

PRACTICE I

1. Title of the Practice: Research and Problem Solving with Interdisciplinary Approach

2. Objectives of Practice:

- To produce/develop engineers having higher level of problem-solving skills, with **inter disciplinary approach**.
- To create inquisitiveness/experimentation towards **research** and **problem solving**.
- To ensure higher research focus in the domain facilitating discussions and interactions amongst the members of the groups from different **departments**.
- To develop **collaborative research** at inter departmental and inter institutional levels.

3. The Context

Industries are now prioritizing advanced skills and interdisciplinary problem-solving approaches. To instil these qualities in students, a change in teaching methods is crucial, requiring educators to continuously update their skills. Introducing Translation Research to students, highlighting interdepartmental cooperation, industry ties, and inter-institutional collaboration, will enhance their creativity, innovation, problem-solving, and communication skills. Moreover, it will nurture greater adaptability, flexibility, and a broader global outlook among students.

4. The Practice

Numerous **faculty competence groups** have been formed, each comprising members from diverse departments focusing on distinct domains of Science, Engineering, and Technology. Every year, new areas of technology are identified and hence a new group is formed with the right faculty. Few Group names are as follows;

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- Materials Engineering
- Nano Composites
- Data Analytics
- Quantum Computing (New Initiative)
- Robotics and Automation
- Construction Materials and Infrastructure Engineering
- Bio Imaging and Biosensors (New Initiative)
- Embedded Systems and IoT
- Business Analytics

For illustration, the Material Engineering Group is a collaboration of faculty members from Physics, Nano Science and Technology, Mechanical Engineering, and Aeronautical Engineering departments, working on composite materials, advanced materials, and nanomaterials. The Data Analytics group consists of faculty members

from the Computer Science and Engineering, Information Technology, Artificial Intelligence & Data Science, and Master of Business Administration departments, who collaborate and perform comprehensive analyses of data to derive meaningful insights and inform decision-making processes. The benefits of such collaborative approach among faculty from diverse departments include Interdisciplinary Collaboration, Comprehensive Exploration, Resource Optimization, Enhanced Research Potential, Innovation and Progress, Accelerated Development, and Educational Benefits. The major outcomes of these groups are new collaborations, high quality research publications, patents, copyrights, new projects etc.

Practice-Process

- Attending quality improvement programmes in premier academic and research institutions and industries in the domain of the group.
- **New competency groups are formed and Peer enablement** amongst the team members.
- Active engagement of the **Center of Innovation (CoIN)** in addressing diverse problem statements sourced from research labs and industry, offering viable solutions.
- Students act as **Ambassadors/Innovative Managers**, utilizing guidance and mentorship to solve problems.
- **Collaborative research** with **Central Government research laboratories** and research departments like CSIR and DAE, Government of India.
- Guiding the students for project work from across the departments.
- Any industry problem to be solved and approached, given to such relevant competence groups for solving.

5. Evidence of Inter –Institute Success

I. Collaborative Government Funding Research Projects:

- Nano Composites group received a **DST-TDP** funding of Rs. 29 Lakhs. The substantial accomplishments arising from these projects encompass two acquired patents, publication of three patents, a book chapter, and two research papers.
- VLSI Design and Applications competency group received the funding of 27.10 Lakhs under **SERB-POWER** Scheme and the project entitled as “Investigations on Low Cost- Power Optimized and Non-invasive Wearable Device for Measuring the Fetal Parameters of Pregnant Women”.
- Faculty members from the Biomedical Instrumentation, Imaging, Signal and Computing competency group has initiated a collaborative research project funded at 18.30 Lakhs through the **DST-SERB under the TARE scheme**, partnering with **IIT Madras**. This project focuses on enhancing the bioactivity of magnesium-based implants through the development of nano coatings.
- Nano Composites competency group applied and got sanctioned the funding of INR15 Lakhs under **MSME Innovative Scheme** and the project entitled as

“Development and Deployment of Self-Sensing Cement Nanocomposite for Real-Time Health and Safety Assessments in Infrastructures”

- Faculty from Materials and Processing group received the research grant of 23.66 Lakhs from **DRDO Aeronautics Research & Development Board Grant-in-aid Scheme**. The project entitled as “Alleviation of black skin formation on Anodizing of Additive Manufactured AlSi10 Mg Alloy components and Enhancement of Corrosion Performance”.
- Faculty members from the Cloud Computing and IOT competency group are involved in a project at the Sugarcane Breeding Institute, funded with ₹18.30 Lakhs from **DST-SERB under the TARE scheme**. The ongoing outcomes of this research project encompass: i) the publication of one patent, ii) a paper in a WoS journal, iii) two book chapters, and iv) six conference publications.
- Faculty members from signal and image processing competency group are involved in a project entitled as “Predictive Analytics on Early Diagnosis and Progression of Alzheimer’s Disease using Deep Learning: A Precision Medicine Approach”, funded with ₹18.30 Lakhs from **DST-SERB under the TARE scheme**. This research project has resulted in the publication of four papers in conference proceedings
- Faculty members from the Nano Innovators competency group have submitted research proposals to various funding agencies and schemes, including **UGC, SERB-SRG, and CSIR-ASPIRE**, with the aim of developing an electronic nose for diagnosing life-threatening diseases such as renal diseases, diabetes, lung cancer, and heart failure.
- Faculty members from the Nanomaterials and Biomaterials competency group have submitted a proposal to the **SERB-TARE** scheme for a project titled "MXenes - Multiferroic Nanocomposites for Magnetically Modulated Supercapacitors."
- Faculty members from the Biomedical Instrumentation, Imaging, Signal and Computing competency group have submitted a proposal to the **CSIR ASPIRE** scheme for a project titled “3D Bioprinting of corneal stroma equivalent with tunable structural and functional properties”.

II. Industrial Consultancy through Competency Group

- Data Analytics and Structural Engineering competency groups teamed up with **UI Bridge Solutions Pvt. Ltd.** to conduct consultancy tasks encompassing anomaly detection in sewage pipelines and the development of a 360 Video Stitching and Viewer Application.
- Biomechanics & Rehabilitation Engineering and Electronics competency groups resulted in the development of a scaled prototype for a hospital waste management system. This device is designed to segregate medical waste, sterilize it, and prepare the waste for first-level recycling or incineration.
- The Quantum Computing research group successfully published a research work entitled "Gold Nanoparticle Decorated Vertical Graphene Nanosheets

Composite/Hybrid for Acetone Sensing at Room Temperature" in the Journal of "Materials Science & Engineering" with an Impact Factor of 6.4.

- Artificial Intelligence competency group collaborate with **LTTTS Ltd., Bengaluru**, to execute consultancy work focused on design and developing an embedded AI framework.
- Robotic Process Automation group collaborated with Rane, Madras, to execute consultancy work centered on **"Smart Visitor Kiosk"**, securing financial support amounting to Rs. 53,100.
- Artificial Intelligence competency group collaborated with GE Healthcare Pvt. Ltd, Bengaluru, and successfully completed a consultancy project focusing on **"Gesture Recognition in ICU Rooms"** and "Identification of Equipment in ICU Setup".
- Nano innovators competency group Industrial collaboration with Cameron Schlumberger Company and establishing a **SLB-SREC Elastomer Lab**. It is a unique and valuable addition to an educational institution. It provides the opportunity to conduct elastomer research, testing, and validation of age-related properties in line with SLB's requirements. This will help to train students in the latest elastomer technologies and prepare them for careers in the oil and gas industry.

III. SEED Grant from Institution:

- Biomedical Instrumentation, Imaging, Signal and computing competency group led to the execution of a project titled "Nanosponges for Rapid Blood Clotting." This initiative received financial support of Rs. 61,000 through the **SREC Seed Grant**.
- The Environmental Engineering competency group has commenced consultancy work on the Central Effluent Treatment Plant (CETP) in Tiruppur. Additionally, they are conducting extended corrosion-based research with a **SEED grant** of ₹1.00 Lakhs.
- Augmented / Virtual Reality and Networking Research competency group are jointly working on Thermal Imaging is being carried out with a **SEED grant** of ₹1.35 Lakhs.
- Industrial Automation competency group working on Smart Hybrid Energy Generation Tree is being carried out with a **SEED grant** of ₹1.0 Lakh.

IV. Institute-Industry Research Work:

- Artificial Intelligence competency group partnered with International Aerospace Manufacturing Private Limited, Bengaluru, to successfully complete the research project titled **"Artificially Intelligent Robotic Vision Inspection System"**.
- Nano innovators competency group Industrial collaboration Alphacraft Pvt. Ltd and developing a nanocomposites based materials to replace a Sailon® in immersion rod.

- Robotics competency group collaborated with Alphacraft, Coimbatore to develop robot gripping solutions for handling sand core components.

V. Memorandum of Understanding (MoU):

S.No.	Industry	Domain
1	Resilience Business Grids LLP (RBG.AI)	Cyber security and Data Analytics
2	Indian Biomedical Skill Council (IBSC)	Molecular and Bio Tissue Engineering
3	Mahindra and Mahindra Limited (M&M)	Electric Vehicle Technology
4	Bootlabs, Bangalore	Internet of Things (IoT)
5		VLSI Design and Communication & Networking
6	Revealer Global Solution Pvt. Ltd., Bangalore	Networking and Process Automation
7	International Skill Development Corporation (ISDC),	Business Marketing
8	NSE Academy Limited, Mumbai	
9	Annamalai Capital Services Pvt Ltd. Coimbatore and	
10	Meynikar Innovation Private Limited, Coimbatore	
11	HiiLSE GLOBAL SDN BHD, Malaysia	Aerodynamics and Population
12	International Aerospace Engineering Private Ltd., (IAMPL)	Environmental Engineering and Remote sensing & GIS
13	AUGER Engineers, Chennai, and	
14	Larsen & Toubro, Mumbai	
15	VKP Geo Tech, Coimbatore	
16	Tamil Nadu Agricultural University (TNAU), Coimbatore	Image Processing & Computer Vision and Networking

VI. Research Outcomes of Interdisciplinary Approaches

i. Publications:

445 Publications indexed in Scopus and Web of Sciences (WoS) and 1783 citations, 74 Book Chapters during the calendar year 2022.

ii. Cumulative Impact Factor:

The Institute's Cumulative Impact Factor stands at 388.3, derived from journal publications in various quartiles for the calendar year 2022, including Q1: 23, Q2: 29, Q3: 39, and Q4: 12 with h-index of 37.

ii. Patents and Copyright:

Collaborations across research competency groups have led to the granting of 10 patents, the publication of 12 patents, and the application and granting of 5 copyrights during the academic year of 2022-2023.

6. Problems encountered and resources requirement

- Translation of research outcomes to commercialization.
- Developing a holistic approach of research to market with multiple stakeholders.

PRACTICE II

1. Title of the Practice: Institutional Social Responsibility (ISR)

2. Objectives of the Practice:

The objectives of the best practice (Institutional Social Responsibility) followed by the Institution are aligned and practised in accordance with the **Sustainable Development Goals of the United Nations as**

- **Quality Education;**
- **Industry, Innovation and Infrastructure;**
- **Good Health and Well Being;**
- **Gender Equality**
- To develop engineers capable of providing solutions to the identified problems of local community and global challenges by harnessing their acquired skills and knowledge, aligning with the vision of our Institute.
- To orient the learning outcomes towards community engagement and local bodies.
- To create more awareness on higher education with skill development amongst children for better employability and improved quality of life.
- To improve environmental awareness, energy conservation and waste management.
- To provide quality education with equalities over gender.
- Empowering women to be confident, self-reliant and leaders.

3. The Context

Tamil Nadu state has a population of 76.9 million and 8.8% are in the age group of 18-22 years. 74.13 % of the people living in villages have an average monthly income of INR.8931 as per NADARD 16-17 Survey-2. With the multiple schemes of Government of India, and State Government, the educational institutions and NGOs should come forward and collaborate to work towards the upliftment of society. As an Engineering institution, the students with technical knowledge should be given inputs and opportunities to look at the societal problems starting from empathy and propose solutions for the sustainable development.

4. The Practice

SREC provides broad and multiple platforms to inculcate the objectives of Institutional Social Responsibilities for achieving the sustainable development amongst students.

i. Imparting Quality Education

Curricula and Syllabi

- **Live-in-Lab** concept introduced for all the undergraduate degree programmes facilitates the students to identify and stay in a village for at least two weeks to understand the problems of that society. Such problems could be converted into statements to provide technology based solutions. This helps the students to develop a solution/product for the society leading to social entrepreneurship as well.

- **Gap Year** - supports students to work on Proof of Concept (PoC) and product development. They can also work towards startup. Come back and complete the degree without affecting classifications
- **Societal relevant courses** in the curriculum
- Regulatory affairs
- Bioethics & Intellectual Property Rights
- Architectural Conservation & Historic Preservation
- Cultural implications on Building Design
- Circular Economy for Sustainable Built Environment
- Sociology for Digital Media
- Entrepreneurship Development
- Workplace Professionalism & Human Ethics
- Nanomaterials for Energy & Environment
- Environmental Science & Sustainability
- Green Chemistry for Engineers
- Waste Management, Global warming and Climate change
- Environmental Management in Industry
- Solar technology
- Social robotics
- Nanotechnology in Environmental Remediation
- Value Education
- Professional Ethics
- **Community oriented projects** are part of the curriculum

ii. Industry, Innovation and Infrastructure

- SREC collaborates with Industries to bridge the gaps with the advanced growing technology used in industries
- Industry experts involve for building curriculum and syllabus, problem solving, resource persons, conduct courses, etc
- Industry consultancy projects and research projects and handled by faculty members and students
- Students innovative ideas are transformed to minimal viable product in SREC CoIN (Pre-Incubation Centre) by providing support them through mentorship, seed fund, business plan, etc.
- SREC SPARK Incubation Foundation (A section 8 company) have been established for the benefit of the stakeholders of the institution for starting their startup.
- Infrastructure and facilities for converting any ideas to commercial products are established in pre-incubation and incubation centre at the cost of approximate four crores.

iii. Well-being and good health through various activities among the stakeholder

NSS, NCC, Clubs and Other Forums

- **NSS** with 3 Units organizes multiple events – Blood Donation, Organ Donation, projects through Unnat Bharat Abhiyan (UBA), Jal Shakti Abhiyan (JSA), Village adoption, Swachh Bharat, Computer and Language Literacy for nearby

school students, Health awareness, Dental awareness, Free Vaccination camps and Road safety awareness.

- **NCC** unit (Army wing SD&SW) conducts special training programmes to the cadets and conducts webinars/conference on social awareness. Selected NCC cadets participate in Republic Day Parade at New Delhi and Prime Minister Rally.
- **Young Indians (Yi -YUVA) club**– As an integral part of Confederation of Indian Industry (CII), Yi-YUVA club of SREC joins hands with CII, Coimbatore and organizes various Yi events/initiatives to enable them to conceptualize, plan and execute. Yi-YUVA engages students in self-development, skill building, community service and nation building activities.
- **SREC-CoIN**– SREC Centre for Innovation supports development of Proof of Concept (PoC), validations and converting them into product.
- **UYIR club** – SREC is a member of UYIR club of Coimbatore, an NGO comprising of members from all verticals –schools, colleges, corporates and hospitals who will reach out to the public to create awareness on road safety, preventing road traffic accidents.
- **Social Development Clubs** organize blood donation camps, tree plantations etc.,
- **Multiple clubs and Professional bodies**– IEEE, CSI and English Literary Society develop computer literacy and communication of the neighborhood population particularly school children.

iv. Gender Equality

- The total number of employees in our Institution is 442, comprising of 225 females and 217 males, which is more than 50% of women and out of 4559, 1477 are girl students.
- The Institution has a high focus on the promotion of gender equity and sensitization.
- There is a special **Cell for Women Empowerment/Internal Complaint Committee** for motivating and **empowering women** to focus on **self-reliance, freedom for women and equity**.
- **Women Empowerment Cell (WEC) and IEEE-Women in Engineering (IEEE-WIE)** organize events for empowering the women at all levels, faculty, students, neighborhood and general public.

5. Evidence of Success

- Under **GOI-UBA Project**, a grant of **₹6 Lakhs** was received to carry out 8 societal and welfare projects in the five adopted nearby villages.
- **72 students** from the batch 2020-2024 completed Live-in-Lab under the regulations. They addressed the issues, developed solutions for the benefit of rural residents.
- A grant of **₹7.96 lakhs** was received as a **CSR fund from IBM** for the purposes of supporting charitable, scientific, and educational activities. Eight activities were conducted through the received fund such as Career Guidance program for school students, Skill Development programme to polytechnic students, Outreach Program for school students “Build a first Robot”,

International Women's Day, World Sparrow day, Telescope Construction for school students, Online cyber Issues & Mitigations, Donation of LCD projector to Idigarai Government higher secondary school.

- Under **Naan Mudhalvan** scheme of Govt. of Tamil Nadu, three Government schools are adopted and programmes on i) developing the Communication and Reading Skills in English, ii) Computer skills, iii) Career Guidance, iv) Awareness on Road Safety and v) Clean India Campaign vi) Tree plantation campaigns are conducted for the school students.
- **Community oriented projects** are carried out by MBA department through the funds collected from the marketing mela (Bazaar mela) conducted every year.
- **MoU signed between SREC and Government ITI, Coimbatore** for a period of 3 years (2021-2024) to provide special skill development trainings related to their trades and motivate them to become successful entrepreneurs.
- **SREC-MHRD IIC** has adopted 5 schools and 10 Faculty members recognized as mentor-for-change under NITI AAYOG ATAL Innovation Mission conduct skill development programmes.
- **SREC-COIN Mentor- Mentee Schemes:** SREC has been selected by MoE's Innovation Cell (Govt. of India) to mentor other institutions. The IIC ID for SREC is IC201811883 with funding assistance from MIC/AICTE under the Mentor- Mentee Scheme 2023.
- **SREC-CoIN supports in developing innovative products using latest technologies.**
 - ✓ BIOSIM - SMART IV MONITORING SYSTEM FOR HEALTH CARE SYSTEM - BioSim (on-power) is used to detect the level of fluid and to alert the nurse. NON-CONTACT SENSOR is used for detecting the presence of liquid based on threshold level. The integration of sensor along with Wi-Fi module will transfer the data to the nurse station via mobile application or alarm system based on the hospital need.
 - ✓ PLANTROX - Product launch of our AI app PLANTROX at TNAU, in presence of Vice Chancellor of TNAU. This app aids to predict the plant diseases in the tomato plant.
- **Establishment of SPARK Incubation Foundation** as section-8 company supports fresh entrepreneurs and startups working on the problem of social economic growth and management. Few of the startup as Glamscrap Technology provides a solution of converting the waste plastic water bottles to 3D printing filaments, Synthesis lab Technology have solutions on the waste water and drainage maintenance at low cost, and Atom6 converts the waste agriculture products of farm to useful nutrition farm sheet. The institution and incubation supports the startups in develop the idea stage to product commercialization stage.
- **Seven day NSS Special Campon** the theme "Healthy Youth for Healthy India" conducted at Tudiyalur middle school and Anaikatti tribal villages (Melpathy, Kilpathy and Thuvaipathi).
- **Medical camps and Blood Donation camps** are conducted for the public and people of nearby adopted villages by Social Development Clubs/NSS/Uyir Club.

6. Problems encountered and Resources required

Problems Encountered:

Creating expected level of awareness with the students about the problems prevailing in the society to which they belong to.

Resources Required:

Sustainable manpower for interactions with the local communities for better understanding of their problems.