GOVERNMENT COLLEGE OF ENGINEERING

JAMUNALIA, OLD TOWN, KEONJHAR-758 002

No: 1525(a) Dated: 01.10.2019

TENDER CALL NOTICE

Sealed tenders are invited from reputed original manufacturers/authorized dealers up to the date mentioned in the tenders for supply of equipment through speed post/ registered post only for Department of **Mechanical Engineering**. The date of opening the tender is mentioned in the tender document, which will be opened in the office of the Principal, Government College of Engineering, Keonjhar in the presence of bidders and/or their nominees. The tender bid documents with details of terms and conditions are to be downloaded from the College Website: **www.gcekjr.ac.in.**

The authority reserves the right to reject/cancel the tenders in whole or in part without assigning any reason thereof. The authority will not be responsible for any postal delay.

Sd/-
Principal

BIDDING DOCUMENTS AND INSTRUCTION TO SUPPLY EQUIPMENTS

FOR

DEPARTMENT OF MECHANICAL ENGINEERING

GOVERNMENT COLLEGE OF ENGINEERING, KEONJHAR

[A Constituent College of BijuPatnaik University of Technology]

Jamunalia,Old Town,Keonjhar– 758 002

INVITATIONFORBIDS

Principal, Government College of Engineering, Keonjhar invites sealed bids from eligible bidders for supply of machineries/equipments to Mechanical Department.

Interested eligible Bidders may obtain detail information and list of items with technical specifications from **the website of the College www.gcekjr.ac.in**

Particulars about submission of bidding document are as follows:

(a) Price of bidding document : **Rs. 1000/-**

(non-refundable)

(b)First date of availability of Bidding

Document in the website : 01.10.2019

(c) Last date and time for submission of bids : 31.10.2019

(d) Time and date of opening of technical bids : Will be published in college website

(f) Time and date of opening of financial bids: Will be communicated to the successful technical bidders after scrutiny of the technical committee/ notice will be published in college website

(e) Place of opening of bids: **Principal Office**

Government College of Engineering Jamunalia, Old Town, Keonjhar-758002

(f) Address for communication : **Principal/Head of Department**

(Mechanical Engineering)

Government College of Engineering

Jamunalia, Old Town,

Keonjhar-758002

Sd/

Principal

1. Eligibility of Tenderer and General Instructions:

1.1 Eligibility:

Those who fulfill the following criteria are eligible to participate in the tender.

a) The tenderer must be a reputed Original Equipment Manufacturer and/or the Authorised agent/ dealer of a reputed manufacturer. Manufacturers must provide all documents relating to their Manufacturing Capabilities.
b) If the tenderer is an Authorized Dealer/Agent of a reputed manufacturer, necessary certificate to this effect from his manufacturer must be enclosed.
c) The bidder must be a registered firm with GST Authority. The bidder must furnish the GST registration certificate and necessary clearance certificates up to March 2019. In absence of such certificates, the bid is liable to be rejected.
d) PAN Number must be enclosed along with the Tender documents.
e) The tenderer must have cleared Income Tax payment up to date (March 2019). Attested copies of Income Tax Clearance Certificate or non-assessment certificate, as the case may be, from the competent authority, up to date must be enclosed along with the Tender documents.
f) Annual Turnover must be Three Crores or more for last three years (2016-17, 2017-18, 2018-19) (in each year). As a letter of support the bidder must submit audited balance sheet of last three financial years.
g) The tenderer must provide evidence of successful execution of supply orders of similar equipment with installation and successful after sales support in reputed organizations like NITs/IITs/IIESTs/IISERs/NISER/IISc/Central Research Laboratories/Government Organizations in last three years.
h) Original catalogue (not a photocopy) of the quoted model duly signed by the company authority must accompany the quotation. The model quoted should be highlighted in the catalogue enclosed with the quotation. Merely copying the specifications in the quotation without any proof shall not make the parties eligible for consideration of the quotation. Photographs and line diagram should be provided for each and every equipment.
i) The firm must have the capability for uninterrupted supply of spares, accessories for a period of 5 years (60 months) from the date of acceptance to avoid any operational problem due to obsolesce. The bidder must submit an undertaking for the same.
j) Minimum 75% of items must be quoted otherwise bid will be rejected.
k) The Company must be ISO: 9001-2008.

1.2 General Instructions:

The selection for procurement of equipments will be based on quality and performance along with cost. In this context decision of technical committee is final based on documentary evidence or actual physical verification.

a) Submission of more than one bid by a particular tenderer under different names is strictly prohibited. In case it is discovered later on that, this condition is violated, all the tenders submitted by such tenderer/s would be rejected or contract cancelled.
b) The tenderer should mention in the tender paper, the location of its service centre nearest to Keonjhar.
c) All offers should be in English and the price quoted for each item should be firm.

d) Warranty period, Delivery period and After-Sale-Service conditions, etc. are also to be clearly indicated.
e) The rates and the conditions of the offer will remain valid for three months from the date of opening of the tender and no change or alteration of the rate will be acceptable on any account.
f) Submitted tender forms with overwriting or erased or illegible specifications and rates will be rejected.
g) Request from tenderer in respect of additions, alterations, modifications, corrections, etc. of either terms & conditions or rate after opening of the bid may not be considered. However, negotiation may be made before finalization.
h) Tenderers shall carefully examine the bid documents and fully inform themselves of all the conditions, which may in any way affect the work of the cost thereof.
i) Should a tenderer find discrepancies or omissions from the specification or other documents and any doubt as to their meaning, he should at once notify the purchaser and obtain clarification in writing.
j) This, however, does not entitle the tenderer to ask for time beyond the due date fixed for receipt of tenders.
k) The tenderer must also specify minimum time and maximum time to repair/replace in the event of a failure and penalty thereof.
l) Verbal clarification and/or information given by the purchaser or its employees or representatives shall not be binding on the purchaser.
m) Submission of sealed bid will carry with the implication that the tenderer agrees to abide by the conditions laid down in the detailed particulars of the bid notice.
n) Conditional offers and offers qualified by vague and indefinite expression, as 'subject to immediate acceptance' 'subject to prior sale', etc. will not be considered.
o) While tenders are under consideration, tenderers and their representatives or other interested parties are advised to refrain from contacting by any means, to the purchaser's personnel or representatives on matter relating to the tenders under study.
p) The purchaser, if necessary, will obtain clarification on tenders by requesting such information from any or all the tenderers either in writing or through personal contact as may be necessary.
q) The tenderer will not be permitted to change the substance of his offer after the tenders have been opened.
r) In the event of non-compliance with this provision, the tenderer is liable to be disqualified.

1.3Procedure for Submission of Tenders:

a) The Tenderers must submit their bids as required in two parts in separate sealed covers prominently super scribed as Part-I "Technical Bid" and Part-II "Financial Bid" and also indicating on each of the covers the "Tender call Notice Number & Date" and due date and time of submission as mentioned in Tender Cal Notice.

Part-I (Technical Bid)

Excepting the price schedule, all other documents as mentioned in para 1.1 i.e details of technical specifications, printed information Catalogue for each instrument, Copy of Firm Registration Certificate from the competent authorities, GST clearance, Income Tax Clearance, PAN Card copy, list of clients, evidence of successful execution, etc. along with

tender document duly signed by the authorized person in each page shall be covered in Part-I (Technical Bid).

Part-II (Financial Bid)

All indications of price shall be given in Part-II (Financial Bid)

b) Both sealed covers Part-I " Technical Bid" and Part-II "Financial Bid" should be placed in a third cover along with requisite EMD & cost of Tender documents (separately in the form of DD drawn in favour of Principal, Government College of Engineering, Keonjhar at any Nationalized Bank payable at Keonjhar) , others requisite supporting documents etc. and sealed. The sealed cover containing tender documents as per procedure indicated above should be sent to the Office of the Principal, GCE, Keonjhar by Registered Post/Speed Post only addressing to the Principal, Government College of Engineering, Jamunalia, Old Town, Keonjhar-758002 within the due date and time as stipulated in Tender. The sealed envelope must show the name of the tenderer and his address and should be super scribed as "*Tender for supply of Equipment for Mechanical Engineering Department***"** on the top of the envelope**.**

c) All the documents submitted must be in the papers showing signature of the tenderer and printed office name of the tenderer on official seal.

d) All the documents must be submitted in a sequential manner with separator/flags to help in quick scanning of the topics. Wherever possible, data in tabular form should be given.

2. Requirements by Tenderer before Supply:

2.1 Rating Plate, Name Plate and Labels:

Each of the equipment is to have permanently attached to it, a rating plate of non-corrosive material in a conspicuous position, upon which the total specifications along with the manufacturer's name, address, etc. are to be engraved.

2.2 Packaging:

All the equipment are to be suitably protected, covered in water -proof packing and crated to prevent damage or deterioration during transit and storage till the time of installation. The supplier shall be responsible for any loss or damage caused during transportation, handling or storage till their successful installation.

2.3.Inspection:

a) All materials / equipment shall be inspected and tested for completeness, proper assembly, operation, cleanliness and state of physical condition and performance as per quoted specification.

b) The test shall be conducted, reported and certifications to be provided by the tenderer.

c) The tenderer shall provide all test and measuring equipment/tools required for inspection / testing.

d) The cost of all such tests shall be borne by the Tenderer.

e) GCE reserves the right to reject any equipment if it does not comply with the specifications during site testing, installation and commissioning stage.

f) Inspection & testing would be conducted, jointly, at various stages as applicable during unpacking, installation and commissioning of respective equipment / components at the manufacturing site.

2.4. Environmental Condition:

All the equipment supplied shall be rugged and should operate without any deviation in quality, or degradation of equipment performance. All the specification/parameters shall be guaranteed over the following environmental conditions:

* Storage Temperature : 0 to 50^0 C
* Operating Temperature : 0 to 50^0 C
* Humidity : 95% RH (non-condensing)

All the equipment are intended to operate under 220 V/ 440V, 50 Hz power supply.

3. Requirements by Tender after Supply:

3.1 Supply:

a) The material would be delivered by the supplier at GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha.

b) The items should be supplied directly from the manufacturing terminal having passed all tests successfully with Certifications as required.

c) Operating/instruction manual and sample calculations must be provided along with the equipment.

d) The equipment should conform to the latest relevant National/International standards and shall be completed in all respect.

e) Any component, fitting etc. which may not have been specifically mentioned in the specifications but which are usual and necessary for the equipment, shall be supplied by the tenderer at no extra cost.

f) In case, articles are found damaged in transit or found short at the time of delivery the full cost of the same will be deducted from the bill of the supplier in case the supplier does not replace the stock within a week from the date of the complain.

g) The articles ordered must be supplied in one lot within 4 (four) weeks of placing of the order.

h) GCE reserves the right to procure the materials from alternative sources at the risk and cost of the successful tenderer giving 15 days notice.

i) Any increase in tax and duties after expiry of delivery period will be borne by the supplier.

j) In case the items supplied by the supplier are found not up to the specification shall be rejected.

k) The supplier will be intimated to take back the stocks at his own cost within three days from the date of rejection and to replace the same within 7 days, failing which the EMD will be invoked in addition to taking legal actions.

l) Imported consignment, if any, should be destined to GCE, Jamunalia, Old Town, Keonjhar – 758002, Odisha, India through Bhubaneswar Air Port.

m) The suppliers shall be responsible for releasing the consignments from the carriers/transporters.

n) The equipment shall be delivered and installed at site at the cost of the tenderer.

o) All taxes, levies, surcharges including the customs clearance and handling freight and insurance should be paid and handled by the tenderer.

3.2 Installation and Commissioning:

Installation and Commissioning shall include the following:

a) Installation and Testing of the Equipment, Machineries etc. must be conducted by the tenderer at GCE.

b) It will be the responsibility of the tenderer to provide all necessary spares and consumables, which may be required during installation and commissioning, at no extra cost to purchaser.

c) The tenderer is to bring their own testing and measuring instruments required for installation, testing, commissioning, which can be taken back after completion.

d) Equipment have to be demonstrated at college site, results must be repeatable within ±2% of the sample calculations provided.

e) Installation must complete within 15 days after delivery on site.

f) During installation and commissioning the complete intended experiments is to be conducted with results must be within accepted level of accuracy.

g) The raw materials and samples required for conducting experiments during installation is to be supplied by the tenderer free of cost.

h) The vendor should provide the satisfactory training to our technical staff after installation/commissioning. The trainer should be a permanent employee of the company with a minimum of 3 years experience in demonstrating such equipments. The details about the training programs.

3.3 Documentation:

a) Detailed technical manuals, handbooks, drawings, Warranty card and Factory Quality Assurance checklist, test results and any other certifications mentioned in the Technical specifications shall be supplied along with the consignment.

b) Supplied manuals/handbooks must cover detailed technical specifications and installation, operation, maintenance and System Safety procedures.

c) For Experimental setups details of theory, procedure and methods of taking measurements etc. should be provided in the form of hand books for each experiment.

d) The receipts for taxes paid, if any, for the supplied materials should also be submitted.

3.4 Trial Operation and Performance Guarantee Test:

a) After successful completion of Installation and Commissioning of the equipment, a 7-day continuous trial operation putting those on optimum use shall be conducted by the tenderer at site, during which the performance of the equipment shall be demonstrated for trouble-free continuous operation, meeting the specified standards and proper training shall be imparted to two persons of the purchaser.

b) During trial operation, tenderer shall do all necessary adjustments required to ensure the performance as per the acceptable level.

c) In case, guaranteed performance is not established, the tenderer shall be given opportunity to rectify/replace the equipment/components, and restart the 7 days continuous trial operation, at the risk and cost of the tenderer.

3.5 On-Site Warranty:

a) The entire materials may be used continuously. The reliability and safety of the total installed system and trouble-free operation are, therefore, of prime importance. The supplied devices/equipment and components shall be covered under **Two-years or more** comprehensive on-site warranty from the date of issue of successful completion of Performance Guarantee Report.

b) During the period of warranty, it shall be the responsibility of the tenderer to provide all essential spares and consumables, which may be required for maintenance and trouble-free operation of the devices / components at the tenderer's cost.

c) Software, if any, has to be tested with at least one-year warranty for trouble free operation.

3.6 Comprehensive Maintenance Contract:

a) The tenderer shall be under the obligation of entering into a Comprehensive Maintenance Contract (CMC) with GCE for a minimum period of two years, renewable if felt necessary, on mutually acceptable rates, terms and conditions. CMC shall start after the completion of Warranty.

b) The scope of CMC shall cover maintenance and supply/replacement of materials and components, for smooth and reliable operation of the systems without trouble.

c) Accordingly, the tenderer has to offer rates for the CMC structure per equipment along with the price for the Systems and other associated Equipment supplied.

3.7 After Sales Service

a) During the warranty period and subsequently, after signing of Agreement for CMC the tenderer shall attend to the problems reported by the users of GCE on a priority basis.

b) For any problem reported the tenderer shall attend and rectify the problem within 7 (seven) days or provide a standby system of the similar configuration.

c) The report on any problem will be informed through phone or fax number of which shall be given by the tenderer.

d) The branch office of the concerned manufacturing firm will be fully responsible to provide maintenance service, in case of any negligence, in providing the service by the tenderer.

e) On failure to comply with those instructions, the Bank Guarantee provided for the warranty period shall be invoked.

4. Financial Terms:

4.1 EMD

a) The tenderer has to submit a Demand Draft / Banker's Cheque / Pay order of Rs.50,000**/ - in favour of Principal, Government College of Engineering, Keonjhar** payable at Keonjhar in any Nationalized Bank towards EMD.

b) There will be no interest paid to the tenderer towards EMD money.

c) In no case, the EMD Money in cash or other forms will be accepted at the time of opening of the bid.

d) No request for adjustment of claims, if any, will be accepted.

e) The EMD of unsuccessful tenderers will be refunded as soon as possible after the tenders are finalized.

4.2 Performance Security Deposit:

In case of successful Bidder EMD will be kept as Performance Security Deposit and will be refunded after expiry of stipulated warranty periods (Two years) from the completion date of installation and commissioning on satisfactory performance of the equipment.

4.3 PRICES:

Price quoted should be **FOR Government College of Engineering, Keonjhar only. Tax components as applicable should be mentioned clearly in the financial bid.**

a) Price should be quoted for unit item.
b) Purchase order will be placed as a single lot for each type of item or for all the items together, as the case may be.
c) In case of items of import, the tenderer should take full responsibility for customs clearance, handling, tax payment, etc. and specify the charge for the same in the price bid.

4.4 Sales Tax Concession:

Central Sales Tax Concession is to be availed on production of the required certificates applicable to Educational Institution.

4.5 Discount:

a) Our Institute is a pioneer Institution in the field of Teaching and Research in Engineering and allied disciplines and do not run with profit motive.
b) As such we are availing price discount for purchase of equipment/instruments.
c) The rate of discount or any other Institutional benefit arising out of Govt. Policy etc., on each item may also be indicated in the bid specifically.

4.6 Payments:

a) In case of imported items, payment will be made by opening LC in the name of the manufacturer subject to the condition that a Bank Guaranty for an equal amount will be submitted by the selected tenderer to GCE for the period of completion of installation and commissioning.

4.7 In case of purchase in Indian Rupees, payment of 90 percent of the ordered value will be made after successful installation and commissioning of the equipment subject to submission of satisfactory performance report by the concerned Head of Department. The rest 10 percent of the payment will be made after one year of successful installation of the equipment.

4.8 Penalty:

If the delivery, installation and commissioning is not carried out in time as specified in other part of the tender document, the tenderer/manufacturer will be charged @ 1 % (one per cent) per week of the total value of the concerned machine / equipment.

4.9 Rate Contract with DGS&D or any other Government Organisation:

In case the tenderer has entered into a Rate Contract with DGS & D or any other Government Organization such as EPM, rate contract preference, number & copy of rate contract have to be submitted along with tender.

5. Instruction to the Tenderer:

a) Some of the minimum specifications specified may be redundant, obsolete or incompatible and in these cases, quote the particulars of correct specification of latest trend and technology.
b) Higher specifications instead of minimum specifications are allowed if a minimum specification is not available, obsolete or incompatible.
c) Otherwise, model with higher specification should be in addition to the model with minimum specifications.
d) Specify brand name and full model name and number for each offer.
e) Include the printed catalogue and pricelist if any for each of the equipment quoted.
f) Specify the list of Accessories required along with each of the equipment.
g) Quote the additional price of the accessories; only those, which are fully compatible with the quoted model, should be furnished.
h) Specify the list of Accessories to be given free of cost, along with the equipment as "**Free Accessories"**; these should be fully compatible with the quoted models.

5.1 Solving Disputes:

a) GCE, the tenderer and the manufacturer shall make all efforts to resolve amicably by direct informal negotiation on any disagreement or dispute arising between them under or in connection with this contract.
b) All disputes arising out of the contract shall be referred to courts under the jurisdiction of the Keonjhar court only.
c) The above terms and conditions except those otherwise agreed upon, shall form a part of the Purchase Order.
d) Sign on each page of this tender document and Return it along with the offer enclosing this part together with the Technical Offer.
e) The GCE authority has all rights to accept / reject any tender without assigning any reasons there of.

6. Technical Specifications:

Following are the minimum specifications of the equipment.

a) The minimum specifications are indicative and not exhaustive.
b) The models with higher specifications may be quoted.
c) The quoted materials should be of latest trend and technology.
d) Each equipment should be complete in itself without needing any extra requirements except the requirement of general test and measuring instruments.

GOVERNMENT COLLEGE OF ENGINEERING, KEONJHAR

Machine/Equipment Specifications for Different Labs in Mechanical Engineering Department (Academic purpose)

The bidder must fillup this format and specify whether they comply with the detail specification or not as per the details given here.

HYDRAULIC LAB			
SI NO	**EQUIPMENT NAME**	**SPECIFICATION**	Complied Yes/No
1	Bernoulli's Apparatus	To verify Bernoulli's Theorem experimentally. To plot the Total energy Vs distance. To Plot Velocity curve in the venturi nozzle.Test section should be made from single piece Acrylic with convergent and divergent sections provided with pressure tapings at different locations. Seven piezometer tubes should be fitted with pressure tapings made of Stainless Steel - 304 Grade. Water circulation should be done by 0.5 HP Pump, Champion/Standard make, Sump tank, 1.2 mm thick, capacity 70 liters to inlet tank, 1.2 mm thick, capacity 20 liters, made of stainless steel 304 Grade. Water flow measurement should be done by measuring tank, 1.2 mm thick, made of stainless steel 304 Grade, capacity 25 liters, with piezometer tube and electronic stop watch. Valves should be manufactured as per EN ISO 9001 standard and 100% tested in accordance with EN 12266-1 standard. Operating/instruction manual with sample calculations, Photographs and line diagram of equipment must be provided along with tender documents otherwise your bid will be rejected. Equipments has to be demonstrated at college site, results should be repeatable within ±5% of the sample calculations provided. The whole set-up should be well designed and arranged on a rigid structure made of MS square pipe 32 mm × 32 mm × 2 mm thickness and painted with industrial PU Paint. The tank should be of SS 304Grade with minimum 1.2 mm thickness.	
2	Bourden Tube Pre. Gauge	Bourdon Tube Pressure Gauge should allow the students to study the internal parts of the gauge. The internal configuration should be exposed through labeled each body parts and internal surfaces.	
3	Model Of Different Types Of Hydraulic Pump (Centrifugal, Reciprocating, Dredge, Jet, Submercible) Cut Section To See The	Cutaway model of different types of hydraulic pumps (Centrifugal, Reciprocating) should allow the students to study the internal parts and fittings of the pump with assembling & disassembling. The internal configuration should be exposed through labeled each body parts and internal surfaces. Cut section to see the internal parts of pumps	

	Components		
4	Model Of Hydraulic Turbine (Axial, Tangential, Radial)	Cutaway model of different types of hydraulic turbines (Axial, tangential and radial) should allow the students to study the internal parts and fittings of the pump with assembling & disassembling. The internal configuration should be exposed through labeled each body parts and internal surfaces.	
5	Flow Through Pipes Test Rig (VELOCITY AND PRESSURE LOSS)	to study the relationship between velocity and pressure loss. To determine the losses due to friction in both pipes. To determine the friction factor for Darcy-Weisback equation.Two Pipe Test sections of Dia. ½", ¾" with pressure tapping length 1.0 m should be made of stainless steel 304 Grade. Water circulation should be done by FHP Pump, Crompton/standard make, sump tank, 1.2 mm thick, Capacity 50 liters made of stainless steel 304 Grade Flow measurement should be done by measuring tank, 1.2 mm thick, Capacity 25 Ltrs, made of stainless steel 304 Grade with piezometer tube and electronic stop watch. Pressure measurement should be done by Inverted U-Tube Manometer (no mercury needed). Valves should be manufactured as per EN ISO 9001 standard and 100% tested in accordance with EN 12266-1 standard. Operating/instruction manual with sample calculations, Photographs and line diagram of equipment must be provided along with tender documents otherwise your bid will be rejected. Equipments has to be demonstrated at college site, results should be repeatable within ±5% of the sample calculations provided. The whole set-up should be well designed and arranged on a rigid structure made of MS square pipe 32 mm × 32 mm × 2 mm thickness and painted with industrial PU Paint. The tank should be of SS 304Grade with minimum 1.2 mm thickness.	
Machine Dynamic Lab			
6	Velocity Ratio Of Belt Drive	The set-up should include a variable speed, FHP motor, 1500 RPM Motor and Driving & driven pulleys of different diameters. Flat belts of fixed length of two different belt materials with Belt tightening arrangement should be provided. 2 Channel digital speed indicator with switch to change the channel. The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	

7	Gear Train (Simple, Compound, REVERTED, EPICYCLIC) MODELS ONLY	Acrylic model of Simple, Compound, Reverted, and Epicyclic gear trains should be provided. These model should be hand driven . The cutaway models should represent original components in which the active parts are clearly visible to the user while fully maintaining their mechanical functionality. Precisely Designed should be assembled on transparent plastic sheet to enables students to see the mechanism clearly, Instructional manual with block diagram should be provided.	
8	Model Of Brake	Model of five types of Breaks (i.e. Hydraulic brake single drum, Single Shoe Brake model, Double shoe brake model, Band Brake model and Band & Block Brake Model) should be provided. These model should be hand driven. Instructional manual with block diagram should be provided. The models should represent original components in which the active parts are clearly visible to the user while fully maintaining their mechanical functionality.	
9	Spring Constatn Apparatus	Wall attachable Cast Iron bracket with slider and scale painted with industrial PU paint should be provided. Springs of different sizes should be provided. A set of dead weights should be provided. Operating/instruction manual consisting of construction, working area of application should to be provided along with the tender documents.	
10	Rope Brake Dynamometer	To determine Output Power, Input Power and Efficiency.The set-up should include a variable speed, FHP motor, 1500 RPM Motor coupled with a suitable rope brake drum type dynamometer. Loading arrangement should consist of hand wheel and spring balance. A digital speed indicator should be provided to measure the output shaft speed. The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	
11	Epicylic Gear Train Apparatus (With Digital Rpm Indicator	To measure Epicyclic gear ratio between input shaft and output shaft (Actual and Theoretical). To measure input torque, holding torque and output torque.Internal Type Epicyclic Gear Train, Compact gear train should be driven by 1HP motor with speed controlling unit. Output torque and holding torque should be measured by Rope break type dynamometer and load measurement should be done by spring balance. Digital RPM Indicator with proximity switch, Voltmeter and Ammeter should be provided. The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	
12	Static And Dynamic Balancing	To balance the masses statically and dynamically of a single rotating mass system. To observation of effect of unbalance in a rotating mass system.Rotating Shaft Shafts should be made of stainless steel 304 Grade and Driven by FHP motor with speed controlling unit. Four Balancing weights with different sized eccentric mass for varying unbalance should made of Stainless Steel 304 Grade. The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	

13	Coriolics Component	To determine Coriolli's Component of Acceleration at various speeds of rotation and water flow rates.Rotating Arms of 9 mm/ 6 mm orifice diameter, Length 300 mm and driven by Variable speed FHP motor, PMDC type. Water circulation by Pump from Water Tank, made of Stainless Steel 304 Grade and flow measured by Rotameter should be of range 250 to 2500 LPH. RPM measurement should be done by Digital RPM indicator with proximity sensor (non contact type). The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint. Operating/instruction manual with sample calculations, Photographs and line diagram of equipment must be provided along with tender documents otherwise your bid will be rejected. Equipments has to be demonstrated at college site, results should be repeatable within ±5% of the sample calculations provided.	
14	Cam Analysis Appt.	With the help of combination of provided cams and followers following experiments can be conducted: a- To plot the n-θ(Follower displacement Vs Angle of rotation) curves for different cam follower pairs. b- The follower bounce can be observed by using a stroboscope (Optional) & effect of follower weight on bounce can be studied. c- To study the effect of follower weight on bounce. d- To study the effect of spring compression on bounceThree cams i.e. Tangent, Eccentric, Circular Arc, made of hardened alloy – steel with Cam shaft should be driven by Variable speed FHP DC Motor with speed controlling unit. Three Followers i.e. Roller, Knife edge, Mushroom should be made hardened alloy – steel. Compression Spring should be made of spring steel. Weights of 500 gm, 300 gm, 200 gm & 100 gm and Dial Gauge of Baker & Mercer/Standard Make should be provided. Digital RPM indicator with proximity sensor (non contact type should be provided for RPM measurement. The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	
15	Velocity Ratio Of Belt Drive	Experimental justification of the equation T = I. ω. ωp for calculating the gyroscopic couple by observation and measurement of results for independent vibrations in applied couple T and precession ωp. • To study the gyroscopic effect of a rotating disc. . Journal of Diameter 50 mm and Bearing of Diameter 55 mm should be drive by Variable speed FHP Motor with speed controlling unit. • Weights of 2 kg, 1 kg should be provided. •Compound Pressure gauge (-1 to 1) Kg/cm2 • Non contact type Digital RPM indicator with proximity sensor for RPM measurement. for Pressure measurement. •The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	

16	Model Of Different Types Of Gear	Model of different types of gears (i.e. Single Stage Spur Gear, Spiral Gear, Double Helical Gear, Bevel Gear, Worm Gear) should be provided. • These model should be arranged on wooden board painted with industrial PU Paint.	
17	Model Of NUT, BOLT, SCREW THREADS	Model of Nut, four types Bolt , Screw threads should be provided. • All they are mounted on Metal/Plastic sheet.	
18	Model Of Different Types Of Coupling (Flange, Oldham, Universal, Muff Etc)	Model of Different Types of couplings should be provided (Flange, Oldham, Flexible, Split Muff couplings etc).	
19	Strain Rosette	DETERMINE OF PRINCIPAL STRESSES 1 AND 2 IN MAGNITUDE AND DIRECTION. STUDY THE EFFECT OF PRESSURE ON PRINCIPAL STRESSES THREE ELEMENT 45 DEGREE RECTANGULAR PLANNER ROSETTE, 350 OHM, THREE ELEMENT 60 DEGREE DELTA PLANNER ROSETTE 120 OHM	
20	Stress Analysis Through Photo Elasticity	PHOTO ELASTIC EXPERIMENTS WITH AN OVERHEAD POLARISCOPE, FILTER ENCLOSED WITH STRESS FREE GLAZING, DIA OF FILTER= 165 MM, DIA OF GREEN FILTER= 150MM, LOAD FORCE= 0 TO 250N, UN-NOTCHED BAR, BAR NOTCHED ON ONE SIDE, BAR NOTCHED IN BOTH SIDE, RECTANGLE WITHOUT STRESS, RECTANGLE WITH STRESS, FORK, CRANE HOOK, FRAME = 500MMX190MMX30MM, FILTER BRACKET= 280MMX280MMX90MM, STORAGE SYSTEM= 1170MMX480MMX178MM, WEIGHT= 10KG MAX,	
21	Model Of Rod Joints (Cutter And Knuckle Joint)	Model of Rod joints (Cotter and Knuckle joint) should be provided. • These model should be arranged on wooden board painted with industrial PU Paint.	
22	Model Of Different Types Of Clutches	Model of Different Types of clutches should be provided (single plate and multi plate dry clutch, cone clutch, centrifugal clutch etc).	
23	Coriolis Component Of Accelaration	Visualisation of the Coriolis force effect. Rotating reference frame consisting of disc.	
Thermal Lab			

24	Reynold's Apparatus	Determination of the Reynold's Number for Laminar, Turbulent and Transient Flow in Pipe. • To study transition zone.Test section tube should be made of Borosilicate Glass having ID 14 mm approx., Length: 600 mm approx. Water circulation should be done by Magnetic Drive Pump, Crompton/standard make, Sump tank, 1.2 mm thick, Capacity 60 liters to Constant head water tank, 1.2 mm thick, capacity 40 liters, made of stainless steel 304 Grade and flow measurement should be done by measuring cylinder and electronic stop watch. Die injection should be done by using capillary tube made of Stainless Steel 304 grade, from Dye vessel having capacity 1 liter, made of stainless steel 304 grade. Valves should be manufactured as per EN ISO 9001 standard and 100% tested in accordance with EN 12266-1 standard. The whole set-up should be well designed and arranged on a rigid structure made of MS square pipe 32 mm × 32 mm × 2 mm thickness and painted with industrial PU Paint.	
25	Separating And Throttling Calorimeter	Separating Chamber of Compatible capacity should be made of Stainless Steel 304 Grade and insulated with Ceramic wool with water level indicator. • Throttling Chamber should be of Compatible capacity provided with gauge to measure inlet Pressure before throttling. • Heat Exchanger should be provided for condensing steam. • Steam Generator should be of Compatible capacity with digital temperature controller to control the temperature inside the steam generator. •Differential pressure measurement should be done by manometer. • Steam pressure measurement should be done by Pressure gauge. •The whole set-up should be well designed and arranged on a rigid structure made of MS square pipe 32 mm × 32 mm × 2 mm thickness and painted with industrial PU Paint.	
26	Emmisivity Measuremen t Appt	• Determination of the Emissivity of a test plate. • Study the variation of emissivity of test plate with absolute temperature.Test plate and black plate should have Diameter : 160 mm (approx.) •Nichrome Wire Heater, 2 Nos. for test plate & black plate should be provided. • Heat input to the heater should be controlled by PID Controller, 0-199.9° C. • Temperature measurement should be done by Temperature Sensors of RTD PT-100 type with Digital Temperature Indicator (0-199.9 °C). Power measurement should be done by Digital Type Energy meter. •Cabinet to accommodate the slab assembly with front window of acrylic. •The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	
27	Model Of Steam Power Plant	Miniature Power Plant Model with Steam Dynometer and bulb . This model should help the student to understand the working of the steam turbine plant very easily. It is specially made dissectible for demonstration purposes	

28	Water To Air Heat Pump	• Determination of co-efficient of performance (COP) of the unit when working as water-to-air heat pump. •To Construction of Energy balances for completed system over a range of operating conditions. •To determine overall heat transfer co-efficient for condenser and evaporator. A Hermitically sealed compressor, Reciprocating type, Capacity 1/3 Ton, Emerson Copeland make should be provided with Refrigerant R-134A. • Condenser should be of Water cooled shell and coil type with refrigerant inside the tube. • Evaporator should be of Air cooled of compatible capacity. • Capillary Tube type Expansion Device of Compatible Capacity, Two Pressure Gauges for suction & discharge pressure measurement and Rotameters for condenser water flow measurement should be provided. • Air Flow measurement should be done by Velocity sensor. • Overload and over current protectors for compressor and Time delay circuit with Low/high voltage auto-cut for safety control. • Temperature Sensors RTD PT-100 type with Temperature Indicator with multi-channel switch. • Control Panel should comprises of Digital Voltmeter (0-500 V), Digital Ammeter (0-19.99 Amp) with mains indicator, Standard make On-off switch etc. •All Other accessories like Hand shut off valves, filter drier and Thermostat (Danfoss make) should be provided. • The whole set-up should be well designed and arranged on a rigid structure painted with industrial PU Paint.	
29	Exhaust Gas Analyzer	Measuring range should be: • For CO2 • For CO : 0-10% : 0-20 vol % • For HC : 0-20,000 ppm • For 02 • For NOx : 0-22 vol % • Resolution for CO2:0. I vol % : 0-5000 ppm • For CO : 0.01 vol % • For HC : 1 ppm • For 02 • For NOx : 0.01 %, Ø Accuracy should be : : 1ppm. • For CO2 • For CO : ±0.1 vol % : ±0.3 vol % • For HC : ±10 ppm • For O2 • For NOx : ±02 vol % Pre filters Plastic (Set of 24 No's) should be provided. : ±20 ppm% Tube filters (Set of 14 Nos.) should be provided. Data Logger software for gas analyzer should be provided.	
30	Model Of Centrifugal Compressor (Axial, Radial, Mix)	Cut section of Axial, radial, Mix should be provided. • All compressors Model Should be brand new. • The whole set up should be arranged on a metal/wooden board. • The cutaway models should represent original components in which the active parts are clearly visible to the user while fully maintaining their mechanical functionality. • Manual with block diagram and all the other technical details should be provided, should be provided.	

31	Model Of Different Types Of Steam Turbine	Models made of wooden and metallic parts showing all the internal construction details of the steam turbine should be provided.	
Production Lab			
32	Slotting Machine	Stroke- 10-250mm, Longitudinal Movement- 230mm, Cross Movement-230mm, Speed Adjustment-3 Speed, Ram Adjustment-250mm, Power-1.5 Hp	
33	Moulding Sand Testing Machine	Determination Of Grain Size, Clay Content, Permeability And Green Compressive Strength Of Moulding Sand	
34	Mould Box preparation hand tools and instruments	Wooden/ metal moulding box, moulding sand(50 kg), Hand tools like riddle, rammer, trowel, slick, lifter, strike-off bar, sprue pins, mallet etc	