INTERNATIONAL CENTRE FOR RESEARCH FACILITATION AND TRAINING (ICRFT)

ANNA UNIVERSITY, CHENNAI-600 025

Conference on

Industry – Academia – R & D Ecosystem-2018

"IARD-2018"

Feb 26-27, 2018

Organized by

Planning and Development

Jointly with

Centre for University Industry Collaboration

&

Centre for International Affairs

Anna University, Chennai – 600 025

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DEPARTMENT OF HIGHER EDUCATION
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Date: 21.2.2018

MESSAGE

The Conference theme "**Industry Academia R&D Ecosystem**" is the need of the hour to deliberate and find better processes to promote Industry Academia Collaboration.

Globally in all developed countries, the contribution of Academia in research areas are very high compared to India. It means that India is not lagging behind talent and other resources. Currently we are not having an Integrated collaborative approach in making a R&D ecosystem that can enhance efficiency and productivity of such collaborations for the benefit of each and every stakeholder in the ecosystem.

On the other hand, Industries have their own issues such as, time taken to develop a new product using its own resources, which in any case will be limited and escalating costs and other risks. This in a way can be reduced by collaborating with Academia who have vast talent pool, lab and other facilities.

Government is keen in this R&D ecosystem and has taken several initiatives in providing Grants, Awards and other forms of support. The Government is continuously promoting such a collaborative ecosystem between Industry and Academia for the benefit of Society so that the Nation reaches many heights as envisioned in our Constitution under Section 51A(j) which states that " **To strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.**"

The International Centre for Research Facilitation and Training (ICRFT), Anna University has taken the right step at the right time towards building a sustainable Industry Academia R&D ecosystem in the Country.

I congratulate the organizers, Professors, Research Scholars, Members from Industry and those who are helping to make the R&D ecosystem work in the interest of developing our Country.

(R. SUBRAHMANYAM)

शिक्षा का अधिकार
सर्व शिक्षा अभियान
सब पढ़ें सब बढ़ें

SUNIL PALIWAL, I.A.S.,
Principal Secretary to Government

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MESSAGE

The Government of Tamilnadu under its vision 2023 has formulated several initiatives to promote higher education in the State. Under this initiative, the International Centre for Research Facilitation and Training (ICRFT) has been established in order to promote high quality research and also facilitate training using the facilities created at Anna University. I am very pleased to know that ICRFT is taking sincere efforts to promote interaction between Industry, Academia and R & D Institutions in India.

It is a matter of pride that Anna University has been active in Industry, Academia and R & D initiatives under which the students get good career growth and the faculty implements specific high quality research through National and International funding. The Department of Higher Education, Government of Tamilnadu has also supported Anna University under various special schemes such as the creation of a Centre of Excellence and 5 linked Technical Skill Development Institutes (t-SDIs) in Tamil Nadu through Public Private Partnership (PPP) in collaboration with Siemens and Designtech Limited, TANII scheme and RUSA scheme under which not only infrastructure has been created but also a broad basing of R & D has been done.

Anna University has also been provided with major funding from D.S.T. in two phases under Promotion of University Research and Scientific Excellence (PURSE). The facilities created through different National and International funding agencies are to be more effectively utilized by Industries through continuous interaction.

I appreciate this initiative by Anna University in conducting this two days Conference on Industry, Academia, and R & D ecosystem on 26th and 27th February 2018, based on the report submitted to the Department of Science and Technology.

I am sure that this Conference with several leading experts from Industry, Academia and R & D Institutions will pave way for the effective utilization of the facilities and will promote several new initiatives.

23/2/18

(SUNIL PALIWAL)
Principal Secretary to Government,
Higher Educational Department,
Secretariat, Chennai-9

Message

Under the auspices of International Centre for Research Facilitation and Training (ICRFT), the Conference on “Industry Academia R&D Eco System”, is being organized by Anna University, Chennai to strengthen the collaboration among Academia industry R&D Organization. This Conference will also enable the participants to get exposure to expertise available. Such integrated collaborative approach in making a R&D Eco System can enhance effective utilization of sophisticated facilities for the benefit of every stake holder.

The International Centre for Research Facilitation and Training (ICRFT), Anna University, Chennai has taken the right step at the right time towards building a sustainable industry Academia R&D Ecosystem in the country.

The main objectives of ICRFT includes:

a) Organize meetings with leading scientists, industrialists and leaders in the field of socio economic research to create awareness and initiate the thrust area of research among the faculty members.
b) Provide research management facilities to the research community.
c) Promote the Technology/knowledge transfer of the research work, including protection of intellectual property.
d) Train manpower in the specialized field of intellectual property protection.
e) Propagate research findings through publications and exhibitions for mediating collaborative research with premier Institutes and industries.
f) To afford international database, good computing and audio visual facilities pertaining to the research.

I congratulate the organizers and participants from the industry, academia and R & D organizations who are helping to make the R & D ecosystem effectively work in the interest of developing our Nation.

S. Ganesan

Registrar

Contents

Venue: National Centre for Sustainable Coastal Management (NCSCM), (Near Dept. of Mining Engineering)

PROGRAM SCHEDULE

INAUGURAL SESSION
26 February, 2018; 09.30 – 11.00 Hrs

Registration: 8.30 AM –09.30AM

09:30 Hrs	**Prayer (Tamil Thai Valthu)**	
09.35-9.45 Hrs	Welcome Address	**Dr.S. Ganesan** Registrar Anna University
09.45-09:55 Hrs	About the Program	**Dr. J .Kumar** Director Planning & Development Anna University.
09.55–10.15Hrs	Presidential Address	**Shri. S. K. Nayak** Director (Technical) Heavy Water Board Govt. of India
10.15–10.40Hrs	Inaugural Address	**Prof. Ravindra Gettu** Associate Dean Industrial Consultancy and Sponsored Research (IC & SR) Indian Institute of Technology Madras
10.40-10.50 Hrs	Vote of thanks	**Dr. N. Rajendran**, Director Center for International Affairs Anna University
10.50-11.00 Hrs	Networking Tea/Coffee	

PANEL DISCUSSION 1

26 February, 2018; 11.00 – 12.00 Hrs

Panel discussion 1: Role of Government and the Policy frame work on Industry – Academia R&D Ecosystem.

Worldwide and especially developed nation like USA, the Academia performs about 60% of all U.S. basic research and the U.S. universities continue to lead world rankings. On the other hand China and South Korea are investing hugely in R&D spent from the Asian continent which is also supported by Government.

With the Indian government's support, the R&D sector in India is all set to witness some robust growth in the coming years. According to a study by management consulting firm Zinnov, engineering R&D market in India is estimated to grow at a CAGR of 14 per cent to reach US$ 42 billion by 2020. India is also expected to witness strong growth in its agriculture and pharmaceutical sectors as the government is investing large sums to set up dedicated research centers for R&D in these sectors. The Indian IT industry is also expected to add to the development of the R&D sector.

In this backdrop, we want to revisit the current Indian Policy on 'Industry – Academia R&D Ecosystem' with the current policy and seek enhancement to the policy in the light of progressing it further in creating value to all stakeholders.

A deliberation on "Industry-Academia R&D Ecosystem" in India an evidence based study done under the aegis of Department of Science and Technology, Ministry of Science and Technology, Government of India is arranged to take the next step forward.

11.00-11.05 Hrs	Opening Remarks by the Moderator	**Dr. J .Kumar** Director, Planning & Development Anna University.
11.05-11.50 Hrs	Remarks by panelist	**Dr. R K Joshi,** Scientist – D Department of Science and Technology Government of India New Delhi **Shri. S. K. Nayak** Director (Technical) Heavy Water Board, Govt. of India **Dr.Vinod. P. Kumar** Technology Leader Manufacturing, Chemical,& Materials Technologies, GE Global Research **Dr. R Ezhil Arasan** Managing director Dr VRE Research Laboratories Pvt Ltd
11.50-12.00 Hrs	Q&A and Closing Remarks by the Moderator	

PANEL DISCUSSION 2
26 February 2018; 12.00 – 14.00 Hrs

Panel discussion 2: Creating Process for a sustainable R&D Ecosystem

The current operating environment does not foster an Ecosystem approach to Industry Academia Collaboration. Often it's worked on silos and based on individualistic aspiration of select people rather than a procedural system that brings value to different stakeholders. The issue is, how we can create a R&D Collaborative ecosystem which is scalable and operating nationwide with the right resources like research-oriented talents, lab facility and other equipment availability etc through processes, techniques, methods. Identifying Issues, Challenges and Opportunities to have a meaningful collaborative environment that is sustainable and fast enough to adapt to market changes and challenges.

Also, there are cultural issues with Academia and Industry as the expectations are often different. How this could be solved through process level changes, policy, and legality. What are the pain points of both the parties that need to be identified in this deliberation. Then only, proper procedures can be created for wider application.

12.00-12.05 Hrs	Opening Remarks by the Moderator	**Dr. R. Jayavel** Director, Centre for Research Anna University
12.05-12.20 Hrs	Special Address	**Prof. T. Thyagarajan** Director Centre for University Industry Collaboration Anna University
12.20-12.55 Hrs	Remarks by the Panelist	**Dr.T. Kalaiselvan** , Additional Director , Centre for University Industry Collaboration (CUIC) **Dr. K. Subramanian** Executive Director, R&D Powergear Ltd. **Dr.Chedarampet S. Karthikeyan** General Manager – Ventures & Business Development Dow Chemical International
12.55-13.00 Hrs	Q&A and Closing Remarks by the Moderator	
13.00-14.00 Hrs	Networking Lunch	

PANEL DISCUSSION 3
26 February 2018; 14.00 – 15.30 Hrs

Panel discussion 3: How digitally automated and integrated technology can help in creating a Value based R&D Ecosystem

Once we have best processes, policies and procedures defined for Industry Academia R&D Eco system, with the advancement and widespread usage of Digital technology, it is a must to have a platform that is integrated, cloud based for wider easy to use approach, enforcing such policies for collaboration to create value among different stakeholders.

The main objective is to create a process driven system, which will integrate different stakeholders in one common platform where collaborative efforts could be achieved to add value to each stakeholder in real time.

14.00-14.10 Hrs	Opening Remarks by the Moderator	**Dr. T. V. Geetha** Director, Academic Course Anna University
14.15-15.10 Hrs	Remarks by the Panelists	**Dr.Velraj** Director, Institute for Energy Studies (Academia), Anna University **Mr. Senthil Kumar** Founder, Director , MyPad **Mr.S. Santhospillai** Co Founder Nvron Life Science **Dr. S. Chitrakala** Associate Professor Department of Computer Science and Engineering, Anna University
15.10-15.15 Hrs	Q&A and Closing Remarks by the Moderator	
15.15-15.30 Hrs	Networking Tea/Coffee	

PANEL DISCUSSION 4
26 February, 2018; 15.30 – 17.05 Hrs

Panel discussion 4: From Publication, Patents, and Products & Services to Entrepreneurship

India is ranking high on the Publication perspective but lagging on number of Patents and market oriented products or services. It is high time to rise ourselves to not only a publication warehouse but to a powerful market oriented products and services development in line with Industry requirement to monetize the Value generated.

15.30-15.35 Hrs	Opening Remarks by the Moderator	**Dr. M. Kantha Babu** The Director Centre for Intellectual Property Rights (CIPR) , Anna University
15.35-15.55 Hrs	Special Address	**Dr. C.N. Shasidhara** Head & Deputy Controller of Patent & Design Patent Office, Guindy, Chennai -600 032
15.55-16.50 Hrs	Remarks by the Panelists	**Dr.P. Sriram** Chairman Chennai Institute of Technology Kundrathur, Chennai -600069 **Dr.K. Ramakrishnan** Secretary M.Kumarasamy College of Engineering Karur **Mr. Sujan Sekhar** (Industry Publications) Market & Business Dev Manager ACS Publications International, Bangalore
16.50-17.00 Hrs	Q&A and Closing Remarks by the Moderator	
17.00Hrs	Networking Tea/Coffee	

PANEL DISCUSSION 5
27 February, 2018; 09.30 – 11.45 Hrs

Panel discussion 5: Interdisciplinary and multidisciplinary Collaboration using R&D Ecosystem

As Knowledge base and technology is converging to keep the Innovation progressing, interdisciplinary, cross disciplinary and multidisciplinary knowledge or collaborating with those who have such specialized knowledge base like some other institutions, other department, Specialized knowledge resources across the world are the need of the hour. Instead of depending on the traditional way of sourcing knowledge-based resources for research collaboration, we deliberate on alternate methods, approaches, issues, challenges in making a successful collaboration.

09.30 Hrs	**Prayer**	
09.35-09.40 Hrs	Opening Remarks by the Moderator	**Dr. S. Thamarai Selvi** Director Centre for Technology Development and Transfer(CTDT) , Anna University
09.40-11.20 Hrs	Remarks by the Panelists	**Dr.Karthik Srinivasan** Vitreo retinal Services, Aravind Eye Care System, Chennai 600077 **Dr.Pankaj Aggarwal** Institute of Wood Science & Technology Indian Council of Forestry Research & Education Bangalore **Dr.Madhavi Ganesan** Associate Professor, Centre for Water Resources, Anna University **Dr.G Sugumar** Dean, TN Fisheries and Research Institute, Thoothukudi. **Prof. Jatin Natwani** Executive Director Waterloo Institute for Sustainable Energy Canada **Dr. T. Balasubramanian** Registrar Tamil Nadu Dr. M.G.R. Medical University
11.20-11.30 Hrs	Q&A and Closing Remarks by the Moderator	
11.30-11.45 Hrs	Networking Tea/Coffee	

PANEL DISCUSSION 6
27 February 2018; 11.45 – 14.00 Hrs

Panel discussion 6: Funding the R&D Ecosystem: Angel Funding, Venture Funding, Debt funding and other forms of financing research oriented projects.

Research & Development takes not only substantial human resources, which the Academia can provide but it also needs support from Industry who is willing to take such concept/ idea to market from the beginning. If the Industry is not willing to support financially in the beginning but makes an agreement that if the concept is developed it can adopt such inventions then we need other players like Financial Institutions, Angel funding, Ventures Funding and other types of funding.

This session brings people from the financial side that will bring their expertise in risk sharing, risk management, financial viability and fund such idea / concept from the beginning, also to help monetize in a practical way.

We also deliberate on the issues, risks, ideas on how we face challenges and from different stakeholder perspective like Academia, Industry, Financial Institutions and other Private Equity, Angel, Venture funding experts.

11.45-11.50 Hrs	Opening Remarks by the Moderator	**Dr. S. Ravikumar** Director Centre for Entrepreneurship Development, Anna University
11.50-12.05 Hrs	Special Address	**Dr. P. R. Basak** Scientist - E TIFAC, DST New Delhi
12.05-12.50 Hrs	Remarks by the Panelists	**Dr. Meenakshisundaram** (Academia) Director Food Technology Anna University **Mr. V. Sridhar,** **General Manager** SIDBI Chennai **Ms. Arthi Ramasubramanian** Senior Investment Manager, GrayMatters Capital India
12.50-13.00 Hrs	Q&A and Closing Remarks by the Moderator	
13.00-14.00 Hrs	Networking Lunch	

PANEL DISCUSSION 7
27 February, 2018; 14.00 – 15.30 Hrs

Panel discussion 7: Industry-Academia Collaboration: Bridging the Gap for the Benefit of Society

This session brings the outcome of Industry Academia Collaboration thus benefitting the Society. However, there are cultural and other issues or gaps between Academia and Industry which we want to identify and bridge it to create synergy so that "Value by Collaboration" is created and benefitting the society.

In essence we will discuss about how research collaboration between Industry and Academia is societal centric and in the process it should benefit all stakeholders involved.

14.00-14.10 Hrs	Opening Remarks by the Moderator	**Dr. A. Rajadurai** Dean, Madras Institute of Technology, Anna University.
14.10-14.25 Hrs	Special Address	**Dr. S .Suresh** Managing Director Mediscan
14.25-15.05Hrs	Remarks by the Panelists	**Dr. Mohan**, Head , Mechanical Engineering **Mr. S. Srinvasan** AIMO Past Chairman – Tamilnadu Chapter **Dr.A.Selvaraj** Industrialist, Former Industry Association President, Advisor, University Industry Collaboration Center, Madurai Kamaraj University
15.05-15.15 Hrs	Q&A and Closing Remarks by the Moderator	
15.15-15.30 Hrs	Networking Tea/Coffee	

Valedictory Session
27 February 2018; 15.30 – 16.30 Hrs

Valedictory Session		
15.30-15.35 Hrs	Welcome	**Prof. T. Thyagarajan** Director Centre for University Industry Collaboration Anna University
15.35-15.45 Hrs	Presidential Address	**Prof. S. Ganesan** Registrar, Anna University
15.45-15.55 Hrs	Felicitation Address	**Dr. P.P. Chandrachoodan** Senior Scientist, (Retd.), BRNS, DAE.
15.55-16.10 Hrs	Valedictory Address	**Dr. B. Chandrasekar** Director, CLRI
16.10-16.25 Hrs	Vote of thanks	**Prof. M. Kanthababu** Director (CIPR)
16.25-16.30 Hrs	**National Anthem**	
16.30 Hrs	Networking Tea/Coffee	

International Centre for Research Facilitation and Training (ICRFT)
Anna University, Chennai

Prof. J. Kumar
Director, Planning & Development
Email : ppd@annauniv.edu

About Anna University

- Anna University was established on 4th September 1978. Anna University is a dynamic institution dedicated to the pursuit of academic excellence. The University has become more relevant than ever as a provider of talent, knowledge and innovation in this age of progress through knowledge.
- Anna University is the largest technical University, with a strength evidenced by 593 affiliated colleges and around 7 lakh students on roll.
- The University stands 2nd in India in the 'h' index citations, based on the research papers published by its faculty members and research scholars.
- Anna University has achieved 6th Rank among the Universities, 8th Rank among the Engineering Institutions and 13th Rank in the overall category and 23rd Rank in the Management category under NIRF 2017 (National Institutional Ranking Framework India Rankings 2017) released by the MHRD, Government of India.
- Currently there are 14 SAP (Special Assistance Programme) recognized Departments receiving long term grant of Rs.16.98 crore from UGC
- Presently the Department of Science and Technology (DST) has recognized 16 Departments under FIST scheme to receive infrastructural grants amounting to Rs.16.40 crore.
- The Department of Science and Technology supports the University under PURSE Scheme (Promoting University Research in Scientific Excellence). DST has recognized the research capabilities and granted ' PROMOTION OF UNIVERSITY RESEARCH AND SCIENTIFIC EXCELLENCE ' Program and in Phase II sanctioned Rs. 35.6 crores.
- UGC has recognised Anna University as "University with Potential for Excellence (UPE)" with Bio-Medical Engineering and released a sum of Rs.23.12 crore as first installment during the year 2016-2017.

- Anna University is re-accredited by NAAC with a CGPA of 3.46 on a four point scale at “A” grade valid for a period of five years from 24th September 2014.
- Anna University is ranked 85 as per QS (Quacquarelli Symonds) University Rankings: BRICS 2018.
- In World University Ranking Anna University is ranked 201 as per QS (Quacquarelli Symonds) in the Faculty of Engineering and Technology during the year 2017-2018.
- University takes the next step forwarded to create **‘ICRFT’** which will enable the students and the faculty to get the best of research training and will also facilitate interaction with all the students of the entire state and industries.

OBJECTIVES

a) Organize meetings with leading scientists, researchers and industries as well as leaders in the field of socio economic research to create awareness among the faculty members, more particularly new faculty and help them to initiate research programs in the fields of their interest.
b) Provide research management facilities to the research community by coordinating with the sources of funding, conduct reviews and enable effective translation of these research programs.
c) The Technology/knowledge transfer of the research work, including protection of intellectual property shall be the responsibility of this Centre.
d) Towards this, the Centre shall train manpower in the specialized field of intellectual property protection. The Centre will also propagate research findings through publications, exhibitions and thereby create a healthy environment through co-operative and collaborative research with premier national and international institutions.
e) The Centre will have an access to international database, good computing and audio visual facilities

TARGETED IMPACT

The Project shall be operated on PPP mode with facility management service provider. The project will be implemented on pilot basis in central northern district of Tamil Nadu.

INFRASTRUCTURE

The **International Centre for Research Facilitation and Training (ICRFT)** will Co-ordinate with all the Faculty Members, Research Scholars, Scientists, Industrialists and Young Innovators and as a model will function at Anna University, Chennai to promote Innovation and Research.

This strategy will be effective to promote and enable the development of technology and will also enhance the industrial output. The Budget proposed will be utilized towards organizing meeting with industrial partners and also provide infrastructure facility involving **Research Facilitation Nodal Centre (RFNC), Research Facilitation Centre (RFC), Innovation and Technology Hub (ITH) and Technology Business Incubation (TBI).**

1. Research Facilitation Nodal Centre (RFNC) at Anna University, Chennai.

The Nodal Centre will keep identifying the thrust area for research and will engage students to promote entrepreneurship. RFNC will continuously interact with leading Scientists, Researchers from all over the country and foreign nations to create awareness among Faculty and Students. The Centre will also facilitate any technology development and coordinate training programs suitable to foster research.

2. Research Facilitation Centre (RFC) at four Regional Centres of Anna University.

RFC will manage co-ordination with RFNC and enable effective transfer of research outputs. It will also create awareness for protection of intellectual property and train manpower. Both RFNC and RFC will provide the platform to continuously access international database, good computing, etc.

3. Innovation and Technology Hub (ITH)

Faculty and students at Anna University have already demonstrated the utility value of a Hub. A National Hub for Health care Instrument operates at Anna University. In similar lines ITH will be established.

In this regard more active students interaction with industrial participation will be the objective of ITH. Anna University has initiated a technology transfer fellowship program which will also enable the effective functioning of TBI and ITH.

4. Technology Business Incubation (TBI)

TBI will be promoted with RFNC and RFC. TBI will continuously engage faculty and students to promote the generation of specific products and transfer technology to the relevant centers.

5. Centralized Data Management Centre interconnecting RFNC with four RFC's ITH an TBI:

The ICRFT will have a centralized data implementation center interconnecting the activities of RFNC with four RFC, ITH, and TBI.

The data center will also provide access to guideline and effective implementation of the schemes.

6. Publication / Exhibition:

The present capability of the faculty members and researchers at Anna University are known to the general scientific and industrial communities through publications in peer reviewed Journals.

However, to provide information on the specific strength and experts available, periodic publication of the expertise available will be made and Exhibitions will be conducted to make a better exposure of the results and technology developed.

7. Access International data base, good communications, etc:

ICRFT will secure access to international database such as standards for material evaluation, testing, and meteorological data.

The center will also provide adequate computing and audio visual access to all the sub systems functioning under ICRFT.

SCHEMES

1. Support for taking up Innovative Research & Product Development Projects:

Certain critical equipment, basic facilities is being established under this scheme.

The equipment facility will provide access to all the participating centers and will also act as the training center for the researches and students Innovators.

2. Support for protection of IP Rights:

The Innovation and Technology Hub will evolve into profitable products. The protection of IP rights is to be strengthened and a strong broad base will be created.

3. Support for technology transfer:

Presently, the research outputs are mostly published in highly reputed international research journals. However, the results have to be suitably transferred to relevant products. In this direction manpower training will be done which will enhance the procedural and implementation methodological skills for technology transfer. This will in turn enable and promote technology products from the University and identify critical needs of the society to the interests of active researchers. This is an inititative for the delivery of the scientific products to the beneficiaries and the end users.

4. Co-operation with International Institution:

The very purpose of International Centre (ICRFT) is to widen the scope of enhancing the Utility value and the Technology Products by effectively using the ideas and innovation available and keep evolving in the University.

In this theme, continuous interaction with industries will be made. Popularization seminar, symposia and training program will be periodically organized.

5. International Collaboration research:

As the nation focuses on "**Make in India**", products for international market can be made available through ICRFT program. In this direction, it is highly imperative that continuous and far sighted programs of research and development activities are conducted with participation from international research communities. Hence, it is proposed to regularly invite experts and eminent Scientists to deliver lectures and interact in the proposed Centre.

Centre for International Affairs (CIA)
Anna University, Chennai

Prof. N. Rajendran
Director
Email ID: dircia@annauniv.edu

The Centre for International Affairs was established in the year 2001. This Centre is an autonomous body headed by the Director at the level of professor. The objective of the centre is to strengthen bilateral research and academic cooperation with overseas universities and institutions. The Centre, in addition to being a nodal point for giving admission for NRI/CIWGC/FN students, into UG/PG/MS (By research)/Ph.D. programmes, is catering to promoting international research and bilateral collaboration. The Centre is taking measures to send faculty and students on exchange programmes through the signing of various Memorandum of Understandings. The Centre is financially supporting faculty and students who go abroad for presenting papers in International conferences/seminars etc.

The Centre is functioning with the following activities :

- Centre for International Affairs (CIA) coordinates bilateral research and academic programmes of the centres/departments of Anna University with overseas Institutions/Universities through Memorandum of Understanding (MoU).
- CIA facilitates Exchange of Students/Faculty members with foreign universities.
- CIA also facilitates the conduct of International Joint Seminars / Conferences.
- The centre supports International projects like UKIERI, which enhance educational links between India and the United Kingdom. This will give opportunities for professional and leadership development of students and faculty members.
- The Centre also conducts foreign language courses such as German, French and Japanese for students, researchers and faculty members.
- The Centre organizes special lectures and seminars by professors/experts from various foreign Universities/Institutions.
- CIA invites prominent visitors from various foreign Universities/Institutions to Anna University to discuss the future collaboration.

- CIA does the pre counseling work for admission of students under Foreign Nationals (FN), Non-Resident Indians (NRI), People of Indian Origin (PIO) and Children of Indian Workers in Gulf Countries (CIWGC) categories to Undergraduate and Postgraduate programmes.
- A Foreign Technical Training Programme (FTTP) has been initiated by the Tamil Nadu Government under 110 Rule by the then Chief Minister of Tamil Nadu.

The Centre for International Affairs also conducts International seminars, conferences and workshops. In addition to this, the centre is also coordinating all the international research collaboration and exchange programmes. The Centre is coordinating the International language programmes i.e. French, Japanese, German, Russian language courses taught by a native language teacher. Several dignitaries in the level of Consulate Generals, distinguished professionals from overseas and other officials of Government and non-government organizations keep visiting the centre for exploring the academic and research co-operation with Anna University.

Centre for University Industry Collaboration (CUIC)
Anna university, Chennai

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Dr. T. THYAGARAJAN
DIRECTOR

The Centre for University-Industry Collaboration (CUIC), Anna University Chennai was established in the year 1991 with a primary focus on the following domains namely: Campus Placement for Engineering / Technology / Management Students; Faculty Empowerment Programmes, Training Programmes for students on Core Competency Development and to explore research in engineering and technology in collaboration with industries. The On-campus placement is regularly arranged every year for the aspiring students belonging to UG / PG programmes offered in the University Departments. Every year around 250 companies from India and abroad, visit the academic portals of Anna University for their prestigious recruitment. The campus placement offers three kinds of jobs namely Core, IT and ITES for the students which cover 95% of the eligible and interested students from Anna University.

Some of the other functions performed by CUIC include the following:

- Facilitating Industrial visits, Industrial training, Internship with stipend; Create student data base using on-line registration.
- Enhancing employability skills by Preparing a Ready-Reckoner booklet containing the information such as**:** Tips for improving communication skills, Tips for improving GD skills, Tips for attending interviews, FAQs with sample answers, Expectations of HR/ Company executives, Contact details of PRs, List of useful websites and distributing it to all the final year UG/PG students.
- Conducting Soft-skill Development Programs for improving communication skills, leadership qualities, personality development, Group Discussion, Aptitude and Attitude, preparation of CV etc.,
- Entering into MOU with industries for formal collaboration in the form of: Giving Awards for Best Project and Best Out going Student; Best Faculty Award; Research Fellowships; Skill Development Programs; Merit-cum-Means Scholarships for the needy students; Creating facility with funding from industry and Implementing their CSR initiatives.

- Conducting Career Guidance Seminars for the benefit of students.
- Organizing FDPs on Capacity Building for the benefit of faculty members and Placement & Training Officers.
- Patronizing Industry Associate-ship Scheme for sharing the resources
- Conducting several Tamil Nadu State Level Placement Programs at different zones, for the benefit of students from affiliated colleges and constituent colleges under Anna University.

Centre for Research
Anna University, Chennai

Dr. R. Jayavel
Director
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Centre for Research is functioning as an important entity of Anna University from its inception on 4th September 1978, offering research Programmes in different branches of Engineering, Technology, Architecture and Planning, Science & Humanities and Management Sciences leading to award of Ph.D. and M.S. (By Research) degrees. Faculty members are actively pursuing interdisciplinary and socially relevant research in thrust areas with state–of–the–art equipment's in addition to teaching, consultancy and extension activities.

This Centre is offering admission to Ph.D. and M.S. (By Research) Programmes twice a year. Around 14,916 research scholars are pursuing Ph.D. and M.S./M.Tech. (By Research) Programmes. Foreign scholars are admitted through ICCR and QIP scholars are admitted through AICTE. Full-time research scholars are covered with accident and medical relief policy. In order to further enhance the research activities in Anna University and to become a global competitor in research, meritorious and talented youth with PG degree are attracted by "Anna Centenary Research Corpus" supporting 50 research fellowships every year with a stipend of Rs.16,000/- per month and a contingent grant of Rs.25, 000/- per year to each scholar for a maximum period of 3 years.

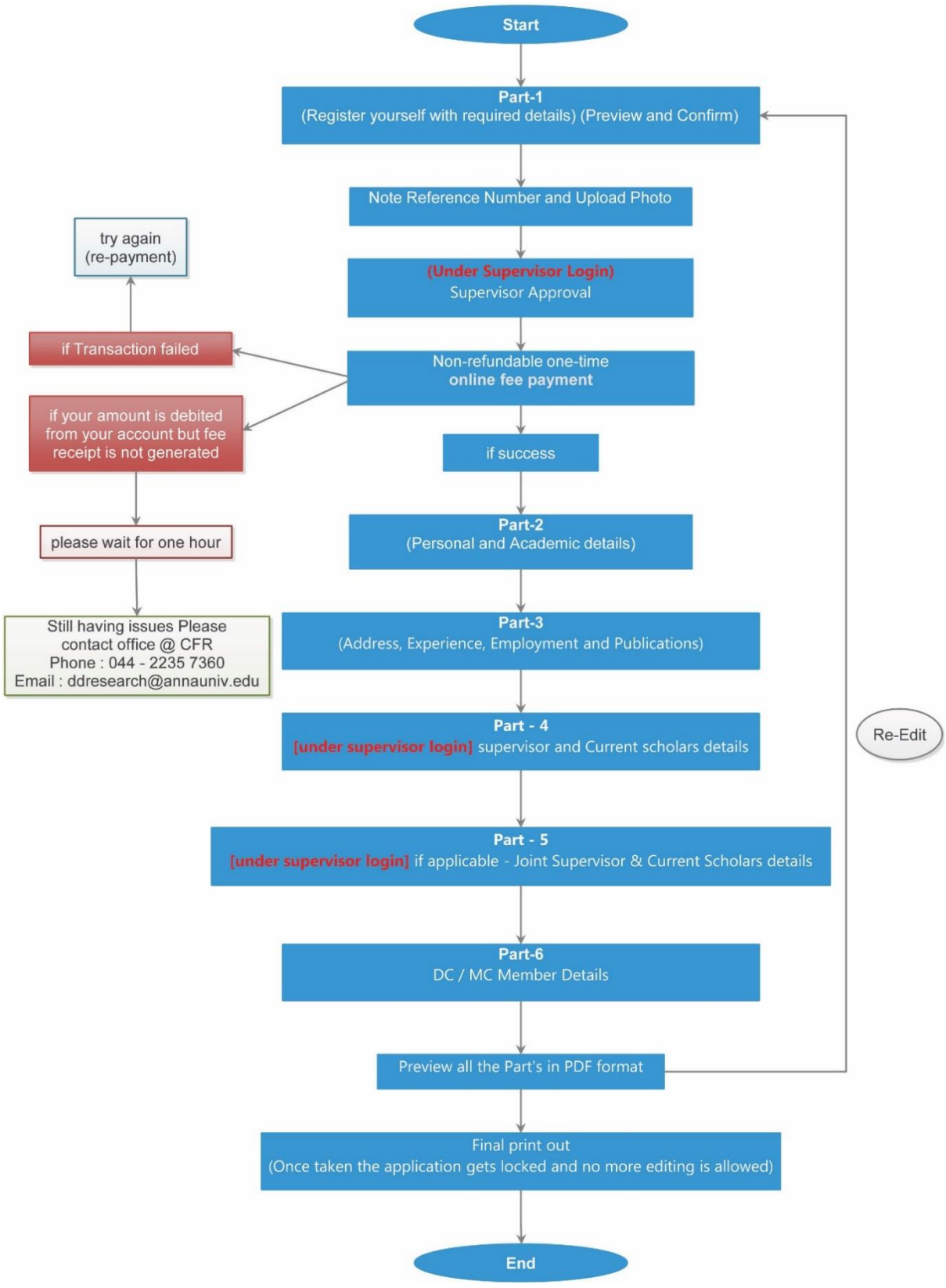
The Centre is taking care of the recognition of Departments of various affiliated Engineering Colleges and Industrial Units/R&D centers to do research with this University. It is also providing a platform for the faculty members to interact with other experts in their area of specialization within India and abroad to provide an opportunity for others to understand the research quality of this University and also pave way for scientific collaboration. More than 5057 teaching staffs/experts are recognized as supervisors by the Centre for guiding research scholars.

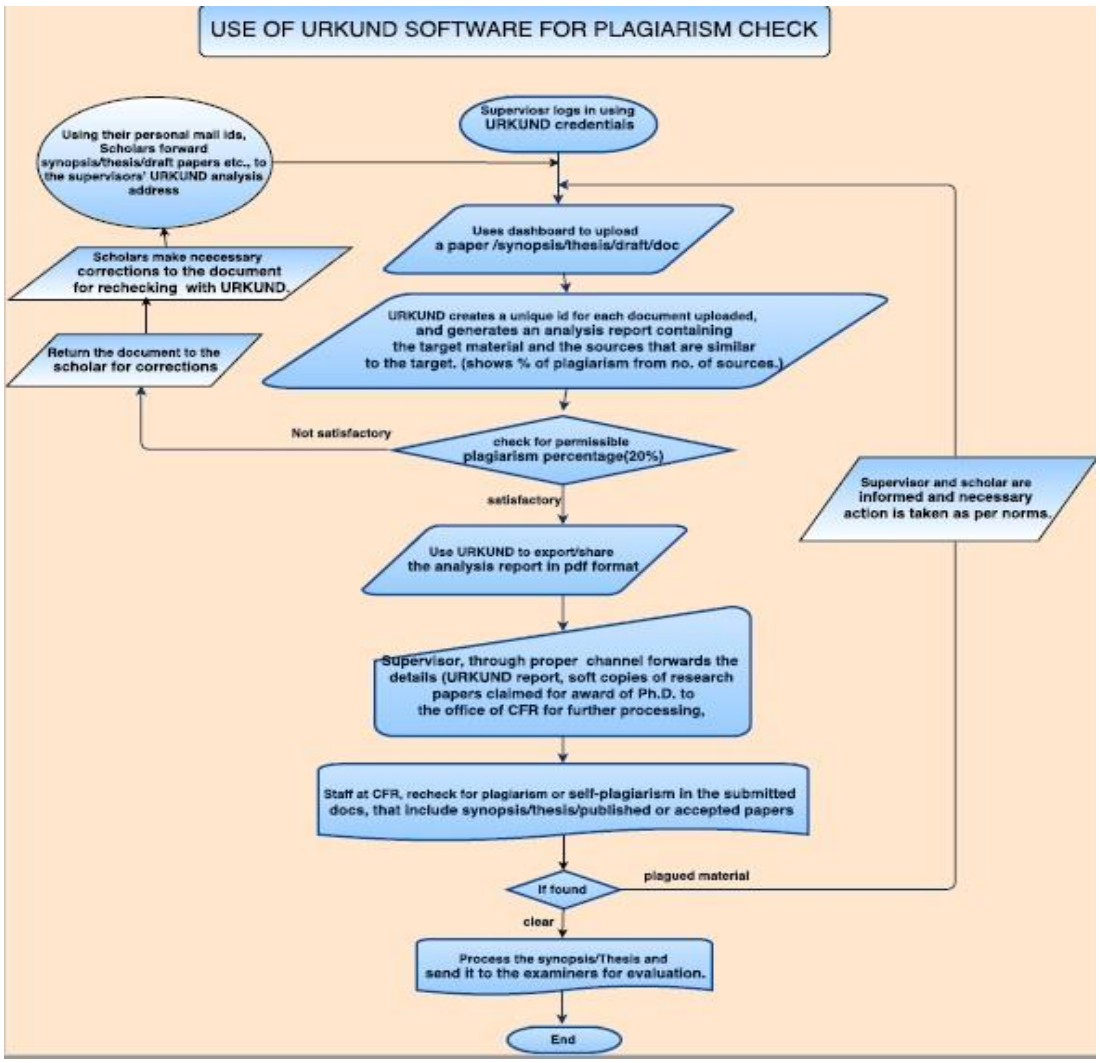
Details required for the scholars/supervisors are posted in the website and periodically updated. **Helpdesk** is available for scholars to express their problems /to clarify any doubts. Centre is focusing fully on e-Governance such as **online**

submission of application for Ph.D. / M.S. Programmes, **Online fees collection** for the research scholars, **online submission of soft copy of Synopsis and Thesis** to speed up the processing. The status of Ph.D. synopsis and thesis submitted by the research scholars can be accessed online from Anna University website. For quick processing of claim bills of the scholars NEFT transfer is adopted and foreign remuneration are settled through SWIFT transfer. **The entire gamut of activities of the Centre such as online functionalities, office administration, etc. including the website management have been conceived, designed and developed by in-house team**. **Evidence of success can be witnessed** from drastic reduction in the duration between submission of thesis and award of degree from 8 months to 3 months on an average and increase in number of scholars receiving Ph.D. Degree. The number of Ph.D. awardees of Anna University from the inception (1978-2017) is 7930 while in the last three convocations (2014-2017) is 3902 and in the convocation held in 2017 alone is 1507. In the 35th convocation **1010 Ph.D.** scholars are awarded degrees. **This is an "All time High" number of Ph.D. awardees (for a calendar year) in convocation for Anna University and the highest number of Ph.D. awardees ever achieved by any other Technical University in India.**

Apart from the number of PhD's produced, the Centre is constantly striving in enhancing the quality of research. This is being carried out by encouraging the scholars to publish their research articles in quality research journals displayed in the center's website. The list of journals around 11,124 in number are being updated continuously on the advice of faculty chairpersons. Thanks to UGC for providing the antiplagiarism software (URKUND) with which the center is able to ascertain the quality of research paper published while submitting the synopsis, and the thesis submitted for the award of PhD. Actions are being taken to encourage the researchers to apply and obtain patent for the products developed by them.

Online Application Process




USE OF URKUND SOFTWARE FOR PLAGIARISM CHECK
Using their personal mail ids, Scholars forward synopsis/thesis/draft papers etc., to the supervisors' URKUND analysis address
Supervisor logs in using URKUND credentials
Uses dashboard to upload a paper /synopsis/thesis/draft/doc
URKUND creates a unique id for each document uploaded, and generates an analysis report containing the target material and the sources that are similar to the target. (shows % of plagiarism from no. of sources.)
check for permissible plagiarism percentage(20%)
Not satisfactory
Scholars make ncecessary corrections to the document for rechecking with URKUND
Return the document to the scholar for corrections
satisfactory
Use URKUND to export/share the analysis report in pdf format
Supervisor and scholar are informed and necessary action is taken as per norms.
Supervisor, through proper channel forwards the details (URKUND report, soft copies of research papers claimed for award of Ph.D. to the office of CFR for further processing,
Staff at CFR, recheck for plagiarism or self-plagiarism in the submitted docs, that include synopsis/thesis/published or accepted papers
If found
plagued material
clear
Process the synopsis/Thesis and send it to the examiners for evaluation.
End

Centre for Technology Development and Transfer (CTDT)
Anna University, Chennai

Dr. S. Thamarai Selvi
Director
Email id: directorctdt@annauniv.edu

- Centre for Technology Development and Transfer (CTDT) was established during the year 2005 to encourage Research and Technology Transfer in our University. CTDT takes initiative to help the User Agencies and the Industries in identifying possible areas of collaboration in Research activities. CTDT interacts with the Stakeholders for partnership with Industries and R&D establishment, for Research, Consultancies and Training programs of the University. Over the past four years, CTDT has received funds of Rs. 147 crores approximately through Sponsored Research projects, Testing, Technology Transfer and Training programmes.
- CTDT also encourages the faculty members especially the ones who joined recently and Students of Anna University by funding for their innovative ideas through Young Faculty Scheme, Student Innovative Projects and Technology Transfer Fellowship from the revenue generated through Research projects, Testing, Technology Transfer and Training programmes.
- CTDT also coordinates the Global Initiative of Academic Networks (GIAN) at Anna University. GIAN course is initiated by the Government of India, with the aim to enhance the quality of education offered on par with global levels. During first phase, 8 GIAN programmes have been conducted during August 2016 - January 2017. Second phase of GIAN starts from February and four courses have been approved which would be conducted during the remaining period of this year 2017.
- Apart from this, CTDT motivates the faculty members by presenting them with the following awards every year.

- ***Distinguished Researcher Award*** - To recognize the eminent researchers in Anna University for their excellent research, innovation and publication
- ***Active Consultant Award*** - To recognize the faculty who is bringing maximum amount towards consultancy based on their technical skills and ability and celebrate how industry clients and consultants work together to

achieve the best results. We cover all the departmental areas, ranging from engineering to technology and management to architecture, putting consultants in the spotlight and focusing on their individual attributes and skills.

- ***Innovation Award*** - To recognize the innovation of individual / team towards the implementation of technologies through their design and development of a product / process / technique and practices which is yet to reach the customer, but has the potential opportunity for societal application with economic feasibility to commercial / socio-economic benefit.
- ***Technology Transfer Award*** - To recognize successful design and / or development of product / process that has been transferred to the industry / client / user and is utilized by Industry / society.
- ***Achiever award*** - Identifying renowned technocrats who have graduated from the (Campus of CEG, ACT, SAP and MIT) Anna University and recognizing their significant contributions to disciplines such as Academics, Research & Development, Entrepreneurship and Social Development.

Centre for Intellectual Property Rights (CIPR)
Anna University, Chennai

Dr. M. Kanthababu
Director
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Major Highlights:

- Centre for Intellectual Property Rights (CIPR) was established in the year 2005 as an Independent Centre in Anna University for promoting innovations of Faculty, Research Scholars and Students of Anna Universities as well as Individuals, Small and Medium Scale Industries, Startups, Large Industries, etc.

- CIPR has a well-established Anna University Intellectual Property (IP) Policy approved by the Anna University Syndicate.

- CIPR, Anna University has been recognised as Technology and Innovation Support Center (TISC) by **World Intellectual Property Organisation (WIPO)** through the Cell for IPR Promotion and Management (CIPAM), Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India, New Delhi.

- CIPR is recognized as **'Facilitator'** for Startups by the Indian Patent Office, Office of the Controller General of Patents, Designs & Trade Marks (CGPDTM), Govt. of India, New Delhi.

- CIPR is actively involved in filing number of IP applications of different categories such as Individual, Institutions, MSME, Large companies, etc in the Indian Patent Offices.

- CIPR has so far successfully filed more than 200 patents, 30 Trademarks and 40 copyrights and 25 Industrial Design. CIPR also assisted in filing 12 International Patent Applications.

- Based on the IPR data, Anna University has able to achieve Accreditation 6th rank among the Universities, 8th rank among the Engineering Colleges and 13th

rank in the overall category in India by **National Institutional Ranking Framework (NIRF)** ranking, MHRD, New Delhi.

- CIPR has so far organised more than Eighty (80) One day IPR Awareness Workshop/Seminar in Tamilnadu and Karnataka.

- CIPR so far organised Ten (10) **Certificate Courses** on various aspects of IPR namely “Certificate Course on IPR”, “Certificate Course on Patent Drafting”, and “Certificate Course on IPR procedures and Best Practices”, etc.

- CIPR has conducted one day Awareness/Sensitization programme for exclusively for MSMEs and acted as Knowledge Partner and also contributes in the form of preparation of Course Notes for the above programme.

- The Annual report on IPR of Anna University and its Affiliated Colleges is prepared every year and circulated among the Anna University personnel and others.

- CIPR presents every year **Anna University IP Award** for two top performers form the Departments/Centers of Anna University and top two performers among the Affiliated colleges of Anna University (region–wise such as Chennai, Tiruchirappalli, Madurai, Coimbatore and Tirunelveli) in order to recognize and motivate the active Inventors.

- CIPR has successfully completed two sanctioned project of Rs.151.80 lakhs (2006- 2009) and of Rs. 3,64,941 (2011) funded by the Department of Information Technology, Ministry of Communication and Information Technology, Government of India, New Delhi.

- CIPR has submitted Project Proposal to MSME, New Delhi of Rs. 65,000,00/- for Setting up Intellectual Property (IP) Facilitation Centre for MSME, and also to Cell for IPR Promotion and Management (CIPAM), Department of Industrial Policy and Promotion (DIPP), New Delhi of Rs.48,70,000/- under IPR Awareness – Creative India: Innovative India program.

Centre for Entrepreneurship Development (CED)
Anna University, Chennai

Dr.G.Ravikumar
Director
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Centre for Entrepreneurship Development (CED), Anna University is conducting various awareness programs / training workshops for kindling the entrepreneurship inspirations of the students. Started in the year 2002, CED was followed by a group of around 100 students of CEG and A C Tech, till two years back. With a total students strength of around 10,000, the Entrepreneurship awareness was literally missing in the campus and every students is after the Placement Cell for their career settling and growth.

In 2013, separate Entrepreneurship Development Cells (EDCs) were formed in each of CEG, A C Tech and MIT. CED is now spreading its wings to coordinate the EDCs in all the 600 constituent and affiliated Engg colleges throughout Tamilnadu State. Still, as CED is located in the AU main campus, EDCs in CEG, A C Tech and MIT receive the maximum attention.

Entrepreneurship Development Cells in University Departments

ED Cells in CEG, ACTech and MIT are looked after by an Asst. Director (Regular faculty) and supported by faculty coordinators from each of the departments nominated by the respective HODs.

In EDC-CEG and ACTech, new EDC libraries were inaugurated with few hundred books on Entrepreneurship and a few business newspapers & magazines are subscribed regularly. During March 2014, a new “Entrepreneurship Forum for Girls” was inaugurated”. Usually, awareness lectures are organized on “Entrepreneurship Opportunities” in various branch of Engg and the students of that respective branch are assembled with the help of the department. With the introduction to Entrepreneurship, EDC in the college and the opportunities available, interested students are becoming members of EDC. For the members, short training programs, onsite Entrepreneurial trainings, full day conference / workshops are regularly organized. For the past four years, more than 50 awareness lectures were

organized. Five one day workshops including the one on “Women Entrepreneurship” were organized. Training program on “Civil Engg Contracting in Govt sector” was organized.

During the academic year 2015-16, EDC-CEG, with the support of Centre for Water Resources (CWR) and Green Brigade Club of CEG, have initiated “ORGANIC FARMING” in the campus. This venture has objectives of undertaking the Organic farming by the students and learning Entrepreneurship Opportunities along with the possibility of any innovation. After preliminary land preparatory works, this was inaugurated on 15th August, 2015.

As of now, few thousand students of University Departments of Anna University are following the EDcell activities. There is a great awareness of Entrepreneurship among the students across the campus. With this platform, created over the four year period of basic programs, the EDC is poised for a vertical growth.

With the support of Entrepreneurship Development & Innovation Institute (EDII), Government of Tamilnadu, CED is recognized as a HUB institution to support programs improve the entrepreneurial ecosystem in 90 academic institutions in and around Chennai. With the support of Alumni Association, College of Engg Guindy, an incubator is functioning in CEG campus with 8 startup companies.

Following are the anticipated future programs to improve the entrepreneurial aspects of Anna University:

(i) Higher level components of Entrepreneurship such as Incubation, mentoring, seed capital, etc are to be created to convert the students’ ideas into successful business ventures.

(ii) Funds /proposals / projects from Govt and private sectors are to be attempted

(iii) Campus companies are to be created for the existing students to learn business within the campus in any sales / service aspect. This requires additional space, manpower to coordinate such ventures along with seed capital for the interested students.

(iv) The EDC library is to be strengthened with additional books for which donations either in the form of old books as well as funds are desirable.

University with Potential for Excellence
in
Biomedical Engineering and Instrumentation

Anna University has been granted “University with Potential for Excellence in Biomedical Engineering and Instrumentation” status for its accomplishments in this area as a pioneer over the past two and half decades. The synergy among a number of Departments and Centres including Centres of Excellence in this area, resulted in 306 publications, 189 Ph.D. theses, 85 projects to the tune of Rs. 65 Crores, 24 patents either filed, published or granted and the recent national recognitions like establishment of a National Hub for Healthcare Instrumentation Development (DST funded) and University Innovation Cluster (BIRAC). UPE status and major funding by UGC will now enable us to make use of this enormous potential to address the serious lack of development of indigenous biomedical instruments resulting in 85% of these being imported without certification or regulation for want of calibration and testing facilities. Moreover, our country’s instrumentation capability requires matching boost from premier technical universities like Anna University, known for the wide diversity (130) of engineering and technology disciplines and corresponding expertise required for a multi and interdisciplinary field like biomedical instrumentation. Biomedical instrument prototypes have been jointly developed in association with hospitals, industrial partners and research institutions across the country in a five-layer approach starting with basic scientific and engineering concepts, laboratory prototype development, productization for commercial validation, technology transfer and post-commercialization support. Commercialization of technology developed at Anna University is implemented by its unique Centre for Intellectual Property Rights and Centre for Technology Development and Transfer, and particularly with respect to biomedical devices, by National Hub for Healthcare Instrumentation Development also.

In the UPE programme Anna University will focus on limited manufacture of Automated Biomedical Device Development for Commercialization with the development of Automated Antibiogram cum Pathogen Identification Device

(Bactibiogramoscope) by a highly interdisciplinary team formed among biotechnologists, engineering faculty from medical electronics, Electronics and Communication Engineering, instrumentation, mechatronics and Medical Physics. It is a totally indigenous idea right from the biochemistry employed to design of the machine and its manufacturing to provide the data on the right antibiotics to be prescribed within 6h and identification of the pathogen within 2h subsequently. It is conceived ultimately with the idea of avoiding human handling and safe disposal of highly hazardous pathogens. This will also address a serious concern of limiting the spread of Multi-Drug-Resistant bacteria and rational prescription of the right antibiotics by the second dose. The lower cost of the test, expected to be less than Rs.100 per sample, compared to Rs. 600-Rs.1000 of prevailing rates, will make the test much more affordable and hence expected to generate better compliance. An exclusive market analysis group with MBAs has been inducted to help in commercialization of this new type of device in the market.

The implementation of this as an example of the University's technical prowess to boost indigenous medical device manufacture would facilitate building major infrastructures with state-of-the-art facilities for design, fabrication, testing, calibration and limited manufacturing for multicentre validation, which is necessary for successful technology transfer and marketing. It will serve as platform to benefit other biomedical devices developed in-house or outside in automation and commercialization. After successful establishment, these can be expanded to national facilities in biomedical instrumentation development. UPE will enormously benefit the initiative of the University to strengthen MSMEs with research and help in clinical acceptance and penetration in Indian market. It'll introduce entrepreneurship and in-campus business set-up by faculty and students. The cumulative effect of all these will make a perceptible difference to the present scenario of indigenous medical devices' novelty, sophistication, manufacture and competitiveness. The University is deeply appreciative of UGC's effort to recognize this potential and guide throughout the proposal to shape it in a way it is a rewarding programme not only to the University but to the whole country.

ATAL Technology Incubation Centre for Smart Society (ATICS) Anna University- Chennai-25

Dr. S. Chitrakala
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With focus on burgeoning next generation social applications for the betterment of human mankind and to reduce the Rural Urban divide in terms of Quality of Life, world class Incubation Centre for smart society can be built on the main opportunities of Information and Communication Technology (ICT) and Smart Drones (SD) on the thrust areas of diverse sectors such as Agriculture, Transportation, Energy, Smart Materials and Instrumentation. Case studies on Socio-economic problems and prevailing environmental factors will be seeded in for building incubators and accelerators to develop innovative and competitive products and services in the focus areas. This Atal Technology Incubation Centre for Smart Society (ATICS) centre provides Business Intelligence (BI) and Smart Drones support to nurture an advanced analytics culture to solve the growing 'Big Data analytical' and 'IoT' challenges of clients from various sectors such as Agriculture, Energy, and Transportation. It facilitates business insights for aspirants, startup entrepreneurs, investors, Service Providers and technocrats and aims to bridge the gap between solution providers and end-users / clients.

In this talk, the highlights of the incubation centre will be projected.This ATICS incorporates multidisciplinary efforts from Department of Computer Science and Engineering, Centre for Aerospace, Centre for Water Resources, Transportation engineering, Institute of Energy Studies, Smart materials , Health care and Instrumentation of Anna University, Chennai. ATICS has commissioned the infrastructure setup for Big Data computing in multi-threaded form to cater to the needs of various sectors. IoT environment support provides test bed for IoT deployment for identified sectors. In Anna University, good innovation eco system is already prevailing in several technological fields remarkably in Agriculture, Energy, Transportation, Smart Materials and Unmanned Aerial Vehicle System, Healthcare and Instrumentation. The synergy between the pool of expertise available in the field

of Big data computing and IoT with above said fields will create technological breakthrough and will support to elevate the growth of above said core technologies at a faster rate for the benefit of the society. ATICS will create conducive atmosphere and suitable platform to facilitate multiple incubatees towards achieving their targets in the above said sectors by connecting the experts and research facilities available in the University. ICT and smart drone based solutions covering various sectors will lead to reduce the Rural Urban divide in terms of Quality of Life (QoL).

CENTER OF EXCELLENCE IN AUTOMOBILE TECHNOLOGY (CEAT)
Anna University, Chennai

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Prof. and Head
Department of Production Technology
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Preamble:

- It is kindly bring to your notice that the Hon'ble Chief Minister of Tamil Nadu State has announced the Vision for Tamil Nadu in 2023 (Vision 2023) in the year 2015 with the aim of Tamil Nadu State to be in the forefront in India in terms of industrialisation in particular the automotive sector.

- As part of the Vision 2023, the Hon'ble Chief Minister of Tamil Nadu in the recent Assembly Meeting announced that a Centre of Excellence in Automotive Technology would be set up in Anna University the flagship University of Tamil Nadu with a total investment of Rs. 50.00 Crores (Rupees Fifty crores only) with the main objective of having collaboration between Anna University and Auto / Auto Component Industries. The Centre would be set up in public - private partnership model with contributions from Anna University about 60 %, the Government of Tamil Nadu 20 % and the remaining 20 % from Auto Original Equipment Manufacturers and component industries.

Introduction:

- Automobile vehicles population grows significantly every year which also increases the pollutants drastically. The atmosphere air is polluted by various sources, out of which the automobile vehicle pollutants contribute more than 50%. The automobile pollutant severely affects the human health and environment. Stringent steps are being taken to control these automobile pollutants in order to meet the emission standards.
- Design of safe, smart and sustainable vehicle would be the major challenges for the automotive industries in the years to come. In addition, finding ways to

improve the resource and energy as well as intelligent light weight technologies to decrease fuel consumption would play an important role in new vehicle production technologies.

- With this background in mind, the Centre of Excellence in Automobile Technology (CEAT) would be incepted in Anna University in partnership with the Government of Tamil Nadu and with leading Auto and Auto Components Industries, with a vision that it should be a Regional Centre of Excellence in Automobile Technology in certain thrust areas by 2025.

Objectives:

- The following are the objectives of CEAT
- To develop the technology for CO_2 emission reduction from automobiles.
- To improve the fuel economy of the vehicles

Technical Description:

- Depletion of fossil fuels, fluctuating fuel cost and increasing environmental pollution due to vehicles ensure that the relation between aerodynamic drag and fuel economy is a scope for detailed research in automotive industry. Fuel consumption, top speed, driving stability of an automobile are affected by the interaction of air flow over an automobile at high speeds. An automobile encounters various undesired forces which have to be reduced to improve the mileage of a vehicle.

- Diesel is mainly consumed in the transport, industrial and agricultural sectors in our country. Hence the cost of transportation affects the economics of all other consumables that reach common people. Thus, the country faces the major challenge of meeting the high demand of oil to meet the growing energy needs. It is therefore, important to explore the feasibility of a suitable substitution to Diesel with an alternative fuel, which can be produced indigenously on a massive scale for commercial utilization.

- Carbon dioxide (CO_2) is one of the important constituents of Green House Gases (GHGs) and it leads to increase the surface temperature of the earth. The earth's climate is rapidly changing, mainly as a result of increases in

GHGs caused by human activities. The concentration of atmospheric CO_2 has increased from a pre-industrial value of about 280 parts per million (ppm) to 379 ppm in 2005 (IPCC, 2007). With projections of global concentrations rising to 550 ppm by 2050 at current trends, or rising to 550-700 ppm by 2050, and 650- 1200 ppm by 2100, without taking any preventive steps emissions from transportation sector are considered as major issue needs to be concerned. The transport sector is responsible for almost 25% of global CO_2 emissions (IISD, 2004). Transport emissions are growing at approximately 2.1% per year worldwide, and 3.5% per year in developing countries (IEA, 2002).Transportation is a major source of GHG emissions which accounts for one-quarter of the world's energy related CO_2 emissions and is expected to be the most rapidly growing source over the next 30 years.

- In this context, the following equipments were proposed with consultation of the expert members from the university. Further it was decided that, fine tuning of the equipments may be carried out based on the inputs from the partner industries.

Outcomes:

The following outcomes are expected as a result of setting up the various facilities :

- State of the art scientific and experimental research facility
- Consultancy and collaborative work between the Institute and Industry.
- Thrust on Skill Development
- Entrepreneurs / SMEs
- Innovation Hub
- Patents and Research Publications
- Knowledge and Technology transfer
- Trained manpower in Automotive Technology
- Enhanced Institute – Industry Partnership

National Hub for Healthcare Instrumentation Development (NHHID)
Anna University, Chennai

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Coordinator
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National Hub for Healthcare Instrumentation Development (NHHID) is established by DST under Technology Development & Transfer in Anna University with an initial 5-year grant of 12.4 Crores. This national facility has been formed with collaboration from reputed national institutes and R&D organizations.

The NHHID is a platform for integration of Scientists, Engineers, Technologists, Industrialists, Businessmen and Clinicians to promote and accelerate the development of healthcare instrumentation indigenously. It aids in the transfer of basic research ideas from research institutions to private biomedical companies and vice versa. It will mainly carry out R & D on healthcare instruments as required by indigenous industry and healthcare needs. The Calibration centre one of the prominent activities of NHHID is being established.

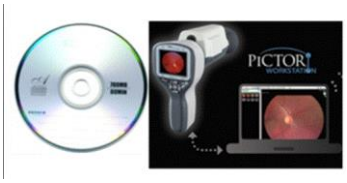
The following five of the prototypes developed by NHHID have reached commercial phase:

Synthetic Milk Tester

Leptospirosis Kit

CMC Daq

Mass Screening Gadget for Ophthalmic Lesions



Hystero Electrical Activity Mapping Device

Centre for Calibration and Testing of Medical Equipment

Centre for Calibration and Testing of Medical Equipment (CCTME) is a sophisticated laboratory of NHHID equipped with state-of-the-art calibrating equipment, IEC standards, operating procedures and trained professionals guided by faculty experts to perform calibration of medical devices to ensure reliable performance for quality healthcare. We provide credible traceability certificates along with calibration reports.

Technology Readiness Level of the Projects proposed in the First Phase of NHHID mentioned below:

Sl.No	Name of the Projects Undertaken	TRL Status Reached and Commercialization Status
1.	FIUROpath – fluorimetric immunosensor for Uropathogenic *(E. coli)*	TRL-6. The fluorescence immunosensing has been modified to fluorescence quenching method and colorimetric methods for simpler identification with imaging and pre-clinical evaluation done. Multiplex PCR method has been developed and integrated with the Antibiogram method after laboratory validation.
2.	Antibiogram device for Uropathogenic *(E. coli)*	TRL-6, Patent has been filed and expected to be awarded anytime. Clinical validation at the NABL-accredited Microbiological Lab is completed. Trivitron Pvt Ltd has initiated technology transfer process and conducted their Third-Party Validation.
3.	Mechanization of Uropathogenic bacterial detection and their antibiogram determination	TRL-6: Optoelectronic device developed at PRC is used for instrumentally determining the antibiogram and validated clinically. Automated antibiogram cum pathogen detection based on the above developments has been taken up in UGC's University with Potential for Excellence scheme for the University with an initial grant of Rs. 23 Cr. in the first year.

4.	Development of rapid detection kit for MRSA diagnosis	TRL-5. The prototype performed well with standard laboratory samples but had problems with clinical samples, especially specificity and sensitivity parameters.
5.	Mass screening gadget for ophthalmic lesions	TRL-8, ToT completed with M/s. TMI Systems Pvt Ltd. Currently TMI Systems are working with an Academic expert in the process of software conversion from Matlab to open source and on road to complete this technical issue and move on to the next stage. The ongoing process should be done by March 2018 and then on they will ready to go for aggressive marketing.
6.	Hystero electrical activity mapping device	TRL-8, ToT completed with M/s. Pentagon Rugged Systems Pvt. Ltd.
7.	Design and Development of a web based online tele-health consultancy system	TRL-6, Multicentric validation is completed. The process of ToT of the system with M/s. Zeal Technologies is in progress.
8.	Development of configurable platform for real-time signal and image processing applications	TRL-6, This two-year project was completed, and the platform is being utilized for developing systems for the diagnostics of respiratory ailments, as suggested by the Steering Committee. The project aimed at the Development of reliable automated systems for mass screening and abnormalities detection of retinal disorders more specifically Glaucoma and respiratory disorders. The novelty was exhibited in terms of increase in efficiency, on integration of signal and image data for the subjects. The algorithm developed could be customized and attempted on hardware systems. The platform could be reconfigured for other medical applications such as neuro-degenerative and neuro-developmental disorders.
Sl.No	**Name of the Projects Undertaken**	**TRL Status Reached and Commercialization**

		Status
9	Rapid prototyping- A manufacturing tool for bio-products, for orthopedics and dental applications with architecture mimicking natural bone	TRL-8, The objectives to prototype and fabricate biomedical instruments and medical concept models for surgical planning and simulation, patient-specific implants, bone scaffolds, orthodontic dental implants and prostheses using rapid prototyping techniques have been fulfilled as committed originally. Specific examples in which such prosthesis have been implanted with desirable prognosis have been shown to the steering committee. The business model involving the investigators, the supplier of the machine and the orthopedic doctor was proposed to the Steering Committee. Since April 2017, the project has been moved to another scheme in which the machines to make the prosthesis is funded. A new business model in which the investigator will partner with the Doctor is proposed.
10	Igm – sensor based fluorimetric detection of leptospirosis	TRL-8, ToT completed with M/s. Genomix Healthcare Pvt. Ltd. in 2015, Since no work had progressed towards marketing, technology has been given for Third-party validation by Ms. Athenese-Dx Pvt. Ltd.
11	Loop Mediated Isothermal DNA amplifier for detection of chikungunya	TRL-6, CHKV-RT-LAMP kit was lab validated and demonstrated to M/s. Helini Biomolecules, Chennai for further commercialization. However, Since Chickungunya is rare now and hence might be the disinterest by diagnostic vendors, the Steering Committee and EAG have asked the investigator to adapt it for detecting other viral diseases like dengue and influenza using support from other agencies.
12	Platform for production of reagents for biosensor / LAMP based detection	This facility was used by Veterinary College and relevant NHHID projects. It is now a DBT-funded multicrore translational facility in TANUVAS and owing to their partnership in the Hub, it is available for NHHID to make use of as and when needed.

13	Instrumentation for long-term monitoring of neuromuscular and cardiovascular status for diagnosis, therapy and rehabilitation	TRL-9, ToT completed with M/s. TMI Systems Pvt. Ltd. and it is being marketed. TMI are working with channel partners across 3 States to position the product as a part of package that offers a combined solution along with other medical devices, in the areas of teaching, training and research. At least 200 Numbers are expected to sell in the next 6 months.
14	Electro optical instrumentation platform for bacterial detection using fluorescence technique	TRL-6, Kriticare India Pvt. Ltd. looking for few more clinical trial, Meanwhile, M/s. Nirmal Optronics (P) Ltd. shown interest in this product and they are doing the market survey. It is also being promoted as an inexpensive hand-held fluorescence spectrometer for education and other low-throughput applications.
15	Development of fluorescence based imaging platform for bacterial/parasite detection	TRL-6 Demonstrated the software to the industry and their response is awaited.
16	Synthetic Milk Testing Meter	ToT- 9 Being manufactured and marketed by M/s. Shree Kamdhenu Electronics Pvt. Ltd.

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Dr. T. THYAGARAJAN
DIRECTOR

The prime objective of the Internal Quality Assurance Cell (IQAC) is to develop a system for internalization and institutionalization of quality culture to enhance the overall performance of institutions. Since, quality enhancement is a continuous process, the National Assessment and Accreditation Council (NAAC), Bangalore proposes that every accredited institution should establish an IQAC.

Some of the functions performed by IQAC are:

- Development of quality benchmarks/parameters for various academic and administrative activities of the institution;
- Facilitating the creation of a learner-centric environment conducive to quality education
- Arrangement for feedback response from students, parents and other stakeholders on quality-related institutional processes;
- Dissemination of information on various quality parameters of higher education
- Organization of inter and intra institutional workshops, seminars on quality related themes and promotion of quality circles;
- Documentation of the various programmes/activities leading to quality improvement;
- Acting as a nodal agency of the Institution for coordinating quality-related activities, including adoption and dissemination of best practices
- Development and maintenance of institutional database through MIS for the purpose of maintaining /enhancing the institutional quality;
- Development of Quality Culture in the institution
- Preparation of the Annual Quality Assurance Report (AQAR) as per guidelines and parameters of NAAC, to be submitted to NAAC.

- Facilitating assessment and accreditation by NAAC, NBA, NIRF and IOE

AU-FRG INSTITUTE FOR CAD/CAM
Anna University, Chennai

Dr. Latha Nagendran
Director
Email id: lathanag@annauniv.edu

AU-FRG Institute for CAD/CAM, a pioneering establishment at Anna University Campus, is offering services to Indian Industries in CAD/CAM/CAE areas to enable them to become global players. Established in 1996, with a substantial assistance from the Federal Republic of Germany, the Institute is growing in strength by way of executing number of consultancy projects. The industries range from large industrial groups such as TVS, L&T, Amalgamation, Hinduja, Satyam, Ford etc, and R&D organizations and government sector organizations such as ISRO, IGCAR, BARC, CIWET. Small and medium sector companies in Automotive ancillary parts manufacturers and consumer product industries etc also form important segments.

The Institute is equipped with the latest version of CAD/CAM/CAE Software tools with matching hardware facilities. The AU-FRG ICC by its unique experienced faculty strength in different fields of Engineering can handle any industrial projects requiring new product design, product modeling, and optimization in product design, mechanical and thermal stress analysis, Flow analysis, NC code generation and CAM. In addition, the institute is having a team of dedicated and experienced project engineers, who can handle any problem requiring CAD/CAM/CAE tools. The Institute is equipped with Additive Manufacturing Machines (3D Printing) and is in a position to take up projects requiring Rapid Prototyping and Rapid tooling also.

AU-FRG Institute for CAD/CAM has been consistently able to carry out industrial projects by using the latest available hardware and software facilities. Projects involving design & development, engineering analysis, flow analysis have been handled successfully for many industries, research establishments, government organisations including medical applications. AU-FRG ICC' s contribution towards the development of Cryo Engines has been appreciated by ISRO.

In the area of human resource development, the AU-FRG ICC is conducting high quality training programmes for working professionals, engineering graduates and diploma holders and, tailor made Corporate Training programmes for industries according to their need.

In addition, the institute is offering a Post Graduate programme on M.E. Product Design and Development in part time mode with the curriculum and syllabi framed to suit the industry needs.

Centre for Biotechnology
Anna University, Chennai

Dr. Anuradha Dhanasekaran
Director and Head
E-mail: anushivan@gmail.com

Centre for Biotechnology was established in 1984 right after the emergence of the new technology globally. As a forerunner in Biotechnology education and research, it is aptly established in a premier technical university supporting multidisciplinary growth along with other engineering and technologies of wide diversity rarely seen in any other university or institution. Globally such institutions were only a few in the 1980s and today it is a preferred destination for Quality Biotech education in the Country.

This center has a unique commitment to educating a broad spectrum of students—including undergraduate, post-graduate, and research scholars. Started with M.Tech Biotechnology for 12 students in 1986, the Centre has expanded into a large Department now offering B.Tech, M.Tech, Ph.D. programmes in Industrial, Pharmaceutical and Food Technology for 1000 students and more than 100 research scholars respectively.

The students and scholars are well-placed all over the world, mostly abroad, and are in great demand in industries, academics and research institutions. Its pioneering curriculum is a model for many other Biotech institutions across the country and its practical training in Bioprocess engineering, Stem cell technology, Recombinant technology, protein engineering, molecular cell biology ,Bioinformatics is highly valued. Owing to its global importance, Centre for Food Technology was formed recently as an autonomous adjunct Centre under the Department. About 1,00,000 sq. ft. of advanced Biotech and Food tech research facilities with modern infrastructure at its Taramani campus supports the research of the faculty. Many national and international collaborations drive the multidisciplinary nature of its research.

Significantly, a rapid detection kit for filariasis that is marketed in India and Africa, and industrial bioprocesses in operation are some of the product-oriented research outcomes. University Innovation Centre, National Hub for Healthcare Instrumentation

Development, Centre with Potential for Excellence in Environmental Sciences and University with Potential for Excellence are department's successful new initiatives for making Anna University to become a national resource for bio-based product development and commercialization.

It pioneered the concept of the industrial consortium to support in a variety of ways other than financial. The department provides a platform for its consortium members and alumni to contribute to the growth of this futuristic technology. In conclusion, with highly competent industry-oriented academics engaged in the interdisciplinary growth of the technology, the department strives in imparting quality technical education and research in advanced and emerging areas of Industrial,Medical, pharmaceutical and food applications of Biotechnology.

Vision

Having emerged the number one destination for Biotechnology Education, to become world class facility for Biotechnology Research as well.

Mission

- To provide students a unique learning experience in Science and Technology, that will best serve the world and betterment of mankind.
- To promote research and consultancy activities in various areas of Biotechnology.
- To foster international alliances and collaborative initiatives to achieve global excellence.
- To promote greater competence in the development of effective, safe and cost-effective diagnostics and therapeutics.
- To nurture individual faculty strengths and interests to develop value enhancing innovation.
- To serve the society with utmost integrity, enthusiasm, diligence, dedication and a shared sense of purpose.

Our faculty members are richly experienced in advanced areas of Biotechnology; from molecular pathogenesis to mitochondrial diseases and stem cell technology to metabolic engineering based bioprocesses, and their research is internationally recognized. Their discoveries or new findings or

innovative methods in the areas of infectious and non-infectious diseases, stem cell biology, bioprocess, drug discovery, food processes, nutraceuticals, and computational biology are funded to the extent of several Crores of rupees mainly by government agencies like DBT, DST and ICMR,UGC and MHRD and the outcomes are published in reputed international journals and the research output is applied for and converted as prototypes and products for commercialization.

The faculty members have either embarked from a Industrial background or after extensive post-doctoral experience abroad which gives a holistic experience and expertise to train the students. The Department is home to numerous patents in various disciplines and technology transfer. This Center is a rewarding and inspiring environment with sustained growth and development which nurtures freedom, empowerment, creativity and innovation.

AU-KBC Research Centre
Anna University, Chennai

P Gautam
Director
Email: director@au-kbc.org

The AU-KBC (Anna University –K B Chandrasekhar) Research Centre in the MIT (Madras Institute of Technology) Campus of Anna University, Chennai, carrying out multidisciplinary research.

The Research Centre was set up in 1999 as a collaborative effort between Anna University and one of its alumni Mr. K. B. Chandrasekhar, a global entrepreneur and investor based in the USA. Done as a part of the Golden Jubilee celebrations of the M I T Campus, the Centre was borne through a Memorandum Of Understanding between the Anna University Chennai and the K B C Research Foundation Pvt. Ltd., Chennai.

The core research areas are in the areas of **Life Sciences** and **Information Sciences.**

Life Science Division

P. Gautam, Director, AU-KBC Research Centre works n the area of Chemical Biology and Computational Biology.

https://sites.google.com/site/gautampena.

Suvro Chatterjee, UGC-FRP Associate Professor works in the area of Nitric oxide, cardio-vascular, vascular remodeling and endothelial cell biology.

http://bio.au-kbc.org/faculty/suvro/.

Kavitha Sankarnarayanan, Member Research Staff, works on Ion channel biology, stem cell biology, Ion channel modulators from natural products.

http://bio.au-kbc.org/faculty/kavita/

M. Ramasamy , Member Research Staff Works on traditional medicine.

http://au-kbc.org/ayush-ism-np/.

Information SciencesDivsion

Sobha, L , Member research staff works on Developing techniques and technologies that enable computers to analyse data and information Building tools,

techniques and resources to support human-computer communication through different media such as text and speech, especially in Indian Languages.

Future Directions:

We would like to start new training programmes at the interface of biology and information sciences. This would be part of the skill development programmes for students of both life sciences and information sciences.

Name of the teacher	Title of the paper	Research journal (only referred)
P. Gautam	Green synthesis and characterization of cadmium sulphide nanoparticles from *Chlamydomonas reinhardtii*and their application as photocatalysts.	Materials Research Bulletin 85, 64, 2017
P. Gautam	Characterization of Biofilms Produced by *Pseudomonas aeruginosa* in Different Metal Fatty Acid Salt Media	Canadian Journal of Miicrobiology. 63, 61, 2017.
P. Gautam	Structure and simulation of a Zundel ion stabilized by 8-hydroxyquinoline-5, 7 disulphonic acid.	Journal of Molecular Structure. 1115, 119, 2016.
Suvro Chateterjee	Interleukin-1β, lipocalin 2 and nitric oxide synthase 2 are mechano-responsive mediators of mouse and human endothelial cell-osteoblast crosstalk.	Scientific Reports 6, 29880 2016.
Suvro Chatterjee	Disturbed flow mediated modulation of shear forces on endothelial plane: A proposed model for studying endothelium around atherosclerotic plaques	Scientific Reports 6, 27304 2016.
Suvro Chaterjee	Mechanical perturbations triggers endothelial nitric oxide synthase activity in red blood cells	Scientific Reports 6, 26395 , 2016.
Kavitha Sankarnarayanan	Understanding autoimmunity: The ion channel perspective	Autommunity Reviews. 15,585, 2016
Kavitha Sankarnarayanan	Structural insights into the Aedes aegypti aquaporins and aquaglyceroporins an in-silico study	Journal of Receptor and Signal Transduction 36, 120,2016.
Kavitha	Influence of Electrodes on Electric Field	Journal of Cancer

Sankarnarayanan	Distribution for Effective Electrochemotherapy.	Prevention & Current Research .4, 107 , 2016.
L. Sobha	Cause and Effect Extraction from Biomedical Corpus	Computación y Sistemas. 21. 10.13053/cys-21-4-2854.2018.
L. Sobha	Patent Document Summarization Using Conceptual Graphs	International Journal on Natural Language Computing. 6. 15, 2017.
L. Sobha	BNEMiner: Mining biomedical literature for extraction of biological target, disease and chemical entities. International Journal of Business Intelligence and Data Mining	International Journal of Business Intelligence and Data Mining. 11. 190.2016.

Centre for Climate Change and Adaptation Research (CCCAR)
Anna University, Chennai

Dr. K.Palanivelu
Director
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CO_2 Mitigation for Stationary Emission Sources - Carbon Capture and Utilization

- The Earth climate is getting warmer and the signs are everywhere because people are adding heat-trapping greenhouse gases like CO_2 to the atmosphere, mainly by burning fossil fuels. As global temperatures continue to rise, we'll see more changes in our climate and our environment. These changes will affect people, animals, and ecosystems in many ways. Thus, it is necessary to control the emission of these gases to atmosphere.

- Carbon dioxide is a waste product in many industries, especially from energy producing thermal power plants and is a major contributor to global warming. The large scale solution to the problem of CO_2 emissions currently being considered is carbon capture and storage (CCS). In CCS, the CO_2 is first separated from the flue gas by capture techniques and then later stored underground. This method does not eliminate CO_2; it just stores it. Environmental threats of escape are spurring re-evaluation of CCS to eliminate CO_2 rather than move and store it. A more attractive solution would be carbon capture and utilization (CCU) in which the waste CO_2 is not dumped, but converted into a commercially valuable product. The growing re-evaluation of carbon capture strategies emphasizes transforming CO_2 to valuable chemical rather than storing it.

- CO_2 utilisation involves non-conversion use of CO_2 by using it in its original form for technological applications and as feed stock to convert CO_2 to usable products (chemicals and fuel). The two modes of utilisation together are expected to reduce global annual CO_2 emissions by about 10%. Chemical conversion of CO_2 accounts for less than 1 % of the global mitigation challenge. Nevertheless wider adoption of utilisation technologies and finding

new uses for CO_2 and its converted products would drive innovations that could have a roll-on the uptake of CO_2 based products.

- Enhanced oil recovery (EOR), where CO_2 is injected into existing oil wells to increase oil recovery, is currently the largest non-conversion CO_2 use. However, most of the CO_2 used for EOR is currently taken from natural sources and not captured emissions. Other technological applications like solvents, fire control, food industry, etc. Conversion of CO_2 to value added commercial products like urea, carbonates, organic acids methanol, fuels is catching up. The market for converted products derived from use of CO_2 is still small compared to the amount of anthropogenic CO_2 emission that must be removed in order to limit global temperature rise
- Utilization technologies especially for stationary industrial sources hold promise by helping to mitigate significantly its environmental impact with simultaneous generation of saleable chemical products like urea, carbamates, carbonates etc., in a sustainable way from this waste CO_2 gas. . The proper use of CO_2 from waste flue gas is expected to provide both environmental and economic benefits

Institute of Energy Studies (IES)
Anna University, Chennai

Dr.R.Velraj
Professor & Director
Email: velrajr@annauniv.edu

About Institute for Energy Studies

Anna University, one of the premier institutes in the country, considering the importance of energy security and the environmental conservation established Institute for Energy Studies (IES) as an as an autonomous centre in the year 1999 by integrating 3 centers of excellence namely Centre for New & Renewable Sources of Energy, Center for Automobile Research & Training and Center for Appropriate Technology. This Institute has state-of-art facilities in the field of energy engineering which serve as a hub for learning and gaining hands-on experience in the fascinated field of energy engineering.

(i) In *developing sustainable aspects of energy resource development* and the associated challenges at the intersection of energy, environment and water.

(ii) Creating *build network and synergies* that promote advanced energy research

(iii) Institute is *equipped with* latest version Modeling and Simulation software and High end measuring and testing instruments, Laboratory Equipment and pilot scale plants.

Hallmarks of the Institute as follows,

(iv) Attained *international reputation* through the noteworthy contributions of Faculty experts in the Thermal Energy Storage research.

(v) One of the 11 institutions of ***Centre of Excellence selected*** **by Ministry for New & Renewable Energy (M N R E), Govt of India** to promote Renewable Energy activities in the country.

(vi) Institute is recognized by Government of TamilNadu to establish ***Centre of Excellence on "Solar & Clean Energy technologies"*** under Tamil Nadu Vision 2023.

(vii) Ministry of Human Resource Development has sanctioned **Rs. 15 Crore under RUSA scheme for the Research & Innovation project titled "Sustainable Energy Technologies - Efficient renewable energy power generation with**

energy storage for sustainable smart grid" submitted by Institute for Energy Studies, Anna University in collaboration with other Universities in Tamil Nadu.

(viii) Apex Institute of MNRE, Govt of India on *Biomass Resource Assessment* Studies for Southern India

(ix) Approved *Energy Auditor of BEE* , PCRA, TNEB, Electrical Inspectorate, Government of Kerala

(x) Undergone several funded research projects funded by DST, MNRE, MHRD, UGC and other national and international bodies of worth approximately (Rs. 29 Crores)

(xi) Bridging the gap between industry and academic institute via consultancy projects. (Worth: Rs. 1.80 Crores)

(xii) Helping scholars to build their career in the field of Energy technologies by availing them *several international scholarship and support* through knowledge exchange program

(xiii) Support towards the growth of Renewable Energy Technologies to a greater extent by the faculty members by serving as advisor, expert member and technical member in several government bodies.

(xiv) Human resource development through several training programs, awareness programs, national and international conference/ workshops for the benefit of various stockholders, students, scholars, academicians, industry professionals and for the public community.

(xv) Generation of distinguished innovations and publishing several patents in the field of Solar & energy storage technologies and in the verge of translating the research outcome as commercial products by adopting several technology transfer strategies

Green Initiatives of the Institute as follows,

- Installation of Centralized Solar PV based street lighting system at CEG and MIT campus (Project worth of INR 1 Crore) – UNDER RUSA SCHEME
- Installation of a biogas plant (1000 kg/day - kitchen food waste utilization) at CEG campus (Project worth of INR 30 Lakhs) – UNDER RUSA SCHEME
- Installation of 500 kW Solar PV power plant at CEG campus, Anna University in progress.

- Design and development of Solar powered tram for short distance mobility of 2 km inside Anna University campus. (In Principle approval received from MNRE – Project cost INR 7.5 crores)

Innovation ecosystem of Institute for Energy Studies:

Institute for Energy Studies (IES was established with an objective “To promote sustainable development and reduce carbon footprint by introduction of new technologies and promoting innovation ecosystem”.

Vision Statement: IES develops technologies, policies, and educational programs that have the potential for offering high-impact solutions to pressing near-term energy issues. IES engages in fundamental energy-related research that will have a long-term, transformative effect on our nation's energy future.

Mission Statement:

To contribute to Nation’s growth by linking energy research, technology, policy, and education to the needs of industry, and to national socio-economic development imperatives, initiatives and programmes.

The Institute leverages the expertise of faculty to study critical energy barriers and challenges, and is dedicated to broadening the educational experience of students. The Energy Institute aims to create excitement about clean energy and promote opportunities for student’s community and scholars to learn about how they can play a role in making a brighter, more sustainable future.

Strategic Goals

1. Collaborate with industry, government, development partners and academic institutions in transformational research projects and educational outreach for new approaches to the nation's energy opportunities.
2. Catalyze the transition to advanced sustainable energy exploration, generation, distribution and utilization, through coordinated research and development, capacity building and project management.
3. Provide a forum for constructive debate to facilitate innovation, development, deployment, and dissemination of energy technology knowledge and good practice.
4. Enhance public understanding of energy resources and technologies and their role in society, in order to address the barriers that hinder increased use and access to modern energy technologies.

Centre for Environmental Science (CES)
Anna University, Chennai

Dr.S. Kanmani
Director
Email: skanmani@hotmail.com

Mission Statement

We at Centre for Environmental studies shall strive constantly

- To educate the future leaders of the environmental profession and to inculcate skills and foundations for life-long learning and growth.
- To conduct research and create new knowledge as an integral part of our education programme and the continued renewal of the profession.
- To contribute towards sustainable management and utilization of natural resources, combat and reduce pollution of air, water and soil, enhance technical management knowledge and develop and promote technology for sustainable management.

Centre for Environmental Studies (CES):

The Centre for Environmental Studies (CES) was established as a Division ofPublic Health Engineering, College of Engineering Guindyduring 1955 and later in 1982, the Centre has gloriously developed into Centre for Environmental Studies. The Centre has been making a significant contribution in the field of Environment with the keen focus on Environmental Education, Research and Extension activities. Infrastructure facilities available at the Centre include Research Laboratory, Analytical Laboratory, Environmental Microbiology Laboratory, Unit Operations and Processes Engineering Laboratory, Tool Room, Computing Facility and Environmental Information Centre. All the laboratories in the Centre have been upgraded to International Standards.

Academic programmes:

With well qualified faculty and state-of-the art laboratory facilities as its main strength, the CES has produced well trained environmental engineers, environmental managers and scientists who were and are occupying key positions in various National and International environmental organizations. The following academic programmes are offers at CES:

- Master’s Degree in Environmental Engineering - Full-time
- Master’s Degree in Environmental Management - Full-time & Part-time
- M.S. by Research
- Doctor of Philosophy

Continuing Education and Training Programmes

The Centre, realising the importance and catering to the needs of the in - service and practising Engineers, Scientists, Bureaucrats and Academicians conducts tailor-made continuing education programmes by way of organising seminars, symposia, conference , workshops and other short term training programmes in the emerging and threshold areas of development.

Research and Development (R&D)

The Centre has involved in fundamental and applied research work. Assessment of chemical and biological characteristics of water bodies, Treatment and reuse of Sewage and Industrial Effluents, Bioremediation, Advanced Oxidation Process, Groundwater recharge, Degradation of toxic wastes, Air Pollution Modeling and Monitoring, Membrane Process, Carbon dioxide Sequestration, Hydrogen production from waste streams, Solid waste management and Hazardous waste management, Rehabilitation of composites are some of the research areas of investigation at the Centre.

Various National/International agencies like Department of Science and Technology, Ministry of Environment, Forest and Climate Change, Ministry of Urban Development, United Nations Development Programme, University Grants Commission, Tamil Nadu Water Supply and Drainage Board, Council for Scientific and Industrial Research, Central Pollution Control Board and Tamil Nadu Pollution Control Board, Centre for International Migration, Germany, Swedish International Development Cooperation (SIDA) and Institute for Global Environmental Strategies (IGES)have funded sponsored research activities.

Technical Consultancy services offered in the followingareas:

- Water and Wastewater treatment/ recycling
- Industrial wastewater treatment
- Hazardous Waste Management
- Air pollution Monitoring and Control.
- Velting of design of STPs and ETPs.
- Technical evaluation of common effluent treatment plant
- Environmental Auditing&Environmental management systems
- Solid Waste management
- Design and analysis of water distribution systems
- Design of sewerage systems

Centre for Medical Electronics
Anna University, Chennai

Dr.S.Shenbaga Devi
Director
Email: s_s_devi@annauniv.edu

EVOLUTION OF MEDICAL ELECTRONICS IN ANNA UNIVERSITY

The core health care science and research in medical sciences will have ever increasing interface with technology areas. The future will not only be dominated by advances in life sciences but will witness the merging of entire technologies and medicine. This synergy is already happening and we should not lack behind. To meet these challenges, a new breed of professionals is required who will be conversant with the medical profession as well as the engineering profession. On a number of occasions, the need to bring closer the scientists/ engineers and medical professional has arisen for specific problems and for further advances in medical research and hence more effective health care.

Department of Electronics and Communication Engineering, College of Engineering has the rare distinction of having a separate Medical Electronics Lab form as early as 1975. Electives were offered in the areas of Medical Electronics in UG and PG since then.

Objectives of Centre for Medical Electronics

- To create and nurture qualified technical manpower towards academic excellence, research and development attitude and competence in the field of Medical Electronics
- To enhance research and development in the field of Medical Electronics and Bio Medical Engineering by having collaboration with other renowned R&D organisations, hospitals and industries
- To provide training for personnel working in this area and to create awareness and benchmark in medical standards.

With these goals, Centre for Medical Electronics was established in the year 1998 in the Department of Electronics and Communication Engineering and in the year 2015, it is made an autonomous Centre of Anna University, Chennai. The

centre carries out research in the field of Medical Electronics and Bio Medical Engineering and also establishes collaboration with medical industries and hospitals.The faculty associated with the centre have completed their doctoral work in the field of Medical Electronics and all of them are actively involved in research work in Medical Electronics

Significant contribution of the faculty members of the centreto the field of Medical Electronics

The faculty members of this centre have contributed significantly to the field of Medical Electronics. Some of them are listed below:

The gadgets done by the students in Medical electronics lab have won National and International recognition in the form of Awards namely National Technology Award from Government of India consecutively for 2 years in 1990 &1991 and the prestigious Vincent Bendix Award from (USA) for the years '90','92' &'94'.

1. Portable Electronic Speaking Aid National Technology Award from Govt. of India, 1990.
2. Portable Electronic Speaking Aid Vincent Bendix Award from IEEE(USA),1990.
3. Electro Larynx National Technology Award from Govt. of India-1991.
4. Electronic Pilot for hearing impaired drivers National Technology Award from Govt. India, 1991.
5. Screen reader for the blind Vincent Bendix Award from IEEE(USA),1992.
6. Communication Aid for Spastics Vincent BEndix Award from IEEE(USA),1994.
7. Functional Electrical Simulation for Upper Extremity.

Best project work Award from Tamilnadu Science and Technology 1995.

All these Award winning projects were guided by Dr.G.Ravindran,Retd.Professor and Director, Center for Medical Electronics. Other than these projects. Lip assisted control unit for quadriplegic were selected for final competition of National Technology Award,1993 at New Delhi. .

Dr.N.Kumaravel, Former Director of the Centre had an experience for five years by working as CT Scan Engineer in Madras Medical College and Govt. General Hospital, Chennai.

Dr.N.Kumaravel (Former Director) and Dr. S.Muttan of Centre had training in Germany under GTZ programme for health care instrumentation for a period of 3 months

UG students of Dept. of ECE with Dr.S.Muttan as the guide have been judged the 1st Runner up in the TI Analog India Design Contest for the project '**Non invasive continuous measurement of blood glucose level'**

A national level patent titled '**A method of Hystero Electrical Activity Mapping'** with Dr.G.Ravindran and Dr.S.Shenbaga Devi as investigators has been awarded from 2001 for 20 years. The technology transfer of this has been made with an industry and currently it is under product development.

Research areas

- Cardiac functional analysis
- Development of low cost rehabilitation aids
- Foetal Electrocardiography and uterine contractile signal analysis
- Development of biosensors and instrumentation
- Biosignal processing and medical imaging
- Medical Informatics
- Brain Electrical Activity Monitoring
- Development of neuro-chips for mentally challenged children
- Medical Standards
- Modeling and simulations studies in medicine
- Brain Computer Interface and applications
- Evoked response studies for detection of vision impairment

The faculty members of the centre have guided around 45 PhD candidates and guiding around 40 PhD candidates. The faculty members have published more than 400 research articles in peer reviewed journals and national and international conferences. All these research paved the way for the centre to have successful collaboration with the following hospitals and industries resulting in a number of projects funded by various organisations in India and abroad. Some of the collaborating organisations and the projects are listed below:

Collaboration with hospitals and industries

The centre has collaboration with the following hospitals and industries

- Apollo Hospitals
- Aravind Eye Hospitals, Pondicherry
- DEBEL, Bangalore
- K. J. Hospital
- Madras Medical Mission
- NIMHANS, Bangalore
- Sri Ramachandra University
- Vision Research Foundation, SankaraNethralaya
- Sri Muthukumaran Medical College and Research Institute

Projects taken up by the faculty members associated to the Centre

S.No.	Name of the Principal Investigator	Title of the project	Funding agency	Grant amount inRs.Lakhs	Duration
1.	Dr.S.Shenbaga Devi CoPI: Dr.K.Ganapathy, Senior Consultant - Neurosurgery,Apollo Hospitals, Greams Road, Chennai	Functional Electrical Stimulation of Hemiplegics for functional restoration of upper limb using EEG based Brain Computer Interface	Life Sciences Research Board, DRDO	19.6	2010 to 2012
2.	Dr.S.Shenbaga Devi CoPI: Dr.Ronnie George, Vision Research Foundation	Mass Screening Gadget for Ophthalmic Lesions	DST, Govt. of India	60	2011-2015
3	Dr.S.Shenbaga Devi	Hystero Electrical Activity Mapping Device	DST, Govt of India		2011-2015
4	Dr.S.Muttan	Design and development of web based telehealth consulting system	DST, Govt of India		2011-2015
5	Dr.S.Muttan, Dr.N.Kumaravel	Automated Low Cost system for malaria	UKIERI Project with	£19960	2012-2014

	(CoPI)	Diagnosis and Classification	University of Westminster, UK, funded by British Council		
6	Dr.S.Muttan (CoPI) Dr.S.Nirmala Devi (CoPI) Dr.K.G.Thirumurugan	Somatic Cell Count Flow- through based Reader for detection of mastitis in bovine	DST, Govt of India	40.6	2012-2015
7	Dr.S.Poonguzhali, CoPIs:Dr.M.Sasikala ,AU Dr.Ravichandran, Stanley Medical College	Development of Tactile sensor based ligature controller to assess pancreatic leak after Whipple's procedure	DST, Govt of India	29.6	2013-2016
8	Dr.S.Shenbaga Devi CoPI: Dr.V.L. Arul Selvan, Consultant Neurologist, Apollo Hospital, Chennai	Evaluation of Functional Electrical Stimulation of Hemiplegics for functional restoration of upper limb using EEG based Brain Computer Interface	Life Sciences Research Board, DRDO	11.1276	2014 to 2017
9	Dr.S.Shenbaga Devi CoPIs: Dr. ParveenSen, Dr.Ronnie J George, Ms. Ramya, Vision Research Foundation , Chennai	Development of low cost sweep VEP system	DST, Govt. of India	44.8	2016-2018

The technology of project 'Mass screening gadget for ophthalmic lesions' by Dr.S.Shenbaga Devi has been transferred to an industry and it is under product development.

Apart from these, all the members namely Dr.S.Shenbaga Devi, Dr.S.Muttan, Dr.S.Nirmala Devi, Dr.M.Sasikala and Dr.S.Poonguzhali are having active roles in UGC funded University with Potential for Excellence in Biomedical Engineering and Instrumentation

Extension activities

In order to share the knowledge in the field of Medical Electronics, the centre regularly conducts workshops in specialized areas and conferences. In total, 1 international conference, 1 international workshop, 10 national conferences and workshops and 5 short term courses in various fields of biomedical engineering from 1998.

Considering all these facts and credentials of the centre, Tamilnadu Government has approved a building space of 2700 sqm to expand the centre as Centre of Excellence in Medical Electronics.

Centre for Nano Science and Technology
Anna University, Chennai

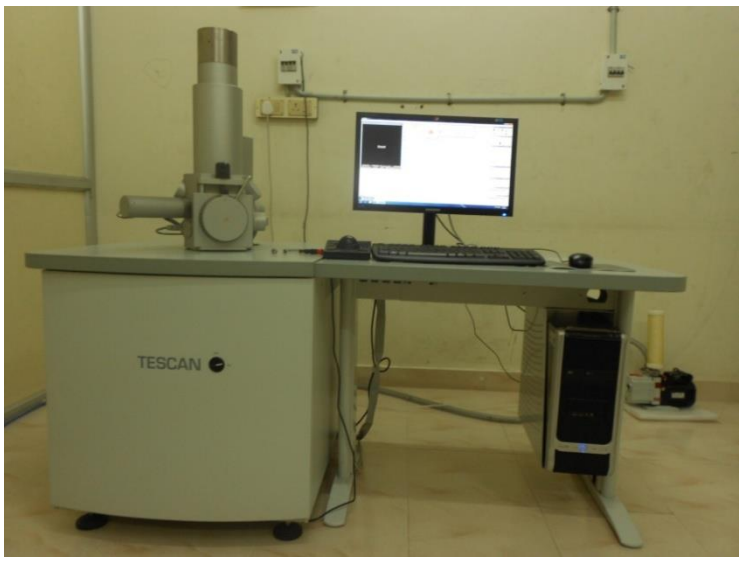
Dr.S.Moorthy Babu
Director
Email: babu@annauniv.edu

The Centre for Nanoscience and Technology established in 2005 at the AC Tech campus, Anna University, Chennai-600 025. The Centre has been actively engaged in research and development on various aspects of Nanoscience and Technology with financial support from DST, UGC, CSIR, BRNS and DRDO. The centre has been offering M. Tech. course in Nanoscience and Technology with a multi-disciplinary curriculum. The centre has been actively pursuing research in various aspects of Nanoscience and Technology including Chemical, Mechanical and Bio Synthesis of nanomaterials like semiconductor nanostructures, nanocrystalline thin films, carbon nanotubes and nanofibres, metallic nanoadhesives, polymer based nanocomposites, nanostructured ferroic materials, etc.

The centre has been periodically conducting seminars, workshops and training programs in Nanoscience and Technology.

The following Characterization Facilities are available at the Centre.

Scanning Electron Microscope



Raman Spectrophotometer

FTIR Spectrophotometer

Labs at the Centre

Nanomaterials chemical synthesis lab

Nanomaterials physical synthesis lab

Crystal Growth Centre (CGC)
Anna University, Chennai

Dr. S. Narayana Kalkura
Professor & Director
E-mail: kalkurasn@annauniv.edu

The study of crystallisation phenomena is highly interdisciplinary, which involves various diverse fields such as physics, chemistry, crystallography, nanotechnology, mathematics, biochemistry, medicine, pharmaceutics etc. Though it has been studied extensively for many years, the theoretical and experimental aspects of crystal growth, is still evolving and plays a significant role in the manufacture of high quality single crystals for various high end technological applications.

Crystal Growth Centre, Anna University, Chennai, India is an internationally acclaimed centre of excellence in the field of crystal growth research and technology. The centre is recognized by University Grants Commission as Crystal Growth Centre-UGC: Anna University Facility (National Facility) for the welfare of the researchers in India. During the yesteryears, since its inception in the year 1982, Crystal Growth Centre has grown several crystals covering a broad range of characteristics. Crystal Growth Centre-which is a UGC-National Facility, is providing a platform for researchers from different parts of India to advance their knowledge and also in initiating and popularising crystal growth research in India. Crystal Growth Centre has produced nearly 200 Ph.Ds. and they are acting as seed for further growth of crystal growth research in different parts of the world. In addition crystal growth centre has also expertise in all major fields of crystal growth research, involving seminconductors, optoelectronics, solar cells, superconductors, magnetic materials, non- linear optical materials and biomaterials. The Centre also has facilities for growing crystals and thin films by various techniques such as **MOCVD a state of the art Unique facility the only one in the Indian Universities, worth more than Rs. 8 Crores**, MELT, SOLUTION, HYDROTHERMAL etc.. The crystal growth centre has all most all major characterisation facilities such as High resolution XRD, AFM, SEM, Photoluminescence System with Raman, FTIR with Imaging facilities, DLS and Nanoindentor. The faculty receives major research funds from various national and international agencies along with international collaborations

with institutes and Universities from US, France, Italy, Spain, Germany, Japan to name a few. Centre could attract about rupees 20 cores worth research projects from various national and international agencies and complete them successfully. At present, the Centre has 9 teaching faculty of international repute and offers Ph.D, M.S (By Research). More than 50 research scholars are doing Ph.D on roll.

Crystal Growth Centre is regularly organizing national and international seminars/workshops/training programmes in the field of crystal growth and characterization of technologically important materials.

Teaching & Research Activities

Teaching Programmes

- Ph.D Programme
- M.S. by research
- M.Tech-Materials Technology (Proposed)

(***UK-Support-Knowledge Economy Partnership***)

Current Research areas

- Semiconductor thin films (MOCVD, LPE and VPE)
- Lasers and Non-Linear Optical single crystals
- Ferroelectric and multiferoic materials
- Biological Crystallization,
- Biomaterials
- Nanomaterials
- Spintronic Materials
- Radiation Detectors

Faculty members (**9**) engaged in teaching of courses and projects guidance for the B.E, B.Tech., M.Tech., and M.Sc. programmes at College of Engineering and A.C. college of Technology

Training Programmes

Visitors &Associates Programme: Faculty and Researchers from all over the country can visit the UGC:CGC-AU Facility for crystal growth and can work on specific problems related to crystal growth throughout the year.

Centre for Water Resource (CWR)
Anna University, Chennai

Dr.N.K.Ambujam
Director
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INTRODUCTION

The Centre for Water Resources (CWR) was established in May 1979 to pursue teaching, research, consultancy and impart training programmes in hydrology, water resources engineering, irrigation management and water quality and quantity management. It is the upgraded Hydraulics Division of the Department of Civil Engineering, College of Engineering, Guindy, Chennai.

Post Graduate Programmes Offered

- From 1956, an 18 months duration M.Sc (Engg) in Advanced Hydraulics, Dam Construction and Irrigation Engineering.
- In 1965, a 2 year restructured M.Sc (Engg) in Hydraulic Engineering.
- In 1974, renamed as 2 year, M.E Hydraulic and Water Resources Engineering.
- In 1978, a 2 year restructured M.E Hydrology and Water Resources Engineering.
- In 1981, a second M.E Programme in Irrigation Water Management.
- Between 1983 and 1991, UNESCO sponsored one year Post Graduate diploma in Hydrology and Water Resources Engineering.
- From 2006, M.E., Integrated Water Resources Management is offered as self supporting programme. Apart from that currently M.E IWRM programme is supported with 5 fellowships each year for the span of 3 years from 2013-2015.

The Centre provides academic support for undergraduate programmes of

- From 2006, a B.E programme in Agricultural and Irrigation Engineering is offered.
- Civil Engineering Department
- Mechanical Engineering Department
- Manufacturing Engineering Department

- Mining Engineering Department
- Industrial Engineering Department.

Research Programmes Ph.D / M.S Fellowship / M.E Fellowship were supported by funding from various organizations such as

- Anna Centenary Research Fellowship
- UGC Ph.D Research Fellowships
- Govt. of Netherlands fellowships through Wageningen University for Ph.D and M.E. in IWRM
- M.E. SAWA Fellowship through IDRC Canada
- ARCUS Ph.D Fellowship.

Sponsored Research Assistance

- COSIST Programmes of UGC SAP.
- FIST Programmes of DST.
- UGC SAP CAS –I Programmes

Many continuing education programmes for the field engineers of WRO and Agricultural Engineering are regularly conducted.

Many community development studies / programmes are undertaken in the field of sustainable drinking water / water quality / irrigation water management and Internship and faculty exchanges.

INTERNATIONAL CO-OPERATION

The Centre was supported by U.S. Government through USAID Programme for strengthening M.E IWM. The Centre received support from Government of Netherland for strength M.E. IWRM. Currently IDRC, Canada supports the IWRM Programme since 2013 till now. Government of France through its ARCUS Programme has research collaboration with the centre from 2012 till date.

VISION:

To be a centre of excellence of international repute by ensuring the highest degree of credibility in assuring quality and relevance of professional education in the field of water resources and irrigation and to fulfill the expectations of stakeholders, viz., government, corporate, industries, students and their parents.

MISSION:

To stimulate quality of teaching, self evaluation and accountability in the system which will help realize the objectives and adopt teaching practices, research, consultancy, training and continuing education that will enable to produce high quality professionals competent in sustainable management of land and water resources.

University Library
Anna University, Chennai

Dr. G. Krishnamoorthy
Director
Email id: krishnamoorthyg@annauniv.edu

- University Library plays a pivotal role in augmenting the mission of the University in disseminating the flow of knowledge and by quenching the “knowledge thirst” of the Library users by providing and promoting access to recorded knowledge.

- The University Library was started in the year 1978 which gradually gained autonomy from December 2000. The University Library is located in three campuses namely CEG, MIT and SAP campus in a sprawling green eco-friendly environment spanning around 4206 sq.mts, 1609 sq.mts and 389 sq.mts respectively.

- Presently, the University library is housing a total collection of around 2 lakhs reading materials in various branches of Engineering, Science and Technology. About 400 Foreign and Indian Journals and around 10,000+ e-journals are currently being subscribed by the library. Around 15,000 registered users access the facilities in the library.

- Many knowledge based services like Reference, Referral, Bibliography, MALIBNET and DELNET are available for users. Many activities of the University Library are automated and entries into the library and issue/return/renewal transactions are made possible with RFID Technology using Smart Card.

Recruitment Cell
ANNA UNIVERSITY, CHENNAI

Dr. M. Venkatesan
Director
Email id: venkatesan.murugesan@gmail.com

The Recruitment Cell of Anna University facilitates the recruitment of Teaching, non-teaching, administrative and technical staff of the University Departments, University Colleges of Engineering and Regional Campuses of Anna University. Recruitment relates to the overall process of calling for applications and arranging for the scrutiny of applications to shortlist the suitable candidates for teaching, non-teaching, administrative and technical positions as per the provisions of the Acts and Statutes of the University.

OVERVIEW

The University aims to select and recruit the best teachers and other academic staff as per the norms prescribed by All India Council for Technical Education (AICTE), the orders of Government of Tamil Nadu and the Regulations of the University. The recruitment of the right candidates will ensure good quality in higher education, for the sustained growth of the nation. The Recruitment Policy provides a framework for the recruitment of University teachers and other academic staff.

SCOPE

The Recruitment Policy applies to the direct recruitment and career advancement of the teachers and other academic staff of the University Departments, University Colleges of Engineering and Regional Campuses of Anna University.

(a) Direct Recruitment

The direct recruitment for the sanctioned posts in each department for all the campuses is based on the AICTE regulations and the orders of the Government of Tamil Nadu including the roster system.

(b) Career Advancement Scheme (CAS)

The career advancement scheme (CAS) is the scheme for the incumbent teachers who are on the role and active service of the Universities/Colleges on the date of consideration and wish to be considered for promotion shall be considered for promotion under this scheme based on AICTE regulations and the orders of the Government of Tamil Nadu.

(c) Direct Recruitment / Promotion of Non-teaching, Administrative and Technical Staff

In case of non-teaching, administrative and technical staff recruitment/ promotion, the University strictly adopts the Special Service Statutes.

(d) Adhoc/Contract Basis

The University may appoint teachers on adhoc/contract basis depending on the requirement as per the direction of the Syndicate of the University.

POLICY

(a) The recruitment policy of the University aims to identify the Indian Nationals of highly qualified, dedicated, academically productive with outstanding quality and potential as teachers who have strong commitment in innovative teaching and high quality research and will contribute to reach the position as India's premier university and to attain global reputation.

(b) The vacancies must be accessed in each department for every six months and the University shall fill such positions periodically. The required field of specializations for the vacant positions shall be obtained from the respective departments.

(c) Also the promotion under career advancement scheme for the incumbents shall be notified for every six months and promotion will be considered for the eligible teachers and other academic staff.

(d) The recruitment policy of the University also aims to identify well qualified and trained administrative, non-teaching and technical staff for the proper administration and technical support of the University.

Department of Chemistry
Anna University, Chennai

Dr.A.Pandurangan
Head
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The department of Chemistry located at College of Engineering, Guindy campus of Anna University, Chennai provides an outstanding environment for studies in Chemistry, is among the most research active departments in Anna University. One of our key objectives is to create good quality human resource. It was established in the year 1975 to pursue teaching, research, consultancy and impart training programmes in different fields of Chemistry. Since its inception the Department offers core courses in chemistry like M.Sc (Applied Chemistry) and Ph.D programs. In addition, Applied Chemistry courses for the various B.E. / B. Tech. programs are being offered by the Department. M. Phil. (Chemistry) program was started in 1980 and M. Tech. (Polymer Science and Engineering), as an inter-disciplinary program, in 1995.

The faculty members in the Department are actively involved in research in thrust areas such as polymer chemistry, Heterogeneous and biocatalyst, analytical chemistry/environmental analytics, corrosion, nano chemistry and theoretical chemistry, which are quite naturally located alongside the classic core chemistry subjects inorganic chemistry, organic chemistry and physical chemistry. About 150 Ph.D. Scholars (Full-Time & Part-Time) are pursuing research in these thrust-areas. The department is recognized by DST, CSIR, UGC- CPEES, DRDO, BRNS, AERB, ISRO / RESPOND, MOEF, AICTE, etc., A sum of Rs.3.82 crores has been mobilized in sponsored research projects, Rs. 1.8 crores through DST-FIST + 0.25 from ICRFT and 0.90 crores through UGC-DRS in the last 5 years, The department has two Instrumentation laboratories with the state-of-art analytical equipments such as ICP-AES, GC, GC-MS, HPLC, DRS - UV-Vis Spectrophotometer, TPD and TPR, IR, FTIR, TOC, TGA, ^{1}H NMR, FE SEM and UTM. Powder XRD equipment and an exclusive computer laboratory are on the anvil under the DST-FIST assistance programme. The faculty members have international research collaborations and

have collectively published 316 research papers in internationally reputed journals in the last 5 years,

The academic staff of the department comprising of three Professors, three Associate Professors, six Senior grade Assistant Professors, six Assistant Professors and eight Teaching Fellows and 11 administrative staff. Many faculty members undergo PDF programme in foreign universities to update their knowledge in the current area of research. The faculty members periodically present research papers at National and International Conferences and Seminars, both within the country and abroad. Many of the faculty members have authored reference books, book chapters and text books on Engineering Chemistry, Applied Chemistry, Analytical Chemistry and Practical Chemistry. Senior members of the Faculty are also members in the academic bodies of other Universities and autonomous colleges.

The Ph.D. Scholars and PG students are actively participating and presenting their research works in conferences/seminars. The research findings are published in journals of high repute. The Ph.D. scholars are well placed within the country and abroad. The department is periodically organizing Summer / Winter programmes, continuing education programmes, refresher courses etc. to bridge the gap between industrialists and academicians.

Department of Chemical Engineering
Anna University, Chennai

Dr.N.Nagendra Gandhi
Professor and Head
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The Department of Chemical Engineering was established in 1944 under the aegis of University of Madras as part of Alagappa College of Technology. In 1978, the department was transferred to the then newly constituted Anna University. The department which started with an undergraduate course in chemical engineering now offers undergraduate, postgraduate courses in traditional courses of chemical, petroleum refining and petrochemicals, and more contemporary courses such as environmental science and technology as well as Doctoral degrees in various interdisciplinary fields.

The department offers undergraduate Bachelor of Technology degree in Chemical Engineering. The department initially offered 5-year bachelor course, which was later truncated to a 4 year course to fast-track students to the industry.Although more recently, the department opened the gates for more undergraduate students increasing its strength to 120. The department has well-equipped and upgraded laboratories and informed technicians which provide an opportunity to concurrently assimilate both theoretical and practical insights in the traditional subjects of chemical engineering.

The department collaborates with its alumni network and reputed industries to create opportunities in practical internships for students. The students are able to successfully convert these internship opportunities into job offers due to the practical curriculum adopted by the department. The students also receive full time job offers from reputed firms which include core companies such as TATA CHEMICALS, SAINT GOBAIN, BPCL, and STEARLITE INDUSTRIES among many others during campus placements organised by the university placement cell.

The department actively encourages students to pursue master’s degree either at domestic and foreign universities including IITs, NITs and IISc. The department in collaboration with the Centre for International Affairs organises student exchange programmes for its students to get exposed to different academic and co-curricular

activities. Students take up projects under the faculties to know their choices for higher education. This helps them to narrow down their career choices.

The three postgraduate courses at the Department of Chemical Engineering include M.Tech - Chemical Engineering, M.Tech - Petroleum Refining and Petrochemical Technology, M.Tech - Environmental Science and Technology, which offers a comprehensive picture about the broad field of chemical engineering. In the early days of the college, research was carried out in the conventional areas of chemical engineering like Absorption, Adsorption, Liquid-liquid extraction, and Fluid Dynamics. Over the period of years the areas of research have moved in line with developments in the chemical process industries. The department focuses on areas like Nano-filtration, Bioengineering and Environmental systems. The department has received multiple grants from various funding agencies which promote indigenous research such as Department of Science and Technology, University Grant Commission, which enables the postgraduate students to take up multiple projects to expand their knowledge. The department is DST-FIST sponsored as well as categorized under UGC-SAP. The faculty also take up consultancy for Industry to tackle problems which require concurrent knowledge with fundamental understanding of the processes. The postgraduate students are exposed to such problems which will provide them advanced skillset when they join the workforce.

The department is blessed with a number of distinguished alumni occupying eminent positions in academia and industry. The department utilises this alumni pool to organize guest seminars which can expose the students to industrial trends as well as establish a networking opportunities for them in the future. The alumni are also invited by the department every year to reminiscence about their old days and instil a sense of pride among the current students.The alumni also are invited to mentor students with entrepreneurial interests.

The department also houses Student Chapter of the professional body Indian Institute of Chemical Engineers (IIChE), which organises student fairs and meet-ups with industrial experts.

The annual technical festival of the department is called Chemfluence, which is organised by the final year undergraduate students under the mentorship of the faculties. It features paper presentation sessions, lectures, video conferences, technical quizzes and other events The symposium mainly aims at exposing the

upcoming engineers to the industrial happenings in the field and opportunity to showcase their knowledge. Workshop, events form the integral part of the Symposium which includes lectures on Industrial Safety & Risk Analysis and on other programming tools like MATLAB, Computational Fluid Dynamics, Programmable Logic Controller etc. This not only acquaints them with theoretical but also with practical tools required in the industry.

The students are encouraged to pursue extra-curricular endeavours including National Cadet Corps, National Service Scheme, Youth Red Cross and National Sports Organisation to facilitate holistic development of the students.

Department of Electronics and Communication Engineering
Anna University, Chennai

Dr. S. Muttan,
Professor & Head
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The College of Engineering, Guindy (CEG), a pioneer in technical education in India and in Asia, was established in the year 1794. Incidentally, CEG was the first engineering institution setup in India. More than 224 years have gone by and today, this college has evolved into Asia's largest technical university.

The Department of Electronics and Communications (DECE), which became a part of this celebrated institution in the year 1945, is one of the leaders in India in this field of technology. The department has faculty members who are experts in their own disciplines and aims at educating and training students with sound knowledge and awareness in the latest trends in Electronics, Communication and Information Technology.

Keeping in line with fast changing technology, the department has a well designed, constantly reviewed syllabus to incorporate all advancements in existing and emerging technologies. The state-of-the-art laboratories complement the high standards set by the competitive syllabus and nurture the inclination of the students towards research and development, besides giving them the necessary and sufficient backing of practical knowledge that they need.

The department has the distinction of being the first institution in India to start a Under Graduate Programme in Telecommunication Engineering in the year 1945. The first Post Graduate Programme in Communication systems was introduced in 1963 and subsequently the PG Programmes in Applied Electronics, Medical Electronics, VLSI design and Biomedical Engineering were introduced.

The DECE has always enjoyed a respectable status among the major recruiters in India and the excellent performance of its students across the industry has enabled the department to maintain its strong brand image. Presently, the research students

are working in the areas of Adhoc Network, Optical Network, Bio-Medical Signal Processing, Medical Image Processing, VLSI Architecture etc. The Department has very good industrial collaborations with global industries such as Altera, Renesas, Cypress Semiconductors, Texas Instruments besides having signed MOU's with more than 40 industries and many Hospitals.

The Department has the distinction of designing and developing the electronics part of the recognized the work of Electronics and Communication students with the supervision of Professors in making ISRO-AU Microsatellite(ANUSAT), developed Infant theft Prevention system for government hospitals, has been a solution provider in the areas such as wireless communication, antennas, EMI & EMC, Biomedical Engineering, Bio-signal and Medical image processing, etc. The highly qualified and motivated faculty of the department was instrumental in obtaining research funds worth several crores.

The department of ECe also offers 2 UG Programmes namely in ECE and Biomedical engineering apart from offering 5 post graduate Programmes namely Communication Systems, Applied Electronics, VLSI, Medical Electronics and Biomedical Engineering with a total strength of 1210 students. The department also has about 45 full time students pursuing research in various specializations in addition to guiding many part time research scholars.

Department of Geology
Anna University, Chennai

Dr. L. Elango
Professor & Head
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Initiated in 1979, the Department of Geology is actively involved in teaching and research in the field of Applied Geology. Over the past decade the Department has strived to maintain its multidisciplinary approach towards Earth Sciences by applying the concepts of Geology to solve scientific problems faced by the society. The Department maintains ties with well-known organizations such as the Geological Survey of India, Oil and Natural Gas Corporation, National Geophysical Research Institute, Central Ground Water Board, ISRO, UNESCO, BSIP, PRL, CESS, the Directorate of Geology and Mining, NRSA other national and international universities and research institutions.

The aims of the Department are:

To design and develop scientific tools to study and monitor the earth processes and geo-resources such as minerals, oil and water, while extending the results of these efforts to the benefits of the students and the community; and to prepare students for careers in the fields of Applied Geology. The vision of the founder professor on importance of geological sciences and technology for current development of education in India, instigated them to start the department and UG, and PG program in Applied Geology. Since 1986, the faculty strength has increased to eight numbers in the year 2009. All the faculties are dedicated to the cause of dissemination of Geological knowledge to the community to address socio-economic problems and exploration of minerals and fossil fuel resources.

The specialized faculty members focus the department for academic research and industrial projects and have generated funds to the tune of Rs. 13,000 lakhs. The department is recognized by UGC-SAP Phase I, II, III, UGC-CPESS Phase I &II and DST-FIST Phase I, II, III program. This has enabled the department to have good instrumentation facility to carryout research and it has produced 68 Ph. D theses in various fields of geology. The faculty members have international research

collaborations and have collectively published nearly 650 research papers in internationally reputed journals. The alumni of this department are placed in reputed institutions and industries in India and abroad. The department is well connected with industry and academic interactions. The goal of the department is to educate the students and prepare the trained manpower for the country.

Faculty

The Department consists of faculty members who have expertise in different fields of Geology. They have traveled to most parts of the world and have wide contacts with various national and international organizations. The department is having Smart Class Rooms-Amethyst and Zircon, Petrology and Mineralogy Lab, Palaeomagnetism lab, SEM lab, AAS lab, Geological Museum, and Spectro Radiometry lab. The class rooms, Amethyst and Zircon, are fully equipped with latest devices like Electronic Overhead Projectors, wireless mic and computer aided interactive panels for better teaching and learning experience.

The department also has an air conditioned Auditorium ‘Hall of Gems’, which can house about 50 persons and is fully equipped with latest audio visual systems along with interactive presentation panels for better ambience for various research interaction sessions and Ph. D viva voce examinations.

The Mineralogy and Petrology lab in the department consists of Hand specimen of various Rocks and Minerals, procured and also collected by the faculty members during various field studies, especially for teaching the M. Sc. and B.E., Students. The specimen Repository facility also includes various Crystal Models for the demonstration to the students.

The lab is equipped with more than 25 petrology microscopes that are used by the students and research scholars during their practical sessions for the Mineralogy and petrology subjects. The latest version of petrology-high resolution microscope with photography and computer logging is the main attraction of this lab. It consists of an application oriented transmitted or transmitted/reflected light outfits, built-in powerful 12V/100W illumination system. It also has Computer-adaptation with C-mounts for various CCD video and digital cameras. It also has the software for image analysis

and database and archiving. The lab also consists of Rock Thin-Section Preparation Unit for microscopic studies of rocks and minerals.

The Department has sanctioned projects from Government agencies such as UGC, MHRD, DST-FIST, DST, BRNS, NRSA, ISRO, UNESCO and CSIR, and is equipped with various geophysical instruments, which are used in various Geophysical and Hydrogeological studies and also cater the needs of the Research Scholars and Final Year M. Sc. Applied geology students during their project works.

The Geophysical instruments in the Department are:

1. Resistivity Imaging System
2. Multiple parameter system for water analysis
3. Water level meter
4. Permeameter
5. Kappa meter-
6. Magnetic Susceptibility
7. GPR

The geochemistry furnishes the needs of the research scholars working in the field of Geochemistry as well as the M.Sc. Applied geology students who would be carrying out their projects work related analysis in this laboratory. It is well equipped with latest devices such as sample drier, high temperature oven, and centrifugal oscillators etc., which are common and necessary for day to day geochemical analysis of the samples.

The latest instruments added to this lab are:

1. Millipore-Water Purifying system
2. Atomic Absorption Spectroscopy
3. Ion Chromatography Instrument
4. Handheld XRF Instrument
5. Auto Titrator
6. AAS

The Micropaleontology Lab is equipped with latest binocular microscopes and software for the preparation of slides and environmental and sedimentary basin research. The Department is added latest Stereo Microscope under the DST-FIST.

Sedimentology lab is equipped with

1. Particle size analyzer,
2. CHNS,
3. Granolometry analyzer and microscopes, SEM

The Remote Sensing Lab at the Department of Geology developed VIS-NIR Spectro Radiometer, VIS-NIR-SWIR Spectro Radiometer and,

1. Global Position System Instruments
2. Aerial Photographs, Satellite imagery and toposheet repository
3. Image Processing and Spectro radiometry software
4. GIS lab

MASTERS PROGRAMME IN APPLIED GEOLOGY

The tradition of academic excellence and the educational vigor of the distinguished University create a stimulating environment for M.Sc. study at the Department of Geology, Anna University. The M.Sc. Program prepares students for careers in industries that involve independent scientific investigations. Through a combination of core courses, electives and interaction with faculty and research personnel, the students are provided with a comprehensive education in advanced Applied Geology. The program is a four-semester course, spanning over two academic years. The evaluation is based on the CBCS. The student has to earn a minimum of 78 credits for the successful completion of the Degree. The intake of students is 30. The Master's program is a process, not only of gaining knowledge, but also of becoming a professional. The highlights of the course are the specialized Applied Geology subjects, regular laboratory and field work, seminars and invited lectures, participation in an intensive industrial training and a research project, done as part of the MSc Dissertation.

SPONSORED RESEARCH

The department consists of faculty members working on the applied aspects of Environmental Geology, Engineering Geology, Geological Remote Sensing, Hydrogeology, Applied Geomorphology and Sequence Stratigraphy in conjunction with the fundamental subjects such as Petrology, Mineralogy, Stratigraphy, micropaleontology, Economic Geology etc. Some of the important broad areas of research of this department include Micro-biota environment of sedimentary sequences, Environmental Hydrogeology, Paleo-Environment of River Basins, Geological Remote Sensing, Coastal Geomorphology and Micropaleontology for hydrocarbon exploration. In the recent years the department has completed major research projects funded by the UGC, DST, BRNS, NRSA, CSIR, MHRD, and ISRO to the tune of more than Rs 10,000 lakhs.

INDUSTRIAL CONSULTANCY

The department has the necessary expertise to provide consultancy in geological mapping, lithological logging, mapping for engineering construction projects, petrographic study of rocks and minerals, groundwater modeling and Remote Sensing and GIS. The department is equipped with advanced image enlarger systems and software for subsurface modeling and geological image processing. In the last five years consultancy services were offered by this department to a number of organizations such as Larsen & Toubro Ltd, Nuclear Power Corporation of India Ltd, Hindustan Construction Corporation Ltd., Oil & Natural Gas Corporation Ltd, Dying industries, and a number of companies involved in civil engineering construction and ground water and GIS projects

COLLABORATING INTERNATIONAL UNIVERSITIES AND RESEARCH OGANISATION

University of Wales, University of Birmingham, UK, University of Arizona, University of Newcastle, University of Colorado, Auburn University, USA. Moscow University, Russia, Deakin University, Australia, Hungarian Geological Survey Russian Academy of Sciences, UNESCO, NASDA, JAPAN, National Institute of Oceanography, Goa, Indian Space Research Organization, Bangalore, Birbal Sahni Institute of Paleosciences, Lucknow, National Geophysical Research Institute,

Hyderabad, Center for earth science studies, Trivandrum, BARC, Mumbai, TATA Steel, Oil and Natural Gas Corporation, Indian Universities& IIT's.

PLACEMENT OF ALUMNI

The students of this department are placed in the following organizations:

Geological Survey of India, Oil and Natural Gas Corporation, Schlumberger Limited Shell Oil Company, Central Groundwater Board, Department of Atomic Energy, Directorate of Geology and Mines Enterprising Enterprises, Larsen and Toubro Limited, Saint Gobain Glass Industry, Tata InfoTech; Pixel Infotek, General Electric, Neyveli Lignite Corporation, ACC India Cements. Geo-services, Oil field Development, Diamond exploration company,IIT-M, IIT-Bombay, Universities in India and Australia, Ethiopia, Malaysia, Kuwait oil company and Engineering Colleges.

Department of Instrumentation Engineering
Anna University, Chennai

Dr.J.Prakash
Professor and Head
Email: prakaiit@gmail.com

Highlights

- Highly qualified faculty members with multi disciplinary research expertise and significant professional accomplishments, dedicated staff members and highly motivated students.
- Well equipped laboratories with State-of-the–art facilities to impart high quality education and to pursue research.
- Both UG and PG programmes are accredited by NAAC ('A' grade' (2014-2019)) and NBA* (2008-2013).
- DST-FIST/DST-PURSE Sponsored /TEQIP Funded Department.
- Recognized by AICTE as MINOR-QIP Centre to offer Ph.D./PG programmes.
- Collaborative research with Universities and R&D organizations in India and abroad.
- Endowments are instituted in the name of former Professors Dr.S.Renganathan and Dr.P.Kanagasabapathy.
- Organizes National/International Conferences, GIAN courses, Workshops, Seminars, Pre-Conference Tutorials, Short-term Training and Faculty Development Training Programmes
- Holds strong relationship between Alumni and Department/University.
- High percentage of on-campus placements in core/IT Industries.

Plan of action chalked out by the Department towards quality enhancement.

- Enhancing the quality of research work leading to more publications in peer reviewed International journals with high impact factor and in Peer reviewed International Conference Proceedings.
- Establishing a Centre for Excellence in Intelligent Sensing and Automation.

- Offering joint degree programmes with foreign universities and premier research institutes in India.
- Motivate faculty members and research scholars to carryout joint collaborative research with International University, Indian Institute of Technologies and Government R & D laboratories.
- Encourage faculty members and students to convert their ideas into products, start-ups, commercialization through technology transfer.
- To update the knowledge and skills, all faculty members of this Department will
    - Visit abroad to carry out collaborative research in the field of Control & Instrumentation
    - Participate in conference and present their research findings in International Conferences/National Conferences.
    - Submission of Research Project proposals by Faculty members to various National/International funding agencies.
    - Attend/organize seminars, workshops, Pre-conference Tutorials, GIAN courses etc.
    - Arrange for Invited lectures by Professors from IITs and from Abroad to keep abreast with recent developments in the field of Control & Instrumentation.
- Motivate students to carry out mini-projects in the area of Electronics & Instrumentation every semester and socially relevant projects funded by CTDT, Anna University, under innovative student project scheme.
- Motivate students to fare well in competitive examinations such as GATE & GRE.
- Assigning collaborative design projects to the students. These projects help students to integrate the knowledge gained in various subjects associated with the Instrumentation Engineering.

Department of Manufacturing Engineering
Anna University, Chennai

Dr. P. Hariharan
Professor & Head
Email: hari@annauniv.edu

ABOUT THE DEPARTMENT

Department of Manufacturing Engineering (DoME) is a versatile, dynamic and quality conscious mechanical faculty, with glorious, rapid and continuing saga of success and achievements.

Its triangular strength is contributed by highly qualified faculty, brilliant students and state of the art infrastructure including classrooms, modern laboratories and library. DoME as it is fondly known has a very friendly and congeal environment providing the platform for teaching, research and learning. It has produced outstanding alumni who are prominent leaders in top level organizations, educational institutions and industries. DoME is actively involved in research in the field of CAD/CAM/CIM/ROBOTICS, micromachining, Additive Manufacturing, composite materials, resource scheduling and SCM. It will not be an exaggeration to state that DoME with its resourceful faculty, brilliant students and modern laboratories is in the forefront of education, research and technology. The department has actively involved in organizing and conducting many workshops, symposiums, national and international conferences. "MANUSYS" a national level technical symposium is conducted during the month of February every year. 'RTMT' a biennial national level conference is organized during the month of April. Association of Manufacturing Engineers (AME) a student's body of DoME is actively involved in organizing guest lectures, personality development programs etc.

HISTORY

Although the Department of Mechanical Engineering, College of Engineering was offering a number of courses related to Production Engineering in the Bachelor of Mechanical Engineering Programme due to realistic vision and a never ending quest for excellence the Division of Production Engineering was started in 1963 offering the M.Sc. Engineering in Production Engineering programme. This programme which excelled in curriculum and syllabus because a much sought after

programme. Many academic stalwarts successfully completed this Master Programme.

In 1978 during the formation of Anna University, a much sought after B.E. Degree programme in Production was started. This programme was unique because of its mandatory Industrial Training. A number of outstanding students graduated out of this programme who at present are playing a pivotal role in the fields of Education and Industry. The M.E. (Production Engineering) Degree programme continued without a break since 1963.

Nothing is permanent except change and hence to keep in line with the changing international trends, the Manufacturing Engineering Division was formed out of the erstwhile Production Engineering Department. Therefore eminent academicians from various well known national educational institutions, experts from renowned industries and other Government organization were invited to plan and draft a curriculum and syllabus which ensure a willing edge education to the students and make them invaluable to their employee. Out of this endeavor B.E. (Manufacturing Engineering) and M.E. (Computer Integrated Manufacturing) programmes evolved. The Manufacturing Engineering programmes not only retained the strength and infrastructure of Production Engineering but infused new and revolutionary courses and the state of the art laboratories vitalized with modern computer hardware and software. The Division of Manufacturing Engineering had all the qualification of a Department viz. eminent faculty, brilliant students, highly skilled and disciplined technical and administration staff, state of the art laboratories and infrastructure and very strong computational hardware and Software. Therefore, in the year 2002 the Department of Manufacturing Engineering was born. (Another outstanding fact of this Gem is its Ph.D. programme. Nearly forty one Ph.D. scholars are actively engrossed in the research in various fields of Manufacturing Engineering and allied areas ably supervised by its eminent faculty members.

The Department assures to move forward with as a leader vision and mission to greater heights not only being prepared for the future but to share the future itself.

VISION

To be an outstanding organization where students can gain acumen and to brew them so that they unswervingly meet the needs of the society.

MISSION

- To foster the growth of its members and develop them in new vistas promoting them to their fullest cognition.
- To be Nationally recognized as the leader of Manufacturing Engineering in education and research.
- Bring augmentation to the Department, College and University.
- Discern the potential of its members.
- Have its members vivaciously conscripted nationally by employers and graduate programs.
- To evoke new ideas in the minds of its members and infuse nascent technology to modern era of manufacturing

PROGRAMMES OFFERED

UNDER GRADUATE DEGREE PROGRAMMES:

B.E. Manufacturing Engineering – Full Time & Part Time

POST GRADUATE DEGREE PROGRAMMES:

M.E. Computer Integrated Manufacturing – Full Time & Self Supporting

RESEARCH DEGREE PROGRAMMES:

Ph.D Manufacturing Engineering – Full Time & Part Time

MS by Research – Full Time

HOD'S DESK

DoME family consists of eminent professors, non-teaching staff and students. Our main objective is to produce disciplined and talented students in diverse fields of manufacturing engineering who shall join leading industries and organizations at top level and serve for a better India, a better tomorrow.

We are keen on delivering quality and contemporary engineering knowledge to the students so as to enrich them with the latest technologies much suitable for moulding themselves in any top level organization. The department is equipped with ample research facilities enabling doctoral research in advanced areas. It gives due importance to procuring and maintaining advanced manufacturing machinery and equipment. Several funded research projects had been taken up and completed successfully in the past. Currently DST, UGC-SAP and BRNS funded projects are being carried out in the area of Additive Manufacturing, Tool-based Micromachining, Abrasive Waterjet Machining and Microgripper, etc. Classy machines such as fully automatic CMM, CNC Multi-process Micromachine, Physical Vapour Deposition Coating Unit, Non contact Surface Roughness Tester, CNC Wire cut EDM, etc., are some of the widely used machine tools. The Department has a strong relationship with its alumni to promote excellent industry-institute interaction for mutual benefit. To reiterate, our department functions as a family in all the ways rendering proper cooperation and coordination in establishing cordial relationship at every level in the continuous process of producing bright students, the pillar of future India.

AREAS OF RESEARCH INTEREST

- Additive Manufacturing
- Tissue Engineering
- Micromachining
- Non-Conventional Machining
- Robotics
- Finite Element Analysis
- Composite Materials
- Nanomaterials
- Surface Engineering
- Supply Chain Management
- Machining and Fabrication of Polymer and metal matrix Composites
- Scheduling

LABORATORY FACILITIES

- Advanced Machine Tools Laboratory
- Precision Engineering Laboratory
- CNC Micromachining Laboratory
- Metrology Laboratory
- Material Testing Laboratory
- Machine Tools Laboratory
- Composite Materials Laboratory
- CAM Laboratory
- CIM Laboratory
- Additive Manufacturing Laboratory
- Nanomaterials Engineering Laboratory

MAJOR PROJECTS

Sl.No.	Name of the Staff	Project Work	Funded by	Project Duration	Cost of the Project (Rs.)
1.	Dr. P. Hariharan & Dr. M. Kanthababu	To strengthen the Research facility in the department	DST-FIST	2017-2021	1,65,00,000/-
2.	Dr. M. Kanthababu & Dr. S. Gowri	Abrasive Water Jet Machining Process for High Strength Materials	UGC-SAP(DRS)	2012-2017	58,11,671/-
3.	Dr. G. Arumaikkannu	Rapid Prototyping - A Manufacturing Tool for Bio-products for Orthopedics and Dental Application with Architecture Mimicking Natural Bone	DST-NHHID	2011-2015	25,00,000/-
4.	Dr. M. Kanthababu & Dr. S. Gowri	Design and development of microsystems optimization of micromachining process parameters and micro tool condition system	BRNS Project	2011-2014	44,41,500/-
5.	Dr. M. Kanthababu &	Development of In-process	DST	2010-2013	19,68,000/-

	Dr. S. Gowri	tool condition monitoring for mechanical micro-machining using multiple sensors	Project		
6.	Dr. S. Gowri & Dr. P. Hariharan	To strengthen the Research facility in the department	DST-FIST	2009-2014	1,14,00,000/-

PATENTS

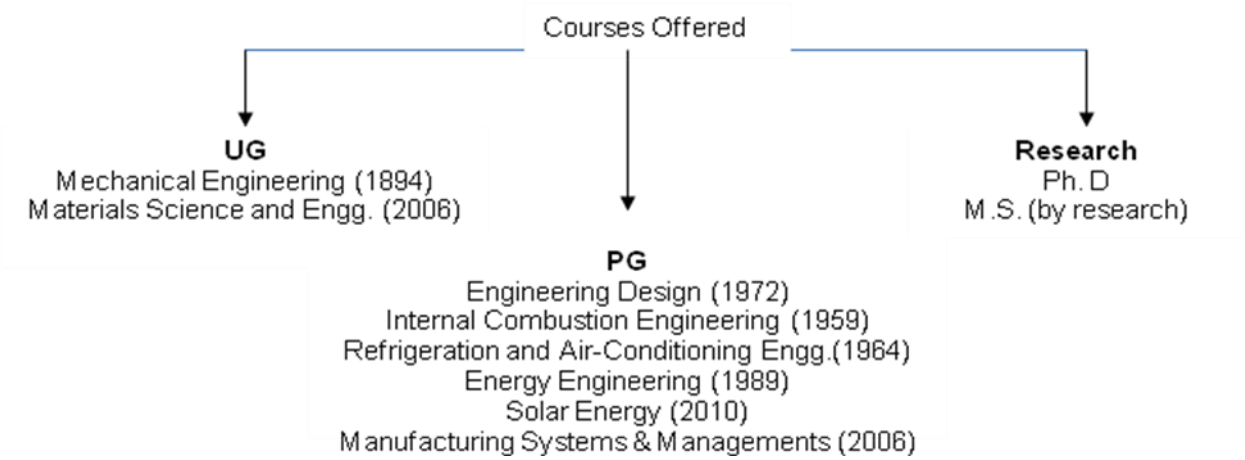
Sl.No.	Name of the Staff	Title of the Patent	Date of filing	Status	Patent Provider
1.	Dr. M. Kanthababu, Dr. S. Gowri, K. R. Sunilkumar, R. Prabhaharan & M. S. Ajmaldeen Ali	Condition monitoring system for focusing nozzle wear in Abrasive Waterjet Machine comprising Acoustic Emission Sensor	12.05.2017	Request For Examination	Centre For Intellectual Property Rights (CIPR)
2.	Dr. M. Kanthababu, Dr. S. Gowri, K. R. Sunilkumar, R. Prabhaharan & M. S. Ajmaldeen Ali	Condition monitoring system for focusing nozzle wear in Abrasive Waterjet Machine comprising Cutting Force Dynamometer	12.05.2017	Request For Examination	Centre For Intellectual Property Rights (CIPR)
3.	Dr. V. Muthukumar & Dr. A. Suresh babu	A bio compatible and bio degradable natural fiber polymer composite internal fixation plate	30.01.2017	Request For Examination	Centre For Intellectual Property Rights (CIPR)
4.	Dr. V. Muthukumar & Dr. A. Suresh babu	Hybrid Metal Matrix Composite for Brake Drum Application	30.01.2017	Request For Examination	Centre For Intellectual Property Rights (CIPR)
5.	Dr. M. Kanthababu, V. Mohan Kumar, V. Sailesh & G. Anuradha	Smart seat belt system	17.06.2016	Request For Examination	Centre For Intellectual Property Rights (CIPR)

6.	Dr. M. Kanthababu, Dr. S. Hosimin Thilagar, Dr. S. Gowri & V. Vidyaa	Circular Microgrippers	17.02.2016	Granted	Indian Patent Office
7.	M. Kanthababu, S. Gowri, M. Venkateshwaran	Focusing Nozzle Condition Monitoring of Abrasive Water Jet Machine Comprising Sound Sensor	27.05.2016	Application Published	Centre For Intellectual Property Rights (CIPR)
8.	M. Kanthababu, S. Gowri, M. Venkateshwaran	Focusing Nozzle Condition Monitoring system of Abrasive Water Jet Machine Comprising accelerometer	27.05.2016	Application Published	Centre For Intellectual Property Rights (CIPR)

Department of Mechanical Engineering
Anna University, Chennai

Dr. B.Mohan
Professor and Head
Email: bmohan@annauniv.edu

Mechanical Engineering Department is one of the oldest departments of College of Engineering, Guindy (CEG), established in the year 1894, providing excellent learning and research opportunities for undergraduate and post graduate studies, in addition to providing consultancy services to the needy industries. The broad areas of Mechanical Engineering include – Design, Manufacturing, Energy and Thermal Sciences. The Department has excellent experimental and computational facilities, such as combustion analyzers, Climate Chambers, Scanning Electron Microscope (SEM), CAD/ CAM/ CAE software tools etc. Faculty members are engaged in active research with partners from Government establishments and industries. The Department's research projects are funded by the UGC, DST, MNRE, AICTE and other governmental agencies and many industries. In the present day dynamic environment, our students find themselves inundated with job offers and exciting career opportunities both in India and abroad. The Department has 60 faculty members, and over 1200 undergraduate, 260 postgraduate students and 150 research scholars. The Department has various divisions namely Internal Combustion Engineering, AU-FRG Institute for CAD/ CAM, Refrigeration and Air-Conditioning, Institute for Energy Studies, Engineering Design and Central Workshop



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Engineering Design

Engineering Design Division has been spearheading since its inception in 1972 in all the areas related to Design. Since its inception, the division always had excellent infrastructural facilities and none to substitute qualified inspiring teachers With time, the division always grew in strength contemporarily with industrial needs and had developed the infrastructure and offered courses related to CAD, CAM, FEA, NVH, Composites, The division has been undertaking research works, consultancies and projects for various research labs such as ISRO, DRDO, IGCAR, etc., and R&Ds of Automotive and Manufacturing Industries.

Presently, there is a lot of dynamism among the relatively young group of faculties doing pursued research and project work on focussed areas such as Rapid Product Design, Composite Materials Development, Surface Coating Technologies, Bio Additive Manufacturing, Electromagnetic Forming, Optimisation Technologies, apart from using CAD/CAE/ERP tools to provide solutions to the existing problems and future possibilities. The Division is presently heading towards the goal of creating man power to provide Accelerated Product Design which enables students to be future ready to be part of any New Product Design. Holistically, the curriculum includes Materials, Characterization, CAD, Optimization, Analysis, ERP, Mechanism& Failure Analysis and Additive Manufacturing with the advances in technology at rapid pace, it is proposed to create facilities like Bio Instrumentation Laboratory,Next Generation Mobility Lab, Advanced Additive Manufacturing Lab,Data Analytics Centre,Nano Engineering Space,Modern Manufacturing and Production Lab, Accelerated Product Design Lab

CENTRAL WORKSHOP

Central Workshop Division of Department of Mechanical Engineering, Anna University is established in the year 1894. It is one of the oldest and largest workshops in an Academic Institute in India. , it is one of the divisions of Mechanical Engineering which supported is by DST-FIST Programme have been completed and pursuing Rs.175.18 lakhs worth of funded projects from DST-Indo Russian Joint Project, CVRDE, ICMR SERB, DBT. The zealous team of faculties who have the expertise in the various fields of engineering namely, Composite Materials, Nanomaterials, Materials Characterization, Metal cutting, Automation, Robotics and Automation. Supply Chain Management, Condition Monitoring, FEM, Cryogenic

Machining, CAD/CAM, Micro Machining, Welding, Biomaterials, Tribology, Additive Manufacturing, etc. works in tandem to innovate new products/process that would benefit the society, provide the solution to the industrial problems and train the younger society to enhance the employability skills.

To provide solutions to Industrial problems administry future technologies , the division is committed to assimilate state of art facilities in the field of Biomechanics, Material Characterization, Additive Manufacturing, Predictive data analytics, High performance computing, etc which in turn would empower the faculty member to foresee the opportunities in Industry 4.0 and integration of smart factories (IOT), Material encyclopedia, Heath care, Crop and Livestock productivity, Safe water, Green Energy, etc.

INTERNAL COMBUSTION ENGINEERING DIVISION

The Internal Combustion Engineering Division is one among the six divisions of Department of Mechanical Engineering, College of Engineering Guindy, Anna University. It was established in the year 1958, and is one of the oldest divisions of College of Engineering, Guindy. The division offers a P.G programme on Internal Combustion Engineering in both full time and part-time and closely interacts with the industrial needs.

The division is actively involved in research and consultancy in the areas of advanced combustion, alternative fuels, Emission control, and CFD studies applied to Internal Combustion Engines.. The conventional fuels like gasoline and diesel produce significant greenhouse gas emissions. Cleaner technologies, pollution control strategies, alternative fuels & vehicle technology and better design requirements are the key to improve ambient air quality. Keeping deteriorated considerably this in mind to improve air quality, the division has very good research facilities to do extensive research in the fields of Electrical vehicles, Fuel cells, Thermal Waste Heat Recovery from Engines, Advanced Combustion Technologies (HCCI, RCCI and GCI). .

This division has very good experimental facilities to carry BSVI emission target research and supportive Computational facilities. The division has three major laboratories such as, Internal Combustion Engines Laboratory consists of single and multi-cylinder stationary and automotive engines with quality loading devices like different range of Eddy current dynamometers, Emission Analysers, Combustion

Analysers etc., IC Engine Simulation Laboratory with computation tools like, STAR-CD, STAR CCM+, eS-ICE, ECFM, DARS CFD, DARS-BASIC to carry out supportive engine flow and combustion research., Also this division has a sub-sonic wind tunnel facility with hot wire anemometer to carryout flow studies in diffusers with and without struts.

AU-FRG INSTITUTE FOR CAD/CAM

AU-FRG Institute for CAD/CAM, a pioneering establishment at Anna University Campus, is offering services to Indian Industries in CAD/CAM/CAE areas to enable them to become global players. Established in 1996, with a substantial assistance from the Federal Republic of Germany, the Institute is growing in strength by way of executing number of consultancy projects. The industries range from large industrial groups such as TVS, L&T, Amalgamation, Hinduja, Satyam, Ford etc, and R&D organizations and government sector organizations such as ISRO, IGCAR, BARC, CIWET. Small and medium sector companies in Automotive ancillary parts manufacturers and consumer product industries etc also form important segments.

The Institute is equipped with the latest version of CAD/CAM/CAE Software tools with matching hardware facilities. The AU-FRG ICC by its unique experienced faculty strength in different fields of Engineering can handle any industrial projects requiring new product design, product modeling, and optimization in product design, mechanical and thermal stress analysis, Flow analysis, NC code generation and CAM. In addition, the institute is having a team of dedicated and experienced project engineers, who can handle any problem requiring CAD/CAM/CAE tools. The Institute is equipped with Additive Manufacturing Machines (3D Printing) and is in a position to take up projects requiring Rapid Prototyping and Rapid tooling also.

REFRIGERATION AND AIR CONDITIONING

The refrigeration Air Conditioning division offers a P.G. programme, M.E. Refrigeration and Air-conditioning with a vision To produce engineering masters professionally strong and ethically sound who can lead teams towards excellence in optimal conditioning of space for quality preservation and control using state of the art technology to make our nation a front liner in refrigeration and air-conditioning technology.

Facilities

- Cryogenic test facility
- Psychrometric test facility
- Nano fluid and flow boiling heat transfer study test facility

Research

A number of research projects which worth lakhs were completed and being carried out in our institute, funded by various agencies such as UGC, DST – SERC, MNRE, GTZ, Whirlpool India Ltd, DDK, DDT, ITC / AAI, LUCAS TVS, HMXSU- MYA and Orchid Chemicals.

INSTITUTE FOR ENERGY STUDIES

Institute for Energy Studies was established as an autonomous research centre in the year 1999 by integrating 3 centres of excellence namely.

- Centre for New & Renewable
- Sources of Energy
- Centre for Appropriate Technology

with the following objectives: To provide sustainable support for the integration of higher engineering education with its energy related research activities, To train man-power with strong basics in energy related area including renewable energy, energy conservation, sustainable energy system etc.

Department of Medical Physics
Anna University, Chennai

Dr.P.Aruna
Professor & Head
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Vision & Mission

"Killing the Killers with Care"

&To Develop the man power with the knowledge of the state of the art Technology to Diagnosis Cancer at an early stage & Therapy with improved quality of life

Generally, Cancer is treated by Surgery, Chemotherapy and radiotherapy out of which radiotherapy plays a vital role, Earlier The majority of the treatment is carried out by physical technique with the help of Radiation Oncology Department. Due to the advancement in technology development various new techniques have been developed to treat cancer there is need for highly trained professionals those who assess the interaction of Ionizing radiation with biological tissues were in preference. To cater this need Medical Physics community has been developed.

Medical physicists are specialized category of physicists who work in radiotherapy, nuclear technology or medical imaging. Medical physicists use a variety of analytical, computer-aided and bioengineering techniques in their work such as radiotherapy, x-ray imaging, ultrasound, tomography, radiology, nuclear magnetic resonance imaging and lasers. They work with patients and with a wide range of medical, technical and administrative staff.

In order to achieve better Therapeutic efficacy in terms of cure rate , to reduce the mortality rate and also making the technology to reach all classes of people hence, Medical Physics has been considered as the thrust area globally by the physicBased on the need , Medical Physics program has been established in 1981 Anna University in collaboration with Cancer Institute Adyar, Chennai and the support of

Bhaba Atomic Research Centre, Mumbai (BARC) and Atomic Energy Regulatory Board of India (AERB)

FACILITIES AVAILABLE IN THE DEPARTMENT

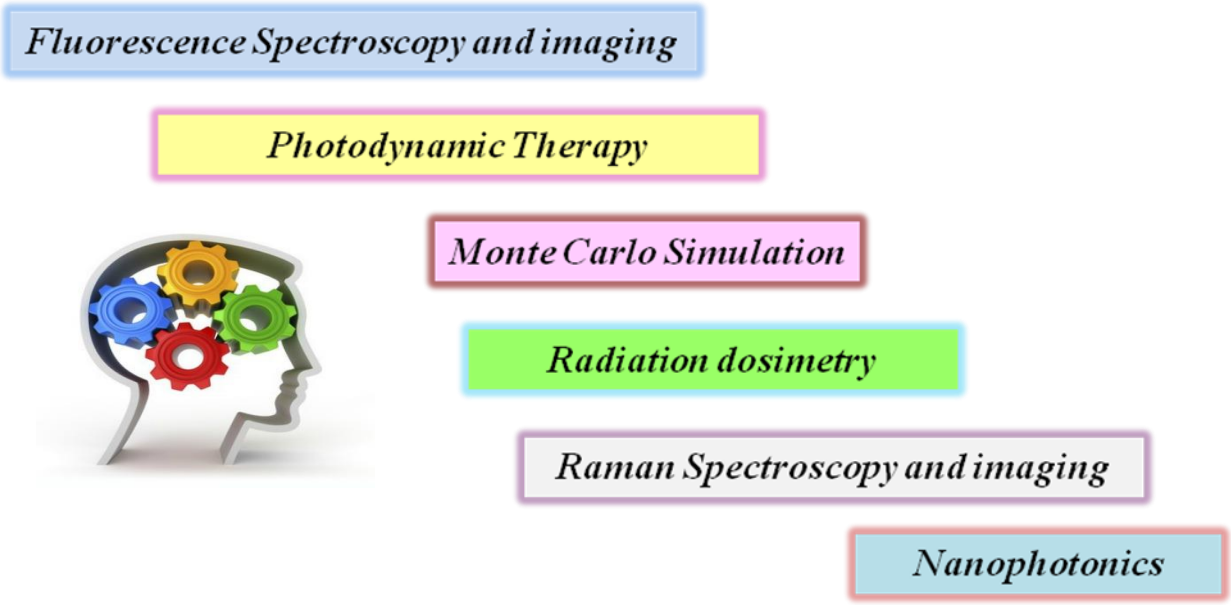
List of equipment available in the department:

UV-Vis. Spectrophotometer
Fibre coupled spectroflurometer
Inverted Fluorescence Microscope
CO_2 Incubator
MOSFET Dosimetry System
Ti-Sapphire Femtosecond laser
Confocal with Raman Spectrometer
Digital Oscilloscope 500 MHz
Time Correlated Single Photon Counting system
FTIR + ATR
Capillary Electrophoresis-Laser Induced Fluorescence
Nd-YAG laser
UV-Vis. Spectrophotometer

Computing and networking facilities:

University network is having a 10Gbps capacity of support network active devices. Under the National Knowledge Network(NKN) scheme, Ministry of Human Resources Development (MHRD) , Government of India has provided 1Gbps bandwidth and 225 Mbps (1:1) Internet bandwidth is pressed into service by the university for Internet activities. Campus Network facility is stretched to the length and breadth of the University

RESEARCH ACTIVITIES



ACHIEVEMENT OF THE DEPARTMENT RELATED CANCER RESEARCH:

- Detailed study on steady state and excited state kinetics of whole blood, haemoglobin, plasma and oral tissues.
- Fluorescence polarization spectroscopy of whole blood of normal and cancerous patients.
- Characterization of oral tissues by reflectance, fluorescence and Raman spectroscopy, and Fluorescence life time imaging of oral tissues.
- In-vivo comparison of Raman, fluorescence and diffuse reflectance spectral data and imaging. Also provided spectral and image features for various tissue conditions.
- Development of invivo dosimeters for The assessment of the final uncertainty between the prescribed dose and dose actually delivered to the patient is an effective way of checking the entire dosimetric procedure. In vivo dosimetry is the only real link possible between treatment planning and dose delivery to the patient . In vivo dosimetry is one of the main quality assurance tools used in radiotherapy to monitor the dose delivered to the patient
- Synthesis and characterisation of nanomaterials related to bio-medical applications.

- ❖ Computer simulations of nanomaterials for basic understanding of stability and mechanism.
- ❖ Published over 150 research papers in National and International peer reviewed Journals

LIST OF FUNDED PROJECTS

Sl. No.	Name of the Project	Name of the Coordinator	Amount Rs. in lakhs	Sponsoring Agency
1.	Setting up of Laser Facility for Medical and Technological Applications	Dr. S.Ganesan	422.78	DAE-BRNS
2.	Automated Biomedical Device Development for Commercialization, with the development of Automated Antibiogram cum Pathogen Identification Device (Bactiogramoscope) under Bioscience and Technology domain	Dr. S.Ganesan & Dr.P.Aruna	290.00	UGC funded University with Potential for Excellence (UPE)
3.	Funds for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions	Dr.P.Aruna	80.00	DST-FIST Program
4.	High Energy Dosimetry	Dr.G.Bharanidharan	50.00	Atomic Energy Regulatory Board
5.	Theoretical Investigations on Materials Relevant for Renewable Energy Technology	Dr. R.Vidya	20.168	Science and Engineering Research Board
6.	Impact of extra-tropical planetary wave forcing on the tropical weather”	Dr.G.J.Bhagavathiammal	18.38	Science and Engineering Research Board

RUSA DETAILS

Name of the Coordinator	Title of the paper	Research journal (only referred)
Dr. S. Ganesan	UV-native fluorescence steady and excited state kinetics of salivary protein of normal subjects, oral premalignant and malignant conditions.	Journal of Luminescence
Dr. S. Ganesan	Near-infrared Raman spectroscopy for estimating biochemical changes associated with different pathological	Molecular and Biomolecular Spectroscopy

	conditions of cervix	
Dr. S. Ganesan	Intrinsic fluorescence of protein in turbid media using empirical relation based on Monte Carlo lookup table	Dynamics and Fluctuations in Biomedical Photonics
Dr. P. Aruna	Polarized Raman spectroscopic characterization of normal and oral cancer blood plasma	Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems
Dr. P. Aruna	High wavenumber Raman spectroscopy in the characterization of urinary metabolites of normal subjects, oral premalignant and malignant patients	SpectrochimicaActa Part A: Molecular and Biomolecular Spectroscopy
Dr. P. Aruna	Oral cancer detection based on fluorescence polarization of blood plasma at excitation wavelength 405 nm	Optical Biopsy XV: Toward Real-Time Spectroscopic Imaging and Diagnosis
Dr. G. Bharanidharan	Synthesis and characterization of ho3+ doped hafnium oxide tld for radiation dosimeter	Journal of Medical Physics
Dr. G. Bharanidharan	Peripheral photoneutron dose measurement in medical linear accelerator using bd-pnd bubble detector	Journal of Medical Physics
Dr. G. Bharanidharan	Measurement of dose in 6mv and 10mv ff and fff photon beams for smaller field size	Journal of Medical Physics
Dr. R. Vidya	Electronic Structure Properties of ATe and A2Te (A: Cu, Ag and Cd)	Springer Proceedings
Dr. R. Vidya	Elastic Properties of Titanium Fluoride Compounds	Springer Proceedings
Dr. D. Durgalakshmi	Effect of Titania Concentration in Bioglass/TiO2 Nanostructures and Its In Vitro Biological Property Assessment	Journal of Nanoscience and Nanotechnology

Product Design and Digital Manufacturing
Anna University, Chennai

Dr. K. Shanmugha Sundaram
Associate Professor
Email: drkshanmughasundaram@gmail.com

Preamble:

Product Design applies to a whole range of contexts, with applications in the creation and improvement to consumer products, industrial products, next generation materials, intelligent and smart manufacturing techniques, modern robotic process and the environment. As a student in the B.Tech (Product Design and Digital Manufacturing), they'll use innovative processes to solve problems creatively, and determine solutions for a better future. They will develop knowledge and skills, and study real projects within the built environment, engineering, and technology disciplines. The students can choose from study areas available as majors and/or minors.

They will work with internationally recognized scholars and industry professionals. Design studios, Product Realization Labs, site visits, field trips and interaction with industry practitioners will take them into 'real life' situations with industry briefs.

Majors (undergraduate degree)

- Rapid Product Design
- Digital Manufacturing Technologies
- Mechanical Systems and Process Design
- Material Preparation and Characterization
- Smart Manufacturing

Design solutions for a better future

- Design-focused studio, workshop and laboratory-based learning
- Choose from study areas available as majors and/or minors
- Learn from internationally recognized scholars and industry professionals
- Flexibility to complete majors, minors, double majors and specializations

Detailed and Tangible Action Plan

- The entire **detailed Curriculum and Syllabus** would be framed with interaction from Industrial experts and foreign collaborative Universities / Professors by end of **April 2018**.

- Action would be initiated right from the first year for procurement to **establish all the laboratories with state of the art modern facilities** that can be used round the clock to incubate ideas by **June 2019**.

- Space would be created to establish the **Open design studios to nurture creativity and advanced thinking skills.**

- **Adjunct Faculties from Industries will be invited to collaborate** and work to find solutions to the existing problems and to the future by **June 2021**.

- Truly **Inter-disciplinary industry ready laboratory based courses and projects** would be completed and the graduate would be a chooser of the job by **June 2022.**

Mile Stones:

Mechanical Systems students will learn to develop and design new products (in wide-ranging areas from transportation such as cars, aircraft and ships through to everyday devices such as air-conditioners, dishwashers, etc) and the machines to make them (robots, machine tools). They will also learn how to design, plan and manage the systems, people and technical facilities needed to produce goods and services for industry and domestic use. Students will also learn about the generation and harnessing of energy (gas turbines, wave power), transport in all its forms (automobiles, spacecraft) and protecting the environment (solar heating, wind turbines).

Mechanical Systems interacts with all other branches of engineering, and is increasingly involved with other fields of study such as medicine and biology.

Students will integrate fundamental science in mechanics with engineering principles, and will learn to solve practical problems involving mechanical systems. Basic principles will be learnt through lectures, interactive small-classes, demonstrations, practical laboratory classes and challenging assignments. A design-based approach to solving problems will be applied to build solutions on the base of the fundamental knowledge acquired through the degree.

- The graduate would be able to deliver design solutions and recommend proper Manufacturing technique for better future.
- The graduate would be learning the global practice followed in Industries and provide solutions for the globe.
- State of the art infrastructure and research facility would be created.

Timelines:

- Detailed Curriculum and Syllabus - April 2018.
- All laboratories with state of the art modern facilities - June 2019.
- Open design studios / Industry Collaboration - June 2020.
- Inter-disciplinary industry ready Projects for the future - June 2021.

Mile Stones to be Achieved in 5 years:

In addition to the generic attributes of the Bachelor of Design graduate, graduates of the Mechanical Systems major should be able to demonstrate:

- Comprehensive understanding of the principles of engineering design and fundamental science in mechanics with engineering principles, and the ability to apply these to solve practical problems of mechanical systems.
- Knowledge and skills to construct accurate models of mechanical systems.
- Critical analysis and abstract thinking in the conduct of laboratory experiments employed to test solutions to complex problems.
- Strong engineering communication skills, conveying complex scientific information clearly and concisely.

Mile Stones to be Achieved in 15 years:

- Truly nation building low cost solutions would be provided to the Industry and Abroad.
- Internationally recognized and collaborative research solutions in the area of design, manufacturing and materials would be carried out.

- The graduates would be able to motivating and delivering design solutions and creating next generation Manufacturing processes for our better future.
- The graduate would be learning / generating new practice to be followed in Industries and provide viable solutions for the globe.
- State of the art infrastructure and research facility would be created.

Timelines to achieve the expectations:

- Infrastructure / Course / Graduation - April 2022.
- All collaborations / laboratories with research facilities - June 2027.
- Industry Solutions - June 2030.