  |  |  |  |
| --- | --- | --- | --- |
| S.No | Clause No | Page No | Statement of deviations and variations |
|  |  |  |  |
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Date Signature

Place Name

Seal

### Abbreviations and Acronyms

|  |  |
| --- | --- |
| Acronym & Abbreviation | Description |
| EMD | Earnest Money Deposit |
| DD | Demand Draft |
| CD | Compact Disc |
| IEC | Importer – Exporter Code |
| LAN | Local Area Network |
| WAN | Wide Area Network |
| VAT | Value Added Tax |
| CEO | Chief Executive Officer |
| UGC | University Grants Commission |
| AMC | Annual maintenance Cost |
| PAN | Permanent Account Number |
| TAN | Tax deduction and Collection Account |
| Number |
| TIN | Tax Information Network |
| CIP | Carriage Insurance paid to |

**Annexure A**

**Commercial Compliance Statement (Note: Fill up legibly)**

**Sl No**

1

2

3

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### Eligibility Criteria

Is the Tenderer have repute

dealing with Civil Engineering Equipments for the last five years?

Does the tenderer have ISO 9001 Certification for its services Practice?

Does the Tenderer have a valid Latest Income Tax Certificate?

Has the tendering company posted profit, having a turnover of at least 5 times of the quoted value for the last three financial years? EMD – 2.5% of the quoted value Cost of tender document ( Rs. 5000/-) for each Lab

Has the Tenderer submitted proposal sheet as per terms ofthe

Tender document certifying that they accept all term sand

Conditions of the Tender Document?

Is the Tenderer a Private / Public

Limited Company having its resident engineer Corporate/Head

Office in Hyderabad / Warangal and a local direct office in

Hyderabad / Warangal? Are they authorized for the equipments quoted by the Manufacturer?

### Yes/No

**Documents Attached**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. NO** | **LIST OF EXPERIMENT** | **QUANTITY** | **APPARATARS** |
| 1. | Test on Aggregate  Agg Impact value  Agg Crushing value  Abrasion Test  Attrition Test | 1  1  1  1  1 | Agg Impact Apparatus  Agg Crushing Apparatus  Los Angels Abrasion Apparatus  Devals Attrtion Apparatus |
| 2 | Shape test | 1 | Elongation and flakiness index |
| 3 | Specific Gravity Test | 2 | Pycnometer |
| 4 | Penetration Test  Ductility test  Softening Test | 1 | SPT and thermometer  Ductility machine  Softening apparatus |
| 5 | Flash and fire point test | 1 | Flash and fire app |
| 6 | Marshall stability test and with extension collar | 1 | Marshall stability test and with extension collar app |
| 7 | CBR test | 1 | CBR apparatus |
| **Note:** Weighing balance trays | |  |  |

Transportation Engineering

Geotechnical Engineering

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl.**  **No** | **LIST OF EXPERIMENT** | **QUANTITY** | **SPECIFICATION** | **APPARATARS** |
| 1 | Consistency Limit  Liquid limit  Plastic limit    Shrinkage limit | 1  1  1 | Oven(450\*450\*450mm) aluminium | Liquid limit device  Glass plate  Evaporating dish mercury spatula hot air oven |
| 2 | Specific Gravity Test  Core cutter method  Sand replacement method  Compaction test  Permeability test  Shear test  Plate load Test  Consolidation test | 2  1  1  1 | 100mm cylinder  Hammer ,detachable base plate | Pycnometer  Weighing balance  Requirements for Core cutter method  Sand replacement apparatus  Light and heavy compaction apparatus    Constant and falling head apparatus  Direct shear apparatus  Triaxial shear apppa  Plate load app  Consolidation app |

**Note:** Weighing Balance, Trays Measuring Jars, Oven.

Surveying

|  |  |  |
| --- | --- | --- |
| **Sl.No** | **EQUIPMENT** | **QUANTITY** |
| 1 | Total Station With all Accessories  G.P.S  Autolevel | 2  1  1 |

**DEPARTMENT OF CIVIL ENGINEERING**

**CONCRETE LABORATORY ESTIMATION**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl.No** | **Experiment** | **Description** | **Qty** |
| 1 | Specific Gravity of Cement | Specific Gravity Bottle upto 100ml  Weighing Balance upto 0.1gm | 2  1 |
| 2 | Soundness of Cement | Lechatlier’s Apparatus | 2 |
| 3 | 1. Standard Consistency of Cement 2. Initial and Final Setting Time of Cement | Vicats Apparatus | 2 |
| 4 | 1. Bulk Density of aggregates 2. Specific Gravity 3. Void Ratio 4. Porosity 5. Bulking of Sand | Cylindrical metal measure  Tamping Rod  Pyconometer | 2  2 |
| 5 | Fineness Modulus of Aggregates | Sieves sizes from (80mm-75 microns) | 1 |
| 6 | Workability Tests   1. Slump Test 2. Compaction Factor Test 3. Vee-Bee Consistometer | 1. Slump cone, Tamping rod 2. Compaction Factor Equipment, Mixing Trays 3. Vee-bee Consistometer apparatus | 1 |
| 7 | Compressive Strength of Cement Mortar and Concrete | Measuring Jar, Moulds (150mm,100mm, 70.6mm)  Vibrating Machine  Compressive Testing Machine | 150mm=05  100mm=03  70.06mm=04  1 |
| 8 | Tensile Strength of Concrete | Moulds Size (300mmx150mm)  Universal testing Machine | 2  1 |

1. Universal testing Machine
2. Mixing Trays = 03, Digital Weighing balance= 10 Kg, Shovels=05.