Evidence for Accomplishments of REC in Research and Consultancy constitutes distinctiveness.

REC has established and supports Research and Consultancy via

Centre for Sponsored Research and Consultancy (CSRC) and Centres of Excellence:

The summary sheet below describes the activities carried out in centre of excellence and CSRC which turn out to be the evidence of research and consultancy activities achieved in REC. The summary is followed by the details of activities and objectivise of all the centre of excellence labs. The Coe activities is followed by Annual report of IIC for the period of 2021-2022 which provide the activates carried out and the success of IIC in REC.

Centres of Excellence Summary Sheet

S.No	Name of the Centre	Research Publication	Research Fund	Consultancy	Patent and Innovation	Project
1	Centre of Excellence in Assistive Technology	2 Research papers	128.68 Lakhs			10
2	Centre of Excellence in Biofilms	9 Research papers	35 Lakhs		21 Bacterial DNA Sequences + 8 Bacterial cultures deposited	9
3	Centre of Excellence in Computational Fluid Dynamics	12 Research papers	71.72 Lakhs			6
4	Centre of Excellence in Data Science	39 Research papers+ 7 Book chapters	5.76 Lakhs			20
5	Centre of Excellence in Digital Manufacturing	5 Research papers		1	2 Patents filed	3
6	Centre of Excellence in Electric Vehicle	5 Research papers	10 Lakhs		2 Patents filed	6
7	Centre of Excellence in Embedded System Technologies	4 Research papers				2
8	Centre of Excellence in Food Products and Process Design	10 Research papers	7.48 Lakhs			1
9	Centre of Excellence in Internet of Things (IoT)	7 Research papers		1		
10	Centre of Excellence in Jet Flows	31 Research papers	26.04 Lakhs			9

S.No	Name of the Centre	Research Publication	Research Fund	Consultancy	Patent and Innovation	Project
10	Centre of Excellence in Jet Flows	31 Research papers	26.04 Lakhs			9
11	Centre of Excellence in Machine Vision	27 Research papers+ 3 Book Chapters + 1 Book		24		28
12	Centre of Excellence in Medical Imaging	1 Research papers				1
13	Centre of Excellence in MEMS & Microfluidics		683.276 Lakhs			
14	Centre of Excellence in Renewable Energy Systems	11 Research papers	15.5 Lakhs	14		
15	Centre of Excellence in Sustainable Construction Materials	24 Research papers+ 2 Book Chapters	89.92 Lakhs	5	1 Patent Granted	

RAJALAKSHMI ENGINEERING COLLEGE

An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centres of Excellence

Sl. no.	Index
1.	Centre of Excellence in Assistive Technology (CEAT)
2.	Centre of Excellence in Bio Films
3.	Centre of Excellence in Computational Fluid Dynamics (Numerical Engineering Simulation Lab)
4.	Centre of Excellence in Data Science (CEDS)
5.	Centre of Excellence in Digital Manufacturing
6.	Centre of Excellence in Electric Vehicle
7.	Centre of Excellence in Embedded System Technologies
8.	Centre of Excellence in Food Products and Process Design (FPPD)
9.	Centre of Excellence in Internet of Things (IOT)
10.	Centre of Excellence in Jet Flows
11.	Centre of Excellence in Machine Vision (CEMV)
12.	Centre of Excellence in Medical Imaging
13.	Centre of Excellence in MEMS and Microfluidics
14.	Centre of Excellence in Renewable Energy Systems
15.	Centre of Excellence in Sustainable Construction Materials

RAJALAKSHMI ENGINEERING COLLEGE THANDALAM CHENNAI 602 105

PRINCIPAL
RAJALAKSHMI ENGINEERING COLLEGE
THANDALAM, CHENNAI - 602 105.

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Assistive Technology (CEAT)

I. Vision:

To create an environment for Special Children and Differently Abled Person to excel and survive globally through appropriate Information Assistive Technologies.

II. Mission:

- To service consumers with products customised to their needs.
- To impart assessment and training in use of assistive technology in an effort to facilitate community integration and improve quality of life.
- To utilize the skills of every engineering department of the college for the development of Assistive Technology.
- To develop the product in vernacular languages

Objective

The main aim to establish "Centre of Excellence in Assistive Technology" is to offer Assistive Technology Services that provide a variety of technical assistance and computer applications for people with disabilities. The objective also includes creating an awareness among the affected rural community to use assistive technology through this centre.

III. Research Activities:

1. ***Social Welfare:*** The centre develops projects to crate gadgets and kits for the ease and betterment of special and disable person life and thereby helping societal welfare
2. ***Academic Research-*** The centre supports and fosters academic research in the field of Assistive technologies and devices and promotes research proposals and projects.
3. ***Knowledge Dissemination:*** The centre disseminates research reports/findings to key stakeholders including academics through a variety of channels viz., media outreach, participation in academic and professional conferences, authored articles, workshops, etc.
4. ***Industry Connect:*** The centre connects with the industry by collaborating with them in

doing projects and also in conducting workshops and seminars for the audience that is keen to track the progress of data science and AI in practice.

5. ***Consulting Activities:*** The centre facilitates the businesses by connecting them with researchers who are working on cutting edge problems and can help solve challenging business problems.
6. ***Centre for awareness:*** The center creates awareness among the affected rural community to use the assistive technology products and gadgets developed by establishing a Centre for communication.

IV. Projects Carried at CEAT:

FUNDED PROJECTS:

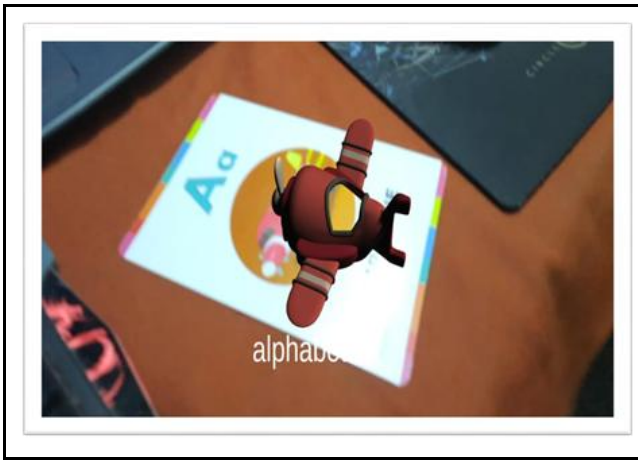
With the support from Technology Intervention for Elderly and Disabled (TIDE) programme under Department of Science & technology we have developed the teaching tools for Autistic children, Hearing impaired children and Intellectually disabled person with 2D and 3D animations, real time videos supported with Augmented reality in order to improve their learning capabilities and to lead a quality life.

S. No	Major / Minor	Funding Agency	Amount	Ongoing / Completed
1.	ITAAC: Interactive teaching Aid for Autistic children	DST -TIDE	41.60 Lakhs	Completed (2014-2016)
2.	Visfel: Visualization Framework to Enhance the Learning of Hearing Impaired Children	DST-TIDE	28.56 Lakhs	Completed (2016-2018)
3.	Enhanced Interactive and Assistive online examination system for visually impaired	UGC – Minor Grant	1,34,000	Completed (2017-2019)
4.	e-Tool to support Intellectually Disabled during COVID-19 Pandemic	DST-TIDE	-	Completed (2020)
5.	S.M.A.R.T. for Alizemer Disease	TNS & TCN	10000	Completed
6.	e –TLSID: Tool to impart Livelihood Skills for Intellectually Disabled	DST -TIDE	57.08 Lakhs	Ongoing (2019 –2022)
Total Amount			**128.68 Lakhs**	

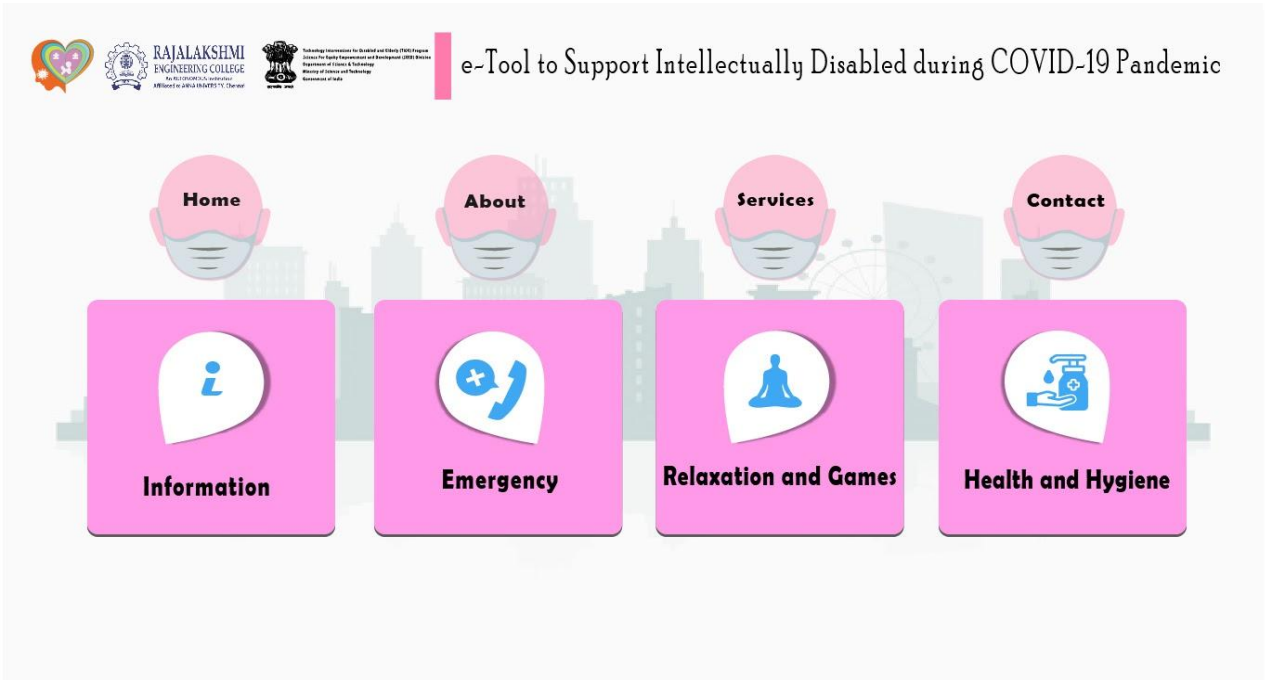
STUDENT PROJECTS:

S.NO	PROJECT TITLE	Year
1.	Interactive E-Learning Kit To Improve The Self Behaviour Of Autistic Children Using Augmented Reality	2014-2015
2.	**Braille Board** -This gadget is designed to help the physically impaired to feed inputs directly to smart devices and retrieve the output data from the smart device in the form of Braille characters.	2017-2018
3.	Remote monitoring of cognitively impaired individuals	2017-2018
4.	**Sign Translator -**Translates any text to Sign language – Enables independent E-learning Environment for Hearing Impaired	2018-2019
5.	**RATSEL:** A game based learning application for the dyslexic using augmented reality	2019-2020
6.	**Voice Enabled secure door and home automation system** based on IOT System for visually challenged people.	2019-2020
7.	**Smart mobile for the Disabled** -Converts the voice commands of the visually challenged into actions for the effective use of mobile phones	2019-2020
8.	**Stylus For Visually Challenged people** - Enables blind people to feel their writing using pen. It contains a Carriage lever to indicate end of line and sense the writer by producing sound	2019-2020
9	Automated Baby Cry Detector For Hearing Impaired Parents	2021-2022
10.	Meditrack-Medical Application To Assist Visually Impaired People	2021-2022

Screenshot of E-TLSID Project	Awareness Stall in Rehab exhibition conducted by DST in Pune
	



Screenshot of E-TLSID Project



Interactive Teaching Aid for Autism Children

V. Training offered:

S.No	Institute	Year	Nature of Programme
1	Training ITAAC kit to AIKYA & NEYAM Special School	2017-2018	Awareness Program
2.	Hands-on training for Autism Student	2017-2018	Workshop towards vocational skills
3.	Training ITAAC kit Audhura	2016-2017	Awareness Program
4.	Training in NIEPMD	2018-2019	Workshop for syllabus framing
5	Training at NIEPMD - Chennai	2019-2021	Workshop for syllabus framing

VI. Research Publications & Awards:

1. S.Poonkuzhali,PriyaVijay,D.SornaShanthi and E.Mohana, "Interactive Novelty Kit in Vernaular Language to Diagonize Functional Capablities of Autistic Children" in CAASR 2nd International Conference on Innovative Engineering & Technologies, Kuala Lumpur, Malaysia, May 5th -6th 2016.
2. Dr.S.Poonkuzhali, Priya Vijay, Sorna Shanthi and Sheik Mohamed Meera,(2019) published a book chapter " Interactive Teaching Aid for Autistic Children" in Intellectual and Developmental Disabilities with their Associated Conditions: Assessment & Therapeutic Interventions, published by AKINIK Publication, New Delhi.

TCS Best Project Awards:

S.No	Student Name	Project Title	Year
1.	**Karthick Raj V.R** **Muruga Padmanaban S** **Murugesan S**	Interactive E-Learning Kit To Improve The Self Behaviour Of Autistic Children Using Augmented Reality	**2011-15**
2.	**Poornima, Sanjana J,** **Sushmitha**	**Opti Ko Math**	**2012-16**

TCS Awards

Aarthy.A,Nagarathinam.SAishwarya.J
TCS BEST PROJECT AWARD 2014

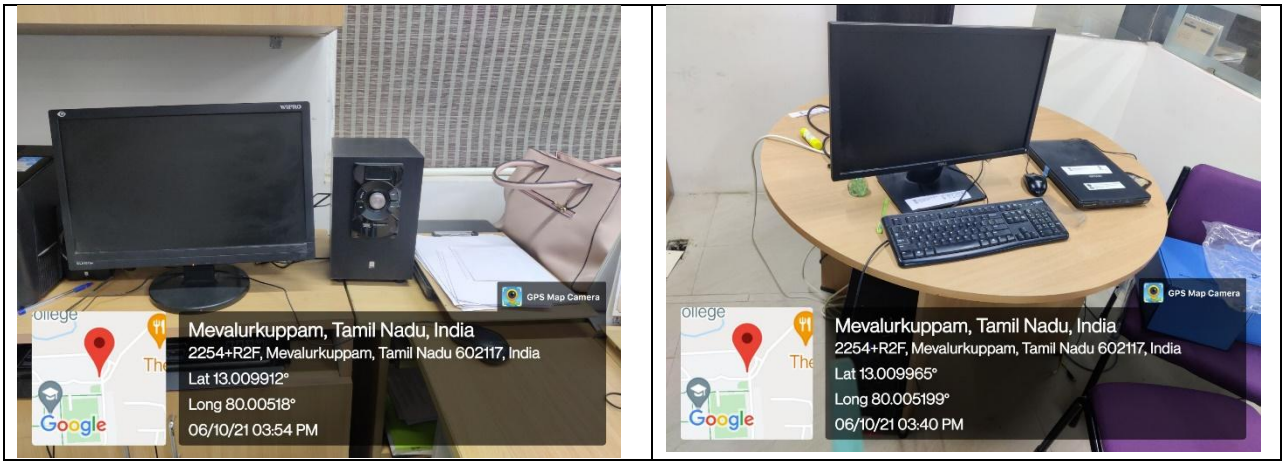
Karthikraj.V .R, Murugesan.S,Muruga Padmanaban.S
TCS BEST PROJECT AWARD 2015

VII. Linkages

S.No	Domain Expert Details	Designation organisation	Specific linkage with purpose & inputs received.
1.	Dr.Himangshu Das 9884141451	Director NIEPMD-Chennai	Done the brainstorming session with domain experts & project investigators for Identification of Trades & Curriculum Framing
2.	Neelam Bansal neelambansal.lko@gmail.com 9140825636	Assistant Professor CRC, Lucknow	Identification of task for each trade. Task analysis for each task listed for the trades, as the set of instructions to carry out animation. Field Testing & Validation of Prototype
3.	NitikaMendiratta nitikamendiratta@yahoo.com 9560047069	Director, Society for Advance Study in Rehabilitation, Bal Kalyan Bhawan, A-40B, Dayal Bagh, Surajkund, Faridabad, Haryana - 121009	Prepared Assessment Checklist(with ratings, inference etc.) for Generic skill based on Adapted VAPS model. Validation of Prototype
4.	Vikas Ray Rehabprofvikas@rediffmail.com 9811962970	Director, Learning Ladder, B-14, Greater Kailash enclave -1, Near TATA Communications New Delhi - 110048	Prepared Assessment Checklist(with ratings, inference etc.) for Pretraining module domains defined by SCPwD. Validation of Prototype
5.	Diana Lil Philip dianalilphilip@yahoo.com 9810540336	Special Educator Somerville School, Vasundhara Enclave, New Delhi- 110096	Preparing Pre requisite assessment checklist for trades Validation of Prototype
6.	Parvathy Viswanath	Director, AIKYA Learning Centre, special school for children with special needs – Mylapore-Chennai	Curriculum Design and Evaluation ITAAC e-kit Design and Implementation(Activity Description and Evaluation of Prototype) Field Testing

VIII. EQUIPMENTS AVAILABLE:

EQUIPMENT LIST	
1	Multimedia PC
2	Server
3	Laptop
4	360 Kinect sensor
5	Canon Camera with Lens, Tripod
6	Graphics Card Render Device
7	Laptop
8	360 Kinect sensor
9	Canon Camera with Lens, Tripod
10	Graphics Card Render Device
11	Scanner
12	External HDD
13	Printer
14	Audio Interface
15	AR/VR Tool
16	Adobe Pack
17	3D Particle Design Tool
18	3D Frame Capture Pack
19	3D Rendering Pack

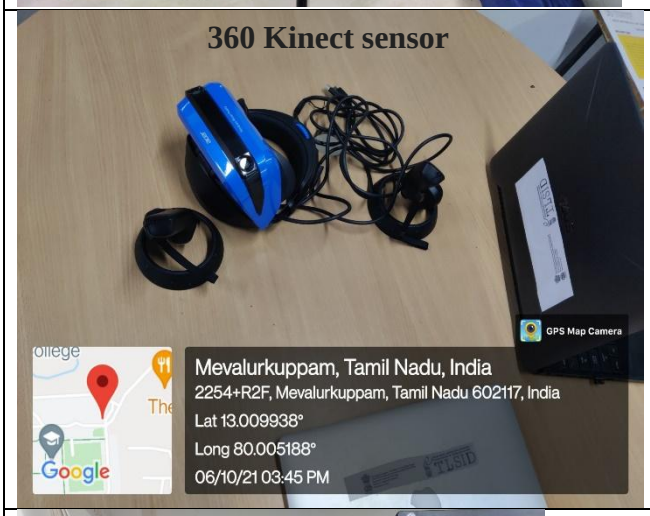


Multimedia PC

Canon Camera

3D Frame Capture Pack

360 Kinect sensor



Graphics Card Render Device

Printer

External HDD

IX. OUTCOME:

This centre helps to develop affordable devices and provides services, strategies, and practices that help people with disabilities live more independent and productive lives in their daily life roles.

- **Employment generation-**Person with ID will become employable and can achieve through placement.
- **Learning Automation**-Multimedia based learning aid to support individuals, special educators, parent and other stake holders.
- **Interactivity**- Attractive, accessible and user-friendly to all (even for rural areas) through vernacular language training.
- **Economic**-Cost effective solution for the consumers.
- **Scalability**-Solutions downloadable in any digital media and hence suitable for mass production and easy to deliver a larger group at the same time.
- **Flexibility**-Trades can be chosen based on interest, assessment and community resources.
- **Sustainability Plan-**After this project deployment and dissemination, we plan to organize workshop at various special schools with nominal fee structure.
- Provides Improved Quality of life for intellectually disabled person under BOP population
- **Digital India Initiative**-Supports sugamya bharat abhiyan since the application is accessible in mobile phones too.

Team Members

- Dr. S. Poonkuzhali – Center Head
- Dr. Priya Vijay – Faculty Coordinator
- Mrs.Sorna Shanthi – Faculty Coordinator

RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Biofilms

I. Vision

To be recognised globally as a Centre of Excellence in the field of Biofilms Biology, imparting knowledge and promoting interdisciplinary research for scientific discovery.

II. Mission

- To develop novel antibiofilms therapeutics .
- To educate students in the area biofilms and groom young scientistsin Research and Development.
- To build the capacity of technical personnel.
- To provide solutions for issues in the environmental and health sectors.

III. Research Activities:

- To carry out advanced interdisciplinary research activities in the area of microbial biofilms.
- To take up new projects funded by extramural agencies and industries.
- To conduct courses with significant participation of external faculty, industrial and regulatory experts on microbiology and biofilms.
- Entering into collaborative research engagements with Research Institutes and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

Biofilms Lab -Structure

IV. Projects at Centre of Excellence in Biofilms:

Funded Project:DST-SERB (ECR/2017/001335)

Project Title: Stress resistance and characterization of exopolysaccharides secreted by oral bacterial biofilm communities: A target for developing novel antibiofilm therapeutics.

Project description:

Colonization of bacteria in human oral cavities can cause serious issues for human health and social economics. Most importantly dental caries prevalence is as high as 60-80% in Indian children. Generally, periodontal disease is more common in adults. The Ministry of Health,Govt. of India, has launched the primary health care program focussed on its prevention and has spent huge amounts for the control measures, every year. It is also becoming more important to understand the whole physiological function of bacteria in biofilm, as metabolic changes control the balance of symbiotic (healthy) and pathogenic species within the oral bacterial communities. Currently advanced technologyis available to study the function of oral microbial communities, primarily focusing on mono species biofilms whereas, mixed species communities are less known. There are only very few reports on multi species biofilm using saliva as sole carbon source to grow the biofilms, while some reports recently describe dual-species and triple-species biofilm models. There is relatively a lack of understanding in the molecular mechanisms of multispecies interaction. Developing new methods to study the stress tolerance mechanisms, especially with the mixed species communities, is essential for guiding the information that helps to plan a strategy to improve human oral health.

The main objectives of the project are characterization of the matrix composition of mono species and mixed species biofilm communities, to identify and study the exopolysaccharides secreted by mono and mixed species biofilm.

OngoingProjects: Studies of isolation, identification and characterization of marine biofilm forming bacteria and its ability to degrade oil contaminants.

Project Description: Marine pollution has a huge impact in the environment. There are several sources and types of pollution that occur due to the release of various contaminants. One of the major contributors is oil spills. Sources for these include releases of crude oil from tankers, offshore platforms, drilling rigs and wells, spills of refined petroleum products (such as gasoline and diesel) and their by-products and the spills of any oily white refuse or waste oil. Bioremediation is a promising tool for the degradation of these contaminants in an eco-friendly manner. From an ecological perspective, microorganisms in environmental biofilms actively participate in ecosystem functioning. Biofilm formation is useful as well as harmful in healthcare, drinking water distribution systems, food, and marine industries etc., Biofilms offer beneficial roles in a variety of fields including applications in plant protection, bioremediation, wastewater treatment, and corrosion inhibition amongst others. Our present work mainly focuses on the isolation and characterization of marine biofilm forming bacteria.

Our objectives of our present work mainly focus on the isolation and characterization of marine biofilm forming bacteria from sediment and water samples collected from the beach shores of Nemmeli, Nivac and Mutukadu located near Chennai and to find its ability to degrade oil.

V. Training offered:

Internship training on Microbial Biofilms

VI. Research Publications:

1. Anand R, Vihaashriee, Johanna Rajkumar and **Saravanan Periasamy** "Isolation and characterization of marine biofilm forming bacteria and its ability to degrade oil. International Conference on Challenges in Chemical and Biochemical Engineering for Sustainable Development, AnnamalaiUniversity, Chidambaram, Tamil Nadu, March 23 & 24, 2022.
2. Poornachandra G, Anand R, and **Saravanan Periasamy** "Investigations on the synergistic antibiofilm activity of antibiotics and sodium dodecyl sulfate on oral biofilm forming bacteria. International Conference on Challenges in Chemical and Biochemical Engineering for Sustainable Development, Annamalai University, Chidambaram, Tamil Nadu, March 23 & 24, 2022.
3. Poornachandra G, Anand R, Johanna Rajkumar and **Saravanan Periasamy** "Stress resistance of biofilm forming bacterial isolates from human oral cavities" International Conference in Recent Progress in Biological Sciences,AyyaNadarJanakiAmmalCollege (Autonomous), Sivakasi, Tamilnadu - March 4 & 5, 2022
4. Anand R, Meeralakshmi MS, Johanna Rajkumar, and **Saravanan Periasamy**, "Extracellular products of *Bacillus amyloliquefaciens* B2SA2 inhibit the biofilm formation of bacterial isolates from oral communities "International Conference on Drug Discovery and Translational Research DDTR-2021", Pondicherry University, pp-12, February 25 & 26, 2021.

5. Pooranchandra.G, Anand R, **Saravanan P** "Stress resistance of biofilm forming bacterial isolates from Human oral cavities" International conference on Environmental, Agricultural, chemical and Biological Sciences ICEACBS 2022, VOICE, In support of UNITED NATIONS -SDGS. January 22,23 & 26, 2022.
6. Subhashini S, Anand R, **Saravanan Periasamy** "Isolation and characterization of coaggregation biofilm-forming bacteria from oral cavity", ICAST, Institute of Innovations, Thiruvannamalai, April 2&3, 2021.
7. Shanmugasundaram S, Sankari K, Rakshanan KS, Anand R, Meerlakshmi MS and **Saravanan Periasamy** "Green synthesized silver nanoparticles from bittergourd (Momordicacharantia) exhibits inhibitory activity of bacterial isolates from dental plaques" Web Conference on Biotechnology for a Better Tomorrow, Kamaraj College of Engineering and Technology, Virudhunagar June 25,26 & 27, 2020
8. Meeralakshmi MS, Anand R, Johanna Rajkumar, and **Saravanan Periasamy**, "Antagonistic interaction of oral biofilm forming bacteria, Boon or Bane to species diversity?", International Conference on Biodiversity and Ecological Restoration, Quaid e Millath Government College,Chennai, pp-18, January 30 & 31, 2020
9. MS Meeralakshmi, Anand R, and **P. Saravanan**, "Isolation and Characterization of Biofilm forming *Streptococcus Salivarius* (M2SA3) *Rothiadentocariosa* (MDP2) from dental plaque and their interactions, 3RD International Conference – Evidence Based Medicine and clinical Research (EBCOON 2020), SRM Medical college and research centre, Chennai, pp-EBOP12, February 7 & 8, 2020.

Invited talk

1. **Dr. Saravanan.P.** Invited as Resource person for the online presentation to the PhD students Organized by Department of Chemical and Materials Engineering, School of Engineering and Digital Sciences,Nazarbayev University Astana, Kazakhstan, 04.11.2020. Title of the Talk " Oral Biofilms Basics"
2. **Dr. Saravanan P.** Invited as Resource person for the Workshop on Anaerobic Microbiology, Organized by Department of Biotechnology, Bharathiyar University, Coimbatore, 28.02.2020 and 29.02.2020, Title of the Talk" Anaerobic Oral Biofilms"
3. **Dr. Saravanan P**. Invited as Resource person for the Workshop on Microbial Biofilms Organized by School of Chemical and Biotechnology, SASTRA University, Thanjavur, 13.12.2019 and 14.12.2019, Title of the Talk" Biofilm methods and Medical Biofilms"
4. **Dr. Saravanan P**. Invited as Resource person for the International Conference workshop on image analysis for the treatment of human infectious disease Organized by Department of Biotechnology, Kumaraguru College of Technology, 10.05.2018 and 11.05.2018, Title of the Talk" Hands on Training on Biofilm Image Analysis".

List of Projects Guided/Guiding

Projects Guided/ Guiding	No. Of Students	Details
Ph.D	1	Anand R (FT) Pursuing
M.Tech	4	Meeralakshmi MS (2018-2020) Subhashini M (2019-2021) VihaaShriee MG (2020-2022) Pursuing Pooranachandra G (2020-2022) Pursuing
B.Tech	3	Shanmugam Rakshana Sankari(2016-2020)
	1	Sowmya Narayanan (2018-22) Pursuing

List of Bacterial 16SrDNA Sequences published in the National Centre for Biotechnology Information (NCBI), USA.

S. No	Accesion Number and Strain Name	Date of Publication
1.	**MN474012*Streptococcus salivarius* RECBT B4TS2** **Periasamy S ,**Sumathi A, Rajkumar J and Anirud R.	September 18, 2019
2.	**MN538249*Rothiamucilagionosa* RECBT B5SA5** Reshabb A, **Saravanan P** Anand Rand Meeralakshmi MS.	October 05, 2019
3.	**MN538250*Bacillus amyloliquefaciens* RECBT B2SA2** Anand A, **Saravanan P** and Reshabb A.	October 05, 2019
4.	**MN602475*Aneurinibacillusaneurinilyticus* RECBT B1DP1** **Saravanan P**, Reshabb A, Anand R and Meeralakshmi MS.	October 24, 2019
5.	**MN832990*Rothiadentocariosa* RECBT MDP2** Meeralakshmi MS, **Saravanan,P.** and Anand R.	December 17, 2019
6.	**MN832993*Streptococcus salivarius* RECBT M2SA1** Meeralakshmi MS, **Saravanan P** and Anand S.	December 17, 2019
7.	**MN039523 *Tsukamurellapaurometabola* RECBT M2SA4** Meeralakshmi MS, Anand R, **Saravanan P** and Ayyadurai N.	February 11, 2020
8.	**MT039533*Bacillusflexus* RECBT SW4** Rakshana KS, Sankari K, Shanmugasundaram K , Meeralakshmi MS, Anand R and **Saravanan P.**	February 11, 2020
9.	**MT039534 *Staphylococcus pasteuri* RECBT B1SA1** Sankari K, Rakshana KS, Shanmugasundaram R , Anand R, Meeralakshmi MS, **Saravanan P**and Ayyadurai N.	February 11, 2020
10.	**MW332548*Pseudomonas aeruginosa* RECBT B3DPE3** Anand R, **Periasamy S,**Shanmugasundaram R, Sankari K and Rakshana K.	December 07, 2021
11.	**MT039531*Enterobacter cloaceae* RECBT E1** Shanmugasundaram R, Rakshana KS, Sankari K, **Saravanan P**, Anand S and Meeralakshmi MS.	February 11, 2020
12.	**MW774348*Streptococcus salivarius*RECBT AS2** Subhashini S, Anand R, Poornachandra G, Vihasriee G,	March 19, 2021

	Periasamy S.	
13.	**MW774351*Staphylococcus arlettae* RECBT S4** Subhashini S, Anand R, Poornachandra G, Vihasriee G, **Periasmy S.**	March 19, 2021
14,	**MZ824593 *Streptococcus salivarius* RECBT SW3** Anand R, Shanmugam S, Sankari K, **Periasamy S.**	August 18, 2021
15	**OL589537 *Streptococcus cristatus* RECBT M2SA1** Anand R, Meeralakshmi MS, **Periasamy S.**	October 22 2021
16.	**OL589516 *Bacillus antracis* N2W** Vihasriee, Poornachandra, Anand R, **Periasamy S.**	November 27 2021
17	**OL589517 *Exiguobacterium mexicanum* NI5** Vihasriee, Poornachandra, Anand R, **Periasamy S.**	November 27 2021
18	**OL589518 *Micrococcus leutus* N2S** Vihasriee, Poornachandra, Anand R, **PeriasamyS.**	November 27 2021
19.	**OM491189 *Streptococcus lutetiensis* OS7** Pooranachandra G, Vihaasriee MG, Anand R, **PeriasamyS.**	February 8 2022
20.	**OM491190 *Staphylococcus epidermidis* OS8** Pooranachandra G, Vihaasriee MG, Anand R, **Periasamy S.**	February 8 2022
21.	**OM491191 *Limosilactobacillus fermentum* OS9** Pooranachandra G, Vihaasriee MG, Anand R, **PeriasamyS.**	February 8 2022

List of Bacterial cultures deposited and their accession numbers:

S.No	Strain Name	Culture collection	Accession Number	Date of Deposit
1.	*Bacillus amyloliquefaciens*RECBT B2SA2	NCCS	MCC 4424	October 10, 2020
2.	*Streptococcus salivarius*RECBT B4TS2	MTCC	13009	March 18, 2020
3.	*Rothiadentocariosa*RECBT MDP2	MTCC	13010	March 18, 2020
4.	*Aneurinibacillusaneurinilyticus* RECBT B1DP1	MTCC	13008	March 18, 2020
5.	*Enterobacter cloaceae*RECBT E1	MTCC	13075	April 12, 2021
6.	*Staphylococcus pasteuri*RECBT B1SA1	MTCC	13076	April 12, 2021
7.	*Pseudomonas aeruginosa*RECBT B3DPE3	MTCC	13077	April 12, 2021
8.	*Tsukamurellapaurometabola* RECBT M2SA4	MTCC	13078	April 12, 2021

VII. Courses in curriculum: Related to Biofilms Biology

S.no.	Course name
1	Microbiology
2	Biochemistry
3	Cell Biology
4	Molecular Biology
5	Immunology
6	Advanced Genetic Engineering
7	Advances in Molecular Pathogenesis
8	Preparative and Analytical Techniques in Biotechnology
9	Bio-separation technology
10	Advanced Genomics and proteomics

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Computational Fluid Dynamics

(Numerical Engineering Simulation Lab)

I. Vision

To be a leader in numerical modelling and simulation of heat and fluid flow problems.

II. Mission

To support the needs of aerospace and automotive industries in both civil and defence by providing technical research and consultancy in the field of numerical modelling and simulation of heat and fluid flow problems.

III. Research Activities:

- To support defence and aerospace industry in simulation and modelling for product re-engineering and new product development.
- To provide design and analysis support for development of Test rigs and research equipment.
- To support SME's in design and product development using cutting edge simulation & analysis.
- To perform interdisciplinary research in the field of medical engineering such as bio-fluidics, bio-mechanics and orthodontics.

IV. Projects at Centre of Excellence in CFD (NES Lab):

Research Projects Undertaken:

Sl.No	Title of the Project	Value in Rs.	Funding Agency	Duration	Status
1	CFD Simulation of Ring Laser Gyroscope (Proposal no.3744)	18.5 lakhs	AR & DB	24 months	Ongoing
2	Design and Development of a motorized temperature measurement system for sector combustor	9.95 lakhs	GTRE	8 months	Ongoing
3	Development and evaluation of rotating nozzle for diesel engine	17.67 lakhs	CVRDE	2 Years	Completed
4	Trajectory estimation of a large object inside an intake duct of an aircraft	6.21 lakhs	GTRE	1.5 Years	Completed
5.	Detail engineering design of a compressor test rig for a small gas turbine	9.29 lakhs	GTRE	1 Year	Completed
6.	Thermography as a tool to detect foetal abnormality	10.1 lakhs	ICMR	2 Years	Completed

V. Training offered:

- Workshop on Computational Fluid Dynamics

VI. Research Publications:

- **Chandrasekar Pichandi** and Natteri M Sudharsan, 2022, 'Performance enhancement and emission control of a DI-diesel engine using a self-rotating injection strategy – A numerical and experimental study', Journal of Energy Resources Technology, Transaction of ASME, (https://doi.org/10.1115/1.4053578), **(SCIE and Scopus Indexed, Impact Factor: 2.90, Cite Score: 5.1)**.

- **Chandrasekar Pichandi** and Natteri M Sudharsan, "Performance enhancement of a diesel engine with rotating injector – a numerical study", Journal of Engineering

Research, Vol.10 (1B), pp. 205-225. [**SCI Indexed, Impact Factor: 0.8, Scopus Indexed**]. (DOI: https://doi.org/10.36909/jer.9597)

- S. V. Ajaicimhan, **Natteri M Sudharsan**, Design of a Centrifugal Compressor Test Rig, Journal of Advanced Research in Fluid Mechanics and Thermal Sciences, Vol. 79, Issue 1, PP. 63-80, Jan 2021, Publisher: Penerbit Akademia Baru. [**SCOPUS Indexed, Cite Score: 1.2**]

- J. Ramakrishnan, P. T. Rushanth Gaurav, N. Subash Chandar & **N. M. Sudharsan**, Structural Design, Analysis and Optimization of MEMS-based Capacitive Accelerometer for Automotive Airbags, Microsystem Technologies, Springer, Vol.27, PP. 763-777, May 2021, [**SCI, SCOPUS Indexed, Impact Factor: 1.5**]

- **P Chandrasekar**, Prasad Neelakantan S, Balamurugan Varadarajan and **N M Sudharsan**, "Design and performance evaluation of a novel self-rotating fuel injector using computational fluid dynamics - a preliminary study", Thermal Science, Volume 24/Issue 1A, PP. 271-280, March 2020, Publisher: Vinca Institute of Thermal science, Serbia. **[SCI, SCOPUS Indexed, Impact Factor: 1.54]**

- Arshibanu & **Natteri M Sudharsan**, Experimental Heat and Mass Transfer Studies On Horizontal Falling Film Absorber Using Water-Lithium Bromide, Thermal Science Vol. 24 (3), pp. 1923-1934, May 2020, Publisher: Vinca Institute of Thermal science, Serbia, **[SCI, SCOPUS Indexed, Impact Factor: 1.54]**

- L. Aravinth, N. Vidhyashankar, Reza Abbas, **N.M. Sudharsan**, Estimation of an Object Trajectory in an Intake Duct using Numerical Simulation, Defence Science Journal, Vol. 70/ Issue 1, 10-17, Jan 2020, Publisher: DESIDOC. **[SCI, SCOPUS Indexed, Impact Factor:** 0.589**]**

- M.S. Pattanaik, V.B. Varma, S.K. Cheekati, G. Prasanna, **N.M. Sudharsan**, R.V. Ramanujan, "A self-regulating multi-torus magneto-fluidic device for kilowatt level cooling" *Energy Conversion and Management*, Vol. 198(2019), PP. 111819, October 2019, Publisher: Elsevier, **[SCI, SCOPUS Indexed, Impact Factor: 7.181]**

- J. Febina, Mohamed Yacin Sikkandar , **N. M. Sudharsan**, Wall Shear Stress Estimation of Thoracic AorticAneurysm Using Computational Fluid Dynamics, Computational and Mathematical Methods in Medicine Volume 2018, Article ID 7126532, 12 pages.

- Vijaykumar B. Varma, Ayan Ray, Zhaomeng Wang, Zhiping Wang, Ruige Wu, P. J. Jayaneel, **Natteri M. Sudharsan**, and Raju V. Ramanujan; Control of Ferrofluid Droplets in Microchannels by Uniform Magnetic Fields; Magnetic Instruments; 1949-307X © 2016 IEEE.

- Vijaykumar B. Varma, Ayan Ray, Zhaomeng Wang, Zhiping Wang, P. J. Jayaneel, **Natteri M. Sudharsan**, and Raju V. Ramanujan; Magnetic Droplet Merging by Hybrid Magnetic Fields; Magnetic Instruments; 1949-307X © 2016 IEEE.

- Ray, V.B. Varma, P.J. Jayaneel, **N.M. Sudharsan**, Z.P. Wang, and R.V. Ramanujan, On Demand Manipulation of Ferrofluid Droplets by Magnetic Fields, Sensors and Actuators B: Chemical, Volume 242, April 2017, Pages 760–768. **Impact Factor – 4.758.**

VII. Courses in curriculum:

S.no.	Course code	Course name
1.	ME19P84	Computational Fluid Dynamics
2.	ME17E77	Computational Fluid Dynamics
3.	ME17E75	Gas Dynamics and Jet Propulsion
4	ME19602	Gas Dynamics and Jet Propulsion

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Data Science (CEDS)

I. Vision:

To be a globally recognised centre of excellence in the field of Data Science to promote data driven problem solving research and industry projects.

II. Mission:

- To upskill students and faculty members in the Data science Field and AI.
- To help customers build new solutions and digital assets to keep them ahead of the curve.
- To attain excellence in data analytics through focused multidisciplinary research and training.
- To work in collaboration with industry and academic institutions to help them generate knowledge from data and create business value.

III. Research Activities:

i. ***Academic Research-*** The centre supports and fosters academic research in the field of data science and AI.
ii. ***Knowledge Dissemination:*** The centre disseminates research reports/findings to key stakeholders including academics through a variety of channels viz., media outreach, participation in academic and professional conferences, authored articles, workshops, etc.
iii. ***Industry Connect:*** The centre connects with the industry by collaborating with them in conducting workshops and seminars for the audience that is keen to track the progress of data science and AI in practice.

iv. ***Consulting Activities:*** The centre facilitates the businesses by connecting them with researchers who are working on cutting edge problems and can help solve challenging business problems.
v. ***Data-driven Policy Enablement:*** The centre enables the policy makers and the industries with reports on the trends and the progression of the analytics tools, techniques, market, opportunities, human capital, and other resources, within the country and worldwide.

IV. Projects at Centre of Excellence in Data Science

Grants Received:

S. No	Major / Minor	PI/Co-ordinator	Funding Agency	Amount	Ongoing / Completed
1.	Efficient Prediction and Monitoring Tool for Diabetes Patients using Data Mining and Smart Phone System	Dr.S.Poonkuzhali	AICTE -RPS	4.76 Lakhs 2015-2018	Completed
2.	Seminar on Data Analytics Techniques to predict Epidemics from public health records	Dr.K.Devaki	Indian Council of Medical Research	50000 2017-2018	Completed
3.	Seminar on Computational Intelligence	Dr. S. Gnanavel	CSIR - Seminar Grant	50000 2019-2020	Completed

PhD Thesis:

10 Scholars pursuing PhD in Data Science Domain

Currently research scholars are working in the following areas in this COE:

- Big Data Analytics for Efficient Prediction and Monitoring of Diabetes Patients using Internet of Things.
- Predictive Analytics to enhance Urban Transportation using Machine Learning Techniques.
- Predictive Analytics for Augmenting Indian Tourism using Deep Learning Techniques.
- Data analytics methodology for IoT Device Security Model.
- Artificial Intelligence Based Student Learning Methodology

Three Research scholars completed PhD

1. Mr. A.Vijayarai completed his PhD Viva voce examination on the thesis titled "AN ENHANCED APPROACH FOR CONGESTION AVOIDANCE IN WIRELESS NETWORKS "- 31st Dec 2019.

2. Mr. S. Vinod Kumar completed his PhD Thesis on the Topic "PREDICTIVE ANALYTICS TO AUGMENT TEXTILE AND GARMENT INDUSTRY GROWTH" - 30th April 2021.

3. Ms. B. U. AnuBarathu completed her PhD Thesis on the Topic "DESIGN OF REAL-TIME DATA ANALYTICS MODEL FOR HEALTHCARE SURVEILLANCE SYSTEM BASED ON MACHINE LEARNING AND DEEP LEARNING' – 27th Sep 2021.

UG/PG Student Projects:

S.NO	PROJECT TITLE	REGISTER NO.	STUDENT NAME
1.	Image recognition using opencv	170701002	Abarna v
2.	Drowsiness detection system	170701051 170701081	Divya cr Iniya k
4.	Movie recommendation system	180701001 180701004 180701008	Aakash g Abdul kader bh Abishek s
5.	Real-time covid-19 face mask detector	170701090 170701066	Jothiswaran A Hari Krishnan G
7.	Currency recognition	170701246 170701256	Udhai solai ar Vasanth p
8.	Emergency vehicle classification system	180701103 180701082	Jayashree d Hanthra b
9.	Sentiment analysis on imdb movie reviews	180701145 180701159	R monish kumar Padmashree j
10.	Image cartoonifyer system	170701061 170701063	Gokul krishnan m gokul raj b

Awards:

- Dr.S.Poonkuzhali Received ***International Paper Presenter Award*** from Computer Society of India in the 53rd National Annual Convention at Bhubaneswar, Odisha during Jan 2020.

V. Training offered:

- **Faculty upskilling programme on Data Science Specialization –Machine Learning**

Year	No of FAculty Members
2021	32

- **Students Upskilling in Machine Learning and Deep Learning**

S.No	Year	Batch	No of Students
1	2019	2017 and 2018	150
2	2021	2029	50

VI. Research Publications

JOURNAL PUBLICATION DETAILS 2018-2019

SNo	Name of the Authors	Title of the paper	Name of the Journal	Vol (Issue)	Year	Indexed by	Impact Factor
1	Vinod Kumar S, Poonkuzhali S	Improvising the Sales of Garments by Forecasting Market Trends using Data Mining Technique	International Journal of Pure and Applied Mathematics	119 (12)	2018	**Scopus**	**0.127**
2	Susmita Mishra, Dr Prakash M	Study of Fuzzy Logic in Medical Data	International Journal of Pure and Applied	119 (12)	2018	**Scopus**	**0.127**

		Analytics	Mathematics				
3	Swetha Sridharan, Venkatesh Prasad R, Srinarayan S	A Detailed survey on Image watermarking	International Journal of Pure and Applied Mathematics	119 (12)	2018	**Scopus**	**0.127**
4	Charulatha BS, Arun Rajaraman	Deep Learning and Indian Heritage	International Journal of Engineering & Technology	7 (3.12)	2018	**Scopus**	**0.135**
5	Geetha Ramani R, Revathy P, Lakshmi B	Grouping of users based on user navigation behaviour using supervised association rule tree mining	International Journal of Reasoning - based Intelligent Systems	10(3/4)	2018	**Scopus**	**No**
6	R.GeethaRamani, Priya Vijay	Improvised emotion and genre detection for songs through signal processing and genetic algorithm	Concurrency Computation Practices	Spl issue	2018	**SCI**	**1.167**
7	Duraimurugan N, Chokkalingam SP, Samir Brahim	Analysis of deep learning models using convolution neural network	International Journal of Engineering and Advanced Technology	8 (3S)	2019	**Scopus**	**1.0**

	Belhaouari	techniques					
8	Rajalakshmi J, Duraimurugan N	Action recognition for controlling electronic appliances	International Journal of Innovative Technology and Exploring Engineering	8 (3S)	2019	**Scopus**	**0.102**
9	Geethapriya S, Duraimurugan N, Chokkalingam SP	Real Time object detection with YOLO	International Journal of Innovative Technology and Exploring Engineering	8 (3S)	2019	**Scopus**	**0.102**
10	Gnanasambandan P and Poonkuzhali S	Predicting the Trustworthiness of Internet Users using Deep Neural Network in Green IT World	International Journal of Pure and Applied Mathematics	**119(16)**	**2018**	**Scopus**	
11	Poonkuzhali S, Sindhuja M, Mohana Elumalai & Vishweshh.R	Android App to provide Context and Mood Based Music Recommendation System Using Sentiment Analysis	International Journal of Pure and Applied Mathematics	**118(16(**	**2018**	**Scopus**	

12	Gnanasambandan P and Poonkuzhali S	Review and Framework for Mining Diverse Patterns on Web Log Files	International Journal of Pure and Applied Mathematics	**118(16)**	**2018**	**Scopus**	
13	S. Vinod Kumar and S.Poonkuzhali	Improvising the Sales of Garments by Forecasting Market Trends using Data Mining Techniques	International Journal of Pure and Applied Mathematics	**118(6)**	**2018**	**Scopus**	

JOURNAL PUBLICATIONS DETAILS 2019-2020

Sno	Author Name	Title	Journal Name	Vol/ Issue	Year	Indexed by	Impact Factor
1	S.Poonkuzhali, S.Vinodkumar	Recommendations to improve dead stock management in garment industry using data analytics	Mathematical Biosciences and Engineering	16(6)	2019	SCI	1.23
2	S.Poonkuzhali, S.Vinodkumar	Visualization of Import and Export Market of Indian Textile Business through Data Analytics	Jour of Adv Research in Dynamical & Control Systems	11 (Spl 5)	2019	Scopus	0.308

3	Shiny K. V, Sugitha N., Swaminathan B, Bhuvaneswaran B.	Enhancement in Segmentation of Brain Tumors on MRI Using Region Growing Algorithm	Indian Journal of Public Health Research & Development	10 (7)	2019	Scopus	0.02
4	M.Sreekrishna, N.Sankarram, Dinesh Sha, Dakshin, Ashwini	Recommendation Based on Prediction of Commuter Flow and Occupancy in Bus Transport	International Journal of Recent Technology and Engineering (IJRTE)	8 (3)	2019	Scopus	1.0
5	M.Santhiya, M.Shobana, R.Jegatha	A Supervised Classification Techniques to Optimize Error Evaluation and Space Complexity	International Journal of Innovative Technology and Exploring Engineering	8(11S)	2019	Scopus	1.0
6	S.Geethapriya, K.Devaki, V.MuraliBhaskaran	Multiple Object Detection in Images Using Template Matching	International Journal of Innovative Technology and Exploring Engineering	9 (1)	2019	Scopus	1.0
7	S. Prithi, S. Sumathi	LD2FA-PSO: A novel Learning Dynamic Deterministic Finite Automata with PSO algorithm for secured energy efficient routing in	Ad Hoc Networks	20	2020	Scopus, SCI	4.1

		Wireless Sensor Network					
8	K. Dhinakaran, N. Duraimurugan, S. Sowmiya, S. Sivasankari	Detection of Driver Drowsiness Using Multi-task CNN Framework	International Journal of Advanced Science and Technology	29(4)	2020	Scopus	0.4
9	N. Durai Murugan, J. Monika Shri , E.Niranjan, R.Poornima	Prediction and Classification of Potholes in Road Surface using CNN	Test Engineering and Management	83	2020	Scopus	0.43
10	N. Durai Murugan, L. Madhan, A. NaveenKumar, S. Naveen	Classification of Diseases in Apple Leaf using Optimized Segmentation and CNN Techniques	Test Engineering and Management	83	2020	Scopus	0.43
11	K.Vijay, N. Natheeswari, Y. Arockia Raj, P. Sivaranjani	Employee Tracking System using Blockchain	Test Engineering and Management	83	2020	Scopus	0.43

12	D.Sorna Shanthi, B.Jaikrishna, RM. Jagan, M.Harish	Recon- Automation using OSINT	Test Engineering and Management	83	2020	Scopus	0.43
13	P. Revathy, B. Tejashree, S. Varshini, S. Vibhaa	Tweets Categorization and Comparison of Results using Machine Learning Models	Test Engineering and Management	83	2020	Scopus	0.43
14	M. Mariprabhu, R. Niranjana, R. Praveen Kumar, V. Jananee	Stock Prediction by Ensembling LSTM Using AdaBoost Algorithm	Jour of Adv Research in Dynamical & Control Systems	12	2020	Scopus	0.308

Book Chapters (2019 -2020)

S.No	Name of the Faculty	Title of the paper	Name of the Journal	Vol. No (Issue)	Page no.	Month	Year
1	Bagavathy Priya S, Vinothini A,	Business Aspects, Models, and Opportunities of IoT	Edge Computing and Computational Intelligence Paradigms for the IoT	Chapter 6	69-99	June	2019
2	Mr.P V. Raja raman, Dr. M. Prakash	A Survey on Text Question Responsive Systems in English and Indian Languages	Advances in Intelligent Systems and Computing	1118	267-277	February	2020

JOURNAL PUBLICATION DETAILS (2020-2021)

S.No	Name of the Authors	Title of the Paper	Name of the Journal	Vol (Issue)	Year	Indexed by	Impact Factor
1	P.Nancy, S.Sridhar, R.Akiladevi, V.Sudha	Exploration on covid-19 data in India using machine learning for prediction of infected and death cases	Advances in Mathematics: Scientific Journal	7(9)	2020	Scopus	1.494

2	P.Durgadevi, M.Bhavani, Shankar, J. Rene Beulah	Bank Endoresement Classification: A Novel Content Based Approach Using Pupil Tracking Technology	Journal of Computational and Theoretical Nanoscience	17(8)	2020	Scopus	0.488
3	G. Charlyn Pushpa Latha, S. Sridhar, S. Prithi, T. Anitha	Cardio-Vascular Disease Classification Using Stacked Segmentation Model and Convolutional Neural Networks	Journal of cardiovascular disease research	11(3)	2020	Scopus	0.59
4	A. Vinothini, S. Baghavathi Priya	Design of chronic kidney disease prediction model on imbalanced data using machine learning techniques	Indian Journal of Computer Science and Engineering	11 (6)	2020	Scopus	0.19
5	B. U. Anubharathi, S.Poonkuzhali	Design and Implementation of Interactive Data Analytics Model for Predicting the Survivability of Breast Cancer Patients	Journal of Environmental Protection and Ecology	21 (4)	2020	SCIE	0.577

6	S.Vinodkumar S.Poonkuzhali	Environmental Issues and Data Analytics Model for Predicting Buyer Sentiments on Women's Clothing	Journal of Environmental Protection and Ecology	21 (5)	2020	SCIE	0.577
7	Shaik Khaleel Ahamed, B.V.Krishna, D.Beulah David	Brain Tumor Segmentation and Classification based on Deep Learning-Based Inception Networks	Annals of the Romanian Society for Cell Biology	25(3)	2021	Scopus	0.1
8	S. Rajkumar, PV Rajaraman, Haree Shankar Meganathan, V Sapthagirivasan, K. Tejeswinee	Covid-Detect: A Deep Learning Approach For Classification Of Covid-19 Pneumonia From Lung Segmented Chest X-Rays	World Scientific	33	2021	Scopus	1.439

9	Prithi Samuel Subbaiyan, S., Balusamy, B. et al.	A Technical Survey on Intelligent Optimization Grouping Algorithms for Finite State Automata in Deep Packet Inspection.	Springer	28(3)	2021	SCIE	0.402
10	A. Mary Judith, S.Baghavathi Priya	Multiset task related component analysis (M-TRCA) for SSVEP frequency recognition in BCI	Journal of Ambient Intelligent Humanized Computing	12 (5)	2021	Scopus	0.402
11	Rajamanogaran, M., Subha, S., Baghavathi Priya, S., Jeevitha Sivasamy.	Contactless attendance management system using artificial intelligence	Journal of Physics-Conference Series	1714 (1)	2021	Scopus	0.41
12	Vinothini A, S. Baghavathi Priya	Selecting Dominant Features for the Prediction of Early-Stage Chronic Kidney Disease	Intelligent Automation & Soft Computing	31(2)	2021	SCIE	1.647

BOOK CHAPTER DETAILS 2020-2021

S.No	Name of the Faculty	Title of the paper	Name of the Journal	Volume No (Issue)	Page Number	Year	Indexed By
1	M.Divya, SankarKoushik Rahav, S.Udhayakumar	Sensible Autonomous achine using Deep Learning and Convolutional Neural Networks	Advances in Intelligent Systems and Computing	1163	603=612	2020	Scopus
2	D.J. Narendran, R. Abilash, B. S. Charulatha	Exploration of classification algorithms for divorce pediction	Advances in Intelligent Systems and Computing	1245	291-303	2020	Scopus
3	K.Vijay, R. Vijayakumar, P Sivaranjani Logeshwari R	Scratch Detection In Cars Using Mask Region Convolution Neural Networks	Advances in Parallel Computing	37	575-581	2020	Scopus
4	M. Bhavani, V. Pavithra, R. Monesh	Prediction of Cancer and Suggestion of Therapies	Advances in Parallel Computing	37	538-542	2020	Scopus

5	M.Shobana . S.Poonkuzhali	A Novel Approach for Detecting IoT Botnet Using Balanced Network Traffic Attributes	Lecture Notes in Computer Science(LNCS)	vol 12632	pp 534-548	2021	Scopus

VII. Courses in curriculum:

- **B.E AI & ML**
- **M.Tech Data Science**

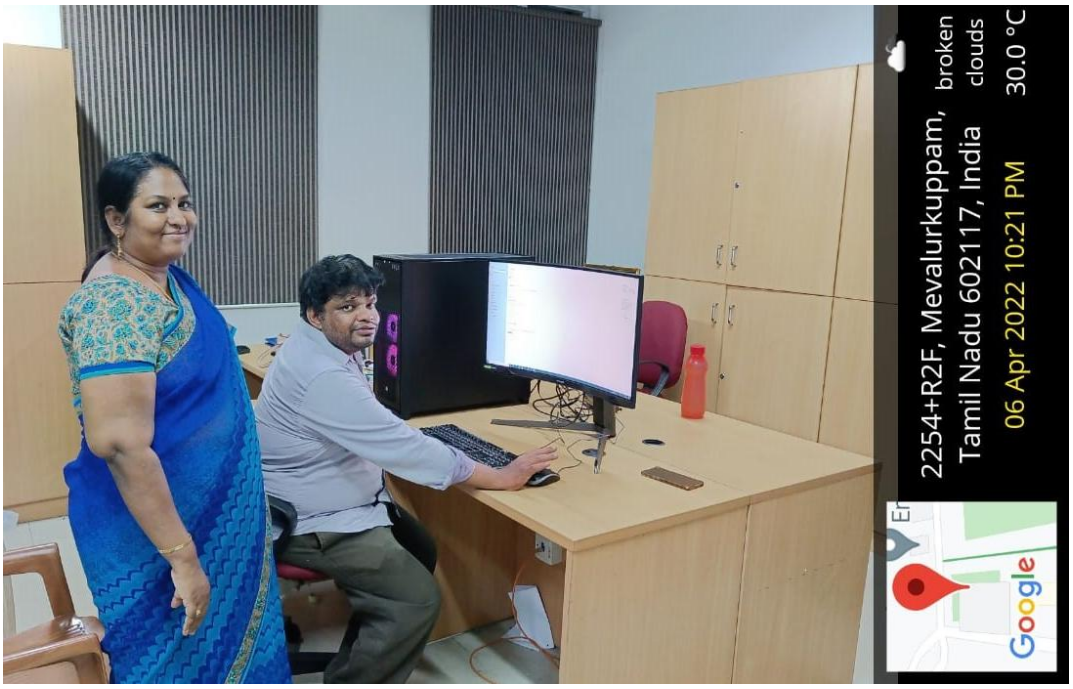
S.no.	Course code	Course name
1.	AI19341	Principles of Artificial Intelligence
2.	IT17601	Computational Intelligence
3.	CS19P15	Data Mining
4	CS19643	Foundations of Machine Learning
5	CS19P18	Deep Learning Concepts
6	CS19P16	Data Analytics
7	CS19P20	Social, Text and Media Analytics
8	CS19P19	Cognitive Science
9	CB19P01	Cognitive Science and Analytics
10	CB19P48	Advanced Social, Text and Media Analytics

VIII. MoU's Signed:

1. DS Consultancy
2. Bennett University

TEAM MEMBERS

Dr.Priya Vijay - Head
Dr.S.Poonkuzhali
Dr.S.Vinod Kumar
Mr.P.V.Rajaraman
Ms. J.Jeyalakshmi
Ms.L.K.Nandhini
Ms.D.Sorna shanthi
Dr.R.Anto Arockia Rosaline
Ms.K.R.Sowmia



DS Consultancy

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Digital Manufacturing

I. **Vision:**

To be a globally recognised centre of excellence in digital manufacturing, offering high-quality education, multidisciplinary research, and development of innovative solutions to various needs through cutting edge technologies.

II. Mission

- To provide training to the students in the areas of 3D printing, Reverse Engineering and Automation for professional skill development.
- To undertake cutting edge research in the areas of Additive manufacturing, Digital Manufacturing, New materials, IoT and AI.
- To offer testing/characterisation of new materials developed.
- An **Innovation Lab** will be housed at the centre to encourage a culture of innovation and open engineering.

III. Research Activities:

To carry out advanced interdisciplinary research activities in the areas of Additive manufacturing, Automation, Internet of Things (IoT) and new materials cater to the needs of the industry and society (in general) and using this as a general research facility to take up new research projects from industry and other bodies.

- Conducting training programmes in the related areas for professional skill development.

- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries covering, but not limited to, manufacturing, agriculture etc.
- Conducting courses with significant participation of external faculty, industrial and regulatory experts on Industry 4.0.
- Entering into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

IV. Projects at Centre of Excellence in IoT:

Consultancy Service offered to :M/s. Atalon Services, Sriperumbudur.

Project Title: Vibration measurement in Carrier and Cylinder.

Project description:

To evaluate the amplitude of vibration and natural frequency of the carrier and cylinder used in the internal combustion engine**.**

Training offered:

- Workshop on Reverse Engineering.
- One day hands-on session on 3D printing.

V. Research Publications:

1. J. Shyam Sundar, R. Subramanian, N. Venkateshwaran, R. Jayasree, *and* A. Saravanan . Preparation and characterization of bromelain-based poly-vinyl alcohol fiber. AIP Conference Proceedings 2395, 020006 , 2021); https://doi.org/10.1063/5.0068225.

2. K Vigneshwaran, N Venkateshwaran. Statistical analysis of mechanical properties of wood-PLA composites prepared via additive manufacturing. International Journal of Polymer Analysis and Characterization,2019, 24 (7), 584-596. Impact Factor: 1.26

3. N Vinoth Babu, N Venkateshwaran, N Rajini, SO Ismail, F Mohammad . Influence of slicing parameters on surface quality and mechanical properties of 3D-printed CF/PLA composites fabricated by FDM technique. Materials Technology, 2021, 1-18.

4. R.RajaSabithaJannet, **N.Venkateshwaran**, S.Gurusideswar, NareshKakur, Effects of Infill Speed and Heat Treatment on Mechanical Properties of Carbon Fiber Reinforced Polyethylene Terephthalate Glycol (CF-PETG) Composites, Reference

Module in Materials Science and Materials Engineering, Elsevier Publication, 2022. https://doi.org/10.1016/B978-0-12-820352-1.00255-8

5. K.Vigneshwaran, N.Venkateshwaran, S. PanneerSelvan, N. VinothBabu and K.Naresh, Ageing Studies of Wood-PLA 3D Printed Composites by FFF Technique. Reference Module in Materials Science and Materials Engineering, Elseiver Publication, 2022, https://doi.org/10.1016/B978-0-12-820352-1.00267-4

VI. Courses in curriculum:

S.No.	Course code	Course name
1.	ME17E86	Additive Manufacturing
2.	ME19702	Automation in Manufacturing
3.	ME19P64	Industry 4.0
4	ME19P65	Robotics
5.	OME1902	Basics of 3D printing and additive manufacturing

VII. MoU's Signed:

1. Discussion is going on with M/s. Next Generation 3D Printers and Services (P) Ltd., Chennai.

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Electric Vehicle

Department of Electrical and Electronics Engineering

I. Vision:

To be a globally recognised centre of excellence in the field of **Electric Vehicle** providing/imparting quality education, interdisciplinary research and innovative development of Electric Vehicle.

II. Mission

- To promote scientific discovery and the invention of Electric Vehicles and Battery Technologies
- To undertake cutting edge research and education in the areas ofDesign of Drive train, Controller Modules and Advancement of Battery manufacturing
- To carry out Interdisciplinary research and education to nurture future experts in Electric Vehicle research by imparting interdisciplinary knowledge, innovative ideas, critical thinking and practical skills.
- To build the capacity of technical personnel fostering strong academic, industrial, and social ties for solving various Technical problems to make an impact on Automobile industry.
- To provide consultancy, training, and outreach services for stakeholders in the region including social institutions.

III. History of COE-EV in REC:

This Centre of Excellence in Electric Vehicle (COE- EV) is the long term dream of the department of Electrical Engineering. We have guided many projects in the area of Electric Vehicles. This kind of initiation gave the road map to Electric Vehicle Centre in our department. Then the association of many faculty members of our department and funded project and relationship with industrial and technical persons we valued now with this outcome. This COE- EV is started in 2020. Now we are supporting our stake holders in the form of knowledge sharing and research possibilities.

IV. Research Activities:

To carry out advanced interdisciplinary research activities in the area of Electric Vehicle cater to the needs of the industry and society (in general) and using this as a general research facility to take up new research projects from industry and other bodies.

- Conducting training programmes in the related areas for professional skill development.
- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries covering, but not limited to, transportation, manufacturing, agriculture etc.
- Conducting courses with significant participation of external faculty, industrial and regulatory experts on EV.
- Entering into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

V. Patents by Centre of Excellence in EV:

1. DUAL STATE CHARGING FOR HYBRID ELECTRIC VEHICLE- Ron Carter SB, Dr. P. Sivakumar, Dr. A. Selvaraj and Dr.K. Premkumar – Patent application No: 202041024233, filled on 9/6/2020 – Published in Patent journal and waiting for further process.

2. OPTIMUM DESIGN FOR NON-SOLENOIDAL OPERATION OF STARTER MOTORS- Jakith Deva Priyan J, M. Deeban Babu, Karthikeyan. N, Selvaraj. A FACULTY - Patent application No:2006/CHE/2014, filled on 17th April 2014 - Published in Patent journal and completed first examination report process. Waiting for final examination.

VI. Projects at Centre of Excellence in EV:

a. SAE eBAJA competition

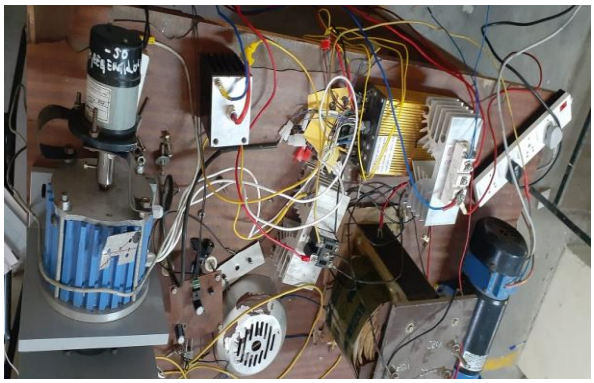
b. ISIEINDIA project

c. Final year Projects related to EV

VII. Funded Projects and Consultancy by Centre of Excellence in EV

a. A funded project received by our faculty Dr. P.Sivakumar, Associate Professor, who initiated the collaborative work to install a charging station for electrical Vehicle from the renewable Energy is successfully installed and operating.

b. We received the infrastructural support in the form of materials like test rig and battery soldering machines to establish centre of excellence and cycle hub project by Komaki Electric Vehicles based on the MoU.



Charging Station for electrical Vehicle from the renewable Energy

c. As the COE-EV, we are proud to be an initiator and mentor for the student start up called HiREC –cycle hub and charging station.

HiREC –cycle hub and charging station

VIII. Training offered:

- Workshops on Electric Vehicle and battery technology to the students and faculties
- Value Added Course on Electric and Hybrid Vehicles to the students
- Hands on workshop on EV to the students and faculties

IX. Research Publications:

1. **K.Premkumar,** M.Vishnupriya,**T.Thamizhselvan,**P.Sanjeevikumar, B.V.Manikandan, "PSO optimized PI controlled DC-DC Buck converter based proton exchange membrane Fuel cell emulator for testing of MPPT algorithm and Battery Charger controller" International Transactions on Electrical Energy Systems, Vol 31(2), Feb 2021, *Publisher:Wiley***[SCIE, Scopus indexed, Impact factor -2.860, Cite score 3.1].**
   DOI: 10.1002/2050-7038.12754
   Scopus Link :
   https://www.scopus.com/authid/detail.uri?authorId=57211386693

2. P. Justin Raj, V. VasanPrabhu, **K. Premkumar,"** Fuzzy logic based battery management system for Solar powered Li-ion battery in Electric vehicle Applications", Journal of circuits, systems and computers, Vol 30(3), 2150043, March 2021, *Publisher: World scientific Publishers***. [SCIE, Scopus indexed, Impact factor-1.363]**
   DOI :10.1142/S0218126621500432
   Scopus Link :
   https://www.scopus.com/authid/detail.uri?authorId=57211386693

3. **Nazar Ali, K. Premkumar,** M. Vishnupriya , B.V. Manikandan , **T. Thamizhselvan,** "Design and development of realistic PV emulator adaptable to the maximum power point tracking algorithm and battery charging controller" Solar energy, Vol 220, pp 473-490, March 2021, *Publisher :Elsevier* **[SCIE ,Scopus indexed, Impact factor -5.742,cite score 8.9]**
   DOI :10.1016/j.solener.2021.03.077
   Scopus Link :
   https://www.scopus.com/authid/detail.uri?authorId=56196401100

4. **Sangari A,M.G. Umamaheswari&**B. LekshmiSree**"** Design and Development of ROSMC-Based Single-Stage Z Source Inverter for Power Quality Enhancement in Hybrid Electric Vehicle Applications" IETE JOURNAL OF RESEARCH,Taylor&Francis,Nov 2021. **[SCIE Scopus indexed, impact factor-1.24,cite score 2.4]**
   DOI :10.1080/03772063.2021.1996283
   Scopus Link :
   https://www.scopus.com/authid/detail.uri?authorId=53867166700

5. **A. Selvaraj, S. B. Ron Carter, and** Thangavel**,**"Design of non-solenoidal operation of startermotor", Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering, Vol 234(13), pp 3095-3102, Nov 2020, *Publisher:SAGE***[Scopus, SCI indexed, IF-1.384, Cite score-2.5]**

X. MoU Signed:

1. KOMAKI ELECTRIC SCOOTERS

   BEST TOWERS
   345A, Old Mahabalipuram Road (OMR)
   Thoraipakkam
   OkkiyamThoraipakkam, Tamil Nadu 600097
   India
   Ph: 085239 05905, 085319 05905

   https://komakiomr.business.site/?utm_source=gmb&utm_medium=referral

RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Embedded System Technologies

I. **Vision** :

To be a globally recognised centre of excellence in the field of Embedded System Technologies providing/imparting quality education, interdisciplinary research and innovative development of ubiquitous computing systems.

II. Mission

- To promote scientific enquiry and product development of ubiquitous computing systems and smart devices.
- To undertake cutting edge research and education in the areas of Embedded Vision System for Robots, self contained smart Assistive Devices with effective utilisation of the resources leading to sustainable growth.
- To carry out Interdisciplinary research and education to nurture future experts in Embedded system research by imparting interdisciplinary knowledge, innovative ideas, critical thinking and practical skills.
- To build the capacity of technical personnel fostering strong academic, industrial, and social ties for solving various societal problems and contribute for corporate social responsibility
- To provide consultancy, training, and outreach services for stakeholders in the region including social institutions.

III. Research Activities:

To carry out advanced interdisciplinary research activities in the area of Embedded Systems) cater to the needs of the industry and society (in general) and using this as a general research facility to take up new research projects from industry and other bodies.

- Conducting training programmes in the area of Embedded System Technologies for UG and PG students and faculty members in the related areas for professional skill development.
- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries covering, but not limited to, transportation, manufacturing, healthcare, agriculture etc.
- Conducting courses with significant participation of external faculty, industrial and regulatory experts on Embedded System Technologies and machine Learning.
- Entering into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

IV. Projects at Centre of Excellence in Embedded System Technologies:

The projects done at Centre of Excellence in Embedded System Technologies which won prizes at regional level and national level are as follows:

1. KID'S ZONE - AN ALPHANUMERIC TUTOR
2. THREE-TIRE SECURITY SYSTEM

Embedded system technologies using Unified Technology Learning Platform(UTLP) supplied by Wipro Technologies

V. Training offered:

- Week long Workshop with hands-on sessions culminating into a demonstrable project in Embedded system technologies using Unified Technology Learning Platform(UTLP) supplied by Wipro Technologies round the year to the UG students of branches like Computer Science, Information technology, Electronics and Communication Engineering, Electrical and Electronics Engineering and Biomedical Engineering from our own Institution and sister Institution throughout the year. Training for PG students of Embedded System Technologies of our own Institution.

VI. Research Publications:

1. Mary Jeniffer, V. Geetha Priya, "Implementation of Road sign recognition" in Second International Conference on Signals Systems and Communication (ICSSC) on 8th January 2019 at Anna University, Chennai.
2. P.Sahithya, M. Arulmozhi "Digital Design of Radial basis function and Recurrent neural network" International Conference on Wireless Communications Signal Processing and Networking(WiSPNET 2019), SSN College of Engineering on 21st March 2019.
3. N.Dhomina, C.Amutha, "Development of eyeball movement and Voice controlled wheel chair for physically challenged people" in Lecture notes :Data Engineering and communication technologies published by Springer, pp. 532-539. March 2019.
4. Mary Angelin Priya, D.Shyam, "A smart sticksor for Dual sensory impaired", Lecture notes : Data Engineering and communication technologies published by Springer, 1168-1180. March 2019.

- **Courses in curriculum:**

S.no.	Course code	Course name
1.	EE19P72	Fundamentals of Embedded Systems
2.	EC19703	Embedded Systems
3.	ET19104	Design of Embedded Systems
4.	ET19P34	Advanced Embedded Systems

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Food Products and Process Design (FPPD)

I. Vision

To function asa renowned centre of excellence in food product development and process design by bridging gap between food industries and society through education, research and skill enhancement.

II. Mission

- To develop state of the art food research laboratory
- To undertake research in functional food product development, novel technologies for processing, packaging, food quality and safetyaddressing / bringing solutions to the problems in food industries.
- To serve as a centre for knowledge dissemination through consultancy, workshops, trainings and demonstrations.

III. Research Activities:

To carry out advanced research activities in the area of food technology and processingproviding solutions to the needs of the industry and society (in general) and thereby leveraging the facilities at the centre to take up new research projects from industry and other bodies.

- Conducting training programmes in the related areas for professional skill development.
- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries and start-ups.
- Conducting courses with significant participation of external faculty, industrial and regulatory experts on food technology.
- Entering into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

IV. Projects at Centre of Excellence in FPPD:

Projects sanctioned by Tamil Nadu State Council for Science and Technology Students Project Scheme 2021-2022

1. Project Title: Development of mineral enriched cookies by the utilization of watermelon seeds
2. Project Title: Extraction of essential oil from tinosporacordifolia (amirthavalli) by hydro-steam distillation and its application

V. Training offered:

- Workshop on Fats and Oils: Basic concepts and analytical techniques by Dr.Jeyarani T, Principal Technical Officer, Department of Traditional Foods and Sensory science, CSIR-CFTRI, GOI, Mysuru. On 17 March 2022.

VI. Research Publications:

1. Stephen, Dillwyn, KulasticJassy Antony, PragalyaashreeMaripillaiMunusamy, andTiroutchelvameDeivanayagame. Impact of Drying Methods on the Quality of Bioactive Components in Tree Tomato (Cyphomandrabetacae). Trends in Sciences 19, no. 2, 2022, pp2060-2060. [Scopus, web of science, UGC CARE II, Anna University]

2. Subramani, Deepak, ManonmaniKumaraguruparaswami, HarshniMuthusamy, SangeethaArunachalam, and GowthamiShanmugam. Formulation and quality evaluation of quinoa enriched ready to cook string hoppers (Indian traditional noodles). Journal of Culinary Science & Technology, 2022, pp. 1-20.[Scopus, web of science, UGC CARE II, Anna University]

3. Shalini. R, Sujithra S, Gururaj. P.N, Ramalakshmi. K. An Overview On Vitamin A Deficiency And Strategies For Its Prevention. GIS Science Journal. 2022. Pp.420 – 442. [Scopus, web of science, UGC CARE II, Anna University]

4. GururajPejavaraNarayana, RamalakshmiKulathooran, SujithraSureshkumar and ShaliniRavichandra. Effect of Process Parameters on the Adsorption of Chromium VI on a Packed Bed Column (PBC) using Vetiver (Vetiveriazizanioides).*Research Journal of Chemistry and Environment*. 2021, Vol. 25 (12), pp 53-59. [Scopus, web of science, UGC CARE II, Anna University]

5. ArumugamSiddhu Adhiaman1, KulathooranRamalakshmi, DhanrajMadhushalini. Industry-Ready Active Packaging Technologies in Food Sector. International Journal of Current Research and Review. 2021, Vol 13 (22), pp 1-6. [web of science, UGC CARE II, Anna University]

6. VijayasriKathirvel, Hemamalini Subramanian, RamalakshmiKulathooran and MadhushaliniDhanraj. Prospects of utilizing banana peel as a raw material-A Review. Journal of ChenguduUniveristy of Technology, 2021.26 (9) 70, pp1-20.. [Scopus, web of science, UGC CARE II, Anna University]

7. SnehalJadhav, V. Kavinya, R. Vijay Nirmal, H. Mohammed Shameem and K. Ramalakshmi. "Physico-sensory and Textural Properties of Composite Millet Palm Jaggery Muffins". *Journal of Natural Remedies*, Vol. 21 (1), pp. 38-43, January, 2021, [Scopus, web of science, UGC CARE, Anna University; Impact Factor 0.15]]

8. Ramalakshmi K, Subhapriya P, Ananthavalli K, Sarada K, and Shanmugapriya D. "Impact of cooking on nutrients in selected vegetables". *International Journal of Engineering Research and Application*, Vol. 11(2), pp. 31-35, February, 2021.

9. RenukaRaju, SubhapriyaPusparaju, RamalakshmiKulathooran and SiddhuAdhiaman. "Extraction of inulin using super critical fluid extractor", *Research Journal of Biotechnology*, Vol 16 (8), pp. 33-37, August (2021) [Web of Science, SCOPUS, BioTechnology Citation Index®, Chemical Abstracts, Biological Abstracts, ESCI, UGC, NAAS, Indian Citation Index, Impact factor: 0.978]

10. SaranyaSelvakumarasamya, BalakrishnarajaRengarajua, SiddhuAdhiamanArumugam, RamalakshmiKulathooran, "Costuspictus– transition from a medicinal plant to functional food: A review" *Future Foods*, Vol 4, December 2021, 100068.[Elsevier publication, DOJA Indexed]

VII. Courses in curriculum:

S.no.	Course code	Course name
1.	FT19403	Food Processing and Preservation Technology
2.	FT19502	Fruit and Vegetable Technology
3.	FT19602	Baking and Confectionery Technology
4	FT19603	Dairy Process Technology
5	FT19P55	Beverages Technology
6	FT19P56	Functional Foods and Nutraceuticals
7	FT19P63	Technology of Plantation crops and Spices
8	FT19P71	Food Plant Design and Layout
9	FT19P72	Food Product Design and Development

VIII. MoU's Signed:

MoU between JAMA botanics, Indian Institute of Technology Tirupathi and REC – Draft submitted. Under process.

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Internet of Things (IoT)

I. Vision

To be a globally recognised centre of excellence in the field of IoT providing/imparting quality education, interdisciplinary research and innovative development of smart systems.

II. Mission

- To promote scientific discovery and the invention of smart systems and Intelligent Technologies
- To undertake cutting edge research and education in the areas ofCognitive Vision, smart Assistive Devices and computational intelligence
- To carry out Interdisciplinary research and education to nurture future experts in IoT research by imparting interdisciplinary knowledge, innovative ideas, critical thinking and practical skills.
- To build the capacity of technical personnel fostering strong academic, industrial, and social tiesfor solving various societal problems to make an impact on sustainable living.
- To provide consultancy, training, and outreach services for stakeholders in the region including social institutions.

III. Research Activities:

To carry out advanced interdisciplinary research activities in the area of Internet of Things (IoT) cater to the needs of the industry and society (in general) and using this as a general research facility to take up new research projects from industry and other bodies.

- Conducting training programmes in the related areas for professional skill development.
- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries covering, but not limited to, transportation, manufacturing, healthcare, agriculture etc.
- Conducting courses with significant participation of external faculty, industrial and regulatory experts on IoT and machine Learning.
- Entering into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.

IV. Projects at Centre of Excellence in IoT:

Consultancy Service offered to : AnDnR Soft Solutions Pvt Ltd

Project Title: IoT Smart Boat

Project description:

IOT- Smart Boat application intends to implement B2B (Business to Business) and B2C (Business to Customer) services for different boats and other floating vessel owners using one platform.

Main objective of this application is to provide an integrated real-time boat monitoring solution that allows the user to check the status of the boat remotely through IOT device and corresponding mobile & web application.

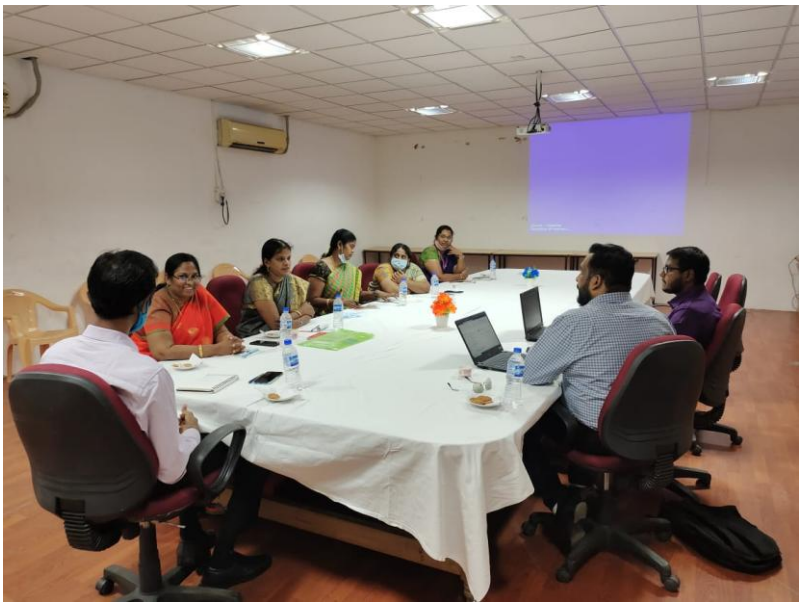
Number of Modules: 07

1. Location Tracker
2. Battery Monitor
3. Security Monitor
4. Smart Fluid/Water Level monitor

5. THS Monitor

6. Smart Connect

7. Website Development and Mobile Application



Interaction with AnDnR Soft Solutions Pvt Ltd

V. Training offered:

- Workshop on Internet of Things
- One day hands-on session on Embedded technologies

VI. Research Publications:

1. Vasanthakumar.S,SaiYashwanthK,Sangamithra and PriyaL “AMachineLearning Model for Robotic arm movement for physically disabled people “, IEEE International conference on Information, Embedded and Communication systems **2019**,Chennai.

2. L.Priya, G.Rajeshkannan, J.Sheik Mohamed Meera, " An innovative TOXIN management through IoT", *International Journal of Pure and Applied Mathematics*, Special issue, Volume 119, No. 12, ISSN: 1314-3395 (on-line version), **2018**, pp16343-16351. **(IF : 0.635,Scopus)**

3. Ganesh.G.S, Mythly T.J, Nathiya R, Priya L “RECTM- An Effective Transport Management ” “Proceedings on IEEE National Conference on Innovative Research Trends for Digital India, Rajalakshmi Engineering College, Chennai , March2018

4. L.Priya, J.Anitha, N.Kayalvizhi, "Smart Farming", *ICCCMIT 2017 - International Conference on Communication, Computing and Information Technology*, MOP Vaishnava College for Women, Chennai,**Feb,2017**.

5. L.Priya, H.Aishwaryaa, B.Aarthi and R.Abirami,"RSPG RFID Based Smart Payment Gateway",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.,* Special Issue 9,**Dec 2016**, pp.57-59. **(Scopus)**

6. L.Priya, K.Subramaniyan , J.Priyanka , V.PreethiSowndharya ,"Nearest Patrol Search under Emergency Condition",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.,* Special Issue 9,**Dec 2016**, pp.94-97. **(Scopus)**

7. L. Priya, M. Leela, P.P. Janardhan, B.S. Thulasi,"Effective TOXIN management-An IoT based approach",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.*, Special Issue 9,**Dec 2016**, pp.88-90.**(Scopus)**

VII. Courses in curriculum:

S.No.	Course code	Course name
1.	CS19P11	Internet of Things Essentials
2.	IT19P74	Internet of Things
3.	EC19703	Embedded Systems
4	EC19P83	Introduction to IoT

VIII. MoU's Signed:

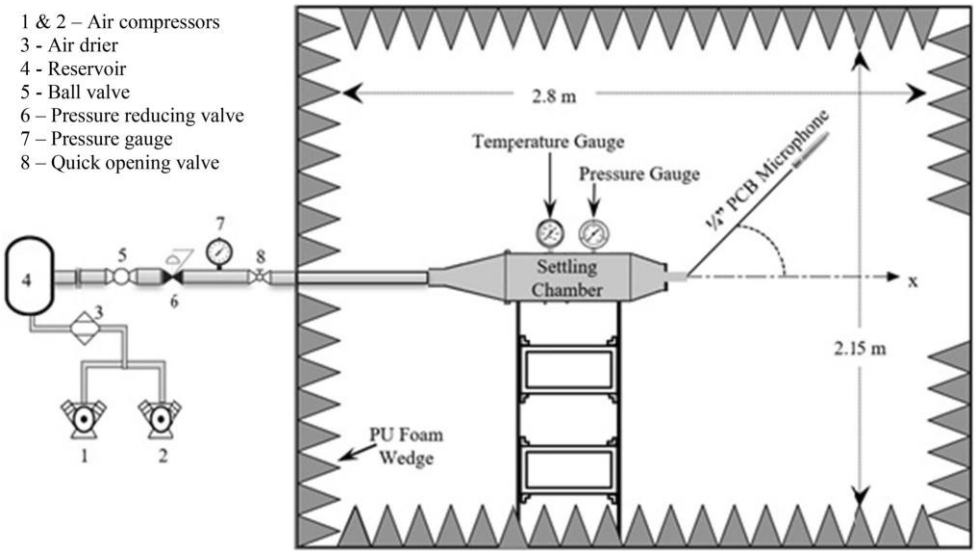
1. Qmax Systems India Pvt Ltd
   795, Trunk Road, Poonamallee
   Chennai, Tamil Nadu 600056
   India.
   https://qmaxsys.com/index.html

2. Voice Snap Services private limited
   Rajambal Street, T.Nagar
   Chennai-17
   www.voicesnap.com

RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

CENTRE OF EXCELLENCE in JET FLOWS

High-speed free jet facility at the Department of Aeronautical Engineering, Rajalakshmi Engineering College



Schematic of Aeroacoustic jet facility at the Department of Aeronautical Engineering, Rajalakshmi Engineering College

I. Vision and Mission Statements

Vision:

To be a globally recognised centre of excellence in the field of high-speed jet flows providing/imparting quality education, research and innovative development of jet mixing and noise suppression techniques.

Mission:

- To promote scientific discovery and the invention of passive flow control methodsand noise suppression techniques
- To undertake cutting edge research and education in the areas ofsupersonic nozzle flows, mixing enhancement and noise reduction.
- To carry out cutting-edge research and education to nurture future experts in high-speed flow research by imparting current knowledge, innovative ideas, critical thinking and practical skills.
- To build the capacity of technical personnel fostering strong academic, research, and social tiesfor solving various problems related to high-speed vehicles.
- To provide consultancy, training, and outreach services for stakeholders in the region.

II. Research Activities:

To carry out advanced research activities in the area of Jet Flows using this as a general research facility to take up new research projects from industry and other bodies.

- Conducting research experiments which add value to the available knowledge in the domain of high-speed jet flows.
- Conducting training programmes in the related areas for professional skill development.
- Conducting consultancy/knowledge transfer works for academicians, researchers and students of other institutions.
- Conducting courses/workshops with significant participation of external faculty, researchers.
- Entering into collaborative research engagements with extra-mural funding agencies for better understanding of issues of scientific and technological management between different stakeholders.

III. Projects at Centre of Excellence in Jet Flows:

Consultancy/Knowledge Transfer Services offered:

S. No.	Project Title	Service Availed By	Duration
2021-22			
1	Noise reduction using Chevron Nozzles	Research scholar from BS Abdur Rahman Deemed University	14 Dec 2021 - Ongoing
2020-21			
1	Mixing enhancement using Tabs	Undergraduate students of P. B. College of Engineering	4 Weeks, dt.18.02.2021
2	Noise reduction of pipe jets	Undergraduate students of SRM University	One Week, dt 01.03.2021
2019-2020			
1	High Speed Jet flow experiments	Undergraduate students of Valliammai Engineering College	2 Weeks, dt.13.03.2020
2018-2019			
1	Mixing enhancement using Tabs	Research Scholars of P. B. College of Engineering	3 Weeks, dt 05.4.2019
2	Mixing enhancement using Tabs	Research Scholars P. B. College of Engineering	4 Weeks, dt.15.3.2019
3	Acoustic spectrum experiments	Undergraduate students of Jaya Engineering College	2 Weeks, dt.13.3.2019
4	Jet mixing experiments	Undergraduate students of Easwari Engineering college	One Week, dt.22.2.2019
5	Mixing enhancement using Tabs	P.B. College of Engineering	3 Weeks, dt.08.2.2019

IV. Training programs offered:

- Faculty Development Program on "Experimental Techniques in High-speed Jets" (07 and 08 July 2017) – 13 faculty members from institutions in and around Chennai have participated and benefitted from the program
- One day hands-on workshop on "High-speed Jet Flows and Acoustics" (19 March 2022) - Total number or participants were 37, of which 11 were students from Rajalakshmi Engineering college and the remaining 26 were from other institutions.

  No. of student participants – 28
  No of Research scholars – 02
  No of Faculty members – 04
  No of Lab technicians – 03

Participants of on- day hands-on workshop on “high-speed jet flows and acoustics”

Hands-on training sessions provided to the participants

h

V. Research Publications

Many of our faculty members and students benefit by the effective utilization of the experimental facility for their research projects. The results from some of these works were also published as journal and conference articles as listed below:

1. **Surendra Bogadi**, B.T.N Sridhar, “Acoustic characteristics of supersonic rectangular jets issuing from nozzles with diagonal expansion ramps’, *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, vol.43, November 2021, ISSN: 1678-5878. **[SCIE, Impact Factor:** 2.22, **SCOPUS Indexed, Citescore: 3.2, Publisher**: Springer **DOI**:https://doi.org/10.1007/s40430-021-03286-w]
2. Kowsalya P, Ashwin V G, **Dharani JandSuresh Chandra Khandai,**“experimental study of supersonic jet characteristics of a grooved nozzle”, *International Journal of Mechanical and Production Engineering Research and Development*, vol. 10(3), pp. 8617–8624, June 2020. ISSN: 2249–6890 SCOPUS Indexed, Publisher**:***Trans stellar.*
3. **Surendra Bogadi** and BTN Sridhar, “Decay of Supersonic Rectangular Jet Issuing from a Nozzle with Diagonal Expansion Ramps”, *Thermal Science*, Vinča Institute of Nuclear Sciences, Vol. 23(6B), pp.3929-3940, Dec 2019. **[SCI Indexed, SCOPUS Indexed, Impact Factor: 1.54]**
4. **Ezhilmaran, G., Khandai, S. C., Sinha, Y. K.,**& Thanigaiarasu, S., “Numerical Simulation of Supersonic Jet Control by Tabs with Slanted Perforation”, *International Journal of Turbo & Jet-Engines*, (doi:10.1515/tjj-2019-0015), 2019 **[SCI Indexed, SCOPUS Indexed, Impact Factor: 0.625]**

5. Sathish Kumar K and Senthilkumar Chidambaram, "Supersonic jet flow control using semi-circular corrugated tabs", Journal of Aircraft Engineering and Aerospace Technology", Emerald Publications, 91/10, 2019 [Scopus Indexed]

6. Surya S, Swetha Sri S and **Suresh Chandra Khandai,** "Effect of Secondary Injection on No-Circular Jets", International Journal of Mechanical and Production Engineering Research and Development, Trans Stellar, Vol.8, No.4, pp. 845-852, August 2018. **(Scopus Indexed)**

7. **Suresh Chandra Khandai,G.Ezhilmaran,**S.Devanandh,P.Hari Prasath,G.Jesurajanishanth and A. Arivazhagan, "Design optimization of single expansion ramp nozzle using computational method", 3rd International Conference on Advances in Mechanical Engineering (ICAME 2020), 2020.

8. Arivazhagan A, Jesurajanishnth G. and **Suresh Chandra Khandai**, *"Design Optimization of Single Expansion Ramp Nozzle using Computational Method",* "Rotary Vanes to Increase Turbulence Inside the Combustor, 3rd International Conference on Advances in Mechanical Engineering 2020 (IOP Cinf series- Materials Science and Engineering 912), SRM Institute of Science and Technology, 24-29th February 2020.

9. **R.Nisha**, A.B. Moosa Naina and **Surendra Bogadi,***"Flow separation control and enhanced expansion of SERN nozzle flows using dielectric barrier discharge",* 3rd International Conference on Advances in Mechanical Engineering 2020, SRM Institute of Science and Technology, 24-29th February 2020.

10. Apoorva S and **Suresh Chandra Khandai**, "Computational Characterization of a CD Nozzle with Variable Geometry Translating Throat", Innovative Design, Analysis and Development Practices in Aerospace and Automotive Engineering (I-DAD 2018), Springer, Veltech University, pp 11-20, Dec 2018**.(Book Chapter)**

11. ManishKumar.V, Srinath. K, and **Ezhilmaran.G**, 'Thrust vector control of supersonic flow in a Rectangular Nozzle using movable plates', International Conference on Green Manufacturing: Analysis, Automation, Processes, Products, Energy & Structures (GM: AAPPES 20018), Rajalakshmi Engineering College, Thandalam, Chennai, 28 March 2018.

12. Selvamuthukumaran.V, Narendiran.B&**Mr. Surendra Bogadi**, "Spread Characteristics of supersonic Jet", in "International Conference on Green Management: Analysis Automation Processes, Products, Energy & Structures (GM: AAPPES)" Conducted at Rajalakshmi Engineering College 28 March 2018.

13. Saji M, Selvamani M, Velmani M and **Mr. Surendra Bogadi** 'Experimental Investigation of Mixing Enhancement by Ramp Induced Vortices in Supersonic Rectangular Nozzle', International Conference on Aeronautics Astronautics and Aviation (ICAAA'18), Dhanalakshmi Srinivasan College of Engineering and Technology, Mamallapuram, Chennai, 28 March 2018.

14. Saji M, SelvamaniM, VelmaniM and **Mr. Surendra Bogadi**, 'Farfield Noise Measurement of Supersonic Rectangular Diagonal-wise Expansion Ramp', International Conference on Green Manufacturing: Analysis, Automation, Products, Energy & Structures (GM: AAPPES 2018), Rajalakshmi Engineering College, Thandalam, Chennai, 28 March 2018.

15. Siluvani Samson D, Yunusur Rahman M & -Pramodh Mahajan B, Design and Fabrication of Bullet Impact test Facility for Aircraft Materials, 8th International conference on Science And Innovative Engineering, paper I. DICSIE 181106, pp18, 2018.

16. Udhayakumar, Pavithrabalan and Mr. **Ezhilmaran** "Supersonic Jet Control By Tabs With Slanted Perforation", International Conference of Green Manufacturing: Analysis, Automation, processes, Products, Energy & Structures (GM: AAPPES 2018)", organized by "Rajalakshmi Engineering College", Chennai, India, 28th& 29th March 2018.

17. Aditya K, Venkatesha Kishore S,**Surendra Bogadi**, "Lab *Scale Schlieren Setup for High-Speed Flow Visualization*",3rd National conference on "Recent Advances in Mechanical Sciences" [NCRAMS 2021], Rajalakshmi Engineering College, Chennai on December 17 &18,2021.

18. B. Suraj, A. Siddarthan, **Suresh Chandra Khandai**, "*Computational Analysis of Inlet Characteristics of Concentric Dual Mode Supersonic Inlet*", 3rd National conference on "Recent Advances in Mechanical Sciences" [NCRAMS 2021], Rajalakshmi Engineering College, Chennai on December 17 &18,2021.

19. Kowsalya P, Ashwin VG, Dharani J &**Dr. Suresh Chandra Khandai, "**Experimental study of supersonic jet characteristics of a grooved nozzle", Virtual Conference on Automation, Materials & Energy (VAME2020), Rajlakshmi Engineering College, 20 June 2021.

20. Santhosh K, Sriramanarayanan K&**Dr. Suresh Chandra Khandai,** "Effect of slanted perforation geometry in tabs for supersonic jet", Virtual Conference on Automation, Materials & Energy (VAME2020), Rajlakshmi Engineering College, 20 June 2021.

21. Muthuraman N, Prasanth S &**Surendra Bogadi,** "Acoustic characteristics of supersonic jets" Virtual Conference on Automation, Materials & Energy (VAME2020), Rajlakshmi Engineering College, 20 June 2021.

22. Nisha R, Moosa Naina AB &**Surendra Bogadi,** "Investigation of dielectric barrier discharge in single expansion ramp nozzle", Virtual Conference on Automation, Materials & Energy (VAME2020), Rajlakshmi Engineering College, 20 June 2021.

23. Abisha C, Kovardhana Guru J and **Ezhilmaran G** "*Effect of lip thickness on rectangular nozzle co-flowing subsonic jet*", National Conference on Recent Advances in Mechanical Science (NCRAMS), Rajalakshmi Engineering College, 16 March 2019.

24. Kannan G, Monica S and **Surendra Bogadi**, "*Thrust Loss Minimization of Injector Nozzle*", National Conference on Recent Trends in Aerospace Technology (NCRTAT-19), Bharat Institute of Higher Education and Research, 29 March 2019.

25. Saranya G and Pavan Ranjith D K and **Surendra Bogadi** "*Aeroacoustic Characterization of an Underexpanded Rectangular Injector Nozzle*", National Conference on Recent Trends in Aerospace Technology (NCRTAT-19), Bharat Institute of Higher Education and Research, 29 March 2019.

26. Devanand, Hariprasath, **Suresh Chandra Khandai**, "*Numerical Optimization of Single Expansion Ramp Nozzle",* National Conference on Recent Trends in Aerospace Technology (NCRTAT-19), Bharat Institute of Higher Education and Research, 29 March 2019.

27. **Ezhilmaran G., Suresh Chandra Khandai, Yogesh Kumar Sinha,** M Natchippan (2019) "*Design and Fabrication of Monopropellant Micro Thruster for Micro Satellite*", National Conference on Recent Trends in Aerospace Technology, 29 – 30 March 2019, Organized by "Bharath University", Chennai, India.(NCRTAT-19)

28. Abisha C, Kovardhana Guru J and **Ezhilmaran G.** "Effect of lip thickness on rectangular nozzle co-flowing subsonic jet", National Conference on Recent Advances in Mechanical Science (NCRAMS), Rajalakshmi Engineering College, 16 March 2019.

29. Kannan G, Monica S and **Surendra Bogadi**. "Thrust Loss Minimization of Injector Nozzle", National Conference on Recent Trends in Aerospace Technology (NCRTAT-19), Bharat Institute of Higher Education and Research, 29 March 2019.

30. Sarnya G and Pavan Ranjith D K and **Surendra Bogadi** "Aeroacoustic Characterization of an Underexpanded Rectangular Injector Nozzle", National Conference on Recent Trends in Aerospace Technology (NCRTAT-19), Bharat Institute of Higher Education and Research, 29 March 2019.

31. UdhayakumarK, PavithrabalanS and **Mr.EzhilmaranG** "Supersonic Jet Control By Tabs With Slanted Perforation", National Conference on Mechanical, Aeronautical and Civil Engineering' (NCMACE' 18), KCG College of Technology, Chennai, 28th March 2018

VI. EXTRAMURAL FUNDING RECEIVED

- **UGC Funded Minor Research Project**

1) Title of the Project -***Study of supersonic jet characteristics***

Sanction Letter No. MRP-6149/15(SERO/UGC) JANUARY 2015 – DECEMBER 2017; by Dr. Suresh Chandra Khandai, Grant Value - Rs. 4.75 Lakhs

2) Title of the Project -***Acoustic measurements of high-speed jets***

Sanction Letter No. MRP-6150/15(SERO/UGC) JANUARY 2015 – DECEMBER 2017; by Dr. Surendra Bogadi, Grant Value - Rs. 4.6 Lakhs

- **AR & DB Funded Research Project**

Title of the Project -***Supersonic Jet Control by Tabs with Slanted Perforation***

Sanction Letter No. ARDB/01/1032019/M/I, Date: 10 January 2022

Principal Investigator - Dr. Suresh Chandra Khandai and Co-Principal Investigator - Dr. Surendra Bogadi; Total project cost - Rs.16.69 Lakhs; Project Duration – 2 Years

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Machine Vision

I. Vision:

To be a globally recognised centre of excellence in the field of Machine Vision providing/imparting quality education, interdisciplinary research and promote further collaboration with various industrial partners

II. Mission:

- To promote scientific discovery and the invention of smart systems and Intelligent Technologies
- Interdisciplinary research and education to nurture future experts in IoT research by imparting interdisciplinary knowledge, innovative ideas, critical thinking and practical skills.
- To undertake cutting edge research and education in the areas of networking systems and computational intelligence, and to derive evolving, comprehensive and integrative methods for solving various societal problems to make an impact on sustainable living.
- To be the premier source of well-educated network and IoT engineers, fostering strong academic, industrial, and social ties, and thereby achieving significant societal impact.
- To carry out innovative research and development that contributes to improve social impacts in the Country.
- To build the capacity of technical personnel working in the various institutions.
- To provide consultancy, training, and outreach services for stakeholders in the region including social institutions.

III. Objectives and Research Activities:

To realize its vision and accomplish its mission, the centre will have the following specific objectives:

To carry out advanced research activities in the area of Machine Vision cater to the needs of the industry and society (in general).

- Conducting training programmes in the related areas for professional skill development.
- Generating Intellectual Properties (IP) in terms of patents and high quality technical publications.
- Conducting consultancy works for industries covering, but not limited to, transportation, manufacturing, healthcare, agriculture etc.
- Patenting and transfer of technology
- Helping and guiding start-ups in relevant areas.
- To enhance the practical knowledge and to develop research culture among students in the field of Image and Video Processing using Machine Learning.
- To provide internships and placement oriented training to students.
- To provide training for faculty members in thrust areas like Digital Image Processing, Embedded Development, Mechatronics, Robotics and Automation and Machine Learning. Also Software's like MatLab, LabVIEW, Solidworks, Auto Cad.
- Offer PhD courses in relevant areas of expertise. Also, to provide customized/flexible PhD Courses to student(s) of any department of the institute pursuing/ intended to pursue his/her thesis on specific problems in Digital image Processing and machine Learning.
- To enter into collaborative research engagements with Extra-mural funding agencies and Industrial Organizations for better understanding of issues of scientific and technological management between different stakeholders.
- Using this as a general research facility to take up new research projects from industry and other bodies.

IV. Projects at Centre of Excellence in Machine Vision:

1. Machine Vision Inspection System for Spline Gear Inner Race and Tripods
2. Machine Vision Inspection System for Brake Piston Cylinder
3. Machine Vision System Integrated to prevent the Press Machine from wrong Assembly in the Flywheel Assembly Process Line
4. Machine Vision System Integrated to prevent the Press Machine from wrong Assembly (ABS/Non ABS) in the Bearing Assembly Process line
5. Machine Vision System Based Automated Visual Inspection of 3G Modem
6. Machine Vision Inspection system for Verification of Dimensional Accuracy of Cage Sleeves
7. Machine Vision System Integrated to avoid Mismatching of tappet door with model code in the Engine Assembly Process Line
8. Fully automated High Speed inspection system for identification of surface defects in rubber gaskets
9. System integrated for Process Control to prevent the Die Damage Using Machine Vision System
10. Machine Vision system for Blood transfusion Needle for tip damages, orientation and glue inspection
11. Machine Vision Inspection system for Barcode reading on Lens Packets
12. Machine Vision System Based Automated Blister Pack Inspection System
13. Machine Vision System for Dimensional Measurement for Tulip Assembly
14. Machine Vision System Integrated to Control Robot from wrong pouring (Non Presence or Mismatch of Stayrod) in the Seat Foam Assembly Process Line
15. Automatic Label Print for Process completion for Multiple Models in the Foam Assembly Line
16. Software Developed for Alternator Test Rig Testing Machine
17. Software Developed for Starter Test Rig Testing Machine

V. Proposal Submitted at Centre of Excellence in Machine Vision:

1. Dimensional Verification of Caliper.
2. Dimensional Verification of Spindle.
3. Procedure to avoid Parts from the Damage in the Surface in Machining and Assembly Line and Inspection Solutions for Dimensional and Operational Missing.
4. Burr and Stem Identification of Brake piston Cylinder (with Inner Stem).

5. Profile Verification of Glue.

6. Automatic Tube Length Cutting and Straightness Identification.

7. Presence/Absence, wrong assembly check in Differential Assembly.

8. Software Development for Supply Chain Management.

9. Identification of wrong part or model mix-up in the Assembly Line

10. Barcode and Label Print System to Ensure the sequence of operation in the FI Line

11. Surface inspection and Dimensional measurement of compressor reed valves.

12. Surface inspection and Dimensional measurement of Oil Seals.

13. Surface inspection and Dimensional measurement of Rubber Caps.

14. Verification of part Presence for Nokia Mobile Panels.

15. Print quality verification of silicon contacts on TV Remote Pads.

16. Blister Pack inspection for OCR, missing, broken and foreign tablets in the Blister Pack Packaging Line.

17. Defects and Dimensional measurement of fasteners.

18. Leak Test and Burr presence in Fuel Cock assembly.

19. Dimensional measurement of Crank Pin assembly.

20. Welding position and Identification of Improper welding in the Wheel.

21. Process Control of Spline Gear Machining to prevent the Wrong part before loading in to the CNC.

22. Surface Defects in the Plastic Mould Parts.

23. Presence/Absence, Identification of Orientation of Labels and checking the Level of fluid in the bottles.

24. Study of Preventing the Oil Wastage and calculating the Stocks, Etc.,

VI. Training offered:

*S:Students; *F:Faculty; *I:Industry

#	Dates	Training Program / Workshop	Participants		
			S*	F*	I*
1	17-18-SEP-2009	Ranga Soft Training	19	5	
2	8-9-OCT-2009	Soliton training		16	
3	24-OCT-2009	Basics Of Machine Vision and its Application	15	7	
4	29-30-DEC-2009	Introduction to Machine Vision Systems			13
5	11-JAN-2010	Digital Image processing using Matlab	20		
6	11-13-JAN-2010	Soft skill Training Program			8
7	18-21-JAN-2010	Soft skill Training Program			8
8	25-28-JAN-2010	Soft skill Training Program			8
9	27-FEB-2010	Basic Of Machine Vision and its Applications	11		
10	6-MAR-2010	Basic Of Machine Vision and its Applications		8	
11	24-AUG-2010	Workshop On Digital Image processing using Matlab	60		
12	21-25-SEP-2010	Digital Image processing using Matlab	23		
13	06-10-DEC-2010	In plant Training In Image processing using Matlab	27		
14	13-17-DEC-2010	In plant Training In Image processing using Matlab	17		
15	20-24-DEC-2010	In plant Training In Image processing using Matlab	14		
16	13-18-JUN-2011	Digital Image processing using LabView	28	2	
17	19-23-DEC-2011	In plant Training In Image processing	20		
18	5-9-MAR-2012	DigitalImageprocessingWorkshop-Level2	25		
19	23-28-APR-2012	Digital Image processing Workshop	20		
20	17-18-JAN-2013	Seminar – Machine Vision Technology at AnnaUniv.	15	2	
21	29-02-AUG-2013	Digital Image processing using LabView	37		
22	24-28-SEP-2013	Digital Image processing using LabView	23		

#	Dates	Training Program / Workshop	Participants		
			S*	F*	I*
23	26-28-NOV-2013	Digital Image processing using OpenCV	15	12	
24	10-14-FEB-2014	Digital Image processing using MATLAB	25		
25	15-17-JUL-2014	Digital Image processing using LabView	30		
26	06-08-AUG-2015	Digital Image processing using LabView	38		
27	17-20-FEB-2016	Digital Image processing using LabView –Level 1	15		

VII. Doctoral Programme:

1. **Dr.L.Priya** Awarded **Ph.D in "Occlusion handling in 2D and 3D Object Recognition"**

VIII. Research Publications:

- **Books Published**

Title: A Guide to Quality control in Machine vision

Author: Sheila anand and L.Priya

Description: ISBN 9780815349273, Published December 9, 2019 by Chapman and Hall/CRC

- **Notable Book Chapters Published**

1. Dr.L.Priya, Ms.A.Sathya, Dr.S.Thangarevathi," Book Chapter:Feature detection and extraction techniques for sensor data", Book title: sensor data management and analysis: The role of deep learning - publisher-Wiley Publications;Wiley publications

2. Dr.L.Priya, Ms.A.Sathya, Dr.S.Thangarevathi," Book chapter: Deep learning in Healthcare", Book title: Deep learning and edge computing solutions for high performance computing; Published by EAI/Springer innovations in communications and computing

3. Dr.L.Priya, Dr.S.KanagaSubaRaja,Ms.A.Sathya,"Clinical Decision Support Systems" BioInformatics and Medical Applications: Big Data Using Deep Learning Algorithms, scrivener-Wiley Publishers

- **Scopus and SCI Indexed Papers Published**

4. **Dr.L.Priya**,Ms.A.Sathya,Ms.K.Poornimathi,Ms.J.Anitha, "A Hybrid Intelligent Diagnosis and Disease Prediction Model Using Machine Learning Approach", Journal of Green Engineering

5. Dr.L.Priya,Ms.A.Sathya,Ms.K.Poornimathi,Ms.J.Anitha, "Re-Skill Before Restart: E- Skilling Is Essential To Build Individual And Optimize Employees Competency", International Journal of Psychosocial Rehabilitation

6. Priya.L, Poornimathi.K, Anitha.J, Sudarsaan.A, Rajesh.P, Anirudh Krishnan, A Study on Machine Learning Algorithms in Medical Imaging, Journal of Advanced Research in Dynamic and control systems, Vol. 11, Special Issue-05, 2019, pp 2162-2170. **(Scopus)**

7. Priya.L, Usha.S and Poornimathi.K " Shape based 2D object recognition for partially occluded objects" Journal of Advanced Research in Dynamic and control systems , April 2019,Volume 11, 02 special issue, pages 44-50.**(Scopus)**

8. Vasanthakumar.S,SaiYashwanthK,Sangamithra and PriyaL "AMachineLearning Model for Robotic arm movement for physically disabled people ", IEEE International conference on Information, Embedded and Communication systems **2019**, Chennai.

9. L.Priya, G.Rajeshkannan, J.Sheik Mohamed Meera, " Effective TOXIN management-An IoT based approach", *International Journal of Pure and Applied Mathematics*, Special issue, Volume 119, No. 12, ISSN: 1314-3395 (on-line version), **2018**, pp16343-16351. **(IF : 0.635, Scopus)**

10. ShyamSundar V, Sudarshan P, Suresh Raja T, Priya L ," Improving Art Experience using Augmented Realty "Proceedings on IEEE National Conference on Innovative Research Trends for Digital India, Rajalakshmi Engineering College, Chennai , March 2018.

11. Ganesh.G.S, Mythly T.J, Nathiya R, Priya L "RECTM- An Effective Transport Management " "Proceedings on IEEE National Conference on Innovative Research Trends for Digital India, Rajalakshmi Engineering College, Chennai , March 2018

12. **Priya, L & Sheila Anand 2017, 'Object Recognition and 3D Reconstruction of Occluded objects using Binocular Stereo**', Springer Cluster computing DOI 10.1007/s10586-017-0891-7 ISSN 1386-7857 pp1-10. **(SCI IndexedAnnexure I, Impact Factor: 2.040)**

13. L.Priya, J.Anitha, N.Kayalvizhi, "Smart Farming", *ICCCMIT 2017 - International Conference on Communication, Computing and Information Technology*, MOP Vaishnava College for Women, Chennai, **Feb,2017**.

14. **Priya, L, Sheila Anand&Poornimathi, K 2016, 'Occluded object detection with 3D projection**', Journal of Chemical and pharmasciences Special issue 9, pp. 50-53, ISSN 0974-2115 Scopus Indexed. **(Impact Factor: 1.421, Scopus)**

15. L.Priya, H.Aishwaryaa, B.Aarthi and R.Abirami,"RSPG RFID Based Smart Payment Gateway",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.,* Special Issue 9,**Dec 2016**, pp.57-59. **(Scopus)**

16. L.Priya, K.Subramaniyan , J.Priyanka , V.PreethiSowndharya ,"Nearest Patrol Search under Emergency Condition",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.,* Special Issue 9,**Dec 2016**, pp.94-97. **(Scopus)**

17. L. Priya, M. Leela, P.P. Janardhan, B.S. Thulasi,"Effective TOXIN management-An IoT based approach",*Journal of Chemical and Pharmaceutical Sciences,JCHPS.*, Special Issue 9,**Dec 2016**, pp.88-90. **(Scopus)**

18. **Priya, L, Sheila Anand& Uma, K 2016, 'Detection of occluded objects under backlighting'**, International journal of computer science and engineering, ISBN:9788192958022.DOI: ICETAKD9502 **(Impact Factor: 2.628,Scopus)**

19. J.Jeyalakshmi,L.Priya,S.Sreesubha," Effective prevention of reverse engineering attacks on software", ARPN Journal of Engineering and Applied Sciences, Vol.10,no.17, pp.7412- 7415, **Sep,2015.(Scopus)**

20. **Priya, L & Sheila Anand, 2015, 'Shape Based Object Detection For Partially Occluded Objects Under Front Lighting Techniques'**, IEEE European Modelling Symposium **2015** 978-1-5090-026, pp.124-127 IXplore DOI 10.1109/EMS.2015.27

21. L. Priya, J. Jeyalakshmi, S. Usha " Modelling framework for Web service based sheltered Medi-Helper", National conference on recent Technologies in IT NC4T10 held on **30-31 jun 2010** at sathyabama university.

22. L. Priya, K. Porrnimathi, "An Ontology based context aware service discovery for smart hospitals", International conference on Information Science and Applications held on **feb 6th 2010** at Panimalar Engineering College.

23. Dr.P. Anadhakumar, L. Priya "Object Oriented Database Approach for Context Aware Services in Distributed Pervasive Healthcare Environment" National Conference on Frontier Research Areas in Computing (NCFRAC'09) on Saturday, **21 February 2009**.saintgits College of Engineering, Kottayam, Kerala and SAINTGITS.

24. Dr.P. Anandhakumar, L.Priya, "Ontology based service discovery model for distributed pervasive health care environment." International conference on "Information Reuse and Integration"IEEEIRI2009, **Aug 10-12th 2009** Las Vegas, USA.

25. Dr.P. Anandhakumar, L.Priya, "Ontology based enhanced service discovery model for distributed pervasive health care environment."IEEE transactions on sustainable computing 2009, volume 212, issue 4, pp no. 1342-1350. **(SCI indexed)**

26. Dr.P.Ananthakumar, Nalinipriya, L.Priya, "An innovative Object Oriented Approach for Context Awareness in Distributed Pervasive Healthcare Environment" Journal of Advances in computers, Elsevier, 2009**.(SCI Indexed)**

27. Dr. P. Ananthakumar, NaliniPriya, L. Priya"Ontology-Based Service Discovery Model For Distributed Pervasive Healthcare Environment" International Conference on Web Intelligence Systems ICWIS09 to be held at REC Chennai, India, **January 8th – 10th, 2009.**

IX. Students Projects in Machine Vision

#	Title	Program	Students
1	Edge Detection of an Object using Fuzzy Logic	UG-ECE	Prasanna.M,Prasanth.L, Satiesh ArunRaj, Yenduri Venkat Rajiv
2	Face Recognition using Embedded System	UG-IT	Aarthy.A,Aishwarya.J, Nagarathinam.S
3	Automatic Road Sign Recognition and Speed Control	UG-IT	ShrutiVenkatesh, Sowmya.S.R., SreeKumar.S
4	Optimization of Machining Parameters and Surface Roughness Measurement using Image Processing	UG-Mech.	Naveen KumarReddy.C, NaveenKumar.V
5	Machine Vision based Master-Slave Intelligent Sorting System	UG-Mech.	Antony AgvinDhas.J,
6	Digital Parking System	UG-IT	DivyaKrishnamohan, Lokavardhini.G
7	Automated Inspection of Contact Lens Manufacturing Processusing Machine Vision	UG-Mech.	Kannan.J
8	Surface Inspection of Ceramic Tile susing Statistical and Neural Network Approach	UG-IT	K.BharathiPriya, P.Krithika,T.Karthik a
9	Enhanced Parking Lot Security System Using Automatic License Plate Recognition	UG-ECE	S.B.ArjunRaj, P.Madhusudanan
10	Automated Number Plate Recognition System	PG-SWEngg.	Anbarasan.V

X. Industries visited and interacted with for potential MV Projects

#	Industry	Location	#	Industr	Location
1	ABB India Ltd. Robotics Div.	Bangalore	2	Accent Pharma	Pondicherry
3	Accurate Product Limited	Chennai	4	Addison	Chennai
5	Allison Transmissions	Chennai	6	Areva	Chennai
7	Ashok Leyland	Chennai	8	Atop products	New Delhi
9	Audco India	Chennai	10	Aurolab	Madurai
11	Aurolab	Pondicherry	12	Auto Tech India Ltd	Chennai
13	AVT Technologies	Chennai	14	BorgWarner	Chennai
15	Brakes India	Sholinghur	16	Brakes India ltd	Polambakkam
17	Chem Pharma Ltd	Bangalore	18	Calex Rubbers	Chennai
19	Citizen Press Components	Ludhiana	20	ChipTest Engineering	Chennai
21	Design Desk india	Chennai	22	Coca Cola Limited	Chennai
23	Fenners India	Chennai	24	Dr Weisner	Bangalore
25	Flextronics India	Chennai	26	Flex Power India	Chennai
27	Ganeshram Enterprises	Chennai	28	Gala Precision	Mumbai
29	Havell's Electricals	New Delhi	30	GKN Driveline	Delhi
31	HighTemp Furnace Pvt Ltd	Pune	32	Hero Motor Corp	New Delhi
33	Iljin Automotive	Chennai	34	HLL Life Care	Chennai
35	JBM	Chennai	36	Jain Rubbers Pvt Ltd.	Chennai
37	Jumna Automotive Comps.	Chennai	38	JCB	Haryana
39	Kemwell Pharma	Bangalore	40	Jwalini Enterprises	Bangalore
41	Krisam Automation Limited	Bangalore	42	Koyas Fasteners	Natarajapuram
43	Kwality Spring Coil Private Ltd.	Madurai	44	Kumar Industries	Chennai
45	LESA-(Lucas TVS Electrical Suppliers Association	Chennai	46	Kyungshin Industrial Motherson Ltd.	Chennai
47	Lucas TVS	Chennai	48	Lucas Industries	Chennai

49	Maini products	Bangalore	50	Lupin Pharma	Indore
51	Nokia Siemens Network	Chennai	52	MM Forgings Limited	Chennai
53	Optomech Engineers	Hyderabad	54	Nutech India Limited	Chennai
55	Qualitas Technologies	Bangalore	56	Plant2PC	Chennai
57	Reddington India	Chennai	58	Rane Engine Valves Ltd	Chennai
59	Roots Industries	Coimbatore	60	Rexam Pharma Ltd	Bangalore
61	RRAutoTech	Faridabad	62	Royal Enfield	Chennai
63	Saint Gobain	Chennai	64	Saimeera	Chennai
65	Schneider Electric	Chennai	66	Sankara Nethralaya	Chennai
67	Shashun NBI Nao tech India	Chennai	68	Sharadha Industries	Haridwar
69	Murugappa Chettiar Research	Chennai	70	Shasun Medicals	Pondichery
71	Somic ZF components	Chennai	72	Silkee Electronics	Bangalore
73	SriMukha Precision Products	Chennai	74	Spinks India	Gurgaon
75	Sundaram Brakes Limited	Chennai	76	Sulzer India Pvt. Ltd.	Chennai
77	Sundaram Technologies	Mumbai	78	Sundaram Fastener	Chennai
79	Super Auto Forge Limited	Chennai	80	Super Auto Forge,MEPZ	Chennai
81	Tube Products India Ltd	Chennai	82	Titan Industries	Hosur
83	TVS Industries	Hosur	84	Tubes Investment India	Chennai
85	UMT AutoTech	New Delhi	86	UCAL Auto	Chennai
87	Woosu Automotive India	Chennai	88	Visteon Automotive	Chennai

Machine Vision–Photo Gallery


Workshop


Flywheel MV System

RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Medical Imaging

I. **Vision** :

To Create a Centre of Excellence in medical Imaging to provide solutions to various imaging challenges and innovative artificial intelligence imaging modalities in the diagnostic medical domain

II. Mission

- To strengthen the knowledge up gradation of faculty members and students in respective domain.
- To establish collaboration with various healthcare organizations such as Hospitals, Radiology centres, Research institutions and commercial industries.
- To promote research activities such as funded and consultancy project execution, prototyping, intellectual property building and publications in the respective domain.

III. Research Activities:

To carry out advanced interdisciplinary research activities in the area Medical Imaging cater to the needs of the industry and society and using this as a general research facility to take up new research projects of healthcare sector.

- Conducting Workshops, FDPs, Seminars, and design contest at regular intervals in order to kindle the awareness of faculty members and students.
- Interacting with industrial experts in order to know the current state of affairs of medical imaging modalities.
- Identifying the various problem statements in the current scenario so that projects and in turn quality publications will be done.

- Regular discussions with people in the hospitals to know the requirement of them in order to propose suitable consultancy woks.
- Establishing contacts with the funding agencies to devise suitable project proposals in the medical imaging domain.

IV. Projects at Centre of Excellence in Medical Imaging:

Project **"**AI tool for analyzing COVID condition in the test Chest X-Ray" is done at the centre during the pandemic situation and submitted and had discussion with Government sectors including ICMR

Project proposal submitted for UK innovation

Title of the proposed work	Objective	Carried by
Design and development of AI tool for analyzing COVID condition in the test Chest X-Ray	Identifying, Analysing and interpreting the COVID-19 condition and infection level within the lung segmented region will assist the physicians to facilitate better treatment to the infected patients and hence development of an efficient AI tool is the need of the hour in today's scenario.	Dr.S.Rajkumar, Professor & Head/BME & Dr.V.Sapthagirivasan, Adjunct Fcaulty, BME

Project proposal submitted for National level funding agencies:

S.no	Title of the proposed work	Objective	Topic assigned to
1	3D volume generation from 2D C-arm images	To develop an algorithm to obtain 3-Dimensional reconstruction from 2-Dimensional image obtained from iso-centric C-Arm X ray machine.	Dr.S.Rajkumar Ms.R.Saidivya Faculty members/BME
2	Real-time Renal Stone Quantification and Classification System	Development of AI based dynamic stone quantification software tool for predicting the size and composition of kidney stones in real-time Ureteroscopy procedure	Dr.G.Nirmalapriya Mr. K.Sivakumar Ms.S.Sheela Faculty members/RIT

3	Conduct Preventive Analysis from Chest X-ray scan and Electronic Medical Record (EMR) Data	To automatically analyze the whole radiology (PA chest x-ray) scans and report all possible abnormalities present in the image in combination with EMR data with the aid of AI power such as Deep Learning.	Dr.K.Devaki, Co-HoD/CSE
4	Breast Mass Detection and Classification System for Digital Breast Tomosynthesis Images	To develop computer-aided detection system to identify masses presents in the digital breast Tomosynthesis volume data by extracting key image features and Deep Learning method.	Dr.T.Manikandan, Faculty/ECE
5	Human Performance Evaluation System	To develop a system which can measure human performances in working environments by analyzing Brain Dynamics for both physical (viz. cognitive, drowsiness) and mental (viz. excited, cheerful) conditions.	Dr.M.C.Jobin Christ, Ms.N.Padmasini Faculty members/BME

S.no	Title of the proposed work	Objective	Topic assigned to
1	Differentiation of benign and malignant breast tumor using Digital Breast Tomosynthesis	To differentiate the benign and malignant breast tissues with DBT using deep learning algorithms	Harini B G - lV year Malavika S - lV year Roshini B - lll year Raksidaa P - lll year Shrilekha T - lll year
2	Detection of cardiomegaly using machine learning and x rays	To detect the presence of cardiomegaly using x ray images using machine learning	Nithila J - III year Lithiga P - III year Jeswin Betcy - III year Prasanna - II year
3	VR based visualization of human body	Making a VR application in order to help medical professionals and medical students in medical schools to visualise the various anatomical areas and physiological regions in the human body, either by viewing the application or by superimposing the images on a 3D printed model for better visualisation.	S. Manikandan - 3rd year Arjun Bhattacharya - 3rd year R. Madhavan - 3rd year M. Madhav - 3rd year
4	Capsule Endoscopy	To detect ulcers,erosion and foreign body in Capsule endoscopic images using machine learning algorithm.	Krithika GK- III yr Dhanusha P -IIIyr Harini CS -IIIyr Chandrasekar –IIIyr

5	KL grading on Knee X-ray images	This is a deep learning model to automatically classify the given knee x-ray image into one of the four grades by KL grading system.	Saranya R- 3rd year Sandhiya N- 3rd year Shivani V- 3rd year Sairam V A- 3rd year
6	"Urinary stone segmentation from Ureteroscopic image data" using machine learning algorithm	Using Ureteroscopic images,we are detecting the number of stones present using machine algorithm.	Keerthana KS -3rd year Jeffi Catherine -3rd year Malathi M- 3rd year Lakshmi Priya G- 3rd year

V. Training offered:

- National level Faculty Development Training Programme (FDTP) on "Image Analysis in Spatial Domain" during 23, 24 of November 2018 One day hands-on session on Embedded technologies.
- Workshop on Recent Advancements and Research Scopes in Gastro-Intestinal Imaging Technologies" on 05.01.2019
- Industry Oriented Hands-on Image Processing Training-2k19 for our students during 20-21 September 2019
- Hands-on FTDP on Deep Learning in Medical Imaging Applications on 7^{th} & 8^{th} June 2019
- Workshop on "Image Processing Using Open CV Hands-on Sessions" on 14.08.2021 and 21.08.2021
- Guest Lecture on "Machine learning for Medical image Analysis" on 05.03.2022

VI. Research Publications:

- S.Rajkumar, P.V.Rajaraman, Haree Shankar Meganathan, V. Sapthagirivasan, K.Tejaswinee, R.Ashwin, "COVID-Detect: A Deep Learning Approach for Classification of COVID-19 Pneumonia from Lung Segmented Chest X-rays" Biomedical Engineering: Applications, Basis and Communications 33 (02), 2150010 https://doi.org/10.4015/S1016237221500101
- Two papers are in review process

VII. Courses in curriculum:

S.no.	Course code	Course name
1.	BM19741	Digital Image Processing Techniques
2.	BM19P71	Soft Computing methods
3.	BM19P86	Virtual Reality in Medical Applications
4	MX19201	Medical Imaging and Processing Techniques
5	MX19P25	Advanced Soft Computing

VIII. MoU's Signed:

- Draft MoU submitted to M/S Aarthi Scans, Chennai.
- Draft MoU submitted to M/S Medall, Chennai.
- MoU is planning with M/S Sentinel Radiology Solutions
- MoU is planning with Deepam Hospitals, Chennai

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in MEMS & Microfluidics (CEMM)

I. **Vision** :

To be a state-of-the-art centre of excellence in the field of MEMS & Microfluidics providing quality interdisciplinary research and developing innovative microdevices

II. Mission

- Carrying out research in emerging technologies in the area of MEMS & Microfluidics
- Imparting knowledge, innovative ideas, critical thinking and skills
- Providing consultancy and services to provide solutions to industries
- Offering training programs to bring up technical personnel in the domain of micro-fabrication
- Collaborating with Universities abroad for knowledge sharing in frontier technologies

III. Research Activities:

To carry out advanced interdisciplinary research activities in the area of MEMS & Microfluidics cater to the needs of the industry and society

- Sponsored research projects
- Conducting training programmes
- Generating Intellectual Properties (IP) in terms of patents
- Publishing articles in peer-reviewed journals
- Conducting consultancy works for industries

- Curriculum development based on research works
- Collaborative research engagements with industries, national research laboratories and international Universities

IV. Research Projects at CEMM:

S. No.	Title of the project	Funding Agency	PI/ Co-PI	Project Value (in Lakhs)	Period
1.	CFD Simulation of Ring Laser Gyroscope	ARDB	Dr. N.M Sudharsan Dr. L. Sujatha	19.87	2Years (2022–2024)
2.	Fabrication of On-Chip Polymer Micro valve Arrays for Microfluidic Systems	DST	Dr. L. Sujatha Dr. R. Sundar	147	2Years (2020-2022)
3.	Development and Characterization of a Surface Acoustic Wave H_2 Sensors	BRNS	Dr. L. Sujatha Dr. R. Sundar	35	2Years (2020-2023)
4.	MEMS 3-axis Accelerometer for Vibration and Orientation Sensing	DST	Dr. L. Sujatha Dr. R. Sundar	80	3Years (2019-2022)
5.	Micro GC column using micro fluidic device with Integrated heater	DRDO	Dr. L. Sujatha Dr. R. Sundar	137	4Years (2018-2022)
6.	Fabrication of Low-Cost MEMS micro fluidic devices using metal embossing technology on glass for lab on chip applications	DST	Dr. R. Sundar Dr. L. Sujatha	124	3Years (2015-2018)
7.	Modeling & Analysis of Fused Quartz Pendulum Type Accelerometer	RCI,DRDO	Dr. R. Sundar Dr. L. Sujatha	9.45	1.5 Years(2017-2018)
8.	Development &analysis of Optimal Coating for HRG Components	RCI,DRDO	Dr. R. Sundar Dr. L. Sujatha	9.77	9 months (2017-2018)
9.	Fabrication of Low-Cost Hybrid Technology based MEMS Acoustic Transducer Using Polyimide Membrane	DST	Dr. R. Sundar Dr. L. Sujatha	38.6	2 Years 2016-2018
10	Fabrication of an EIS Biosensor for Detection of Uric Acid Level in Human Body	UGC	Mrs. S.Suganthi Dr. L. Sujatha	4.1	2 Years 2015-2017
11	Fabrication of MEMS Accelerometer for vibration Sensing in gas turbines	GTRE-DRDO	Dr. R. Sundar Dr. L. Sujatha	10	1 Year 2016-2017

12	Fabrication of Polymer micro molds for MEMS Biosensor using soft lithography techniques	DRDO	Dr. L. Sujatha Dr.B.Venkatachalapathy	21.686	2 Years (2014-2016)
13	Fabrication of MEMS devices with Thin Film technology	REC	Dr. L. Sujatha	11.3	1 Year (2014-2015)
14	Fabrication of Nano Oxide-Based Sensor on Stabilized Nano Zirconia for Detection of H_2S	AERB	Dr. T. M. Sridhar Dr. L. Sujatha	25	3 Years (2013-2016)
15	Fabrication of Super Capacitors using Conducting Polymers Nano tubes for Automobiles	AICTE	Dr. L. Sujatha Dr.B.Venkatachalapathy	9.5	2 Years (2010-2012)
16	Establishment of National MEMS Design Centre (NMDC)	NPMASS Govt. of India	Dr. L. Sujatha	In kind(MEMSCAD tools)	3 Years (2009-2012)
Total Funding value				683.276	
Infrastructure(cleanrooms,MajorEqptetc.)byREC				150	

Clean Room ISO 6 Clean Room ISO 7

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Renewable Energy Systems

Department of Electrical & Electronics Engineering

I. **Vision**:To be a centre, carrying out innovative research work and creating new knowledge enabling the, installation and operation of Renewable Energy systems for various applications, ultimately leading to the large scale replacement of conventional energy installations

II. Mission:

- To design highly reliable and cost effective wind energy and solar energy electric conversion (WEEC and SEEC) systems, build and test prototype models
- To bring out most appropriate Power Electronic circuits for field operation of WEEC ,SEEC and hybrid systems
- To take up consultancy projects in Renewable Energy systems and enable start-up units in this area.
- To offer systematic training to academicians and industry personal in the design and operation of Renewable energy systems.

III. Research Activities:

The RES Centre has the knowledge and infrastructure to harness renewable energy and it has integrated following multidomain activities:

- Research scholars, UG and PG students undertake research works and publish the papers in SCI, Scopus and web of science indexed journals

- Promotes Consultancy projects in renewable energy based multi domain areas
- Conducts the training programmes, hands on workshops and webinars for both academic and business communities
- Generates Intellectual Properties (IP) in terms of patents and high-quality technical publications.
- Promotesthe energy audit programme in Industrial, commercial multi storage and residential buildings.

IV. Projects completed at Centre of Excellence in RES:

Sponsored Projects

1. Funding Agency: AICTE-RPS

   Project Title:Renewable Energy Integrated movable charging unit for electric vehicles with smart Grid management concepts

   Sanctioned Amount: Rs: 8,00,000.00.

   Principal Investigator: Dr.P.Sivakumar

2. Funding Agency: TNSCST

   Project Title: A solar power assisted dual battery balancing system for electricvehicles

   Sanctioned Amount: Rs: 7,500.00.

   Principal Investigator: Mrs.B.Dhivya

Consultancy projects at RES :

Sl. No.	Client	Type	Work	Title
	Perumal Manimekalai College of Engineering	College	Design and development	Renewable Energy lab equipment (PV-Emulator, Fuel Cell-Emulator & hybrid power system)
1	Integrum Enterprises	Small scale industry	Program coding check	Code debugging for job scheduling problem
2	Navodaya Institute of Technology, Raichur	College	MATLAB and SIMULINK with Real Time Applications	MATLAB and SIMULINK with Real Time Applications
3	ADROIT SOLUTIONS Company	Small scale industry	Code generation	PV sourced Nano grid controller model for charging applications

4	INTEGRUM ENTERPRISES	Small scale industry	Simulation	Simulation of Multilevel inverter by using dSPACE-1104.
5	TRANSPOWER Company	Small scale industry	Design and development	To develop the biased transformer for hybrid heating application
6	Viswa Jothi Technologies Private Limited.	Small scale industry	Design and development	Inverter controller for BLDC drive applications by using dSPACE-1104.
7	Loyola-ICAM	College	MATLAB and SIMULINK with Real Time Applications	Training on Arduino
8	SRI Software System and Technologies	Small scale industry	Design and development	Solar Powered Energy conversion system with Internet of Thing
9	Integrum Enterprises	Small scale industry	Design and development	GSM Based On - Off Control of Starter for water pump in Agriculture Application
10	ICMR	GOVT. of INDIA	Design and development	Temperature Monitoring Units with deep freezer
11	REC	Internal	Design and development	Energy saving controller for HVAC systems
12	SanSel Instruments and Control	MSI	Design and development	Temperature controller using Fuzzy control
13	REC	Internal	Design and development	0-100A variable DC current power supply unit for electrocoagulation system
14	REC	Internal	Design and development	Three Phase Inverter

V. Training offered:

- Workshop on PV sourced EV charging.
- Three-day hands-on session on hybrid power sourced EV charging

VI. Research Publications:

1. P. Arokiya Prasad and **P. Siva Kumar** "Biased Maximum Power Extraction from a PV during Low Irradiation and a Highly Stiffed Grid Condition", International Transactions on Electrical Energy Systems, Volume 2022 |Article ID 4802473 | https://doi.org/10.1155/2022/4802473.

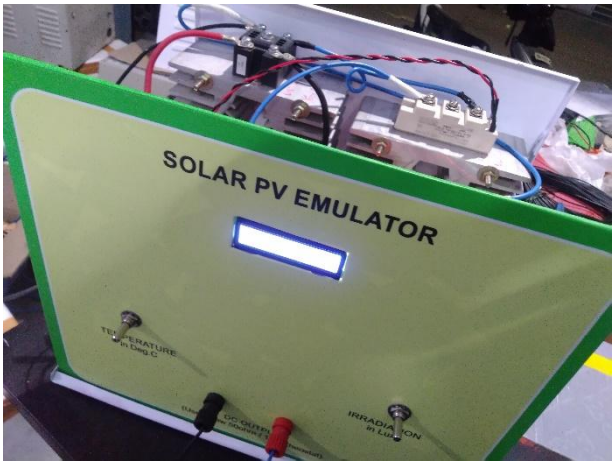
2. Ranjitha, K., **Sivakumar, P**., Monica, M., "Load frequency control based on an improved Chimp optimization algorithm using adaptive weight strategy", COMPEL - The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, 2022
3. **R.Essaki Raj, C. Kamalakannan**, R. Karthigaivel, "Genetic algorithm based analysis of wind driven parallel operated self-excited induction generators supplying isolated loads" IET Renew. Power Gener. ISSN 1752-1416, Vol. 12, No.4, 2018, pp. 472-483.
4. Ranganathan, S., **S. Rama Reddy** Design and Analysis of Fast Response Sliding Mode Controller for Quadratic Boost Converter based Hybrid PV/Wind System in DC Micro-grid. J. Elect. Eng. Technology, Springer, 2561–2571, 2021. https://doi.org/10.1007/s42835-021-00767-9
5. **R.Essaki Ra**j and Sridhar, S. (2021), "Grey wolf optimizer algorithm for the performance predetermination of variable speed self-excited induction generators", COMPEL - The international journal for computation and mathematics in electrical and electronic engineering, Vol. ahead-of-print No. ahead-of-rint. https://doi.org/10.1108/COMPEL-06-2021-0197
6. Ranjitha, K., Ponnurangam, **Sivakumar**., Rajapandiyan, A."Impact of demand management with load frequency control in distribution network with high penetration of renewable energy sources" was published in International Transactions on Electrical Energy Systems 2021, 31(11), e13066 WILEY
7. **Essaki Raj, R., Kamalakannan, C.**&Karthigaivel, R. An optimum three-stage stator winding connections for wind-driven stand-alone self-excited induction generators for enhanced annual energy output. Electrical Engineering, springer (2020). Vol. 103, No.2, 2020, pp. 865-880. https://doi.org/10.1007/s00202-020-01125-0
8. **A.NazarAli,K.Premkumara,M.**VishnupriyabB.V.Manikandanc**T.Thamizhselvana "**Design and development of realistic PV emulator adaptable to the maximum power point tracking algorithm and battery charging controller**"** Solar Energy, Volume 220, 15 May 2021, Pages 473-490.
9. G. Soorya Priya, **P. Sivakumar** "Analysis of antlion optimizer-based ABT for automatic generation control of an interconnected power system" was published in Springer Berlin Heidelberg pp. 1-15, May 2019
10. **P. Sivakumar,** M. Arutchelvi, "Modified composite power control strategy for grid connected wind- PV systems with unbalanced nonlinear current" published in the International Transactions on Electrical Energy Systems E2587, 26 April 2018 WILEY
11. **P. Sivakumar,** M. Arutchelvi, "Maximum power extractions in a single stage PV sourced grid connected inverter during low irradiations and nonlinear loads" published in the Renewable Energy. Volume 107, July 2017, Pages 262-270,ELSEVIER

VII. MoU Signed:

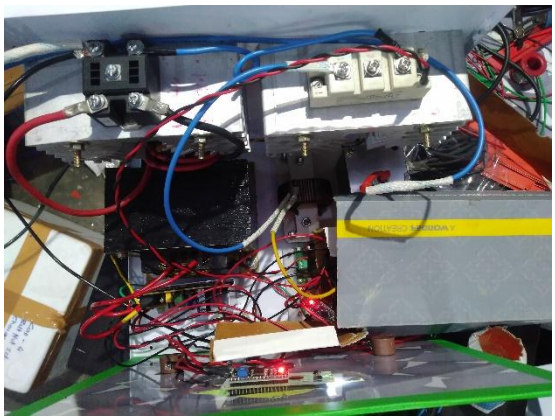
1. **Right Renewable Tec**
   TS , 116/1 ,3R FLOOR ,TINY SECTOR SIDCO EKKATUTHANGAL CHENNAI TN- INDKOLKATA ,HYDERABAD, VIZAG BLACK POOL - UK.
   www.rightrenewables.com

5kW PV panel on rooftop of workshop block

500W Wind turbine Emulated PMSG power generator



500W PV Emulator



Hardware Fabrication of 500W PV Emulator

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Centre of Excellence in Sustainable Construction Materials

I. VISION:

To be a frontier research centre in construction Materials for developing environmental friendly building materialsusing sustainable concepts and embracing innovative technologies for the benefit of society and industry.

II. MISSION:

- To pursue and excel in research to develop construction materials with less carbon footprint.
- To emerge as the most preferred resource centre for construction industry in developing innovative products to suit the customer needs.
- To develop and transfer sustainable technologies addressing societal Needs
- To be a preferred knowledge centre for providing structural engineering consultancy for using innovative materials in construction
- To train the students with focus on developing new products using sustainable concepts.

III. FUNDED PROJECTS:

The Sustainable construction Materials Research Centre aims at research and development of sustainable and innovative building materials. The Centre is established by the funding from various sponsored research projects –DST (YSS), DRDO (NRB) and DST (WMT).

- **DST-SERB** has funded a project on "Characteristics of Aerated Concrete using Mineral Admixtures" for Rs. 20,94,090/-Lakhs. Project Sanction No: YSS/2014/000044. (Sep 2015-Sep 2018)

- **DRDO-NRB** (Naval Research Board) has funded Rs20,15,887/-for the Project on "Corrosion Resistant Concrete with Phosphogypsum, Mineral Admixtures and Carbon Fibres for Marine Applications". Project Sanction No: NRB/4003/PC/376 (March 2016- March 2018)

- **DST- TDT-WMT (Technology Development & Transfer)** has funded a project on "Grinding waste from automobile Industry as sustainable construction material" for Rs. Rs.48,82,290/- Project Sanction No: DST/TDT/WM/2019/85. (April 2020-April 2023)

IV. RESEARCH ACTIVITIES:

The sustainable construction materials research laboratory is focused on evolving effective building materials for varied applications. Methods to realize light-weight construction materials enable better utilization of raw materials. Additives and blends with customized composition provide wide scope of applications for customizing construction materials with parameters tuned to application requirements.

High-volume industrial waste such as fly-ash and bottom-ash from thermal power plants enable an alternative high-volume raw material source for synthesizing building materials.

Major research oriented project activities being pursued at this lab are:

- Developing Geopolymer aerated concrete based on fly-ash using mineral admixtures.
- Corrosion Resistant Concrete with Chopped carbon fibres and phosphogypsum.
- Reactive Powder Concrete with Polyurea coating for Blast Resistance.
- Service life of Graphene oxide (GO) admixed in association with CECRI.
- High strength lightweight concrete for precast concrete members.
- Artificial lightweight aggregate which aims at high volume utilization of fly ash and bottom ash
- Use of geogrid as reinforcement as a substitute for steel rebars in slabs
- Latex concrete for absorbing shocks in Machine foundations.

Apart from research on sustainable construction materials we are also working on the disaster management and diagnosis techniques using sensors for monitoring the distress in structures. Research work on studying the feasibility of using "grinding waste from automobile industries as sustainable construction material" was carried out and the results have been patented with claims that this material can be used in concrete as sand replacement up to 20%, in bitumen pavements and also concrete without cement has been produced using fly ash, metakaolin and catalyst.

V. INFRASTRUCTURE AND FACILITIES:

- The research laboratory is established in an area of about 4000 sq.ft with facilities for processing the raw materials by pulverizing, mixing concrete and curing by accelerated methods using hot air ovens, steam chambers and high temperature autoclaving. These facilities enable preparation, processing, fabrication and characterization of varied construction materials.
- The laboratory is equipped with facilities for testing concrete in both fresh and hardened state for comprehensive characterization and process qualification.
- Facilities are available for preparing the concrete for micro structure analysis using cutting machine and polishing disc.
- Characterization instruments include standard strength, and endurance tests along with application specific tests such as chloride penetration, shrinkage testing, corrosion testing and impermeability. A high resolution optical microscope with software utilities provides the ability to view, capture, analyze and characterize microstructure of materials**.**
- Testing Instruments include 3000 kN compression Testing machine, 100 kN Flexure testing machine and 100 Ton Loading frame with all necessary accessories including data logger, for testing all structural elements like beam, column, wall panels and slab

FACILITIES AVAILABLE:

- ***Accelerated Curing***

Steam Curing Chamber

Autoclave

Hot air oven

- ***Durability Testing***

Impermeability Testing

Elcometer

RCPT

- ***Micro structure analysis***

Cutting Machine

Polishing Disc

Optical microscope

- ***Strength Testing Equipments***

Loading Frame (100 Ton)

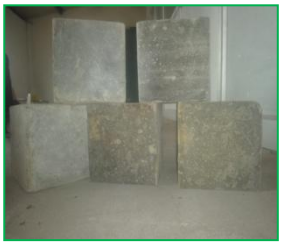
Compression Testing Machine

Flexure Testing Machine

VI. PRODUCTS DEVELOPED

Aerated Geopolymer concrete

Artificial lightweight Aggregates



Corrosion Resistant concrete

Concrete from Grinding Waste

VII. CONSULTANCY WORK

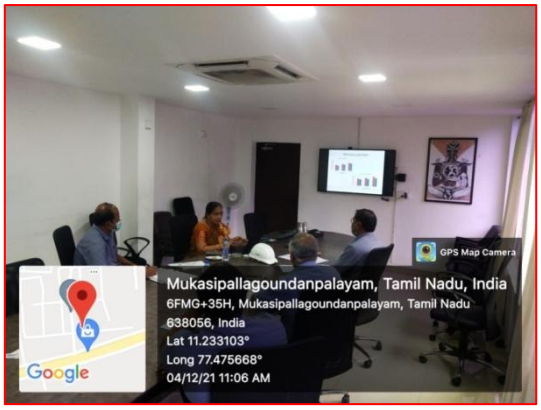
The facilities in the research Lab has been used for various consultancy works for public and private sectors and an amount of around Rs 8,00,000/- has been generated so far from the consultancy work.

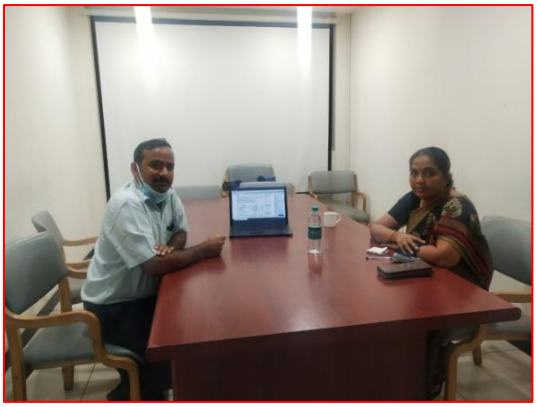
- Material testing for Krishna Water project and mix design for the entire project was done for PWD(Public Works Department, Govt of Tamilnadu)
- Material Testing for Highways Department and Rural Works Development is a routine consultancy work carried out in this centre.
- Consultancy work was carried out for Ashok Leyland in developing a product using the grinding waste generated in Ennore plant and the product was used in the construction yard in the factory.

Grinding waste sample(5 kg) sent from AL-Ennore to REC on 5th Aug17

Grinding waste sample made into solid block for structural test at Civil Laboratory, REC

- Foundry sand from Sakthi Auto Limited Tiruppur was used for developing six different products- Aerated concrete, Pervious concrete, fly ash bricks, Latex concrete, Pre-packed and Polymer mortar which has been for construction in their factory premises.
- Consultancy work for Steel sludge Waste from ILJIN and grinding waste from WABCO are also carried out for converting it into useful building material. Reactive powder concrete has been developed from the steel sludge waste.





Interaction with officials for Consultancy works

VIII. TRAINING PROGRAMMES ORGANISED

A two days workshop on "Corrosions Resistant concrete" was conducted on 29.11.17 and 30.11.17. The experts for the conference were Dr.ManuSanthanam, Professor, IIT Madras, Dr.N.P.Rajamane. Former Scientist CSIR-SERC, Dr.Vedalakshmi-Principal Scientist CSIR-CECRI and Dr.Sunitha Nair-Scientist IIT Madras. 40 participants attended the workshop and there was a demonstration session of the durability testing in the Research Lab.


Workshop on Corrosions Resistant concrete

A workshop on "Prototype Development" in association with IIC and CSRC in the Sustainable Construction Materials Research Lab for II and III year students from 18th to 20th March 2021. Students were trained to work on special concrete and Demonstration on various facilities available in the research Lab was given to them.


Workshop on Prototype Development

IX. PATENT GRANTED:

Based on the work carried out in the Research Centre a Patent has been granted on "GrindingWaste from AutomobileIndustryasaPotential Construction Material". Patent No. 383096, Date of entry 24thSeptember2018. Innovators: **Dr.S.Geetha, Dr.M.Selvakumar**

X. RESEARCH PUBLICATIONS:

a) Journal Publications

[1]. Geetha, S and - Selvakumar. M (2015) "Lightweight Composite for Structural Wall Panels", Materials Today, 2 , pp. 2928-2937.

[2]. Dr S.Geetha and Dr M.Selvakumar "Characteristics of Lightweight Composite wall panels with Polypropylene fibres," International Journal of Engineering Research and Technology, Vol. 4, no.13, pp.57-63 , 2015.

[3]. Dr S.Geetha and Dr M.Selvakumar "High performance concrete with copper slag for Marine Environment" Materials Today, 4 , pp. 3525-3533,2017.

[4]. Dr S.Geetha and Dr M.Selvakumar "Optimization of structural Light weight Concrete for use in precast construction" International Journal of Emerging Technology and Advanced Research, Vol. 7, no.2, pp.263-268 , 2017

[5]. Dr S.Geetha , Akshaya and Hemalattha "Geogrid reinforcement in Aerated Concrete" International Journal of Innovative Research in Science, Engineering and Technology, Vol. 7, no.5, pp.66-71 , 2018

[6]. Geetha.S and Selvakumar.M (2018), "Graphene Oxide Admixed Aerated Concrete Composite with Carbon Fibres", Materials today, Elsevier, Vol. 5, Issue 9, pp.19808-19814

[7]. Geetha.S and Selvakumar.M (2018), "Service Life Prediction for Concrete Composite with Carbon Fibres for Marine Environment" International Journal of Science and Technology, Vol.4, issue 2, pp.113-124

[8]. Dr S.Geetha and Dr M.Selvakumar (2018)"Fibre Reinforced Lightweight Composite Reinforced with Geogrid for Wall Panels" Materials Today, 5 , pp. 5623–5630,

[9]. Geetha.S and Selvakumar.M (2019), „A composite for the future-Concrete composite reinforced with shape memory Alloy fibres", Materials today, Elsevier, Vol 18, pp.5550-5555

[10]. Geetha.S and Selvakumar.M (2019), "Properties of Aerated Hempcrete as a potential sustainable Building Material", IOP Conf Series, Material Science and Engineering 577 pp.1-8

[11]. Geetha.S and Selvakumar.M (2020) "Ductile cementitious composite with copper slag as fine aggregate" in Materials Today: Proceedings 26 (2020) pp.434–438.

[12]. Geetha.S Selvakumar.M, Muthulakshmi .S (2020) "Optimization of high strength concrete with construction and demolition waste", IOP Conf. Series: Materials Science and Engineering 989 (2020) 012027 IOP Publishing doi:10.1088/1757-899X/989/1/012027

[13]. Muthulakshmi.S, Geetha.S and Selvakumar.M (2020), "Application of lime and GGBS to improve the strength of clayey sand", IOP Conf. Series: Materials Science and Engineering 989 (2020) 012028 IOP Publishing doi:10.1088/1757-899X/989/1/012028

[14]. Dr.M.Selvakumar, Dr.S.Geetha, SnehaKasthurirangam, Sithrubi and Sathyasriya published a paper(2021) "Effect of Glass Powder as Partial Fine Aggregate Replacement on Properties of Basalt Fibre Reinforced Concrete" in Materials Today Proceedings Elsievier, Volume 43, Part 2, Pages 1460-1464. (Scopus Indexed with impact factor 0.694)

[15]. Selvakumar.M, Prasannakumari. V, Geetha.S, Muthulakshmi.S, (2021) "Validation of Line source Models for determining Industrial Pollution and Integrating with IoT for

Vulnerability Management", IOP Conf. Series: Materials Science and Engineering. 1055 012022 IOP Publishing doi:10.1088/1757-899X/1055/1/012022

[16]. Geetha.S, Selvakumar.M, Muthulakshmi.S, (2021) "Characteristics of Polymer Modified Reclaimed Bitumen and Aggregate as Sustainable Pavement Material", IOP Conf. Series: Materials Science and Engineering 1055 (2021) 012019 IOP Publishing doi:10.1088/1757-899X/1055/1/012019

[17]. Geetha.S Selvakumar.M, Muthulakshmi .S (available online) "Strength Properties of Aerated Cement Composite Reinforced with Steel Fibres" Materials Today: Proceedings , Elsevier

[18]. Muthulakshmi.S, Geetha.S and Selvakumar.M (available online) "Predicting soaked CBR of SC subgrade from dry density for light and heavy compaction" Materials Today: Proceedings, Elsevier

[19]. Geetha.S and Selvakumar.M (2021) "Optimization of Multifunctional Nano Cement Composite for Self – Sensing" in Materials Today: Proceedings, 44 Part 1 pp 70-74 , Elsevier

[20]. Dr.M.Selvakumar, Dr.S.Geetha (2021) "Alkali Activated Porous Material with Nano Graphene Oxide as Adsorbent in Wastewater Treatment" Materials Today: Proceedings 45, Part 4, 2021, pp 4087-4090.

[21]. Dr.S.Geetha, Dr.M.Selvakumar, (2021) "Self Prestressing concrete composite with shape memory alloy " Materials Today Proceedings Elsevier, Volume 46, Part 10, , pp 5145-5147

[22]. Dr.S.Geetha, Dr.M.Selvakumar, Mrs.S.Muthu Lakshmi "3D Concrete Printing Matrix Reinforced with Geogrid " Materials Today Proceedings Elsevier,Volume 49, Part 5, 2022, pp 1443-1447

[23]. Dr.S.Geetha, Dr.M.Selvakumar, Mrs.S.Muthu Lakshmi "Investigation on Properties of Reactive Powder Concrete with Automobile Grinding Steel Waste as Fine Aggregate" E3S Web of Conferences **309**, 01216 (2021), pp. 1to 4.

[24]. Dr.S.Geetha, Dr.M.Selvakumar, Mrs.S.Muthu Lakshmi "Properties of aerated concrete with steel sludge waste from automobile industry" Materials Today Proceedings Elsevier,(available online)

b) Book Chapters:

[1]. Dr.M. Selvakumar, Dr.S. Geetha, Agaliya B. V., Shine S., Rupasudharshnee R. U. authored a book chapter on "Study on Properties of Polymer Mortar with Foundry Sand "Sustainable Practices and Innovations in Civil Engineering Select Proceedings of SPICE 2021, Part of the **Lecture Notes in Civil Engineering book** series (LNCE, volume 179), **Springer Publication**, pp 209-218 (available online from 21 November 2021)

[2]. Dr.M. Selvakumar, Dr.S. Geetha, Christina Joby Maria, Pavithra S., Rakesh S., Udhaya K. authored a book chapter on "Use of RMC Wastewater in Concrete with Admixtures, for Strength Enhancement" Sustainable Practices and Innovations in Civil Engineering, Select Proceedings of SPICE 2021, Part of the **Lecture Notes in Civil Engineering book** series (LNCE, volume 179), **Springer Publication**, pp 201-207 (available online from 21 November 2021)

.....

RAJALAKSHMI ENGINEERING COLLEGE THANDALAM CHENNAI 602 105

PRINCIPAL
RAJALAKSHMI ENGINEERING COLLEGE
THANDALAM, CHENNAI - 602 105.

RAJALAKSHMI ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION
RAJALAKSHMI NAGAR, THANDALAM, CHENNAI 602 105
TAMIL NDAU, INDIA

IIC ACTIVITY – 2021-22

REPORT

TABLE OF CONTENT

F	Highlight Few Best IIC Faculty/Student Members And Their Achievements/ Rewarded For The Innovations At Different Forum
G	Highlight Selected Best Innovations & Images With Mention Of Inventor/Innovation Name
H	Highlight Selected Start-Ups Established By Students/Faculties With Mention Of Founder/Cofounder Name
I	List If Any Break Through Innovations / Technology Developed At The Institute (2-3 Technology With 2-3 Lines About Technology And Innovation
J	Participation Of IIC-Institute In Various Programs Of Central And Stage Govt. Highlighting Specially For The Schemes Or Programs
K	Detail Of Social Media & Connections Of IIC Institute
L	Testimonials From IIC Members And External About IIC Institute And IIC Of MOE's Innovation Cell
M	Images
N	Contact

A. ABOUT IIC INSTITUTE

A.1 RAJALAKSHMI ENGINEERING COLLEGE

Rajalakshmi Engineering College, an autonomous institution affiliated to Anna University, Chennai, was established in the year 1997 under the aegis of Rajalakshmi Educational Trust whose members have had consummate experience in the fields of education and industry. The College has grown from strength to strength in the last 20 years and progressing towards Excellence in Engineering Education, Research and Development.

Started with 3 Under Graduate programmes in Engineering with an annual intake of 180 students in 1997, the College presently offers 12 Under Graduate and 10 Post Graduate programmes, with an annual intake of 1950 students. The approval of AICTE and affiliation of the Anna University for such a progressive intake is a standing testimony for the continuous growth of the college over the years. 9 of

our Departments are recognized as Research Centers of Anna University to conduct Ph.D. and M.S. (By Research) programmes and many scholars have obtained Ph.D. through these research centres.

Ours is one among the few Colleges to receive accreditation for nine Under Graduate Engineering programmes from the National Board of Accreditation (NBA), New Delhi, as soon as attaining the eligibility to apply for accreditation. The College is accredited by the National Assessment and Accreditation Council (NAAC) with 'A' Grade. The college has also secured 12(b) status from UGC. Anna University, Chennai has granted Permanent Affiliation for Eight programmes, viz., B.E. Aeronautical Engineering, B.E. Computer Science and Engineering, B.E. Electronics and Communication Engineering, B.E. Electrical and Electronics Engineering, B.E. Mechanical Engineering, B.Tech. Biotechnology, B.Tech. Information Technology and M.B.A. The Department of Scientific and Industrial Research (DSIR), Government of India has recognized the College as a Scientific and Industrial Research Organization (SIRO), considering its potential for Research and Development activities.

Vision

To be an institution of excellence in Engineering, Technology and Management Education & Research. To provide competent and ethical professionals with a concern for society.

Mission

To impart quality technical education imbibed with proficiency and humane values. To provide right ambience and opportunities for the students to develop into creative, talented and globally competent professionals. To promote research and development in technology and management for the benefit of the society.

The major assets of the Rajalakshmi Engineering College

- Eminent and well experienced faculty
- Research facility
- NAAC 'A' Grade awarded Institution
- NBA Accredited departments
- Accredited by Tata Consultancy Services
- ISO certified
- MoUs on important issues such as research, academic/cultural exchange and industry interaction
- Career guidance cell
- Entrepreneurship cell
- Value addition in terms of employment and higher studies
- Dedicated placement cell

A.2 VISION OF IIC AT REC

To achieve recognition as an institution of excellence in innovation promotion ecosystem.

A.3 MISSION OF IIC AT REC

- Conduct periodic workshops/seminars to expose and promote innovative thinking
- Network with entrepreneur development cell
- Organize idea contests to showcase the innovative ideas
- Define and direct focused technical innovations targeting national priorities
- Follow guidelines recommended by MHRD's IIC initiative

A.4 JOURNEY OF IIC

The Institution's Innovation Council has been constituted as prescribed by MHRD-IIC initiative. The activities of the council are carried out on a programmed schedule to promote innovative thinking among the students. IIC activities are managed through two cells within the institution to handle and promote innovative thinking namely Innovative Project Cell (IPC) and Intellectual Property Rights (IPR) Cell. Workshops/Seminars to improve the cognitive ability and boot camp for entrepreneurship development are organized periodically for the students. The IPC conducts idea contests regularly to showcase and recognize innovative ideas and IPR provides motivation and guidelines to incubate ideas for start-ups.

First Year of Entry 2018 - 2 Star rating

Second Year IIC2.0 – 4.5 Start Rating

Third Year IIC 3.0 – 4.0 Star Rating

A.5 DIVERSIFIED REPRESENTATION IN IIC ESTABLISHED AT THE INSTITUTES FROM INDUSTRY

1. In this academic year the guest speakers from diversified domain and sector visited to deliver the guest lecture on the thrust areas such as Additive manufacturing, Advanced Manufacturing System, Industry 4.0, Blockchain Technology, Cyber Physical System, Embeded System, High Voltage, Renewable Energy Systems, Quantum Computing etc.The delegates from industries such as Hyundai, Ford, Renault Nissan, Daimler, Royal Enfield, Qmax System, HCL Technologies, Infosys, TCS, CTS, ZOho, DST, ISRO, Lucas TVS, Rane Madras etc. Academic delegates are from IIT Madras, IIT Thirupathi, IIT Hyderabad, NIT Warangal, NIT Tiruchy, NIT Surathkal, IIT Bombay, IIITDM, etc.

B. FUNCTIONALITIES OF IIC AT REC

B.1 IIC Members Details

Table 1 IIC Member Details

S.No	IIC MEMBER	Designation	Description	Department
1	Dr.S.P.Srinivasan	President	Innovation Ambassador	ME
2	Dr.S.Poonkuzhali	Vice President	Innovation Ambassador	IT
3	Dr. K. Devaki	IIC Member	Innovation Ambassador	CSBS
4	Dr. L. Priya	IIIC Coordinator	Innovation Ambassador	IT
5	Dr.T.Tamizhselvan	IIC Member	Innovation Ambassador	ECE
6	Dr. V. Gayathri	IIC Member	Innovation Ambassador	BT
7	Dr.K.Sathya	IIC Member	Innovation Ambassador	BT
8	Dr.V.Prassannakumari	IIC Member	Innovation Ambassador	CSE
9	Mr.B.R.Gopi	IIC Member	Innovation Ambassador	IT-Manager
10	Mr.M.Chenthil	IIC Member	Innovation Ambassador	ME
11	Mrs.Millicent Mable	IIC Member	Innovation Ambassador	BT
12	Mr. I. Philip Praveen	IIC Member	Innovation Ambassador	EEE
13	Dr.Rubarani P Gangadharan	IIC Member	Innovation	HS

			Ambassador	
14	Dr. A. Selvaraj	IIC Member	Innovation Ambassador	EEE
15	Dr. Santhanam.V	IIC Member	Innovation Ambassador	MCT
16	Dr.R.Kalaivani	IIC Member	Innovation Ambassador	EEE
17	Dr. L.Bhagyalakshmi	IIC Member	Innovation Ambassador	ECE
18	Dr. S. Geetha	IIC Member	Innovation Ambassador	CE
19	Mr. Dinesh Kumar P K	IIC Member	Innovation Ambassador	AE
20	Dr.MC.Jobin Chris	IIC Member	Innovation Ambassador	BME
21	Dr.A.Paramasivam	IIC Member	Innovation Ambassador	ME
22	Mrs.T.Manonmani	IIC Member	Innovation Ambassador	FT
23	Mr.T.Premnand	IIC Member	Innovation Ambassador	AE
24	Dr.B.Mullai Sudaroli	IIC Member	Innovation Ambassador	ATE
25	Dr.C.Kamalakannan	IIC Member	Innovation Anbassador	EEE

B.2 Key Functionaries of President & Vice President

- Conduct the Quarterly Meeting
- Planning of activities in each Quarter based on Theme suggested by IIC
- Analyze the Gap and Fall-off in each quarter
- Motivate the Conveners and Coordinators
- Directing the Conveners and Coordinators to undergo the Innovation Ambassador Training
- Organize the Student-centered programs with the focus towards Innovation, Startup & Entrepreneurship

B.3 Key Functionaries of Convener & Coordinators

- Organize the Special lectures on the theme instructed by IIC in each quarter
- Share the national level competition / hackathon's organized by IIC or partnering Institutes to the faculty and students in their departments
- Undergo the Innovation Ambassador Training – Basic and Advanced Level
- To participate in the Special lectures conducted by the IIC and share the information to all the faculty and students
- Innovation Ambassador's have to provide the orientation programme at the Home Institute level and Outside institutes

C. PORTFOLIO / GRAPHICAL / TABULAR REPRESENTATION OF RESOURCE STRENGTH (HUMAN CAPITAL AND PHYSICAL CAPITAL) OF THE IIC INSTITUTION

C.1. Total Number of IIC Member: 25 Members

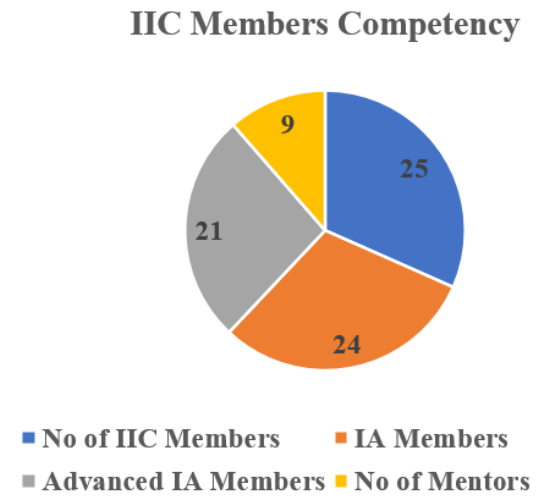
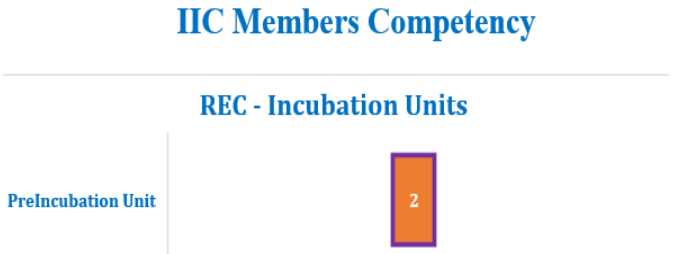


Figure 1- REC IIC Member Portfolio

C.2 Total No. of Innovation Ambassador: 24 Members
C.3 Total No. of Advanced level Innovation Ambassador: 21 Members
C.4 Total No. of faculty Mentors From Portal : 9 Members



Pre-Incubation Units -02

1. **IEDC – Institute of Entrepreneurs Development Cell**
2. **Industry Institute Interaction cell – Start-Up / Consultancy**

C.5 Incubation Units – 24

C.6 IP Facilitation Unit – 01

C.7 NISP Cell - 01

INTELLECTUAL PATENT

Vision – IP

To be a centre of excellence in providing an ambience to transform innovative thinking into product ideas that lead to start-ups and entrepreneurship ventures.

Mission – IP

To identify and protect intellectual properties created by faculty and students of the institution that have value in providing innovative solutions as well as support entrepreneurship and start-ups to build useful products.

AY	Number of Patents			Amount Spent for IPR
	Filed	Published	Granted	
2018-2019	9	9	1	Rs.4.16 Lakhs
2019-2020	22	2	3	Rs.5.72 Lakhs
2020-2021	30	15	12	Rs.1.03 Lakhs
2021-2022	74	70	20	Rs. 5.49 Lakhs

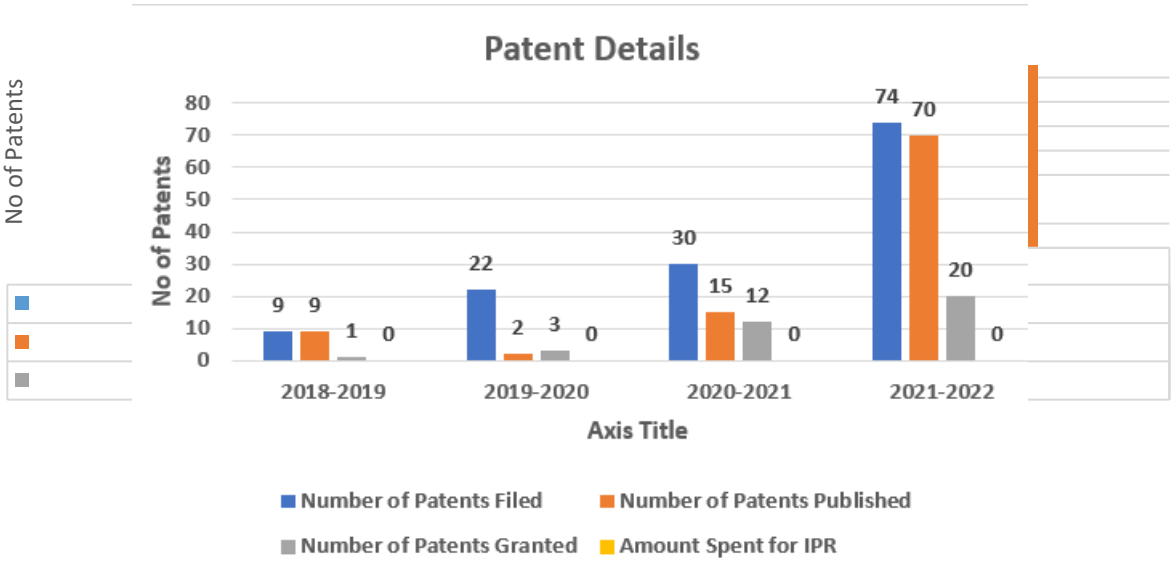


Figure 3. REC IIC Patent Portfolio

No of Ideas Generated and Prototype developed by Students and Faculty

AY	Innovation / Prototypes Developed Faculty	Innovation / Prototypes Developed Students	Prototype developed	Amount Spent
2018-2019	116	136	6	4.16 Lakhs
2019-2020	120	138	12	5.72 Lakhs
2020-2021	110	178	60	1.03 Lakhs
2021-2022	128	186	112	12.45 Lakhs

D. HIGHLIGHT FACILITIES, INFRASTRUCTURE OF PRE-INCUBATION & INCUBATION KIND AND STUDENT BODIES/CLUBS ENGAGED IN PROMOTION OF INNOVATION AND ENTREPRENEURSHIP IN THE CAMPUS

D.1 INCUBATION UNIT

Name: Centre for Sponsored Research & Consultancy
Head : Dr. L. Sujatha, Professor, ECE
Board Members : Dr. C. R. Muthukrishnan, Advisor, Rajalakshmi Institutions Chairman, CSRC
Advisory: Dr. Natteri. M. Sudharsan, Professor, Mechanical Advisory Expert, CSRC

Major goals of CSRC include the following:

- Establish and Nurture Research culture
- Develop and Augment Research labs
- Encourage Sponsored Research & Enhance facilities
- Provide Ambience for State-of-the-Art Research
- Engage in Collaborative Research
- Pursue focused research towards International Expertise

Research Lab Facility

- Machine Vision Software &Hardware Labs
- Clean Rooms Class A 1000 & Class A10,000
- MEMS & Micro fluidics
- MEMS Design Centre
- Numerical Engineering & SimulationLab
- Sustainable Building MaterialsResearch lab
- Project Incubation Centre
- Biotechnology Research Lab
- Chemistry Research Lab

Projects Completed and On-Going

FABRICATION OF SOLAR DRYER FOR VEGETABLES – FUNDED by IIT PALS RuTAG.

Fabrication of solar dryer for vegetables, main objective is to help the small and medium villages to process and store their agricultural products as when they are in abundant and to get good returns for their harvest.

D.2 NISP CELL

VISION (NISP)

Rajalakshmi Engineering College (REC) is committed to promote innovation, industrial spirit and Entrepreneurship among their students and faculties and external participant by establishing and promoting start-ups and thereby reduce dependency on job market, consequently making us "Atmanirbhar". This innovation and start-up will be the kernel for our future education system.

MISSION (NISP)

REC commits itself to technological excellence.

Vision of REC NISP will be attained by multi-pronged approach. Policy document states the salient features of Institute start-up policy. Road map to achieve this vision is stated below.

- Identify students in first year with entrepreneurial background and willing to have independent career.
- Exposing second year onwards all students to industrial visit, exposing them to the culture of industry.
- Assign start-up-based projects to Eligible freshers.
- Invite entrepreneurs to educate students on entrepreneurship by conducting classes and lecture and to train student entrepreneurs.
- Conduct optional course on subject matter.
- Give adequate flexibility in academic activities for start-up.
  Technology and innovation will be the key consideration for all future performance evaluation.

D.2.1 Entrepreneurship Development Cell

Vision - Entrepreneurship Development Cell

- To identify and empower Student Entrepreneurs for Job Creation and Wealth Generation aiding in the development of the nation.
- To create an entrepreneurial ecosystem that provides the platform for individuals with creative minds and ideas with potential for substantial business opportunities.

Mission - Entrepreneurship Development Cell

- To pragmatically educate the various nuances of Entrepreneurship imbibed with talent nourishment and capacity building.
- To provide the right environment and identify opportunities to develop and empower globally competent entrepreneurs.
- To set up an ecosystem for experimenting, learning and to incubate companies in their early stages of growth.

OBJECTIVES of EDC

1. To Inculcate the passion and spirit among students to pursue entrepreneurship.
2. To spread the knowledge about entrepreneurship through guest lectures etc.
3. To Motivate students to develop their start-up and to Identify the brightest ideas and platforms and convert them into a business model.

D.2.2 Innovative Project Cell

Coordinator

Dr. Johanna Rajkumar, Professor, Biotechnology

- Every Academic year Innovative project cell, will conduct the events to present the idea generated by students and competition will be carried out. From this best ideas will be forwarded to patent process.

D.2.3 Patent Cell

D.3 Student Bodies / Clubs – Student bodies and clubs arrange the events for students to participate and to enhance their social awareness and well-being. Events are regularly organized throughout the year.

- Photography
- Leo club
- Rotaract
- Unison
- EDC
- SEDS
- Enactus
- Yuva YiCii Club
- YRC
- Yazh Tamizh mandram

E. Highlight Achievements (Narrative/Graphical/tabular representation)

E.0 IIC EVENTS ORGANIZED QUARTER WISE

Quarter	IIC Calendar Activity		MIC Calendar Activity		Self Driven Activity	Celebration Activity
	Total no	Conducted	Total no	Conducted	Conducted	Conducted
1	7	7	-	-	10	03
2	7	7	3	3	7	03
3	7	7	2	-	25	03
4	7	7	4	4	25	03

E.1. Number and Different types of I&E and IPR activities Conducted

AY	I&E and IPR Activities Descriptions
2018-2019	4 Events
2019-2020	8 Events
2020-2021	10 Events
2021-2022	16 Events

E.2 No. of student's & faculty ideas generated

AY	Ideas Generated	
	Faculty	Student
2018-2019	116	136
2019-2020	120	138
2020-2021	110	178
2021-2022	128	186

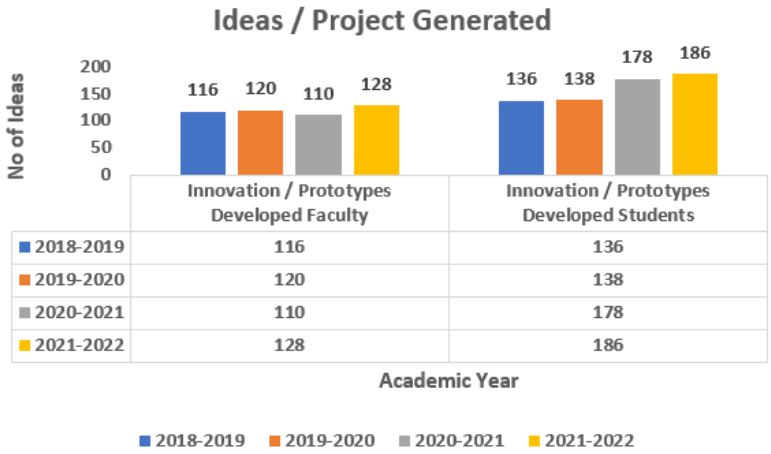


Figure 6 Ideas Generated by Students & faculties

F. Highlight few best IIC Faculty/Student members and their achievements/ Rewarded for the innovations at different forum - [Profile of few faculties with 2-3 line of their achievements]

Achievement / Reward of IIC Faculty / Student members	**Descriptions**
Pre-Incubation Unit Dr.V.Selvakumar, Professor, ECE, Rajalakshmi Engineering College	Developing coatings on the surfaces of protection equipment such as gowns, masks, gloves and face-shield. The coatings have anti-viral properties which help to destroy the coronavirus, which would otherwise stay alive for more than 8 hours and spread through air. a start-up called "Armor Shield Healthcare Innovations
Dr.S.Sekar & Dr.P.Chnadrasekar	IIT PALS RuTAG Project – Solar Dryer for Vegetable
Dr.R.Shanthi Dr.V.Gayathri DrP.Sujatha	Patent – Award -Cash Prize of 1 Lakh each
Dr.V.Gayathri Ms.Asharsha Begham	BIOACTIVE COMPOUND OF ELEPHANT FOOT YAM AS BIOPESTICIDE AGAINST STORED FOOD GRAIN PEST - Basically,pests consume food grains which are rich in carbohydrates and it undergoes further digestion.To inhibit this process,digestive inhibitor can be used which are able to inhibit the carbohydrate metabolism and the ingested carbohydrate cannot be converted into simpler sugars.

G. Highlight selected best Innovations & images with mention of inventor/innovation name

H. Highlight selected start-ups established by students/faculties with mention of founder/cofounder name

1. **Venkatasubramanian(Founder)** of the 2020 batch, Mechanical Engineering. Four years ago I remember hearing motivational talks by alumni entrepreneurs at an event by our EDC. Little did

know that I would pursue entrepreneurship right after my graduation. I am always thankful to REC for moulding me from a student into an Innovator (one of my innovations won in SIH was recognized as Top Innovations of an Indian in 2019 by MoE's Innovation Cell, Govt of India) and now an Entrepreneur (Running a year old Startup India Recognized Company).

2. **Vibhish S(Flounder)**., Final Year Mech D Section (2022 Batch), I started working on Projects on Emerging New Technologies, 3D Printers and Robotics, For the past Four Years. With the continuous efforts put-up, presently I have built my own 3DPrinters with the Trade Name, iMAGIC3D and have also already registered with GST. Also, the work is in progress on the Projects CNC Laser Technology and CNC Milling and High-Tech Filament Making Machines. These works are in progress from 2017. With the Attendance to the Academic Courses, the time available for the work on these projects becomes scarce and during corona lockdown also the work was slow due to complete shut-down. So far, we have spent more than Rs. 15 Lakhs for the R&D Work, Experimental set-ups and the development of the 3D FDM printers. With the time and effort put-up, the total investment cost would go up tp Rs. 20 Lakhs. We have started marketing our products in the leading e-marketing provider IndiaMart. Also, we have started our Marketing to the Educational Institutions and have given demonstrations on Robotics Laboratories, STEM (Science, Technology, Engineering & Mathematics) Laboratories and 3D Printers to some few schools and Engg & Tech Institutions in our native Salem and also Coimbatore Districts. Some schools and colleges have asked for the establishing of the Robotics and STEM Laboratories in their Institutes and also have shown their Interest to buy our 3D Printers.

I. List if any break through Innovations / Technology Developed at the institute (2-3 technology with 2-3 lines about technology and innovation

1. **Pre-Incubation Unit** – To develop coatings on the surfaces of protection equipment such as gowns, masks, gloves and face-shield. The coatings have anti-viral properties which help to destroy the coronavirus, which would otherwise stay alive for more than 8 hours and spread through air.
2. BIOACTIVE COMPOUND OF ELEPHANT FOOT YAM AS BIOPESTICIDE AGAINST STORED FOOD GRAIN PEST - Basically,pests consume food grains which are rich in carbohydrates and it undergoes further digestion.To inhibit this process,digestive inhibitor can be used which are able to inhibit the carbohydrate metabolism and the ingested carbohydrate cannot be converted into simpler sugars.This results in reduction of mobility and reproducibility of the pests.The biological compounds from plants are well known for their pesticidal activity.Therefore by using the biological compound from plants,we can produce a effective biopesticide which doesn't alter the odour and taste of the food grains.Here,Elephant foot yam is used as a plant source.
3. SIMMON: AN AUTONOMOUS ROBOT AS ORDER TAKER - THE ORDER TAKING ROBOT An Order taking robot replaces the staff at restaurants to establish an automation that provides options

for effective customization for ordering items in a restaurant. It includes advanced user interaction which makes users more convenient to order their intended food items at great ease. To overcome the drawbacks in current "one-size-fits-all approach based system", the proposed SIMMON could adapt itself for the recommendations given out by the customers on any time instants. Unlike the existing system, this robot is very much efficient and fast

J. Participation of IIC-institute in various programs of Central and Stage Govt. Highlighting specially for the schemes or programs

- **ARIIA – participation and Rank - Participated – Excellent**
- **NISP Adoption status - Trained Faculty, Policy Formulation, Policy Implementation - ACTIVE**
- **Smart India Hackathon – Conducted and Students Participated and won the first Place continuous academic year of 2018-2019, 2019-2020, 2020-2021& 2021-2022**

Our Institute actively participating in various central and state Government Programmes such as

1. **KAPILA**
2. **MARGDARSHAN**
3. **IIT PALS**
4. **NPTEL**
5. **Faculty Mentors for Universal Human Values**
6. **IIC**
7. **NISP - Active**
8. **EDC**
9. **IIT VLAB**

K.Detail of Social Media & Connections of IIC institute

Instagram - instagram.com/myrecchennai
Face book - facebook.com/myrecchennai
LinkedIn- https://www.linkedin.com/school/rajalakshmi-engineering-college/mycompany/
Twitter - witter.com/myrecchennai

L.Testimonials from IIC members and external about IIC institute and IIC of MoE's Innovation Cell

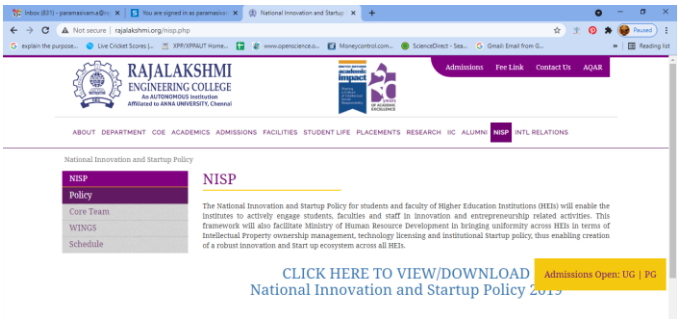
Testimonial from President

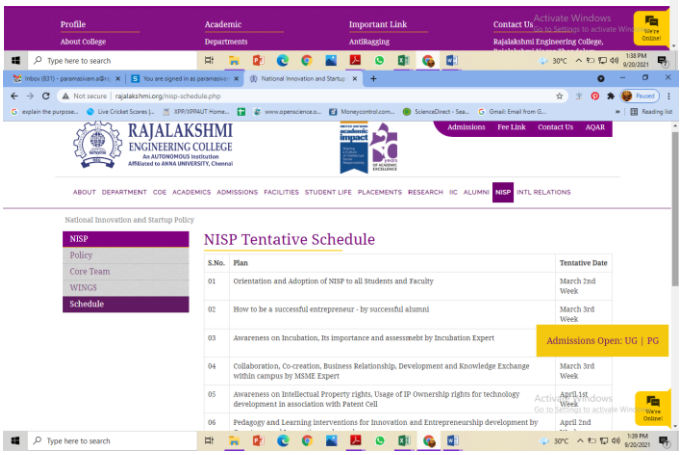
As a President, IIC of our Institution, the IIC driven activities are theme-based for each quarter. The activities in each quarter are more real-time based and meet the expectation of the industries and enrich the conversant knowledge of participants such as faculty, students, research scholars.

M.Images


RAJALAKSHMI ENGINEERING COLLEGE
INSTITUTION'S INNOVATION COUNCIL
Admissions Open: UG | PG

RAJALAKSHMI ENGINEERING COLLEGE
Admissions Open: UG | PG


RAJALAKSHMI ENGINEERING COLLEGE
NISP
CLICK HERE TO VIEW/DOWNLOAD
National Innovation and Startup Policy 2019
Admissions Open: UG | PG


RAJALAKSHMI ENGINEERING COLLEGE
NISP Tentative Schedule
Admissions Open: UG | PG

RAJALAKSHMI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

INSTITUTION'S INNOVATION COUNCIL
(Ministry of HRD Initiative)

सत्यमेव जयते
Ministry of Education
Government of India

Ministry of Education's INNOVATION CELL
(GOVERNMENT OF INDIA)

Azadi Ka Amrit Mahotsav

IIC ID : IC201811401

VISION

To achieve recognition as an Institution of Excellence in Innovation promotion ecosystem.

MISSION

Conduct periodic workshops/seminars to expose and promote innovative thinking
Network with Entrepreneur Development Cell
Organize idea contests to showcase the innovative ideas
Define and direct focused technical innovations targeting national priorities
Follow guidelines recommended by MHRD's IIC initiative

MENTOR MENTEE INSTITUTIONS

MEENAKSHI SUNDARARAJAN ENGINEERING COLLEGE
RAJALAKSHMI INSTITUTE OF TECHNOLOGY

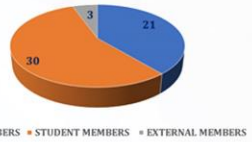
INCUBATION UNITS - 01

(Center for Assistive Technology and Devices)

PRE-INCUBATION UNITS - 01

(IEDC)

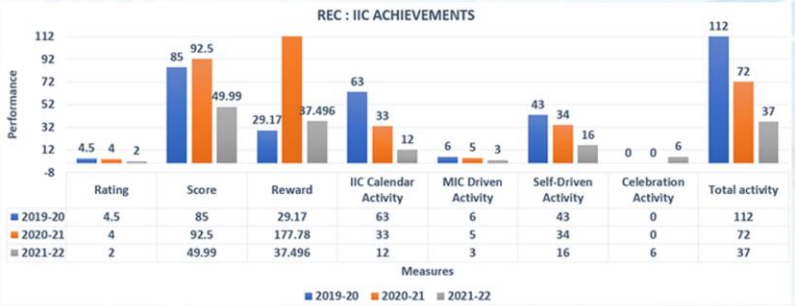
REC:IIC TEAM



IIC MEMBERS FOUNDATION IA

IIC MEMBERS ADVANCED IA

REC : IIC ACHIEVEMENTS



	Rating	Score	Reward	IIC Calendar Activity	MIC Driven Activity	Self-Driven Activity	Celebration Activity	Total activity
2019-20	4.5	85	29.17	63	6	43	0	112
2020-21	4	92.5	177.78	33	5	34	0	72
2021-22	2	49.99	37.496	12	3	16	6	37

M. Contact

Dr.S.P.Srinivasan
President of IIC
Director of Mechanical Science
Professor & Head Department of Mechanical Engineering
Rajalakshmi Engineering College
Thandalam, Chennai 602105
Email- iic@rajalakshmi.edu.in

Dr.S.N.Murugesan
Principal & Professor
Department of mechanical Engineering
Rajalakshmi Engineering College
Thandalam, Chennai 602105
Email: principal@rajalakshmi.edu.in