

**3.1.5 Institution has the following facilities to support research**

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## Central Instrumentation Centre


KLE Technological University has provided following Central Instrumentation facility for research

- i) MakerSpace
- ii) Centre for Material Science
- iii) ESDM / VLSI Incubation centre
- iv) Thinkering Lab

<b>Centre Name</b>	<b>MakerSpace</b>
Details	<p>The 'MakerSpace' is a central facility created to promote product development and realization ecosystem on the campus. It intends to provide students with unique learning experiences on real industry problems and products in a work-emulating environment. It helps them understand industry needs, professional requirements and the product realization process. The MakerSpace provides modern design, prototyping, and manufacturing facilities required for realization of any electromechanical product. It also provides expert supervision and training to use the facilities.</p> <p>The MakerSpace is administered by the College as a resource for all engineering departments. Facilities, with an investment of about 3.0 crores of rupees, occupying 10,000 square feet, include a machine shop (4000sq.ft), model shop (2000sq.ft) and project work area (4000sq.ft). Engineering student can use the MakerSpace for concept design &amp; realization, course-related activity and/or competition projects such as SAE Formula, SAE- BAJA SAE- eokart, SAE-Efficycle, ROBOCON, etc. The shop is open 8 am-8 pm weekdays and on weekends as needed.</p>
Year of Establishment	2015
Photo	
Brochure	<a href="#">MakerSpace Brochure</a>

<b>Centre Name</b>	<b>Centre for Material Science</b>
Details	<p>The Centre for Material Science (CMS) at KLE technological university was established in April 2014 to foster advanced, interdisciplinary research in the areas of nano-materials and nano-composites for various engineering applications. The centre has several on-going government funded projects and state-of-the art facilities to carry out innovative research in material science. Micro-Nano Fabrication Facility (CMS-MNF2) was initiated in April 2017 which houses a Class 10,000 clean room dedicated for nano-fabrication activities. With five core research groups, the centre engages in providing an early research experience for undergraduates (REU), M.Tech and Ph.D candidates to promote interest in the field of research and product development.</p>
Year of Establishment	2014
Photo	
Link for details	<a href="https://kletech.ac.in/initiatives/cms/">https://kletech.ac.in/initiatives/cms/</a>
Brochure	<a href="#">Centre for Material Science</a>

<b>Centre Name</b>	<b>ESDM / VLSI Incubation centre</b>
Details	<p>The KLE CTIE has already several startups like Vegam-io, Skycraft in the area of ESDM and VLSI. To grow this ecosystem further 'Karnataka Biotechnology and Information Technology Services (KBITS)' Government of Karnataka, KLE Tech University and Indian Electronics and Semiconductors (IESA) have come together to establish a unique incubation center to support start-ups in the areas of ESDM and VLSI. Startups in this domain find very difficult to access the software and the licenses due to the very high cost of access the same. The incubation centre will make these advanced world class design tools and facilities available to the start-ups in the domain. The center with approx. 5000 sq. ft of office space at KLE technological University Tech Park, will have world class hardware/chip design, testing and validation facilities. High end EDA tools partnering with Mentor Graphics, Cadence, ARM will be made available to the startups. The faculty expertise of KLE Tech and Skilled industry mentors for product design, system, ESDM and VLSI will help the start-ups to scale up and meet the market needs. The centre will also work towards creating the skilled manpower in these domains.</p>
Year of Establishment	2012
Photo	
Link for details	<a href="https://kletech.ac.in/esdm-vlsi-incubation-centre-at-kle-technological-university-2/">https://kletech.ac.in/esdm-vlsi-incubation-centre-at-kle-technological-university-2/</a>


<b>Centre Name</b>	<b>Thinkering lab</b>
Details	<p>Thinkering lab is a small-scale prototyping facility available at KLE Technological University, which caters to the multi-disciplinary prototyping aspirations of first-year engineering students in the course Engineering Exploration. Thinkering lab was conceived by the Centre for Engineering Education Research (CEER) in March 2017. It is located in CEER, R K Kulkarni, Lecture Hall complex. The facility is 4500 sqft.</p> <p>The facility has almost all varieties of manual tools and handheld machine tools needed for prototyping purposes. The lab is equipped with different kinds of operations that can be performed on various soft materials like wood, acrylic, foam, aluminum, etc. The facility hosts a low-cost laser acrylic cutting solution, needed for the project requirements of the students. Since its inception, more than 850 first-year engineering projects are produced out of the Thinkering lab.</p>
Year of Establishment	2017
Photo	
Link for details	<a href="https://www.kletech.ac.in/engineering-exploration-course-project-exhibition/">https://www.kletech.ac.in/engineering-exploration-course-project-exhibition/</a>
Brochure	<a href="#">Thinkering lab</a>

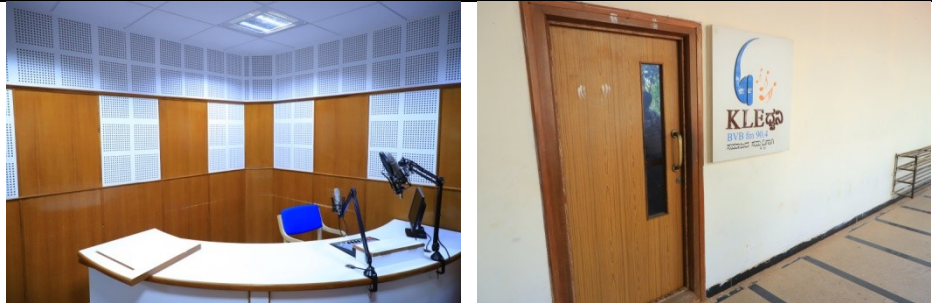
## Media laboratory/Studios includes

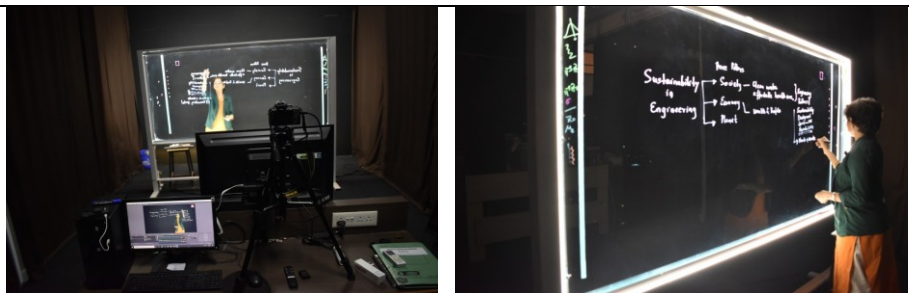
KLE Technological University has established three facilities namely,

1. KLE Tech - BVB Media
2. KLE Dhvani – 90.4FM
3. Light Board Studio

Faculty and students take active participation in all of them, the details of which are as below.

<b>Name</b>	<b>KLE Tech - BVB Media</b>
Details	KLE Tech – BVB Media is a club of students from KLE Technological University engaged in photography, web designing, posters & logo design, stop motion animation and many more. All designs of BVB Media are Open Source.
Year of Establishment	2012-13
Photo	
Link for details	<a href="https://www.flickr.com/photos/bvbmedia/">https://www.flickr.com/photos/bvbmedia/</a>

<b>Name</b>	<b>KLE Dhwani – 90.4FM</b>
<b>Details</b>	<p>“KLE Dhwani” is a ‘community radio’: a people’s radio by the people and for the people. Though launched by KLE, it gives an open opportunity to all types of citizens and organizations to express their aspirations, pains and pleasures, achievements and problems.</p> <p>‘KLE Dhwani is different from Akashavani, commercial FM radio stations, TV channels or news papers: it restricts itself to the affairs of Hubli Dharwad city; reflects your lives directly; reaches the happening of various extensions of the city to your listening; strives to mobilize people’s strengths to resolve the local problems; it provides a platform for exchange of thoughts on local administration, health, education, employment opportunities, personality development, women, children and youth development, music, literature, culture, heritage and the like. It provides free and fair time for all schools, colleges, organization, groups, forums etc to express themselves. Government departments, boards, corporations, city corporation, local governments can use KLE Dhwani as a tool to reach people of the city.</p> <p>KLE Dhwani, 90.4 FM broadcast programs in Kannada, Marathi, Urdu, Hindi, English, Konkani or any other languages spoken by local people.</p> <p>Facilities Soundproof audio recording studio, Speech, Music processor</p>
<b>Year of Establishment</b>	2013-14
<b>Photo</b>	
<b>Link for details</b>	<a href="https://www.facebook.com/pages/category/Community/KLE-Dhwani-BVB-904-fm-523166067763219/">https://www.facebook.com/pages/category/Community/KLE-Dhwani-BVB-904-fm-523166067763219/</a>

<b>Name</b>	<b>Light-board Studio</b>
Details	At KLE Technological University, faculty members have Light-board (Glass-board) recording studio. These studios offer a new way to create videos for e-learning. The light board technology provides new opportunities for creative use as presenters interpret images, animations and videos; here, presenters can position themselves behind the glass and write key points on it and the writing glows because of fluorescent markers. And presenter can also do a live graphics overlay. Light-board helps in transforming offline classes into online using existing classroom infrastructure with some modifications like making the classroom sound proof and air-conditioning
Year of Establishment	2019-20
Photo	
Link for details	<a href="https://www.kletech.ac.in/information/">https://www.kletech.ac.in/information/</a>



## Business Lab

KLE Technological University has established Business lab to support finance and business studies.

Name	SMSR - Business lab
Details	<p data-bbox="386 417 662 447"><b>Finance lab (Fin-Lab)</b></p> <p data-bbox="386 457 1435 751">It is essential for the MBA finance graduates to understand the working of capital markets with special reference to BSE and NSE. The capital markets and price movements are major areas of study worldwide. In order to sensitize MBA Finance students to Indian capital markets, the Finance Laboratory was planned. It is a unique exercise to get D-Street to classroom. The finance lab established in 2014 under “Finance Club” at SMSR. The lab provides insights to the capital markets and asset prices. The objective of this lab is to connect pedagogy to practice.</p> <p data-bbox="386 804 1435 1140">The lab has 60 work stations well connected with high speed internet and power backup facility. Through each of the work stations, students get connected to the websites, obtain the data and interpret. The price data is received live (previous day’s closing) from BSE and NSE websites on timely basis. Students carry out Fundamental and Technical Analysis through freely available websites like investing.com, in.tradingview.com, stockchrats.com, and equitymaster.com. Students spend around 25hrs of their course time to carry out the study. Initially lab focused only to equity data that was later extended to currency and commodities market.</p> <p data-bbox="386 1192 1435 1486">Students carry out trading exercises and create portfolio in monecontrol.com as a part of their laboratory exercise. Further they practice constructing portfolios, minimizing risk, and return maximizing strategies. Finally, student-wise and group-wise reports were generated and submitted at the end of the course. The club also hosts talks by the experts on fundamental analysis, technical analysis, budgets and its effect on capital markets, and portfolio analytics by the industry practitioners. The experts and course coordinator provide regular feedback on trading strategies adopted by students.</p> <p data-bbox="386 1539 1435 1728">The assessment weighed 80% of the In-Term-Assessment. The simulated trading practical helped students to polish their savings and investment skills to become real life trader, an investor and investment banker. This also helped the students to connect courses like Security Analysis and Portfolio Management, Risk Management, and International Financial Management.</p> <p data-bbox="386 1780 1230 1799">Some of the activities carried out in Fin-Lab are illustrated below:</p>



Fig. 1:- Money-gram is an event that brings industry investors and freelancers to classroom. Experts share their investment journey with students on one-to-one basis. In this event around 14 investors participated and interacted.

Fig. 2 & 3: Union budget and its effect on capital markets expert talk was carried out at SMSR. Experts from academia and industry shed light on budget and capital markets behavior in present and past.

Fig. 2





Fig. 3



Fig. 4: Students visit to IIFL, Dharwad branch as a part of lab exercise.

Fig. 4



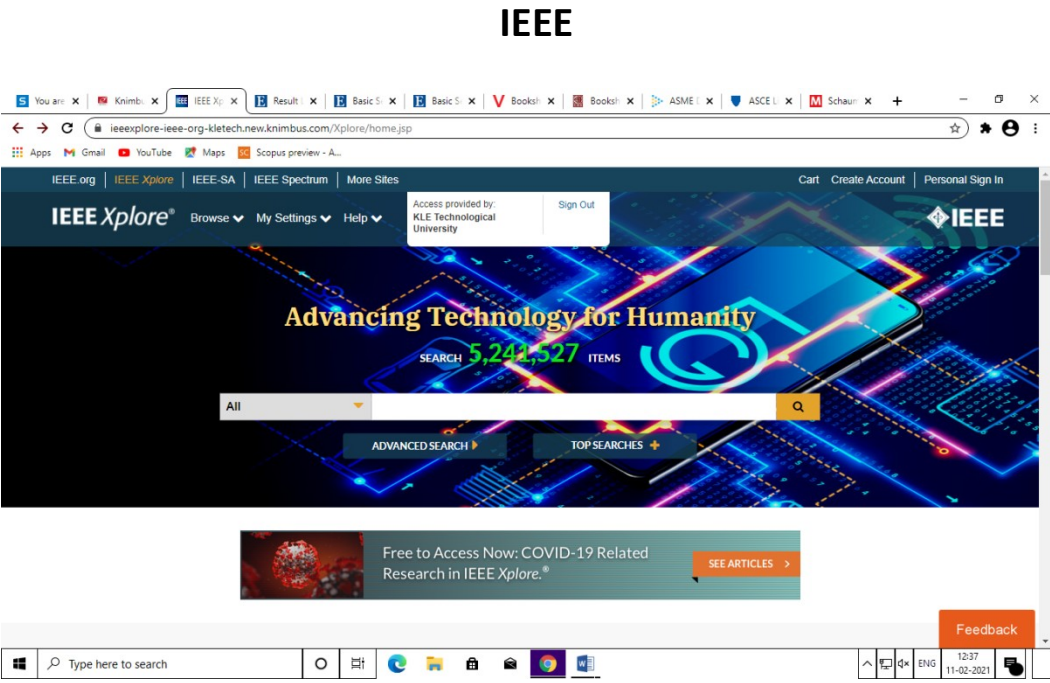
		<p>Fig. 5 : Post Budget Analysis talk by experts</p>						
<p>Supporting Lab</p>	<table border="1"> <tr> <td data-bbox="386 758 581 831">Computer Lab</td> <td data-bbox="586 758 1430 831">Computer Lab with 60 networked PCs</td> </tr> <tr> <td data-bbox="386 831 581 936">Life skills Lab</td> <td data-bbox="586 831 1430 936">Organize life skills like Team working, Communication skills through activity based workshops</td> </tr> <tr> <td data-bbox="386 936 581 1089">Business Modelling Lab</td> <td data-bbox="586 936 1430 1089">The Lab provides live inputs in organizing a business model right from scratch. It helps students to identify a market, create products / services, sell products and show how profits should be made.</td> </tr> </table>		Computer Lab	Computer Lab with 60 networked PCs	Life skills Lab	Organize life skills like Team working, Communication skills through activity based workshops	Business Modelling Lab	The Lab provides live inputs in organizing a business model right from scratch. It helps students to identify a market, create products / services, sell products and show how profits should be made.
Computer Lab	Computer Lab with 60 networked PCs							
Life skills Lab	Organize life skills like Team working, Communication skills through activity based workshops							
Business Modelling Lab	The Lab provides live inputs in organizing a business model right from scratch. It helps students to identify a market, create products / services, sell products and show how profits should be made.							
<p>Year of Establishment</p>	<p>2008</p>							
<p>Photo</p>								
<p>Link for details</p>	<p><a href="https://kletech.ac.in/somsr/">https://kletech.ac.in/somsr/</a></p>							

## Research / Statistical database

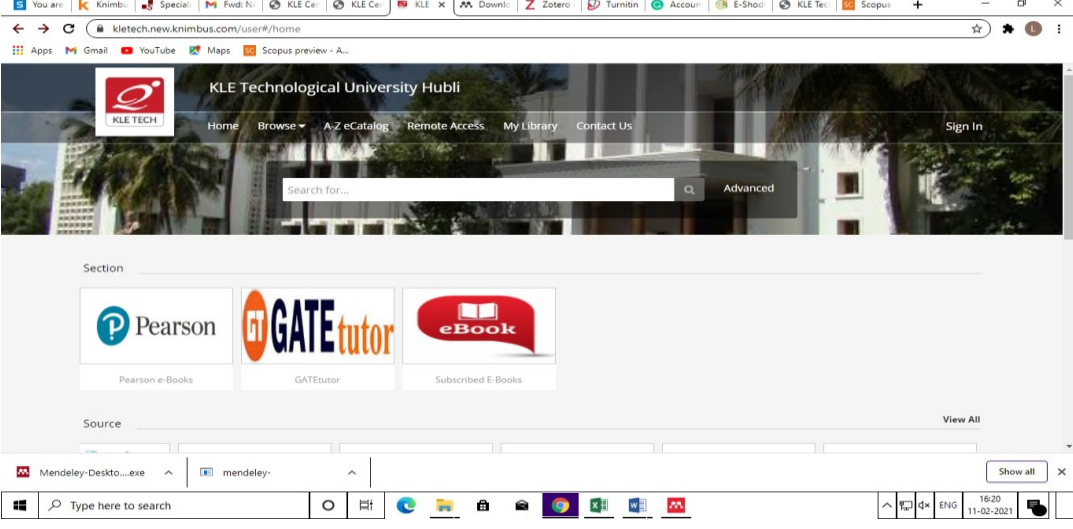
KLE Technological University has provided following research / statistical databases,

1. IEEE Explore, Knimbus
2. SPSS
3. R software

### IEEE Explore



KLE Technological University has subscription to IEEE Explore, which is a powerful resource for discovery of scientific and technical content published by the IEEE (Institute of Electrical and Electronics Engineers) and its publishing partners.

<p><b>Knimbus</b></p>	<p style="text-align: center;"><b>KNIMBUS PLATFORM</b></p>  <p>Knimbus is an information search and collaboration platform that connects researchers of different fields and helps them to discover open access.</p>
<p><b>SPSS Software</b></p>	<p>The IBM® SPSS® Statistics software platform is a robust statistical software platform. It comes with a comprehensive range of capabilities that enables to derive actionable insights from its data. This is used by students/Researchers /Faculty for their research work and projects.          SPSS:<a href="https://www.ibm.com/in-en/analytics/spss-statistics-software">https://www.ibm.com/in-en/analytics/spss-statistics-software</a></p>
<p><b>R Software</b></p>	<p>R is free Software that can perform mathematical and statistical calculations. It comes with its own programming language and built-in functions for doing any particular task. This is used to deliver courses like Engineering Mathematics, Business Analytics, Data Analytics for undergraduate students and post graduate students.          Site Link: <a href="https://www.r-project.org/">https://www.r-project.org/</a></p>

**Copy of Subscription letters**

- 1. Subscription letter of SPSS Software**
- 2. Subscription letter of IEEE Explore**
- 3. Subscription letter of Knimbus**

**Pronteff IT Solutions Pvt Ltd**  
 #1-48/243, 4th Floor, RR Plaza, Kavurihills,  
 Madhapur, Hyderabad  
 Telangana 500081 IN  
 9392241641  
 accounts@pronteff.com  
 GSTIN: 36AAJCP3092M1ZW  
 PAN No. AAJCP3092M  
 CIN: U72900TG2017PTC118318

**Tax Invoice**

INVOICE TO
KLE Society's B V Bhoomaraddi College of Engineering & Technology, Vidya Nagar, Hubli Karnataka 580031 India State Code: 29
<b>PLACE OF SUPPLY</b> 29 - Karnataka

SHIP TO
KLE Society's B V Bhoomaraddi College of Engineering & Technology, Vidya Nagar, Hubli Karnataka 580031 India State Code: 29

INVOICE NO.	DATE	TOTAL DUE	DUE DATE	TERMS	ENCLOSED
1281	24/03/2020	INR 2,01,579.00	25/03/2020	Immediate	

**PO NO. & DATE**

TEQIP-III/2020/KA/bcet/70

NO	HSN/SAC	ACTIVITY	UNIT	QTY	RATE	TAX	AMOUNT
1	997331	<b>DOEKZLL</b> IBM SPSS Statistics Standard Authorized User License + SW Subscription & Support 12 Months		1	1,70,830.00	18% IGST	1,70,830.00

Ref No: TEQIP-III/2020/KA/bcet/70 Date: 06-Mar-20  
 Bank Details :  
 Account Name Pronteff IT Solutions Private Limited  
 Account No. 50200026354988  
 Type of Account Current  
 Name of Bank HDFC Bank  
 Branch Name 1/10/60/3, Begumpet Rd, Old Patigadda, Chikoti  
 Gardens, Begumpet, Hyderabad, Telangana  
 IFSC No. HDFC0000621  
 MICR No 500240002  
 SWIFT Code No. HDFCINBBHYD

<b>SUBTOTAL</b>	1,70,830.00
<b>GST @ 18% on 170830.00</b>	30,749.40
<b>TOTAL</b>	2,01,579.40
<b>ROUND OFF AMOUNT</b>	-0.40
<b>BALANCE DUE</b>	<b>INR 2,01,579.00</b>

Declaration - No TDS on Software sales Certified in accordance with  
 CBDT Notification No.21/2012 dated 13 June 2012





# IBM Singapore Pte Ltd

Registration No. 1975-01566-C

IBM Singapore Pte Ltd, 9 Changi Business Park Central 1, The IBM Place, Singapore 486048

Quantity	Part Number	Description	Software Subscription and Support Coverage Dates
1	D0EKZLL	IBM SPSS Statistics Standard Authorized User License + SW Subscription & Support 12 Months Total points for this item: 29.60	19-Mar-2020 - 31-Mar-2021

[www.ibm.com/software/getspss](http://www.ibm.com/software/getspss)

Data Processing Protection - IBM's Data Processing Addendum (DPA) at <http://ibm.com/dpa> and the DPA Exhibit at <https://www.ibm.com/mysupport/s/article/support-privacy> apply to Client personal data, if and to the extent: i) the European General Data Protection Regulation (EU/2016/679); and ii) other data protection laws identified at [www.ibm.com/dpa/dpl](http://www.ibm.com/dpa/dpl) apply.

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IBM Order Reference Number: **62497593**

IBM Customer Number: **010034**

Inter-co Ref. number: **62499019**

Useful/Important Web resources:

Passport Advantage information, customer secure site access, training, etc.: [ibm.com/software/passportadvantage](http://ibm.com/software/passportadvantage)

IBM's International Program License Agreement and product License Information documents: [ibm.com/software/sla](http://ibm.com/software/sla)

IBM Software Support Web site: <https://www.ibm.com/software/support/handbook.html>

IBM Customer Number: **010034**

Inter-co Ref. number:

# IBM Singapore Pte Ltd

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Passport Advantage information, customer secure site access, training, etc.: [www.ibm.com/software/passportadvantage](http://www.ibm.com/software/passportadvantage)

IBM's International Program License Agreement and product License Information documents: [www.ibm.com/software/sla](http://www.ibm.com/software/sla)

IBM Software Support web site: <https://www.ibm.com/software/support/handbook.html>

IBM Customer Number: 010034

# E-COPY OF THE LETTER OF SUBSCRIPTION of E-JOURNALS

**EBSCO** **PROFORMA TAX INVOICE**

GSTIN: 9917USA290120SE  
 Name: EBSCO INTERNATIONAL INC.  
 Address: 5724, Highway 280 East, Birmingham, Alabama, United States of America- 35242  
 S. no. of Invoice: 1/19-20/P1-38  
 Date of Invoice: 30 April 2019  
 PAN Number: AACCE-3535-D

**Details of Receiver (Billed to)**  
 Name: The Registrar, K L E Technological University  
 Address: Vidya Nagar, Hubballi,  
 State: Karnataka  
 State code: 580031  
 PAN:  
 GSTIN (Unique ID)  
 Place of supply: Hubballi Karnataka

Sr. No.	Description of Goods/Services	Subscription Period	HSN/service accounting code	Qty	Unit	Currency Exchange Rate	Total (USD \$)	Total (INR)
1	IEEE IEL Online Innovation Q Plus Package	12months	998431	1	1	72.00	\$ 13,800.00	₹ 9,93,600.00
SUB TOTAL							\$ 13,800.00	₹ 9,93,600.00
							USD Value	INR Value
							Discount Rate	
							Taxable Value	\$ 13,800.00
							Add: IGST @ 18% (Refer Point No.8 of Terms & Conditions)	\$ 2,484.00
							TOTAL	\$ 16,284.00

Total Invoice Value (In figure) ₹ 11,72,448  
 Total Invoice Value (In Words) Rupees Eleven Lakhs Seventy Two Thousand Four Hundred and Forty Eight Only  
 Amount of Tax subject to Reverse Charge No Nil

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 a) EBSCO Information Services India Private Ltd. is an independent entity.  
 b) EBSCO Information Services India Private Ltd. role is limited to marketing and coordination for the distribution and delivery of the worldwide publications offered by EBSCO International Inc. in India and collecting payments from customers of EBSCO International Inc. in India.  
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 2. PURCHASE ORDER (PO) MUST BE IN THE NAME OF EBSCO INTERNATIONAL INCORPORATED.  
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 4. Bank Exchange rate - GOC rate is applicable.  
 5. Terms: Net due upon receipt of invoice EBSCO guarantees payment to all publishers.  
 6. Payment should be made within 21 days.  
 7. Shipment is made directly from overseas supplier.  
 8. We have been made to understand that, K L U Technological University qualify as 'non-taxable online recipient' under Section 2(16) of IGST Act. Accordingly, GST under forward charge will be payable by us i.e. EBSCO International Inc. However, please note that you being a 'non-taxable online recipient' would not be able to claim ITC (tax credit) of such GST collected from you and paid to government. Further, in case, at a later stage, we are informed that K L E Technological University does not qualify as 'non-taxable online recipient', the GST paid by us to the government under forward charge would not be refunded.

**BANK DETAILS**

INDIAN RUPEE WIRE TRANSFERS CAN BE SENT TO  
 Account Name: EBSCO Information Services India Pvt. Ltd.  
 301 & 303, Ansari Chamber - II, Bhitkai Cama Place  
 New Delhi-110066  
 SWIFT CODE: DEUTIN33DE  
 IFS CODE: DEUT1796DE  
 Deutsche Bank AG, Filiale New Delhi, Global Business Services, 18-20, 14th Floor, HT House K G Marg,  
 110 001, New Delhi  
 ACCOUNT NO.: 1527340000

US DOLLARS TRANSFERS CAN BE SENT TO  
 Account Name: EBSCO International Inc.  
 5724, Highway 280 East, Birmingham, Alabama,  
 United States of America - 35242  
 SWIFT CODE: WFBIUS65  
 Bank Name & Address: Wells Fargo Bank, San Francisco, CA USA,  
 ABA: 121000248  
 ACCOUNT NO.: 2000027338795

Signature: \_\_\_\_\_  
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*TEEE*  
*Budhan*  
*24/05/19*

## IEEE PAYMENT DETAILS

SL. NO.	PAR TIC ULARS	SUBSCRIPTI ON PERIOD	SUBSCRIPTI ON PRICE	PUBLISHE RS	PAYMENT DETAILS	INVOICE NO. & DATE
1	IEEE IEL	FROM 30-04-2019 TO 30-12-2020	1172448.00	EBSCO	GIST CHQ. NO.: 410486/2.5.2019, UTR NO. P19050338506530	GISTIN 9917USA290120SE-1/19-20/P1-38; 30-04-2019

KNIMBUS SUBSCRIPTION DETAILS

KNIMBUS

This is DSC Based Payment. PPA generation not applicable

**PFMS Generated DSC Transaction Payment Advice Report**

Agency Name: NATIONAL PROJECT IMPLEMENTATION UNIT-[BVBCETH]

Debit Bank Name : PUNJAB NATIONAL BANK

Bank Account No: 3702002100031759

Approval date in PFMS: 21-Dec-2019

DSC Signing Date in PFMS: 22-Dec-2019

Amount (in Rs.) : 566,400.00 (Amount in words : Five Lakhs Sixty-Six Thousand Four Hundred

No. Of Beneficiaries: 1

Not to be used by bank for making any payments

Debit Payment Advice No.: C121920713464

S.No.	Beneficiary Name	CPSMSTransaction ID	Account Number	IFSCCode	UIDNumber	Amount In (Rs.)
1	KNIMBUS ONLINE PRIVATE LIMITED	C121920713680	xxxxxxxxxx1000	HDFC0000044		566,400.00
Total Amount(Rs):						566,400.00

(Sign by Authorized Signatory)

Name - \_\_\_\_\_

Designation - \_\_\_\_\_

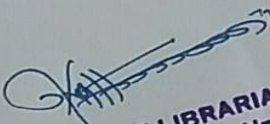
Mobile No - \_\_\_\_\_

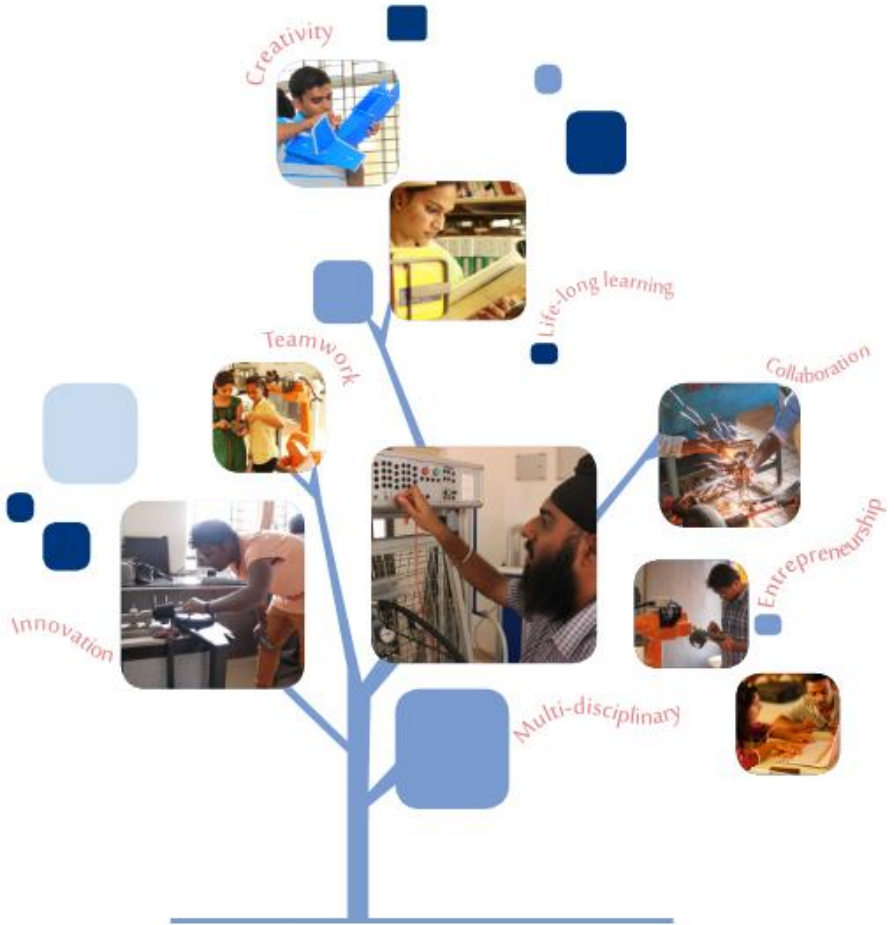
(Sign by Authorized Signatory)

Name - \_\_\_\_\_

Designation - \_\_\_\_\_

Mobile No - \_\_\_\_\_

  
**CHIEF LIBRARIAN**  
**KLE Technological University**  
**MIBBALLI-580 031.**



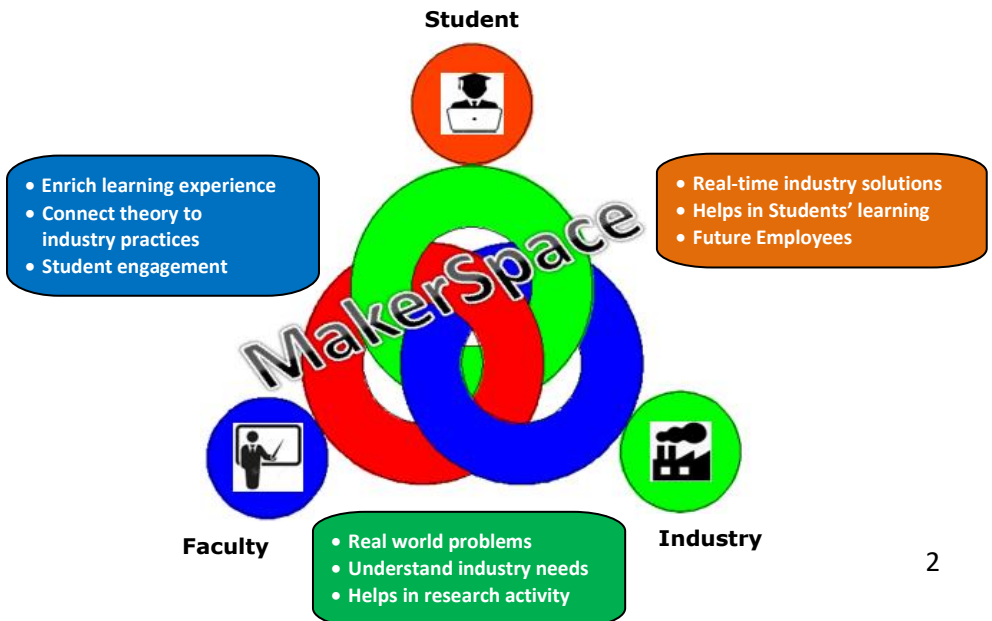
# MakerSpace

*Dream it., Make it...*

# MakerSpace

The 'MakerSpace' is a central facility created to promote product development and realization ecosystem on the campus. It intends to provide students with unique learning experiences on real industry problems and products in a work-emulating environment. It helps them understand industry needs, professional requirements and the product realization process. The MakerSpace provides modern design, prototyping, and manufacturing facilities required for realization of any electro-mechanical product. It also provides expert supervision and training to use the facilities.

The MakerSpace is administered by the College as a resource for all engineering departments. Facilities, with an investment of about 3.0 crores of rupees, occupying 10,000 square feet, include a machine shop (4000sq.ft), model shop (2000sq.ft) and project work area (4000sq.ft). Engineering student can use the MakerSpace for concept design & realization, course-related activity and/or competition projects such as SAE Formula, SAE- BAJA SAE- ecokart, SAE-Efficycle, ROBOCON, etc. The shop is open 8 am-8 pm weekdays and on weekends as needed.



Supervision is provided and advice is offered to get them started, but students build their own dreams, make their own mistakes, and learn from them. Facilities include state of the art machine tools and support systems that compliment the prototyping process.

The ultimate goal of the MakerSpace is to support the students and entrepreneurs to convert their product ideas into a reality. The facilities are open to student teams, faculty members and entrepreneurs working towards creating products to realize our national dream 'Make in India'.



To avail the MakerSpace facility engineering student/ student teams irrespective of any discipline should undergo a safety training workshop which would be conducted on every Saturday from 10am to 12noon. The workshop emphasis is on the personal safety in the workshop, safe handling of the equipment/ the artifacts made and the environment. Thereafter students will be issued with a MakerSpace identity card and would be the gate pass. It has a full- time staff members, headed by a facilities coordinator.

## Facilities in Nutshell

SNo.	Facility	Capability
1.	CNC Turning Centre	Precision Cylindrical parts High-speed Machining Versatile
2.	CNC Vertical Machining Centre	Parts of dies and molds High-precision parts Prismatic part machining
3.	CNC Wire EDM Machine	Electric Discharge Machining Machining difficult to machine materials Delicate parts
4.	CNC Router	Machining various materials Complex contours Easy to operate
5.	CNC Laser Cutting Machine	Cutting materials such as acrylic, Double colored board, leather, fabric, paper, wooden packaging box, bamboo craft, leather shell, ivory and so on. Architectural model, aviation and navigation model
6.	CNC Plasma Cutting Machine	Any thickness from 0.3mm through to 25mm can be cut. Virtually any metal can be plasma cut including: steel, stainless steel, aluminum, copper, galvanized sheet Cut precise and intricate flat shapes.
7.	3D Desktop Milling Machine	PCB making Non-proprietary materials – acrylic, wax, . . . Creating prototypes
8.	3D Printing Machine	High-end prototyping Powered by Poly-jet technology ABS as printing material.



9.	3D Imager	Fast and consistent measurements for dimensional inspection and reverse engineering applications. On parts, assemblies, and tools. Reverse engineering applications
10.	Portable Co-ordinate Measuring Machine	Verification of product quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis, reverse engineering Measurements with regard to GD&T
11.	Plastic Injection Molding Machine	The plastic injection molding machines along with the customized mold are used to produce vast quantities of identical plastic items ranging from disposable consumer goods to high precision engineering components Mass Production
12.	Universal Cylindrical Grinding Machine	Grind the external and internal surfaces of a cylindrical work-piece to a very close tolerance up to 0.003mm with high quality surface finish (up to N4).
13.	Universal Tool & Cutter Grinding Machine	Sharpening and reconditioning wide range of high speed and carbide tipped tools
14.	PCB Machining	PCB Prototyping systems enable easy and high precision board making <ul style="list-style-type: none"> <li>• Ideal for in-house prototyping</li> <li>• Time saving of product development</li> <li>• Produces boards with the precision expected in a laboratory</li> <li>• Processing without chemicals</li> </ul>

## CNC Turning Centre (02Nos.)

CNC turning center meets the needs of modern machine shops, now and long into the future. High-speed precision CNC turning center offers maximum versatility and productivity.



### Specifications

Swing over Bed/ cover	400mm
Swing over carriage	250mm
Distance Between Centers	380mm
Max. Turning Diameter	225mm
Max. Turning length between chuck & center	300mm
Motor Power	5.5/7.5 k W
Spindle Bore Diameter	40mm
Bar Capacity	25mm
Max. Speed	4000RPM
No. of Stations on Turret	08 No.
Positional Accuracy X axis	+/- 0.005mm
Positional Accuracy Z axis	+/- 0.0075mm
Repeatability X axis	+/- 0.002mm
Repeatability X axis	+/- 0.003mm
Control System	FANUC Oi Mate TD
Power Supply	3HP



## CNC Vertical Machining Centre (02Nos.)

A vertical machining center (VMC) is a machining center with its spindle in a vertical orientation. VMCs are high-precision machines often used for tight-tolerance milling, such as fine die and mold work. Vertical machining centers are creating the parts and die/ molds that matter with precision, accuracy, repeatability and surface finishes that virtually eliminate bench work. They can rough and finish hardened steel cavities/cores far more efficiently than general-purpose machines. High-speed spindles employ high-feed-rates at shallow depths of cut to achieve high- efficiency milling.



### Specifications

X axis travel (Longitudinal)	480mm
Y axis travel (Transverse)	360mm
Z axis travel (Vertical)	500mm
Repeatability	+/-0.005mm
Positional Accuracy	0.010mm
Stalling Torque	6Nm
Control System	FANUC OI Mate MD
Max. Spindle Speed	9000RPM

## CNC Vertical Machining Centre (DMG MORI)

Aircraft parts are more difficult to machine than general parts. The reasons include the work-pieces being with complex curved surfaces, as well as being susceptible to deformation because of thin walls; also the issue of high-performance aircraft materials such as titanium, stainless, exotic alloy. The Machine is intended for this purpose with capabilities for machining high speed-high precision parts for aerospace application. An optimized machine structure also increases stability during machining, and a high degree of manufacturing flexibility is provided in the standard version by having 30 tool pockets in the tool magazine.

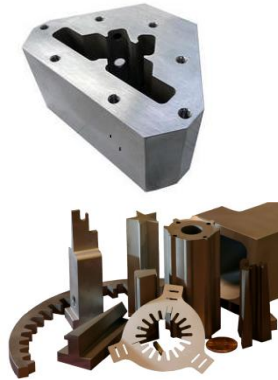


### Specifications

X axis travel (Longitudinal)	600mm
Y axis travel (Transverse)	560mm
Z axis travel (Vertical)	510mm
Repeatability	+/-0.005mm
Positional Accuracy	0.005mm
Stalling Torque	6Nm
Control System	HEIDENHAIN
Max. Spindle Speed	12,000RPM

## CNC Wire EDM

Wire EDM is a method to cut conductive materials with a thin electrode that follows a programmed path. The electrode is a thin wire. Typical diameters range from 0.10mm - 0.30mm although smaller and larger diameters are available. The hardness of the work piece material has no detrimental effect on the cutting speed. There is no physical contact between the wire and the part being machined. Rather, the wire is charged to a voltage very rapidly. This wire is surrounded by de-ionized water. When the voltage reaches the correct level, a spark jumps the gap and melts a small portion of the work piece. The de-ionized water cools and flushes away the small particles from the gap. The CNC machine can independently move four machines axes to generate taper cuts. A stamping die can be machined with 1/4 degree taper or a mold with one degree taper in some areas and two degrees in another with precision. Extrusion dies can be cut with the taper constantly changing. Wire EDM can be accurate to +/-0.003mm. Virtually no burrs are generated. Since no cutting forces are present, wire EDM is ideal for delicate parts. No tooling is required so delivery times are short. Pieces up to 200mm thick can be machined.



### Specifications

Max. Table Size	370 x 670 mm
Max. Work-piece height	200 mm
Max. Taper Angle	+/- 5 degrees/100mm
Dry run Speed	80 mm/min
Wire Diameter	0.25mm
Min. Input Command	0.001mm
Min. Resolution	0.001mm
Data Input/ Output	USB 2.0, Keyboard & RS232C
Power Supply	3Ph 415V

## CNC Router

A CNC router is a computer-controlled machine for cutting various hard materials, such as wood, composites, aluminum, steel, plastics, and foams. It is one of many kinds of tools that have CNC variants. A CNC router is very similar in concept to a CNC milling machine.

A CNC router can be used in the production of many different items, such as door carvings, interior and exterior decorations, wood panels, sign boards, wooden frames, moldings, musical instruments, furniture, and so on. In addition, the CNC router helps in the thermoforming of plastics by automating the trimming process. CNC routers can help ensure part repeatability and sufficient factory output.

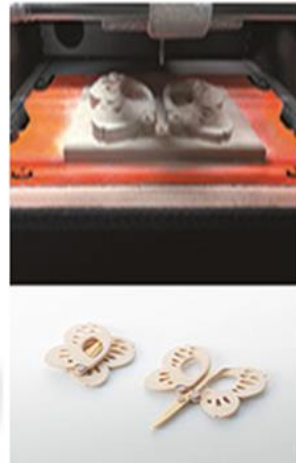


### Specifications

Bed type	Regular PCB Drilling Type
Max. Working Area	1200 x 600 x 120mm
Spindle	2.2KW, Water Cooled, 24000RPM
Collet Type	ER16
Control Language	Exlon Drill File, Standard NC
Addressable Resolution	0.05 mm
Power Supply	AC 1Ph-240V

## 3D Desktop Milling Machine

The 3D desktop milling machine incorporating innovative subtractive rapid prototyping (SRP) features to deliver accuracy, smooth finishes and efficiency in a compact format. With its new-design milling spindle, collet, circuit boards and control software, the machine produces beautiful finishes, including smooth curved surfaces and intricate details. Precision milling makes it ideally suited for creating prototypes which require mechanical checks and confirmation of fit. The machine can mill a variety of non-proprietary materials including modeling board, acrylic and wax. The results look and feel closer to the final production runs and are ready for final validation.

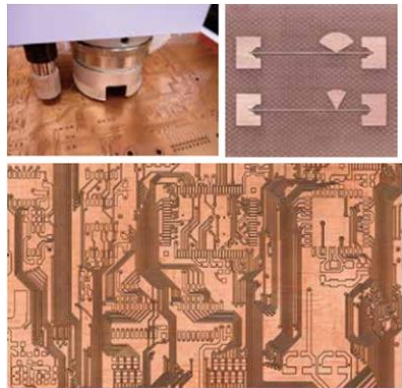


### Specifications

Max. Working Area	203 x 152 x 60mm
Table Size	232 x 156 mm
Max. Weight On Table	2 Kg
Tool Shaft Diameter	STD Collet 6mm
Max. Feed Rate	30mm/sec
Mechanical Resolution	0.001mm
Spindle Motor	30W, DC motor
Cutter Rotation Speed	3000- 7000 RPM
Type of axis motors	Stepper
Interface with Computer	USB 2.0
Control Software	Modela Player 4
Power Consumption	55W

## PCB Prototyping Machine

MITS PCB prototyping machine can mill various types of the boards from normal circuit boards to extremely thin circuit boards. Besides PCBs, MITS PCB prototyping machine achieve the fine processing on the surface of other materials such as aluminum or acrylic. Printed circuit boards can be machined by importing your CAD data (Gerber or DXF output format) to MITS software enabling smooth process from CAD designing to board making.



### Specifications

Working area	229x300x45*6 mm
Table size	296x370 mm
Minimum width line & space	0.1mm
Resolution	0.156 $\mu$ m
Maximum travel speed	55 mm/sec
Spindle speed	5,000 -62,000 RPM
Power consumption	200 VA
Features	Auto tool change
Machine weight	Approx. 0.34 kg



## CNC Laser Cutting Machine

Over the past decade, laser cutting has developed into state-of-the-art technology. It is estimated that more than 40,000 cutting systems are used for the high-power cutting of metals and non-metals world-wide. When including low-power applications, such as plastics cutting and paper cutting, the numbers are even higher.

This CNC Laser cutting machine has laser power of 180watt CO2, sealed Laser tube of wave length 10.6um; able to cut up to 30mm acrylic, up to 8mm MDF, up to 0.8mm stainless steel, fabric, paper and paper board. The power working is 1220 x 2440 mm and the positional accuracy is about 10 microns.



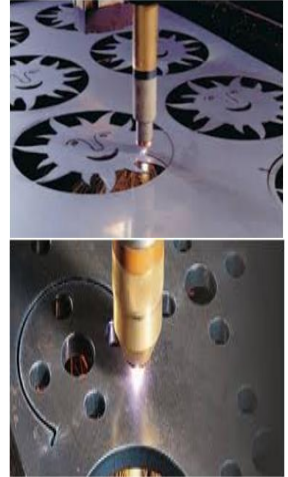
### Specifications

Laser Tube	180W
Working Area	1220 x 2440mm
Laser Type	CO <sub>2</sub> , Sealed Laser Tube, Wave Length 10.6um
Cooling System	Water Cooling
Power Adjustment	0-100% Step-less control 0-100% Adjustable in software
Engraving Speed	0-70000mm/min
Cutting Speed	0-18000mm/min
Positional Accuracy	<0.01mm
Consuming Power	<2000W
Support Format	PLT, DST, DXF, BMP, AI, Support Auto CAD, Corel Draw Output
Power Supply	AC 220V/110V+10% 50Hz/ 60Hz Peak current 10KVA



## CNC Plasma Cutting Machine

The plasma cutting systems are powerful and accurate machines which run off a personal computer. These machines are remarkably versatile and easy to use; cut precise and intricate flat shapes. Any thickness from 0.3mm through to 25mm can be cut, depending on plasma cutter selection. Virtually any metal can be plasma cut including: steel, stainless steel, aluminum, copper, galvanized sheet and more.



### Specifications

Machine Type	Cantilever
Effective Cutting Width	1500mm
Effective Cutting Length	3000mm
Positioning Speed	6m/min
Air Plasma Source (Torch)	Power Source to Cut Pierce Capacity 10mm
Auto Lifter, Anti-collision Device	Enabled
Oxy-Fuel Torch (Acetylene/ LPG)	Cutting Range 6mm-50mm (MS) Hole Piercing 6mm-40mm(MS)
Power Supply	3Ph, 415V, 20HP at Peak Load

## 3D Printer

The Objet30 Pro combines the accuracy and versatility of a high-end rapid prototyping machine with the small footprint of a desktop 3D printer. Powered by Poly-Jet technology, it offers eight different 3D printing materials, among them clear, high-temperature and simulated polypropylene, and features the industry's best print resolution so you get smooth surfaces, small moving parts and thin walls. With a roomy tray size of 300 × 200 × 150 mm. Objet30 Pro is ideal for prototyping consumer goods, consumer electronics, medical devices and more. The Objet30 Pro gives the power to create realistic models with specialized properties quickly and easily in-house.

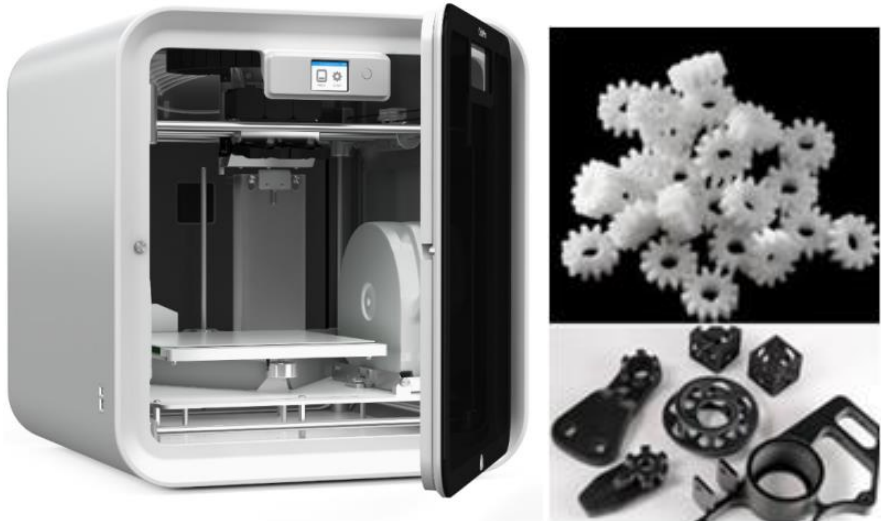


### Specifications

Model Material	Rigid opaque, Vero White Plus, Vero Gray, Vero Blue, Vero Black, Simulated Polypropylene: Durus
Support Material SUP705 gel-like photopolymer support	SUP 705 (Water jet removable) SUP706 (Soluble)
Max. Bed Size	294 x 192 x 148.6mm
System Size & Weight	82.6 x 60 x 62 cm; 106kg
Resolution	X-Y axis 600 dpi, Z-axis 900 dpi
Accuracy	0.1mm varies depending on part geometry , size orientation, material and post processing method
Min. Layer Thickness	28 microns
Build model	High Speed 30 microns resolution
Software	Objet Studio
Operating Conditions	Temperature 18-25°C Relative Humidity 30-70%
Power Requirements	1Ph, 100-200V, 50-60Hz, 7A or 200-240V; 50-60Hz, 3.5A

## 3D Printers (Cubepro 2 Nos.)

The **Cubepro** 3D printers (Duo & Trio) are efficient, strong, fast, fully automated low cost printers, multi-colored, easy feed cartridges gives the flexibility in printing accurate components out of ABS, PLA and wood filaments.



### Specifications

Max. Build Size (Duo-Double Head)	242.9(W) x 230(H) x 270.4(B)mm
Max. Build Size (Trio-Triple Head)	200.4(W) x 230(H) x 270.4(B)mm
Z axis Resolution	0.100mm
Layer Thickness	70microns, 200microns and 300microns for fast mode
Print Tolerance	X & Y axis_ +1% of Dimension or +0.2mm Z axis_ half the processed Z resolution
Print Speed Extruded Volume	Max. 15mm/sec and polymer dependent
Weight	4.5 kg
Power Requirement	100-240V AC
Max. Operating Temperature at Extruder Tip	536°F / 280°C
Support Material	PLA/ABS/ Dissolvable natural PLA
Support Removal	Dissolvable in sodium hydroxide solution used with heated ultrasonic cleaner

## 3D Printer -AION 500

AION 500 is a fully enclosed industrial grade 3D printer and high print quality and repeatability. The machine is easy to use for prototyping to low-volume manufacturing with impeccable accuracy. The AION 500 is a high performance 3D printer that offers a professional-level build size of 500 x 500 x 500 mm volume. With multiple connectivity options and sensors, it is one of the most advanced 3D printers available.



### Specifications

Physical Dimensions(DWH)	955mm x 1040mm x 925mm (37.6in x 40.99in x 36.41in)
Maximum Printable Area(Dual Extruder)	500mm x 500mm x 500mm
Recommended Materials	ABS, PLA, HIPS, PETG, Carbon fiber, AFPM Special Material, & AFPM Carbon fiber
Material Support	Non hygroscopic HIPS
Maximum Print Speed	200mm/s
Build Rate(Material Deposition Rate)	15-30 cm <sup>3</sup> /hour
Layer Precision	Layer thickness range:range1:0.1-0.15,range2:0.15-0.25,range3:0.25-0.3
XY Precision	Positional accuracy 16 micron
Z Precision	Patented precision Z axis mechanism with electromechanically synchronized four ball screws and moving XY gantry

## 3D Imager

The FARO Cobalt Array Imager is a metrology-grade, non-contact scanner which utilizes blue light technology and on-board processing to capture millions of high resolution 3D coordinate measurements in seconds. It delivers fast and consistent measurements for dimensional inspection and reverse engineering applications.

Compact and lightweight, the Cobalt Array Imager is easy to use across multiple applications. The combination of flexibility, portability, speed and accuracy makes Cobalt Array Imager an ideal solution for demanding metrology needs

Benefits: Increases the effective field of view which, in turn, reduces inspection time and increases productivity. A multiple imager array of Cobalt sensors is more flexible and affordable than purchasing a larger field of view system.



## Portable Coordinate Measuring Machine

The Faro Arm is a portable coordinate measuring machine (CMM) that allows manufacturers easy verification of product quality by performing 3D inspections, tool certifications, CAD comparison, dimensional analysis, reverse engineering, and more. Using a point or ball probe on an articulating arm allows the user to collect individual 3D data points of an object in space.

This method of data collection is the most accurate way to define the form of an object that is typically more geometric than organic.

It is especially useful for reverse engineering applications when precision is the most important factor.



### Specifications

Working volume	1200mm spherical
Accuracy	0.018mm

### Most Common Applications

Metal Fabrication	Dimensional Analysis, Part Inspection, On-Machine Inspection
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Aerospace	First article Inspection, Alignment, Dimensional Analysis
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Tool & Die	Dimensional Analysis, Tool Set-up, On-Machine Inspection
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Automotive	Part Inspection, Alignment, Dimensional Analysis Portable and easier-to-use than a fixed CMM
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Features	Mount and measure parts in process Generate GD&T & SPC reports
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## Vertical Plastic Injection Molding Machine

Injection molding is often ranked as the one of the commonly used processes in the production of plastic items. The plastic injection molding machines along with the customized mold are used to produce vast quantities of identical plastic items ranging from disposable consumer goods to high precision engineering components.



### Specifications

Max. Injection Shot	60gm
Injection Unit Screw Diameter	25-30mm
L/D ratio	20
Screw Speed	0-180RPM
Injection Stroke	125mm(Min.)
Max. Mould Clamping	30T
Mould Opening Stroke	300mm
Min. Mould Thickness	75mm
Max. Mould Thickness	175mm
Size of the Mould Plate Distance Between Tie-Bar	300 x 180mm



## Power Tools

These robust tools offer personnel in the metalworking trades fast work progress, even in tough applications. The special advantages include an extremely robust lever and spring construction and a powerful 2000-watt motor with starting current limitation. They work quickly and reliably when cutting metal profiles like rectangular or steel pipes. At the heart of this tool is the tried-and-tested Bosch angle grinder motor, so these always deliver and achieve a superior lifetime.



**Pedestal Grinder**



**Hand Drilling Machine**



**Angle Grinding Machine**



**Abrasive cut-off machine**



**Mitre saw**



**Jig Saw Machine**

## Other Machine Tools



**Centre Lathe**



**Drilling Machine**



**Surface Grinder**



**Universal Tool & Cutter Grinding Machine**



**Universal Cylindrical Grinding Machine**

## Contact Details

The students, faculty members and the entrepreneurs who are in alignment with the objectives and wish to avail the support of the MakerSpace may note the contact details as follows.



**KLE** Technological University

Creating Value  
Leveraging Knowledge

**Praveenkumar M Petkar**  
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**Dr. Ravi Guttal**  
Director, Center for Innovation &  
Product Development (CIPD)  
Tel. +91 9923800242  
[ravi\\_q@bvb.edu](mailto:ravi_q@bvb.edu)

**Coordinators of Schools of Engineering**  
Heads of Engineering Departments  
KLE Technological University  
Hubballi





**CENTER FOR MATERIAL SCIENCE (CMS)**  
**KLE Technological University**

**Vision**

The Material Science Cluster will be recognized in education, research and consultancy in **composites and nano-materials** by industries, peers at academic institutions and will be a source of research expertise, technical innovation and product development.

**Mission**

- To develop research facilities for synthesis, characterization and testing of composites.
- To foster capacity building of researchers and promote collaborative works.
- To develop composites and nano-composites for structural, automotive and energy engineering applications.
- To facilitate interdisciplinary and applied research with a focus on innovative product development.

**About Centre for Material Science**

Centre for Material Science mainly caters to research and development activities in the area of Nano-materials, Nano-composites for various engineering applications like structural, energy, biotechnology and agricultural sectors. The centre has several funded projects and state-of-the-art facilities to carry out innovative research in material science. Establishment of clean room facility of class 10000 for dedicated nano-fabrication facilities exist.

**Research facilities:**

- Class 10,000, grade C- Cleanroom
- Chemical Vapor Deposition (CVD)
- PVD-Thermal evaporation unit, RF Magnetron Sputtering
- Hall effect measurement system
- Probe Sonicator
- Spin coater
- Wear & Friction monitor Model-20LE Ducom Instruments
- 8” Double Disc Variable Speed (Chennai Metco)
- General Purpose Grinder (Chennai Metco)
- Trinocular Vertical Metallurgical Microscope



- Chemical Fume
- Pervaporation Set up
- Keithley 6517B High Resistance Electrometer
- Universal Testing Machine
- Physical Vapor Deposition
- Radiator and Heat Exchanger test rigs



### Chemical vapor deposition (CVD)

Make: VT Vacuum Bangalore

- Tube Furnace with Max temp-1200° C with vacuum
- Gas Mixing and delivery System
- Mass Flow Controller: Power Supply - 247 D to M 100B
- Calibrated for Ammonia (NH<sub>3</sub>), Nitrogen(N<sub>2</sub>), Argon (Ar)
- 247 D Four Channel Mass Flow Controller Power Supply
- Agilent make Rotary Vane Pump DS:302



### Thermal Physical Vapor Deposition (PVD)



Make: Vacuum Techniques Bangalore

- Vacuum Chamber :400mm(W) x 400mm (D) x 400mm(H)
- Rotary Vacuum Pump and Diffusion Vacuum Pump
- Liquid Nitrogen Trap
- High Vacuum Valve
- Digital Pirani and Penning Gauge



**Wear & Friction monitor (Model-20LE)**

Make: DUCOM Instrument

- Wear Disc Diameter:  $\varnothing$  165 mm
- Pin Diameter and Ball Diameter
- Wear Track Diameter
- Disc Speed: Min 200 - Max 2000Rpm





- 1) General Purpose Grinder
- 2) 8" Double Disc variable Speed
- 3) Trinocular Vertical metallurgical Microscope, Plain Optics & Incident Light illumination, Chennai Metco.



#### **Probe Sonicator (Anamatrix Instruments)**

- Power:250 W Advanced and Frequency: 20KHz
- Display temperature control
- Overload Protection
- 10 operation Programs
- Probe Diameter :¼" (6mm)



#### **Programmable Spin Coating System**

(Apex Instruments)

- Oil free Vacuum Pump
- Delrin Substrate Holders
- Inert Gas Purging port (Nitrogen)



### Hall Effect measurement (Ecopia Corporation)

- Model: HMS - 3000/MS55T
- Spring Clip type sample Board



### PVD - RF/DC and Thermal Sputtering

#### Specifications

DC sputtering (DC Power supply model PS-1000)

Applied voltage: 0-1000

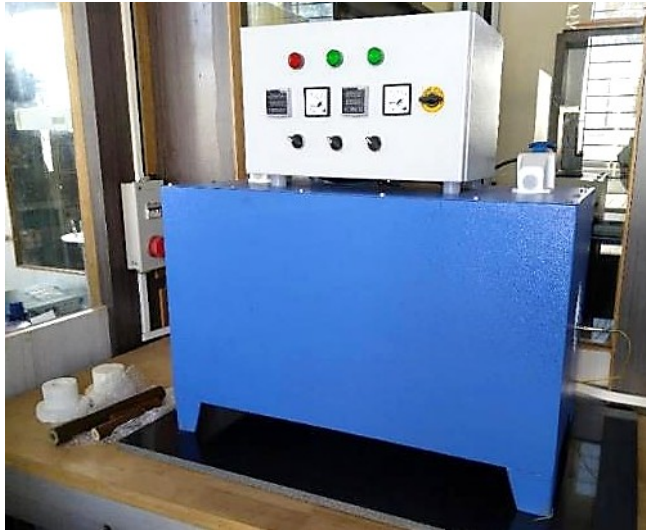
Cathode assembly: 2 inches

Rf sputtering (AG plasma Series RF generator)

RF power out output: 0-300 w

Cathode assembly: 2 inches

1. Reactive gases: Oxygen and Nitrogen
2. Sputtering gas: Argon
3. Substrate temperature: up to 400 °C
4. Substrate rotation



### Chemical Vapor Deposition

1. Two zone furnaces
2. Programmable Temperature varies from room temperature to 1000 °C



### Probe station with R-T Measurement system

Specifications (Make: 6517b Electrometer/ High Resistance Meter)

1. Build in voltage source up to 1000 V
2. Voltage measurements up to 200 V
3. Measures Resistance from 1 to  $10^{18}$  Ohm
4. Current measurement 10 aA to 20 Ma
5. Charge measurement: 1fC to 2  $\mu$ C
6. Substrate temperature varies from room temperature to 450 °C





### UTM, Model 10 ST

#### Features

- Suitable for tension, compression, flexure, shear and other tests to a maximum force of 10kN / 2,000 lbf
- Various system interface options available, from a familiar tethered handheld interface, a wireless Bluetooth interface panel, or virtual machine controller
- All interface options integrate with Horizon data analysis software
- Meets or exceeds the requirements of national and international standards for materials testing systems
- 8 full-length T slots built into machine column to allow accessories to securely mounted to the test frame
- Built-in pneumatic distribution ports that provide local air supply to pneumatic grips

### Membrane Technology Laboratory (VGST sponsored)



#### Fourier Transform Infrared Spectroscopy

Make: PerkinElmer, Spectrum Two FT-IR Spectrometer

Specifications



- 21 CFR Part 11 Compatible Yes
- Depth 30.0 cm
- Detector Type DTGS
- Height 21.0 cm
- Operating Range 5 - 45 °C
- Portable Yes
- Product Brand Name Spectrum Two
- Wave Length 8300 - 350 cm<sup>-1</sup>
- Weight 13.0 kg
- Width 45.0 cm



**Pervaporation setup**

It is used to remove moisture from alcohols using membrane technology



**Karl Fischer Titrator (KAFI)**

Make: Labindia

Features



- Advanced Microcontroller based user-friendly, state-of-the-art product design with User interactive software for ease of operation with protection against invalid entries.
- Quick interchangeable imported burette assemblies with intelligent recognition for its volume size. Burette validation factor for dispensing correction is available for true end point volume.
- System recognizes proper connectivity of other peripherals like Burette, Stirrer, Electrode, Pen Drive etc. Gives indication in case of improper connectivity.
- Large memory capacity for method storage with suitable scientific parameters having GLP compliance.
- Sample Name & Identification Number with Date and Time for authentication. Daily Auto Incremented Run number and Factory entered CUSTOMER NAME & Instrument Sr. No. on report printouts make the system foolproof and GLP compliant.
- Quick monitoring, and automatic neutralization of moisture leak into vessel to keep it ready for next titration.
- End point delay up to 100 sec for slow moisture releasing samples.
- On line leak rate correction available.
- Microcontroller based variable speed, magnetic stirrer with digital indication.

**UAS Dharwad sponsored**



**Contact angle meter**

**Make: Apex instruments**



### Make: Acam Series Features

- Stage Heating Module: Up to 200°C by Heating Jacket Module or by Liquid Circulating Jacket Module
- Stage Movement Module: Movement of Substrate Stage in XZ Directions or XYZ Directions
- Zoom Lens Module: Zooming Facility up to 10X
- Auto-dispensing Module: Liquid Dispensing with a Programmable Volume & PC-controlled Dispensing Speed Range of 0.038 - 16 µl/sec.

### Details of Publications

- Journals: 140
- Conference proceedings: 50

### Details of Patents

Sl. No	Financial Year	Title of Patent	Patent Application No.	Inventors Type	Current Status
1.	2015-16	Nano-composite coatings for Tribological applications	2182/CHE/2015	Shankar A. Hallad N. R. Banapurmath Arun Y. Patil Anand M. Hunashyal Ashok S. Shettar	Online Published
2.	2015-16	Nanocomposites for cutting tool tip	4628/CHE/2015	Shankar A. Hallad N. R. Banapurmath Arun Y. Patil Anand M. Hunashyal Ashok S. Shettar	Online Published
3.	2016-17	Nano ceramic coating for cement composites	201641034228	Shankar A. Hallad N. R. Banapurmath Anand M. Hunashyal Sreelekshmi B. Shridevi H. Ashok S. Shettar	Online Published
4.	2016-17	Potash Alum Reinforced in Epoxy Resin	201614002919	Shankar A. Hallad N. R. Banapurmath Anand M. Hunashyal Chetan Kulkarni Ashok S. Shettar	Online Published
5.	2017-18	Synthesis of Nano-Coolant	201641034226.00	Shankar A. Hallad N. R. Banapurmath Anand M. Hunashyal Akshay P. M Ashok S. Shettar	online Published
6.	2017-18	Ceramic Membrane filtration	201641034227	Shankar A. Hallad N. R. Banapurmath Anand M. Hunashyal Ashok S. Shettar	Online Published



7.	2019-20	Ceramic nanocomposite for nuclear radiation shielding application	201941038623	Shankar A. Hallad N. R. Banapurmath Anand M. Hunashyal Ashok S. Shettar	Online Published
8.	30 November 2019 (2019-20)	Biodegradable Polymer Blend Films, Method and Process For Production Thereof	201941049309	Dr. Ashok M. Sajjan Dr. N. R. Banapurmath Mr. Sharanappa Achappa Dr. Ashok S. Shetter	Filed
9.	01-08-16	Ball Drying Apparatus	5664/CHE/2015	Mr. Arun Y. Patil Mr. Saurabh Bidari Dr. Nagaraj R Banapurmath Mr. Shankar Hallad Dr. Ashok S Shettar	FER Issued

### Funded projects

There are several fundings form state government agencies

- VGST, KFIST-Level II, Bangalore (40.0 Lakhs)- 2016-17, “Development of Novel Nano-composite hybrid polymer membranes for pervaporation separation of water from industrial waste organic solvents”, PI: Dr. Ashok M Sajjan
- VGST, KFIST-Level II, Bangalore (40.0 Lakhs)- 2013-17, “Synthesis and Characterization of group III- nitride nanostructure based FET for bio-chemical sensing applications”, PI: Dr. N. H. Ayachit and Dr.N .R. Banapurmath.
- VGST, SEED MONEY TO YOUNG SCIENTIST FOR RESEARCH (SMYSR) (Rs. 4 Lakhs) Synthesis of Ag and Au-coated III nitride nanostructures for biochemical sensing applications PI: KISHOR UPADHYAYA
- VGST, KFIST-Level I, Bangalore (20.0 Lakhs)- 2012-13, “Establishing the facility for nanotechnology for structural and energy engineering applications”, PI: Dr. S. S. Quadri.

### UAS Dharwad

- UAS, Dharwad (Rs. 4 Lakhs)- 2017-18, “Development of membrane filter technology for ethanol purification for fuel”, PI: Dr. A. M. Sajjan, Dr. N .R. Banapurmath and Dr. Geeta Shirnalli (UAS Dharwad).



- UAS, Dharwad 2nd Phase (Rs. 10 Lakhs)- 2016-17, “Development of membrane filter technology for increasing heat efficiency of biogas for power generation”, PI: Dr. N.R. Banapurmath, Dr. A. M. Sajjan and Dr. Geeta Shirnalli (UAS Dharwad).
- UAS, Dharwad 1st Phase (14.55 Lakhs)- 2015-16, “Development of membrane filter technology for increasing heat efficiency of biogas for power generation”, PI: Dr. N.R. Banapurmath and Dr. A. M. Sajjan.

### **Startup funding**

- IDEA2POC-Startup Grant from GOK (Rs. 25 Lakhs)- April 2017, “Economical production ecofriendly bioplastic for packaging segment”, PI: Dr. Jayachandra S. Y.



## ABOUT THINKERING LAB:

Thinkering lab is a small-scale prototyping facility available at KLE Technological University, which caters to the multi-disciplinary prototyping aspirations of first-year engineering students in the course Engineering Exploration. Thinkering lab was conceived by the Centre for Engineering Education Research (CEER) in March 2017. It is located in CEER, R K Kulkarni, Lecture Hall complex. The facility is 4500 sqft.

The facility has almost all varieties of manual tools and handheld machine tools needed for prototyping purposes. The lab is equipped with different kinds of operations that can be performed on various soft materials like wood, acrylic, foam, aluminum, etc. The facility hosts a low-cost laser acrylic cutting solution, needed for the project requirements of the students. Since its inception, more than 850 first-year engineering projects are produced out of the Thinkering lab.

Along with the various handheld and power machine tools, Thinkering lab also has a storage facility which issues consumables free of cost to students based on the requirement. The store is made available with the intention that the time spent by students in procuring the consumables otherwise can be used wisely to enhance the creativity in students' projects.

While one part of Thinkering lab comprises the tools and equipment, its value is enriched by a peer-mentoring program that operates here. The peer-mentoring program is called MITRA -**Mentor In ThinkeRing Lab**. Students of higher semester students come with their disciplinary knowledge to help the first-year engineer Exploration students in their course project physical implementation phase. MITRA provides in-time support to Exploration students in the Thinkering lab after college hours. The role of student Mentor's is to observe the safety and security of students and tools, fabrication Help, tools support, and debugging.

## Machines and Consumables available in Thinkering lab

### List of Machines:

1. Bench Lathe
2. Bench Milling Machine
3. Bench Multipurpose machine
4. Laser Acrylic cutting and engraving machine
5. Soldering stations
6. Glue gun 250 Watt
7. Vernier calliper 150mm (Digital)
8. Cordless Drilling Machine
9. Power Drilling Machine
10. Bench Grinding Machine
11. Bench Pillar Drilling Machine
12. Bench Sander Machine
13. Scroll Saw Machine
14. Handheld Multipurpose Tool + kit (12 pieces)

15. Jigsaw Machine
16. Handheld sanding machine
17. Hot Air Gun
18. Aluminum cutter
19. Sheet metal bending shearing rolling machine

**List of Consumables:**

- |                                      |  |
|--------------------------------------|--|
| 1. Bread board 175x67x8mm            | 86. Fevi bond 25 ml                        |
| 2. Arduinio Mega 2560                | 87. L- Clamp 3"                            |
| 3. Ultrasonic Sensor                 | 88. L- Clamp 1/2"                          |
| 4. Motor 60rpm                       | 89. L -Clamp 2"                            |
| 5. Motor 3.5rpm                      | 90. Hinges 40mm                            |
| 6. Battery cell 9volt                | 91. Radium cutter 18mm                     |
| 7. Bluetooth Module                  | 92. Fewikike gel 1gram                     |
| 8. Male to Female Connector 20cm     | 93. Fevi col 250 gm                        |
| 9. Scissors                          | 94. Lead big size 250 gm                   |
| 10. Two way Tape                     | 95. Single stand wire Black 91 meter       |
| 11. Electrical Insulating Tape Black | 96. Single stand wire Red 91 meter         |
| 12. Castors Wheel                    | 97. Freshners Sprey                        |
| 13. Taparia Screw driver 810         | 98. Glue Gun Sticks 20 cm                  |
| 14. Plastic Box No-33                | 99. 9volt battery cell                     |
| 15. Two channel relay 5v             | 100. PLM Oil (Machine purpose) 1 liter     |
| 16. FLD Belt                         | 101. File Handle                           |
| 17. Battery 12v,1.3amp               | 102. Paint Brush 100 mm                    |
| 18. Singlestand wire 91meter, 1/0.20 | 103. Steel Wire Brush                      |
| 19. Female to female connector 20cm  | 104. Two way tape 1" 5 meter               |
| 20. Big Screw Driver box             | 105. Jigsaw blade T123                     |
| 21. Adapter D.C pins(male+female)    | 106. Jigsaw blade T 119Bosch               |
| 22. Design Links box                 | 107. Jigsaw blade T118A Bosch              |
| 23. Spanner 6X7                      | 108. PVC pipe cutter                       |
| 24. Spanner 21X23                    | 109. Rubber pipe 6mm 20 meter              |
| 25. Ice-cream Sticks                 | 110. Rubber pipe 8mm 15 meter              |
| 26. Plastic Spoon                    | 111. Scissor 6"                            |
| 27. Adapter 12 volt 2 amps           | 112. First aid kit                         |
| 28. M3X20mm Bolt                     | 113. Cable Ties 200X3.6mm                  |
| 29. M3X25mm Bolt                     | 114. Cable Ties 150X3.6mm                  |
| 30. M3X35mm Bolt                     | 115. Ferm Scroll Saw Blade (HSN 8467)      |
| 31. M3X45mm Bolt                     | 116. Ferm Make BGM 1003 Sanding Belt       |
| 32. M3X100mm Bolt                    | 117. Ferm Make BGA 1037 Sanding Disc Paper |
| 33. M3XNut                           | 118. 12v Adapter D.C Jack                  |
| 34. M4X60mm Bolt                     | 119. CR Cell 2032 for vernier              |
| 35. M4X80mm Bolt                     | 120. Pully Belt 14" rubber                 |
| 36. M5X15mm Bolt                     | 121. Gear 6cm dia plastic                  |
| 37. M6X25mm                          | 122. Gear 4cm dia plastic                  |
| 38. M6XNut                           | 123. Pulley 7.5cm dia 2mm width            |
| 39. M8x20mm Bolt                     | 124. Pulley 5.5 cm dia 2mm width           |
| 40. M8x30mm Bolt                     | 125. Pulley 5 cm dia 2mm width             |



41. M8x50mm Bolt
42. M8x100mm Bolt
43. M8XNut
44. M10x40mm Bolt
45. M10x50mm Bolt
46. M10XNut
47. Washers M3
48. Washers M4
49. Washers M5
50. Washers M6
51. Drill bits 3mm (MS)
52. Drill bits 4mm (MS)
53. Drill bits 5mm (MS)
54. Drill bits 6mm (MS)
55. Drill bits 2mm (MS)
56. Drill bits 8mm (MS)
57. Drill bits 9mm (MS)
58. Drill bits 10mm (MS)
59. Drill bits 13mm (MS)
60. Drill bits 15mm (MS)
61. Drill bits 5mm (SS)
62. Drill bits 6mm (SS)
63. Acrylic Sheet 4MM (24 sqft)
64. Acrylic Sheet 6MM (24 sqft)
65. Foam board 3MM (32 sqft)
66. Aluminium Tube 1/2X1/2 Square
67. Aluminium square tube  
3/4X3/4(7608)
68. Aluminium L-Angle 1/2X1/2
69. Aluminium L-Angle3/4X3/4
70. Aluminium L-Angle 1X1(7608)
71. Aluminium L-Angle 1 1/2 (7608)
72. Aluminium L-Angle 2X2 (7608)
73. Aluminium Round pipe  
10mm(7608)
74. Aluminium rods 6MM (7604)
75. Aluminium rods 10MM (7604)
76. Aluminium rods 12MM (7604)
77. Aluminium U channel 1" (7604)
78. Plastic Square pipe
79. Nylon Rod 6mm X 1meter
80. Nylon Rod 10mm X 1meter
81. Nylon Rod 12mm X 1meter
82. Nylon Rod 14mm X 1meter
83. Nylon Rod 16mm X 1meter
84. Nylon Rod 20mm X 1meter
85. Nylon Rod 25mm X 1meter
126. U -Clamp 0.75"
127. U - Clamp 1"
128. U - Clamp 1.5"
129. U - Clamp 1.75"
130. Cleaning mop
131. Spirit Level
132. 1mm PCB Drill bit
133. Safety padded gloves
134. Safety goggles
135. Box 777 plastic
136. Box No.33 plastic
137. Heat resistant gloves
138. Taparia Screw Driver 6x200mm P6 862 \*
139. Taparia Screw Driver 6x250mm C 826 -
140. Taparia Screw Driver Small (Two in One) 810
141. Taparia Screw Driver Small (Two in One) 803
142. Taparia Screw Driver (Two in One) 9031
143. Taparia C- Clamp 2" 1259-2
144. Taparia C- Clamp 3" 1259-3
145. Dot Punch
146. Spanner (Jhalani) 12X13
147. Spanner Taparia 8X9
148. Taparia Spanner 6X7
149. Taparia & Deeps Spanners 10X11
150. Taparia Spanner 16X17
151. Nose plier 170mm
152. Cutting Plier 210mm
153. Jhalani Adjustable Spanner
154. Taparia sheet metal cutter 200mm
155. Hacksaw Frame (Small) 6"
156. Hacksaw Frame (Big) 12"
157. Bastard File 10"
158. Wooden File 10"
159. Half Round Wood File 12"
160. Half Round Wood File 8"
161. Hacksaw Blade (Big) 24TPI/12.5mm
162. Wood Cutter Disc 100mmX40T
163. Ball peen hammer
164. Chisel (20mm)
165. Trisquare 100mm
166. Nylon Mallet SFH25 Taparia 25mm
167. Wooden Hacksaw 18"
168. Wood Chisel 5cm
169. Stud M6
170. Stud M8

**STUDENTS IN ACTION IN THINKERING LAB**



**MITRAS IN THINKERING LAB**

