SCIEnT PROPOSAL

Facilitating students' innovation and technological development

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NIT TRICHY ALUMNI BATCH 1990 CHARITABLE TRUST SCIEnT, NIT Trichy, TAMIL NADU, 620015, India,

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1) Introduction:

This is a proposal that seeks to transform the educational experience for students interested in pursuing various technical activities in the campus. The objective of this project is to transform the Student Centre for Innovation in Engineering and Technology (SCIEnT) into a comprehensive resource hub that caters to the diverse needs of various technical clubs and individual innovators within NIT Trichy.

2) About NIT Trichy

National Institute of Technology, Tiruchirappalli (NIT Trichy), makes innovation and meets excellence! Situated in the heart of Tamil Nadu, NIT Trichy stands as a beacon of cutting-edge technical education, research, and development. The dynamic campus fosters a vibrant community of scholars, engineers, and innovators, all driven by a shared passion for pushing the boundaries of technology. With state-of-the-art facilities, a rich legacy of academic prowess, and a commitment to shaping the future, NIT Trichy is a gateway to a world of endless possibilities in the realm of technology and engineering.

3) About SCIEnT

In 2015, a remarkable idea took root during the 25th-year reunion of the Class of 1990 at the National Institute of Technology, Trichy (NIT Trichy). This idea, born out of a collective passion for innovation, would later blossom into a thriving hub for student-driven technology and creativity. This visionary group of alumni saw the need for a dedicated space where students could pioneer innovation and pursue their wildest ideas with the necessary resources. Thus, the Student Centre for Innovation in Engineering and Technology, or SCIEnT, was born with the motto: "**Walk in with an idea, walk out with a prototype**." This facility is NITT's step towards an Atmanirbhar Bharat. Here, students are equipped with all the resources and support they need to take strides in innovation and technology, to ideate, create and make in India.

4) Goal of the Project

The goal of this project is to enhance the learning and research capabilities of students. Currently, the SCIEnT facility faces a significant equipment shortage, compelling students to travel to the city for access to precise instruments required for their projects. By acquiring state-of-the-art equipment within SCIEnT, we aim to:

i) Facilitate Student Innovation

- Around 1000 students annually work at the SCIEnT lab on various technical projects.
- Ensure easy access to advanced equipment within the university.
- Reduces travel time and costs for students.

ii) Promote Interdisciplinary Collaboration

- Create a collaborative environment for students from different technical clubs.
- Encourages collaboration on innovative projects.

iii) Improve Skill Development

- Provide hands-on experience with cutting-edge technology.
- Enhances students' technical skills
- Increases their employability.

5) Project Objectives

1. Comprehensive Resource Hub:

The primary objective of this project is to transform the Student Centre for Innovation in Engineering and Technology (SCIEnT) into a comprehensive resource hub that caters to the diverse needs of various technical clubs and individual innovators within NIT Trichy. The specific objectives include:

a. Centralized Access: To provide a one-stop venue where all students, regardless of their technical club affiliations, can conveniently access high-tech equipment and facilities for their innovation projects.

b. Modeling After Excellence: To model SCIEnT after the success of institutions like Stanford Innovation Lab and IIT Madras' Centre for Innovation (CFI), ensuring that NIT Trichy offers similar, if not superior, resources and opportunities for innovation and research.

c. Facilitating Cross-Collaboration: To encourage cross-club collaboration, enabling students from diverse backgrounds to work together on interdisciplinary projects, thereby fostering a culture of innovation and teamwork.

d. Promoting Excellence: To raise the standard of innovation within NIT Trichy by equipping students with state-of-the-art tools, enabling them to excel in their respective fields and contribute to the institution's reputation for academic excellence.

e. Creating Industry-Ready Graduates: To provide students with practical experience on industry-standard equipment, ensuring they are well-prepared for future careers by aligning their skills with industry needs.

2. Enhancing Accessibility and Convenience:

Acquiring the necessary high-tech equipment for SCIEnT will directly contribute to the achievement of these objectives by:

a. Eliminating Barriers: By making advanced machinery readily available on campus, students from various technical clubs will no longer face barriers like time-consuming travel and resource scarcity, enabling them to focus on innovation and research.

b. Promoting Innovation: Access to cutting-edge equipment within SCIEnT will catalyze innovation by simplifying the prototyping and experimentation process, empowering students to develop and test their ideas efficiently.

c. Strengthening Collaboration: With easy access to shared resources, students will be encouraged to collaborate on cross-disciplinary projects, enhancing their skill sets and fostering a sense of unity among diverse technical clubs.

d. Elevating the Institution: The acquisition of high-tech equipment elevates NIT Trichy's status as a leading engineering institution, attracting top talent and encouraging alumni engagement, thereby reinforcing the institution's reputation and influence within the industry and academia.

6) The Current Need:

a. To fulfill project objectives:

- **28** high-tech instruments and equipments are required and the estimated cost will be ₹72L.

b. **Expected Impact:**

- Eliminates the need for students to travel to the city for specialized tools.
- Saves valuable time and resources.
- Allows usage during evening hours and weekends, aligning with academic schedules.

c. Accelerated Innovation:

- Access within the campus expedites the innovation process.
- Enables prototyping, testing, and refinement in real-time.
- Fosters a culture of rapid innovation and iteration.

d. Interdisciplinary Collaboration:

- Encourages collaboration among students from diverse technical backgrounds.
- Prepares students for cross-functional teamwork and diverse perspectives.
- Mirrors real-world professional environments.

e. Competitive Edge for a Top 10 Institute:

- Strengthens the university's position in national and international rankings.
- Attracts top students and faculty.
- Elevates the university's reputation as a center of innovation and excellence.

f. Industry Readiness:

- Graduates gain hands-on experience with industry-standard tools.
- Exceptionally well-prepared for the job market.
- Meets the demand for candidates who can hit the ground running.

g. Alumni Pride and Engagement:

- Engages alumni in supporting the project.
- Instills pride and ownership among graduates.
- Creates opportunities for alumni to mentor and connect with current students.

Thus, providing high-tech equipment within SCIEnT not only simplifies the student experience but also positions NITT as a leader in innovation, research, and education. It sets our institution

apart as a destination for aspiring tech leaders and ensures that our students are equipped to make significant contributions in their respective fields, propelling our university to greater heights in the world of academia and industry.

7) The Lab and its Needs

The SCIEnT lab is a common facility that supports innovation and technical needs. It is open to all students across UG, PG, and PhD programs and Operates 24x7 with access control. It is modeled on the lines of the Center for Innovation(CΦ), IIT Madras. It aims to prime student technical activities on campus. It has been around 8 years since the lab started to function and around 50+ projects have been fabricated at SCIEnT. In order to promote and facilitate this culture, students have requested the following equipment:

i) CNC Lathe:

A CNC (Computer Numerical Control) lathe is a vital tool in engineering that automates the precision machining of cylindrical workpieces. It uses computer programming to control the rotation of the workpiece and the movement of cutting tools. CNC lathes are ideal for tasks like turning, facing, drilling, and threading, allowing for intricate and accurate metal and plastic component production. They enhance productivity, reduce human error, and enable the creation of complex shapes, making them indispensable in manufacturing industries, from automotive to aerospace.

ii) CNC Lase Cutter:

A CNC Laser Cutter is a versatile tool in engineering that employs a high-powered laser beam controlled by computer software to precisely cut and engrave various materials, including balsa wood and carbon fiber composites. In structural engineering, it plays a pivotal role by crafting intricate and custom components from these materials, allowing for lightweight yet robust structures. CNC Laser Cutters offer exceptional precision, speed, and repeatability, making them indispensable for fabricating parts used in aerospace, architecture, and automotive industries, where lightweight, durable structures are paramount.

Required Specifications:

2-axis lathe and 3 and 4-axis milling machines
Should include software to easily convert your CAD designs

iii) Vertical Drilling Machine

A Vertical Drilling Machine is a specialized tool in engineering that primarily drills holes vertically into workpieces. It's widely used in various industries for tasks such as creating precise holes for fasteners, dowels, or conduits in metal, wood, or plastics. Its simplicity and accuracy make it essential for basic drilling operations.

Required Specifications:
0.55 KW / 1 HP
1440 R.P.M

iv) Spot Welding Machine

Spot Welding Machines are vital in manufacturing, joining two or more metal sheets by creating localized, high-intensity heat through electrical resistance. This process is common in automotive, electronics, and metal fabrication industries, ensuring quick and reliable connections for components like car body panels, battery packs, and sheet metal assemblies.

Required Specifications:
Semi-Automatic
Copper
Hand Operated Spot Welder

v) Sheet Metal Bender

A Sheet Metal Bender is a crucial tool for shaping and bending metal sheets into desired angles and forms. It plays a key role in metal fabrication, allowing for the creation of precise components and prototypes used in industries like manufacturing, construction, and product development.

Required Specifications:
Stainless Steel 3 In 1 Shear Brake And Roll Machine

Bed Width - 305 mm
Max. Shearing Thickness - 1.0 mm
Max. Bending Angle - 90 Deg
Max. Rolling Thickness - 1.0 mm
Min Rolling Dia - 39 mm
Packing Size - 49 x 33 x 42 cm

vi) Inclinometer

An Inclinometer is a device used in machining and chassis leveling applications. It measures angular tilt or slope, ensuring precision during machining processes and aiding in chassis alignment. This tool is essential for maintaining accuracy in manufacturing and vehicle setups, optimizing performance, and safety.

Required Specifications:
Measuring Range of 4*90°

vii) Bending Machine

A Bending Machine is a versatile tool employed in manufacturing, including chassis fabrication. It shapes metal sheets or tubes by applying force, enabling precise bending and forming of

components. In machining and chassis construction, it ensures accurate and uniform angles, critical for structural integrity and stability in vehicles and machinery.

viii) High speed processors

High-speed processors are indispensable in the stu-satellite domain for processing complex deep learning algorithms. These processors facilitate real-time data analysis, image recognition, and decision-making, enabling stu-satellites to autonomously respond to changing environmental conditions, capture scientific data, and perform intricate tasks with enhanced efficiency and accuracy.

Required Architectures:

SoC boards - raspberry Pi -8gb/jetson nano(2gb/4gb), khaas VIM4
Dsp boards : TMS320C8X, ADSP-21XX, MSC81XX
FPGA:XILINX, SPARTAN BOARDS, Artix

ix) DJI Drone

The DJI Mavic Drone is a compact aerial device used for various purposes, not directly related to chassis or machining for leveling. It's primarily utilized for aerial photography, videography, and surveying, offering high-quality imaging capabilities and remote monitoring in industries like cinematography, agriculture, and infrastructure inspection.

x) Hot Air Blower(Gun)

For shrinking the heat shrink tubes which are used for insulating the electronic components.

Required Specifications:

Airflow: 250 liters/min and 550 liters/min
Temperature: 350 and 550 degree centigrade
Power: 1500 watts

xi) Heat Sealing Iron

Monokote is a special type of plastic and we will need the machine to seal it , to fabricate the wings of a plane.

xii) Vacuum Pump

For avoiding air bubbles during sealing monokot wing and preparing CF composites

Required Specifications:

Inlet port - 1/4″ Flare
Oil Capacity - 310 ml

8) Project Budget

Project Name: SCIEnT, the Student Centre for Innovation in Engineering and Technology
Project Information: The Student Centre for Innovation in Engineering and Technology (SCIEnT) at the National Institute of Technology, Trichy (NITT) has been a cornerstone of fostering creativity, innovation, and technological advancement for over three decades. To further empower our student community and elevate the culture of innovation, we present this proposal to secure funding of 75 lakhs INR for comprehensive facility enhancements.
Our vision for SCIEnT encompasses a series of strategic upgrades aimed at optimizing its infrastructure and services. These upgrades span multiple facets of the facility ranging from cutting-Edge Equipment and Technology to ergonomic and collaborative environment.
Project Manager: Ganesh Babu S
Project Start Date: 1st October, 2023
Project End Date: 30th September, 2023

Sl. No.	Category	Cost Per Piece	Quantity	Total Cost
I	**Personnel -** Supervisor	25000	12 months	300000
II	**Supplies and Materials**			
1)	**Machines**			
1	CNC Lase Cutter	500000	1	500000
2	Vertical Drilling Machine	55000	1	55000
3	Spot Welding Machine	66500	1	66500
4	Sheet Metal Bender	40,000	1	40000
5	Inclinometer	8025	2	16050
6	Bambu Lab X1 Carbon Combo 3D Printer	190000	1	190000
7	Pipe Bending Machine	175000	1	175000
		95000	1	95000
2)	**High Speed Processors**			
1	Original Raspberry Pi 4 Model B – 8GB RAM x 4	7500	7	52500
2	NVIDIA Jetson Nano Developer Kit-B0	20,549	2	41098
3	Khadas VIM4 Amlogic A311D2 SBC Supports 4K UI and HDMI Input	27899	1	27899
4	dsp board: TMS320C8X	22380	1	22380
5	ADSP-21XX	6527	1	6527

6	FPGA: XILINX (4)	2500	4	10000
7	EDGE Spartan 7 FPGA Development Board	10500	1	10500
8	Artix - BOARD FPGA BASYS3 FOR VIVADO	13698	1	13698
2	NVIDIA GEFORCE RTX 3090	352750	2	705500
3)	**Equipment**			
1	DJI Drone -Mini 3 Pro With DJI Rc Smart Remote Control with Fly More Kit Plus Series	139456	2	278912
2	Hot Air Blower(Gun)	21500	2	43000
3	Heat Sealing Iron	15000	1	15000
4	Vacuum Pump	7000	2	14000
5	Carbide Drill Bits - 4-10 mm	35515	2	71030
6	Cobalt Drill Bits - 4-10 mm	35,919	2	71838
7	Sheet Bending Machine	52000	1	52000
8	Adjustable power supply >5A and <5A)	30000+17807	1	47807
9	Metric tap wrench	3299	1	3299
10	Overleaf subscription	9599	5	47995
4)	**Office Supplies**			
1	Precision 3260 Compact Workstation	105000	5	525000
3	1 Ton Air Conditioners	37000	9	333000
4	Chairs	5000	70	350000
5	Tables	2500	600	1500000
6	Stationary	30000		30000
III	**External Services - Maintenance**	10000	1/quarter	30000
V	**Miscellaneous**	40000		40000
	Sub Total			**5480533**
	GST			**986496**
	Transportation of equipment and machinery			**250000**
	Administration Charges			**700000**
	Grand Total			**7417029**

9) Sustainability and Maintenance

Regular Maintenance:

Scheduled Inspections: Monthly equipment inspections.
Preventive Maintenance: Follow manufacturer guidelines for cleaning, lubrication, and parts replacement.
Repairs and Calibration: Budget for repairs and calibration.
Documentation: Maintain detailed maintenance records.

Proper Use and Care:

Training: Mandatory training for all users.
User Guidelines: Display safety instructions prominently.
Supervision: Assign supervisors for oversight.
User Responsibility: Encourage reporting of issues.

Sustainability Initiatives:

Energy Efficiency: Turn off equipment when not in use.
Recycling and Waste Reduction: Establish recycling stations.
Regular Audits: Identify sustainability opportunities.
Budget Allocation: Allocate funds for maintenance and sustainability.
Grant Opportunities: Seek external funding sources.

Training and Education:

Continual Learning: Encourage ongoing education.
Collaborative Workshops: Organize workshops and seminars.

Communication:

Regular Updates: Keep users informed through newsletters or bulletin boards.
Feedback Mechanism: Create a feedback system for user input.

Emergency Response:

Emergency Procedures: Develop and communicate equipment-related emergency procedures.

10) Annexure I - Case Studies

a. SCIEnT as a catalyst for success in Smart India Hackathon

Background:

Students of the Robotics and Machine Intelligence Club (RMI) participated in the Smart India Hackathon.
They developed a model named ANVI for the competition.

Resource Utilization:

Leveraged tools and equipment from the inventory of the Student Innovation Center (Scient).

Collaborative Approach:

RMI students collaborated with Scient to access the necessary tools and resources for their project.

Success in Smart India Hackathon:

ANVI, developed with Scient's resources, led RMI to secure a prize in the Smart India Hackathon.

Openness to Support:

Scient has consistently demonstrated a commitment to supporting student clubs by providing access to tools and resources.

Key Takeaways:

Collaboration between student clubs and innovation centers can lead to remarkable achievements.
Access to well-equipped inventories, like Scient's, enhances students' capabilities.

b. NIT Trichy's Heartfelt Response During Kerala Floods

Background:

In the face of Kerala's devastating floods, NITT (National Institute of Technology, Trichy) college responded with compassion and urgency.
Witnessing the unprecedented suffering of fellow citizens, NITT students felt a deep sense of responsibility to help.

Volunteer Efforts:

With unwavering determination, NITT students volunteered their time and expertise to assist the flood-affected.
They embarked on a mission to provide approximately 500 electrical switchboards to restore power to those deprived of electricity.
Resource Support:
SCIEnT, the Student Innovation Center, played an invaluable role by generously providing the necessary tools and equipment for the entire project.

Recognition and Accolades:

NITT's selfless and swift response garnered admiration and accolades from both the affected communities and observers afar.
The institute's actions showcased the immense impact that an educational institution can have when guided by empathy and a sense of duty.

Key Takeaways:

In the face of adversity, the altruistic spirit of NITT students shone brightly, illuminating a path of hope for those in need.
Collaboration with innovation centers, such as Scient, exemplifies the power of unity and resourcefulness in disaster relief efforts.

Annexure II - Annual Report Series

2015:
Conceptualization: The idea of Scient was conceived by the 1990's batch.
Inspiration: Modeled after IIT Madras' Center for Innovation, which by itself was modeled after Stanfords
Infrastructure: A dedicated building was established for Scient, equipped with support from alumni.

2016:
Inception: SCIEnT officially started its operations.
Project Development: Began assisting various student groups, including DC, 3D, RMI, Bhive, etc. Completed 7 projects in its inaugural year.

2017-18:
Significant Growth: SCIEnT's impact expanded, contributing to the completion of 23 projects. An official Students team was created.

2018-19:
Continued Engagement: Maintained active involvement in project development, overseeing 19 successful initiatives.

2019-21:
Project Proliferation: Oversaw a remarkable increase in project activities, with 26 successful projects.

2022-23:
Post-Pandemic Collaborations: SCIEnT engaged in numerous collaborations with various teams and clubs. Here are a few major events:
Co-organized the E-Summit, the annual Entrepreneurial Summit of NIT Trichy, in partnership with E-Cell NITT.
Conducted "TransfiNITTe," a 42-hour hackathon, in collaboration with the Technical Council.

2023:
SCIEnT was inducted into the Students' Council for its work in recent years. SCIEnT now acts as the official Technical Wing of RECAL (The Alumni Association of NIT Trichy).

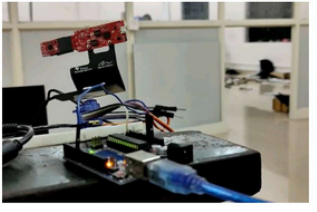
Annexure III- Equipment & Machine Sources

Here is a list of the websites from which the needed can be sourced.

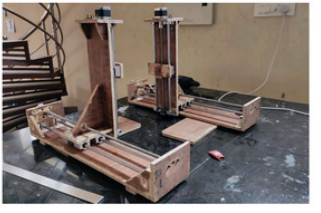
Supplies and Materials	Links
Machines	
CNC Lase Cutter	Automatic Wood CNC Router Machine Latest Price, Manufacturers & Suppliers
Vertical Drilling Machine	S.K 15" Center Vertical Drilling Machine, Type of Drilling Machine: Pillar, Spindle Travel: 130mm
Spot Welding Machine	Hand Operated Spot Welding Machine, Model: CSH15R
Sheet Metal Bender	Stainless Steel 3 In 1 Shear Brake And Roll Machine
Inclinometer	Bosch GLM 40 Plastic Professional Digital Laser Measure (Blue), 1 Piece : Amazon.in
Bambu Lab X1 Carbon Combo 3D Printer	Bambu Lab X1 Carbon Combo 3D Printer
Pipe Bending Machine	Electrical Pipe Bending Machine, Max Bend Radius: 300 Mm, Min Capacity (Diameter): 20 Mm
	32 mm X 2 mm Pipe Bending Machines, Min Capacity (Diameter): 12 mm
High Speed Processors	
Original Raspberry Pi 4 Model B – 8GB RAM x 4	Original Raspberry Pi 4 Model B – 8GB RAM
NVIDIA Jetson Nano Developer Kit-B0	NVIDIA Jetson Nano Developer Kit-B01
Khadas VIM4 Amlogic A311D2 SBC Supports 4K UI and HDMI Input	Khadas VIM4 Amlogic A311D2 SBC Supports 4K UI and HDMI Input
dsp board: TMS320C8X	TMS320C6455BCTZA Texas Instruments
ADSP-21XX	ADSP-21369KBPZ-3A
FPGA: XILINX (4)	XC7S15-2CSGA225I Xilinx | Mouser India
EDGE Spartan 7 FPGA Development Board	EDGE Spartan 7 FPGA Development board
Artix - BOARD FPGA BASYS3 FOR VIVADO	410-183
NVIDIA GEFORCE RTX 3090	RTX 3090
Equipment	

DJI Drone -Mini 3 Pro With DJI Rc Smart Remote Control with Fly More Kit Plus Series (47 Min Battery)	DJI Mini Pro
Hot Air Blower(Gun)	Hot Air Blower
Heat Sealing Iron	Foot Direct Heat Sealing Machine
Vacuum Pump	Vaccum Pump
Carbide Drill Bits - 4-10 mm	
Cobalt Drill Bits - 4-10 mm	Cobalt Drilling
Sheet Bending Machine	Sheet Bending Machine
Adjustable power supply	Adjustable power supply
Metric tap wrench	metric tap wrench
Overleaf subscription	Plans and Pricing - Overleaf, Online LaTeX Editor
Office Supplies	
Precision 3260 Compact Workstation	Precision 3260 Computers

Annexure IV - Pictures



Radar module that sends FMCW for area mapping, vital signs detections, motion estimation, etc.



CNC machine(Computer Numerical control) designed to help build wings, fuselage, vertical stabilizers and horizontal stabilizers within days instead of weeks.

One of the 500 electrical switchboards fabricated to restore power to those affected by Kerala floods

Final Presentation during TransfiNITTe, the annual 42 hour hackathon of NITT

Workshop where students are learning the operation of machines

Design and planning of a mechanical project