



VISWAJYOTHI
COLLEGE OF ENGINEERING & TECHNOLOGY
Approved by AICTE New Delhi & Affiliated to APJ Abdul Kalam Technological University

Vazhakulam P.O., Muvattupuzha
Ernakulam Dist., Kerala - 686 670
Tel: 0485 2262211 / 44
Email: vjcet@vjcet.org
www.vjcet.org



Report

on

Fabrication Laboratory

of

Viswajyothi College of Engineering and Technology

Vazhakulam, PO, Muvattupuzha, Kerala 686670



CONTENTS

I. AN OVERVIEW OF THE FACILITIES PROVIDED	3
I.1 ShopBot	4
I.2 3D Printer.....	5
I.3 Laser Cutter.....	6
I.4 Sand Blaster	6
I.6 Vinyl Cutter	7
I.7 Electronic Workbench	7
I.8 Equipment / Machines - Number and Usage Levels	8
I.9 The Space Earmarked for the Functioning of the Facility.....	9
II. THE DETAILS OF MAJOR PRODUCTS MADE IN THE FACILITY.....	10
II.1 Details of Projects from Mini Fab lab.....	13
II.2 Details of revenue generated from Fab Lab operations.....	17
III. TRAINING PROGRAMMES CONDUCTED UNDER THE FAB LAB FACILITY	17
III.1 Training Programme conducted for Students.....	18
III.2 Training Programme conducted for Faculty.....	18
III.3 Training Programme to use Fab Lab facility for Public.....	18
IV. INDUSTRY CONNECTIONS / COLLABORATIONS WITH THE FACILITY....	19



I. AN OVERVIEW OF THE FACILITIES PROVIDED

A Fabrication Laboratory (Fab Lab) of Viswajyothi College of Engineering and Technology (VJCET) provides a scientific prototyping platform for novelty and invention. Fab Lab also helps in providing stimulus for local entrepreneurship and serves as a platform for fostering creativity and learning. It is a miniature scale workshop offering digital fabrication which enables the clients to craft smart devices for themselves which can be tailored to local or personal needs. The Fab Lab also becomes a channel for linking to a global community of technologists, researchers and innovators. Students are given ample opportunities for hands own experience through Fab Lab.



ShopBot



3D Printer



Laser Cutter



Sand Blaster

Fig. 1: FAB Lab Machines



Fab Lab is one among the highlights of our College. As an add-on to the university prescribed syllabus, open ended experiments, advanced experiments, and design experiments are conducted in Fab lab to enhance the practical knowledge of the students. The details of the machines present in the Fab Lab are detailed in Fig. 1. The Fab Lab machines include:

I.1 ShopBot

Our affordable, smaller-sized ShopBot (Fig. 2) desktop is a digital fabrication powerhouse. It's built to perform like a big tool, built to be rugged, and built to last. In addition to impressive woodworking capabilities, the desktop delivers engraving level precision, and the power and rigidity to machine parts from wood, plastic, aluminium, and other materials. The desktop can perform a wide range of workbench, prototyping and production projects. Also, it is an agile platform to support your growing digital fabrication interests and needs.



Fig. 2: ShopBot Desktop

The features include:

- Drive System: 4 motors with integral, Teflon-coated precision lead screw with anti-backlash technology on each axis (1X, 2Y, 1Z)
- Integral guard and dust skirt
- Cut Speed: 4 inches per second (100mm/sec)
- Jogging Speed: 6 inches per second (150mm/sec)
- Resolution: 0.00025" (.00635mm)
- Electrical System Requirements: 120V @ 15Amps
- Frame: Machined aluminium members that are bolted together



- Linear Bearings: Fully supported precision linear guides and blocks on each axis
- ShopBot Control System software to run your CNC
- Each new ShopBot tool includes powerful design software to create CNC projects.
- Tasks carried out include Cutting, Drilling, Machining, Shaping and Print on Demand

I.2 3D Printer

The 3D Printer of Viswajyothi College of Engineering and Technology is called as Ultimaker 2+ Connect single nozzle 3D printer (Fig. 3). The Ultimaker 2+ Connect allows you to print with a wide range of materials, including, Nylon, PLA, ABS, CPE and TPU. The printer comes with a 750g spool of Ultimaker Silver PLA. The main components of Ultimaker 2+ Connect are print head, print head cable, build plate, build plate clamps, display, USB port, spool holder, bowden tube, feeder, on/off button, OUT port, power socket, ethernet port. The key features include:

- Network connectivity: Via Wi-Fi or Ethernet, print remotely over the cloud with added security
- Next-gen components: A stiffer build platform and rigorously tested material profiles ensure reliable printing
- Touch screen: For every action, the 2.4" color touch screen gives you intuitive control and assistance
- NFC material recognition with complete Cura software integration
- Enhanced safety: The Ultimaker 2+ Connect air manager removes up to 95% of ultrafine particles and shields users from hot components (sold separately)



Fig. 3: Ultimaker 2+ Connect single nozzle 3D printer



The device is mainly used for flexible design, rapid prototyping and print on demand options.

I.3 Laser Cutter

The Epilog Mini CO₂ Laser Cutter (Fig. 4) is used to engrave MDF, acrylic, paper, fabric, leather and much more. The machine uses the laser as an engraving tool and CO₂ as a laser source, to produce a permanent, crisp and a highly detailed mark without actually touching the material. The fabrication process of laser cutter includes Custom Designing using laser beam that is controlled by a PC. The model number is 1390, body material is acrylic, laser power is 40w, and power source is CO₂. The features of the laser cutter are:

- Flexibility
- Precision,
- Repeatability,
- Speed,
- Automation,
- Quality,
- Contactless Cutting



Fig. 4: Epilog Mini CO₂ Laser Cutter

I.4 Sand Blaster

Sand Blaster is shown in Fig. 5. The specifications of sand blaster include access doors 16-Inch wide; window size 9'' by 10.75'', abrasive capacity 10-pound, air pressure requirement 60-100 psi, and overall size is 24'' by 21'' by 19''. The features include:

- Used for removing debris



- Shoots out pressurized sand
- High speed
- Smoothens materials
- Also removes paint, dirt, rust and corrosion



Fig. 5: Sand Blaster

I.6 Vinyl Cutter

The vinyl cutter helps to trace out shapes and graphics for precision cuts applicable to multiple facets of vinyl image transfers. The machine (Fig. 6) is used for making stickers, letter cutting, and t-shirt making, etc. The features include:

- Used for precision cutting of graphics
- Produce shaped stickers and window graphics.
- Highly accurate cutting via vector cutting applications

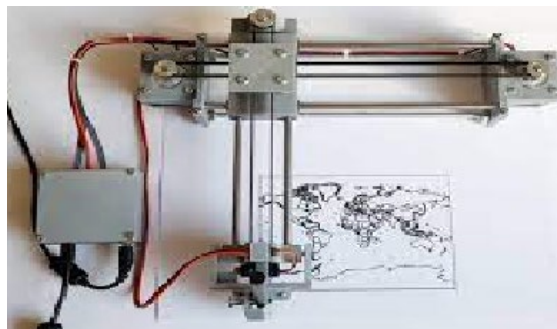


Fig. 6: Vinyl Cutter

I.7 Electronic Workbench

The Electronic Workbench of Viswajyothi College of Engineering and Technology (Fig. 7) allows the students to construct and interactively simulate both analog and digital circuits. Using standard schematic symbols for parts, the user selects individual components, which are displayed on the screen, and assembles them into a completed circuit.



Fig. 7: Electronic Workbench

The various functionalities of the Electronic Workbench include a Digital Storage Oscilloscope (DSO), Function Generator, Power Supply, Soldering Station, Microwave Oven, and Magnifier.

I.8 Equipment / Machines - Number and Usage Levels

Figure 8 shows and Table 1 illustrates the equipment / machines number and usage levels. Depending on the project work done by students, on an average five to six projects per year use these machines. During the period covid-19 pandemic 2020-2021 the usage was bit low.

Table 1: Equipment / Machines – Number and Usage Levels

Sl. No.	Equipment / Machines	Number	Frequency of Usage	Current Status
1.	ShopBot (CNC Machine)	1	Moderate	Working
2.	3D Printer	1	Moderate	Working
3.	Laser Cutter	1	Moderate	Working
4.	Sand Blaster	1	Moderate	Working
5.	Vinyl Cutter	1	Moderate	Working
6.	Electronics Workbench 6.1 DSO 6.2 Function Generator 6.3 Power Supply 6.4 Soldering Station 6.5 Microwave Oven 6.6 Magnifier	1	Moderate	Working
7.	Screen Printing	1	Moderate	Working
8.	Molding and Casting (Process)		Frequent	Working



Fig. 10: Space earmarked for Fab Lab in the institute

Fab Lab of Viswajyothi College of Engineering and Technology is located in the 2nd floor of R&D Centre building. The advanced Fab Lab was established in the campus for designing and developing innovative solutions to socially relevant projects. Layout plan for the Fab Lab of Viswajyothi College of Engineering and Technology is depicted in Fig. 9. The area constitutes about 198 m². The space earmarked for the functioning of the facility is shown in Fig. 10.

II. THE DETAILS OF MAJOR PRODUCTS MADE IN THE FACILITY



Fig. 11: Few Products made from various activities



Fig.12: Cybathlon Team

Figure 11 shows few products of various activities held in Viswajyothi College of Engineering and Technology. The details of these products made during various activities conducted are listed in Section III.

Viswajyothi College of Engineering and Technology secures 9th position in international level technical meet “Cybathlon 2020” global edition. The photograph (Fig. 12) shows the team members of “Cybathlon 2020” from Viswajyothi College of Engineering and Technology.

ETH Zurich is a public research university in the city of Zürich, Switzerland founded by the Swiss Federal Government Robert Riener, head of the professorship for Sensory-Motor Systems at ETH Zurich, initiated the Cybathlon in 2013 as a platform for the development of everyday-suitable assistance systems. The Cybathlon comes out of collaboration with the Swiss National Center of Competence in Robotics Research, which intends to use the competition to promote the development and widespread use of bionic technology.

Viswajyothi College of Engineering and Technology was the only engineering college selected from India to the International Competition – Cybathlon 2020 Global Edition. The Viswajyothi team designed and developed electromechanical arm prosthesis with PLA material. The robotic arms can assist people who have lost his/her limb due to illness or injury, in doing his/her day to day activities with ease. The designed model will create a revolution. Prof. Ralph Snider, German Scientist’s guided the team under the supervision of Dr. Anishin Raj, Dean & Professor Computer Science and Engineering who was the team



manager. The team members are Mr. Jekson George, Mr. Nixon George, & Mr. Akhil Raj (Technical staff from ECE and ME Department, Mr. Rahul Sathyan, Mr. Anjith P. N. and Mr. Harisankar S. (Student members from Electronics & Communication Engineering) and Co-ordinated by Ms. Jessy Mathew and Mr. Sanoj Saju. The task was performed by the Pilot Allen Mathew. The competition was held online on Nov13th 2020, at Zurich University. Among 49 participants from the top Technical universities from the 20 countries (Italy, Japan, Russia, France, South Africa, England, Germany etc.), Viswajyothi College of Engineering & Technology was awarded the 9th position in the powered arm prosthesis. It was a proud moment to all Viswajyothians!



Fig.13: FabricationProcess



Fig.14: Powered Prosthesis Arm

For competing in the contest, an innovative product “**Powered Prosthesis Arm**” was developed in the Fab Lab of Viswajyothi College of Engineering and Technology, so as to help the physically disabled people. The fabrication process of the “**Powered Prosthesis Arm**” is shown in Fig. 13 and the developed “**Powered Prosthesis Arm**” is presented in



Fig. 14 and Fig. 15.



Fig.15 Cybathlon competition

II.1 Details regarding some of the Projects done in Fab lab

Project 1

Name of the Project	HYBRID FUELED SI ENGINE
Description	Used laser printer
Faculty In charge	Mrs.Cini K
Details of Students involved	1. Arshal Muhamed 2. Filjo Thomas 3.Rishan Thomas 4.Romamol Johny
Status of the project	Successfully Completed

Project 2

Name of the Project	MODULAR ROBOT
Description	Used 3D printer
Faculty In charge	Mr.Sharone Varghese
Details of Students involved	1. Albert Baby 2. Jestin P Shaji 3.M J Krishnapriya 4. Maria Varghese
Status of the project	Successfully Completed



Project 3

Name of the Project	M _o S ₂ & B ₄ C REINFORCED HYBRID EPOXY COMPOSITE
Description	Used Milling Machine and Laser cutter
Faculty In charge	Mr. Unnikrishnan T G
Details of Students involved	1. Alen Shanty 2. Astrin Anil 3. Jithu George 4. Eldho Baby
Status of the project	Successfully Completed

Project 4

Name of the Project	BIO CERAMIC B ₄ C/MoS ₂ HYBRID EPOXY COMPOSITE
Description	Used Milling Machine, Laser Cutter
Faculty In charge	Mr. Unnikrishnan T G
Details of Students involved	1. Tony Biju 2. Sumesh Babu 3. Roshi Benny
Status of the project	Successfully Completed

Project 5

Name of the Project	SMART THERMAL JACKET
Description	Used Vinyl cutter and screen printing
Faculty In charge	Mrs. Breeza Paulose
Details of Students involved	1. Alex Thomas 2. Amal Vijay 3. Amrutha Krishna C S 4. Ashbin
Status of the project	Successfully Completed



Project 6

Name of the Project	ROBOTIC ARM
Description	Used 3 D printer
Faculty In charge	Mrs. Ranjini Surendran
Details of Students involved	1. SajithSaju 2.ArathyBKurisunkal 3.Arutha Mohan 4.Rhithu Shysu
Status of the project	Successfully completed

Project 7

Name of the Project	Smart Advertisement using Smart Mirror
Description	Used 3 d printer
Faculty In charge	Dr. Anishin Raj M.
Details of Students involved	1. Akhil Mathew 2.K J Harikrishnan 3. Athul Nair
Status of the project	Successfully Completed

Project 8

Name of the Project	High Performance Line Follower Robot
Description	Used 3 D printer
Faculty In charge	Mr.Manu Jose
Details of Students involved	1. Angola Sunny 2. Arya C S 3.Aryadevi K.V 4. Greeshma George 5. AnuShalet Philip
Status of the project	Successfully completed



Project 9

Name of the Project	Honey Comb driveways with bitumen finish
Description	Used 3 D printer
Faculty In charge	Mrs.Tina Jose
Details of Students involved	1. Basil K Alias 2. Deepanjali S Shaju 3. SagarTomy 4. Sreelakshmi R
Status of the project	Successfully completed

Project 10

Name of the Project	Prosthetic Arm
Description	Used 3 D printer
Faculty In charge	Mr.Eldhose Paul
Details of Students involved	1. Amal Sajeev 2. Cibin Thomas Jose 3.Basil Joy 4. Basil Shaju
Status of the project	Successfully completed

Project 11

Name of the Project	Convertible Drone
Description	Used 3 D printer
Faculty In charge	Mrs.SmithaCyriac
Details of Students involved	1. Anantha Krishnan M S 2. Anandhu Murali3.Paul Kuriakose 4. Sarathchandran S
Status of the project	Successfully completed



Project 12

Name of the Project	Self-Driving Car Using Computer Vision
Description	Used 3 D printer
Faculty In charge	Mrs. Sabitha Raju
Details of Students involved	1. Ananthakrishnan S Nair 2. AshwinSajeew 3. Sudev S 4. Melvin Vincent
Status of the project	Successfully completed

Project 13

Name of the Project	3-BSD Nozzle Design
Description	Used 3 D printer
Faculty In charge	Mr.Nibin B
Details of Students involved	1.Alwin Shaji 2.Arjun Bharath shah 3.Darpan Johnson 4.Arun Thomas
Status of the project	Successfully completed

II.2 Details of revenue generated from Fab Lab operations

A sum of Rs. 4700(material cost) was obtained as an income from the students of Viswajyothi College of Engineering and Technology for using Fab Lab for their project works. 564 Mementos were crafted at VJCET Fab Lab for all the graduated students of VJCET on the Merit and Farewell day of 2022.

III. TRAINING PROGRAMMES CONDUCTED UNDER THE FAB LAB FACILITY

Numerous training programs are conducted under Fab Lab of the institute, to name a few:



III.1 Training Programme conducted for Students

The training programs conducted for students are as follows:

1. A demonstration of Fab Lab machines to S7 CSE, S5 ME, S5 IT, S4 CSE was carried out in the year 2017 and 2018.
2. An orientation of Fab Lab for students of Civil, IT, ME, CSE, EEE was done in the year 2018.
3. Hands on Demo of Fab Machines to CSE, IT, ECE, ME, EEE students in the years 2019, 2020 and 2021 were carried out.

III.2 Training Programme conducted for Faculty

The training programs conducted for faculty are as follows:

1. An International Symposium on Innovative Engineering Paradigms by Mr. Ralph Schneider, SES Expert from Germany for the topic “Hands On Training On CNC Machine Laser Cutter, 3 D Printer, Vinyl Cutter” at VJCET Fab Lab (3-12-2018 to 21-12-2018)
2. Participated in Project contest named Cybathlon 2020 conducted at Zurich, Germany. The project is developed at Fab Lab of VJCET. Fab Lab workshop for Faculty of VJCET by expert resource persons on 18/10/2018 to 21/10/2018.
3. FDP program on Fab Lab by EEE department of VJCET on 4-7-2019

III.3 Training Programme to use Fab Lab facility for Public

The training programs how to use Fab Lab facility for public was conducted as follows:

1. Fab Lab orientation programme for school students of High School IT Club Koothattukulam from 3rd December 2018 to 31st December 2018.
2. Demonstration of Fab lab machines for Plus two school students- Koothattukulam on 7th February 2019.
3. Introduction to Fab Lab Machines and Equipment’s for Plus two students of St. Augustine HSS, Muvattupuzha on 27th February 2019



4. Demonstration of Fab lab machines for Cooperative school on the topic “Workshop on Robotics and Fablab”, Thodupuzha and De Paul Public School students- Koothattukulam on 2nd March 2019
5. Orientation program for +2 students of Technical Higher Secondary School, Muttom on 3rd August 2019.
6. Orientation program for +2 students of HSS Vimala Matha Kadalikad on 27th September 2019.
7. Workshop on “An Introduction and Demonstration of Fab Lab Equipment’s and Machines” to students of IT Club of St. Augustine’s G.H.S.S, Muvattupuzha on 20th February 2020.
8. Demonstration of Fab modules on the topic “Exposure to Fab Lab Machines” to students of St. Augustine HSS on 9th March 2020.
9. Demonstration of Fab Lab machines and equipment’s on the topic “Exposure to Fab Lab Machines” to 1st year students of AI and EEE from 19th March 2021 to 25th March 2021.

IV. INDUSTRY CONNECTIONS / COLLABORATIONS WITH THE FACILITY

Fab Lab of our institute is having collaboration with Senior Experten Service (SES) Germany Collaboration. The institute organized various activities along with SES. Such as,

- Department of Mechanical engineering and SES skilled in manufacturing proceduresliketurningjointlyorganizedinternationalsymposiumoninnovativeengineering paradigms on 3rd – 21st December 2018 (Fig. 16).



Fig.16 SES Database Workshop Inauguration



➤ The International workshop on Databases was organized by the Department of CSE, VJCET in Collaboration with Senior Expert Service (SES), Germany from 3/12/2018 to 10/12/2018 (Fig. 17). The resource person was Mr. Dipling Jürgen Gau, SES Faculty, Germany. The main objectives of the workshop were:

1. To understand the latest trends and innovations in the area of NoSQL Databases for the development of Social Network / Machine Learning related software development.
2. To enable the delegates to develop new applications for start-ups in the latest arena of computer science.



Fig. 17 SES Database Workshop



Fig. 18 Inauguration of SES AI Workshop



Two weeks 'International workshop on Artificial Intelligence organized by the department of IT, VJCET & Senior Expert Service (SES), from 3rd December 2019 to 13th December 2019 (Fig. 18). The resource person was Mr. Doepel, SES Faculty, Germany.