

### ***Project Description:***

## **Creating the South-East Asia educational Network for Disaster and Environmental Engineering: SEAN-DEE**

### **1. Project goals**

The successful creation of *Regional Centres of Excellence in Disaster and Environmental Engineering Education* (ReCEDEE) at two universities in Bangladesh with the help of a DAAD grant within the program of *Subject Related Cooperation with Higher Education Institutions in Developing Countries* had a tremendous impact on higher education in this country. When the 2-year program *Master in Disaster and Environmental Engineering* (program brochure in annex 1), was inaugurated in January 2011 after 3 years of development more than 50 applicants registered for the 30 spaces available at Chittagong University of Engineering and Technology (CUET), a leading partner in this SEAN-DEEN project. No other master program in Bangladesh has produced this kind of interest and demand. Students left their jobs even with international NGOs (only to be told to come back when they have their Master Degree), to develop problem-solving skills necessary to face regional disasters and environmental problems that threaten their very lives and the sustainability of the economic and social development of their country.

ReCEDEE has shown that there is a clear need to help the emerging regional academic institutions on their declared goal to become “*Regional Academic Centres of Excellence*” especially when it comes to disaster mitigation and environmental protection. To provide adequate high-quality education in these centres, it is necessary to:

- enhance their bachelor curricula with respect to disaster and environmental engineering topics
- develop high-level collaborative master programs in a network eventually leading to joint degrees
- develop joint doctoral programs
- train their academic staff
- include cultural and language aspects in curricula to promote exchange of students and foster mutual understanding and acceptance
- network them regionally and with international academic institutions

The *Comprehensive Disaster Management Program* (CDMP) of the United Nations and the World Bank (among others) have recognized this demand and the need to support this activity by providing financed student projects and infrastructure grants to ReCEDEE.

This success clearly demonstrates the overwhelming demand and need for this kind of higher education which is obviously not just confined to Bangladesh or can be satisfied by the two higher education institutions involved in ReCEDEE alone: Many regions in South-East Asia face similar problems and have similar needs and demands. It is therefore most important to utilize the ReCEDEE experience as a basis to create a *South-East Asia educational Network for Disaster and Environmental Engineering: SEAN-DEE*, so that other higher education institutions in South-East Asia can benefit from this development, create their own version and cooperate in this network to produce international level Masters in this field. They are badly needed.

It also allows the creation of comprehensive Ph.D. programs where partners in SEAN-DEE can work together and have their Ph.D. students engage in international collaborative research. For this project, the collaboration with Germany (in particular through the University of Kassel, UNIKA and DAAD) is very important, having helped in creating ReCEDEE and being viewed as a reliable development partner in academic matters and an important asset

even in internal discussions within the institutions or with superior administrative entities like ministries. An important goal of this project (next to creating SEAN-DEE) is therefore the strengthening of this collaboration through a comprehensive exchange program for which a strong demand was expressed by the partners' students and professors alike.

Science and education at UNIKA will also benefit substantially. With a strong agenda in environmental and disaster engineering, UNIKA will benefit greatly from master and doctoral work performed by SEAN-DEE students. Some examples are advanced seismic retrofitting technologies under study at UNIKA (like the Hyde or Tendon systems), advanced seismic testing methods, flood control studies, flow of contaminated ground water or local environmentally compatible technologies.

## **2. Project components**

To create SEAN-DEE and make it sustainable beyond 2015, yearly one week long workshops are organized by different partners to discuss all major issues and produce documents that outline its strategy (detailed project plan in annex 2). When establishing ReCEDEE such workshops were vital to its success and are therefore an integral component of the SEAN-DEE project.

Verifiable outcomes of the 4 workshops will be:

1<sup>st</sup> Workshop at CUET, Bangladesh:

SEAN-DEE officially inaugurated, Master Plan to coordinate teaching and exchange within the network drafted.

2<sup>nd</sup> Workshop at CDS, Nepal:

Infrastructure Master Plan for each SEAN-DEE partner drafted, long term strategy on securing student and staff exchange developed.

3<sup>rd</sup> Workshop at NIE, India:

Master Plan for SEAN-DEE to implement a common quality control system for Ms and Ph.D programs drafted.

4<sup>th</sup> Workshop at KUET, Bangladesh:

Road Map to joint international degrees in DEE among SEAN-DEE partners established, possibly new partner institutions joining SEAN-DEE.

For UNIKA to engage in a strong cooperation with the partners, a comprehensive exchange program has been developed together with the partners consisting of three main yearly activities, which are to be implemented during this project:

1. Involving up to 4 UNIKA-professors in teaching the courses at the partner institutions that they have helped to develop in ReCEDEE.
2. The SEAN-DEE lab at UNIKA, which brings up to 30 Master and Ph.D. students plus 4 professors from the network every year for two weeks to Kassel to learn about and engage in subject related laboratory work and foster their understanding of German culture and language. It will also improve the understanding of people working at UNIKA about South-East Asia and its varied cultures and thus help them to open up to more cooperation with scientist in this region.
3. Medium term project related stays (3-5 months) at UNIKA of up to 9 Master and Ph.D. students every year to engage in front line research, which will be of mutual benefit.

## **3. Financing concept for project components**

### ***Workshops and UNIKA Profs teaching at SEA partners:***

Funding for international travel is sought from DAAD. The hosting partner institutions will provide room and board as well as local transportation, which are verifiable own contributions.

### ***SEAN-DEE Lab at UNIKA:***

For up to 30 participating graduate level students and 4 teachers/trainees from SEA partners, financial support is sought from DAAD based on DAAD's daily allowance (980,- € total per participant). Participants will pay their international travel including visa costs and insurance themselves, which is estimated to 750,- € per person. These costs are verifiable own contributions.

Travel funding for up to 2 external experts from within Germany to teach at the lab is sought from DAAD (150,- € per expert).

1500,- € event allowance for each lab is sought from DAAD.

### ***Medium term project visits at UNIKA:***

For up to 9 Master or Ph.D. students from SEA partners, financial support is sought from DAAD based on DAAD's monthly allowance (1000,- € per person and month, duration 3-5 months per person). They will pay their international travel including visa costs and insurance themselves, which is estimated to 750,- € per person. These cost are verifiable own contributions.

## **4. Expected results**

Regional but networked *Academic Centres of Excellence in Disaster and Environmental Engineering* will be created in South-East Asia through SEAN-DEE by:

- Upgrading and harmonizing curricula and course contents of partners
- Creation of an International Master Program on Disaster and Environmental Engineering (MsDEE) within the network based on the developments in ReCEDEE
- Participation of partners in this program through exchange of students and staff
- Joint supervision of Master and Ph.D. students with UNIKA-professors
- Better cultural understanding

## **5. Participating institutions and their senior partners in SEAN-DEE**

### **• Universität Kassel (UNIKA), Germany:**

UNIKA offers a broad range of studies covering engineering, natural and social sciences as well as the arts for a total of about 17000 students on three campuses. Its Civil and Environmental Engineering Department offers bachelor and master programs. Its structural laboratory offers unique testing capabilities on its 7 x 14 m strong floor where up to 3-storey ½-scale buildings can be subjected to a simulation of earthquake or other dynamic loads. With IWAU, the University of Kassel has an interdisciplinary work and research group, which focuses on hydraulic engineering and water management, waste technology and waste water management.

**Prof. Dr. Uwe E. Dorka** is the coordinator of this project. He has a civil engineering degree from Ruhr-Universität Bochum, a Master of Science from the University of Washington, Seattle, USA and a Doctorate from Ruhr-Universität Bochum. He performed post-graduate studies at the Building Research Institute, Tsukuba, Japan (AvH-STA fellowship), the University of Washington, Seattle, USA and University of Innsbruck, Austria (DFG fellowship). He holds the chair of steel and composite structures. With about 80 international publications, he is an acknowledged scientist in earthquake engineering with a focus on seismic rehabilitation and testing. He is a leading developer of hybrid simulation techniques where "virtual" numerical structures are coupled to actual specimen on shaking tables or other testing equipment (DFG project subshake, FP7 projects EFAST and SERIES). Next to basics of steel and composite structures, he teaches earthquake engineering and the internationally

acclaimed course “introduction to earthquake engineering” (in English) at the International Summer University at UNIKA as well as courses on “seismic control” at Middle East Technical University, Ankara, Turkey and University of Salerno, Italy (ERASMUS). He helped re-establish the Institute for Earthquake Engineering and Seismology (IZZIS) in Skopje, Mazedonia as the leading earthquake engineering institution in the Balkan region (HRK SEE-financing) and served as adviser to establish the Bangladesh Earthquake Engineering Network BEEN (DAAD advisory program). He is also the coordinator of ReCEDEE.

- **Chittagong University of Engineering and Technology (CUET), Bangladesh:**

CUET is one of the prestigious degree awarding universities in Bangladesh. There are five engineering departments. In addition, CUET has established the Department of Architecture, Urban & Regional Planning Department, one Institute on Energy Technology and three centres, namely, Earthquake Engineering Research Centre (EERC), Centre for Environment Studies and Engineering (CESE) and Centre for Information and Communication Technology (CICT). The Department of Civil Engineering offers Bachelor, M.Eng., M.Sc. and PhD degrees. There are 58 postgraduate courses addressing different disciplines in civil engineering. Teaching staff consists of 6 Professors, 2 Associate Professors, 11 Assistant Professors and 5 Lecturers with most of them having home and foreign degrees. There are outreach programs to create disaster and environmental awareness of citizens.

Research in disaster mitigation has focused on earthquake vulnerability assessment, liquefaction potential, new technologies on earthquake proof rural houses, local earthquake retrofitting technologies, flood protection, drainage system of cities and cyclone resistant housing. Environmental research focuses on river pollution, arsenic mitigation, potable water free from disease-carrying waste, and waste management.

A joint collaborative agreement was signed with the Institute of Earthquake Engineering and Engineering Seismology (IZIIS), Skopje to establish the EERC.

**Prof. Dr. M. Jahangir Alam** has a Civil Engineering degree from CUET, a Master of Engineering and a Doctorate from Anna University of Madras, India. He performed post-graduate studies at IZZIS and University of ST. Cyril and Methodius, Skopje, Mazedonia (UN fellowship). He was the UNESCO-Fellow to India from Bangladesh from 1989-1992. He is a member of the American Society of Civil Engineers (ASCE) and the New York Academy of Sciences, USA. He has established the Earthquake Engineering Research Centre (EERC) at CUET and serves as its coordinator. He is the coordinator of ReCEDEE at CUET under the support of DAAD. With 30 international publications, his research interests are mainly in earthquake resistant structures, seismic retrofit and liquefaction. He teaches “Structural Dynamics & A-seismic Design of Structures”, “Finite Element Method”, “Computer Application to Structural Analysis”, “Analysis & Design of Tall Structures”, “Theory of Structures” and “Mechanics of Materials”.

**Prof. Dr. Md. Hazrat Ali** has a B. Sc. Eng. (Civil) degree from KUET awarding SOBA scholarship; a Master of Eng. (WEM) from Asian Institute of Technology, Bangkok, Thailand, awarding DAAD scholarship and a Ph.D. from University Putra Malaysia, awarding Malaysian Ministry of Science, Technology and Environment fellowship. He is the Fellow of the Institution of Engineers, Bangladesh (IEB), Fellow & Honorary Vice-President of the Royal Institute of Water Engineers, Singapore and Lifetime Member of AITAA. His main research interests are in applied water resources engineering, including modelling in this field with focus in environmental engineering. He has published many papers in international journals, having high impact factors and

is a reviewer of several international journals with impact factors. He has participated in several scientific workshops/training programs at home and abroad such as the “Regional Training Course on Simulation Models in Eng. & Technology”, IIT, Madras, India (UNESCO financing) and the “International Training Course on Seismology, Seismic Data Analysis, Hazard Assessment and Risk Mitigation”, GFZ Potsdam, Germany. He teaches and supervises undergraduate and postgraduate courses and theses in water resources and environmental engineering at CUET. He also taught, supervised and evaluated postgraduate courses and theses at Universiti Teknologi Malaysia. He has experience in handling several research projects.

- **Khulna University of Engineering and Technology (KUET), Bangladesh:**

Khulna University of Engineering & Technology (KUET), Bangladesh established in 1967 as Khulna Engineering College starts its journey on June 3, 1974, later converted to an autonomous Institution called Bangladesh Institute of Technology (BIT), Khulna in July 1986. The Institute was upgraded and renamed as KUET in September 2003. Presently, it has 3 Faculties comprises 14 Departments and 1 Institute including major branches of engineering and sciences offering both the undergraduate and postgraduate degrees, with 665 fresh UG and about 100 PG students in each year. The university aims to take the leadership in promoting technological developments and management of the nation by strengthening engineering and technological education and research. It has the approved plan to open the Institute of Disaster Management in the year of 2012-2013. The Department of Civil Engineering offers B.Sc. Eng., M.Sc. Eng. and PhD degrees. There are 58 postgraduate courses addressing different areas in civil engineering. Teaching staff consists of 9 Professors, 3 Associate Professors, 18 Assistant Professors and 6 Lecturers with most of them having higher degrees from home and abroad. During the last 36 years of its journey, the growth of Civil Engineering Department of KUET is accompanied with a high level of productivity in the number of graduates and in faculty research and scholarly publication activities. The research conducted here addresses a wide range of topics having state-of-the-art research facilities to accomplish the requirements of the country, with special reference to south-west region, which part of the country is very much vulnerable to the impacts of climate change. To this endeavour several workshops, seminar and international conference has been arranged and collaborations are made with other higher education and research institutes from home and abroad.

**Prof. Dr. Muhammed Alamgir** is a Professor of Geotechnical & Geo-environmental Engineering in the Department of Civil Engineering at Khulna University of Engineering and Technology (KUET), Bangladesh since 2002, where he joined as a Lecturer in 1986. Presently, he is acting as the Vice-Chancellor of KUET. He obtained B.Sc. Eng. (1986) & M.Sc. Eng. (1989) degrees from BUET, Dhaka and Ph.D. (1996) from Saga University, Japan. He was awarded JSPS Post Doctoral Fellowship for 18 months (1986-1998), NST Senior Fellowship for 1998-2000. His research areas cover solid waste management & geo-environmental engineering problems, sanitary landfill, composting, soft soil characterization, ground improvement, foundation in soft soil and sub-soil exploration. He successfully completed several research projects since 2002 funded by the Government of Bangladesh and European Commission under its Asia Link, Asia Pro-Eco Programme and 7th FWP. About 130 technical papers written by him were published in conference and journal proceedings. He edited two seminar proceeding, two workshop handouts on geo-environmental eng. and solid waste management, one book on feasibility study on MSW management in LDACs and two proceedings of international conferences. Prof. Alamgir visited 22 countries for research

and professional work. He is the life fellow of IEB, BAAS and member of ASCE. He was born in 1963.

**Mr. Md. Rafizul Islam** has been serving as the Assistant Professor in the Department of Civil Engineering, KUET, Bangladesh since October 2010 where he joined as a Lecturer in 2008. He obtained a B.Sc. Eng. (2003) & M.Sc. Eng. (2006) degrees from KUET. His research covers the experimental aspects to evaluate the properties of reconstituted organic soils, MSW management, sanitary landfills, lysimeter technology, leachate characterization and evaluation of landfill contamination. He successfully worked as a Research Assistant and Research Associate on several research projects funded by the Government of Bangladesh and European Commission under its Asia Link and Asia Pro-Eco Programme. About 35 technical papers written by him were published in conference and journal proceedings. He edited one seminar proceeding and one proceedings of an international conference. Mr. Rafizul visited Singapore for attending an international conference. He is the member of IEB. He was born in 1981.

- **Shahjalal University of Science and Technology (SUST), Bangladesh:**

SUST is one of the leading A - category (ranked by UGC of Bangladesh) universities of Bangladesh. There are twenty-five departments of sciences and technologies offering Bachelor, Postgraduate and Doctorate degrees, 392 teachers, 140 officers and 352 supporting staffs at SUST. Among the departments, Civil and Environmental Engineering (CEE) Department established in 1995 is the leading one that offers B.Sc Engineering, MSc Engineering and PhD degree. Laboratories of CEE department are well furnished with modern sophisticated equipments like AAS, GC, EMS, UTM etc. CEE has a few attached centres to extend advisory, consultancy, research, and training services at SUST namely International Training Network (ITN) for Water and Waste Management in 1996; Centre for Research, Testing and Consultancy (CRTCC) in 2004 and Centre of Excellence offering M.Sc Engineering degree in Disaster and Environmental Engineering under the linkage with University of Kassel, Germany and CUET in January 2011. CEE is the first department of SUST introducing international linkage with the universities at home and abroad. CEE signed linkage project "Appropriate Technology for Waste Water Treatment" between Shahjalal University of Science & Technology (SUST) and Staffordshire University of UK in November 1996 that continued up to 1998. CEE was also linked with Global Water Partnership forming Surma Water Partnership (SWP) under the umbrella of Bangladesh Water Partnership (BWP) from 2002 to 2006. CEE as an associate partner of CEP department of SUST was also interlinked with University of Applied Science, Karlsruhe, Germany, Jiangsu Polytechnic University of China and ITM-CNR of University of Calabria, Italy under Asia-Pro-Eco program from 2005-07. CEE of SUST has also been interlinked with the Ministry of Food and Disaster Management of Bangladesh through the linkage program CDMP since November 2008 to date. CEE department organized a specialized seminar on "Sustainable Development and Environment Friendly Building Material" March 10-11, 2010 and an International Conference on Environmental Technology and Construction Engineering for Sustainable Development (ICETCESD) March 10-12, 2011 where participants from 15 countries presented technical papers. There are two Professors (with PhD degree in environmental engineering), 4 Associate Professors (one with PhD in structural engineering, one with PhD in water resources engineering and two with PhD in environmental engineering), 12 Assistant Professors (7 with MSc engineering degree, 4 doing PhD in SUST) and 4 Lecturers (2 with MSc engineering degree and 2 doing M.Sc Engineering). There are a few outreach programs to create water supply, sanitation, disaster and environmental awareness of citizens conducted with the assistance of ITN.

**Prof. Dr. Mohammad Aktarul Islam Chowdhury** is Head of the CEE department of SUST. He supervised and reviewed more than 100 undergraduate theses and is currently supervising a number of PhD and MSc engineering thesis in the field of environmental engineering. He is the author of a couple of engineering texts and reference books published by Bangladesh University Grant Commission ISBN: 978-984- 8920-07-7 in 2011 and by Atlantic Publishers Ltd., Calcutta, India in 2007 and 142 technical papers published in international journals (57 in journals) and proceedings of international conferences, seminars and workshops. He is editor and member of the editorial boards of half a dozen international journals and has peer-reviewed more than 20 technical papers of about a dozen of international journals published in the UK, USA, India, Malaysia, Pakistan, Bangladesh etc. He is a member of the International Water Association (IWSA) and the International Water Association (MIWA) since 1995. He is a Life Fellow (F/5549) of the Institute of Engineers, Bangladesh (FIEB) since 1993. He served as the chairman of the organizing committee of the specialized seminar on “Sustainable Development and Environment Friendly Building Materials“ held on March 10-11, 2010 and the international conference “Environmental Technology and Construction Engineering for Sustainable Development “ held on March 10-12, 2011 at SUST. He worked in a number of international linkage projects as coordinator and researcher between SUST and Staffordshire University of UK, MIT of USA, Miyazaki University of Japan, UNU of Japan, UAS - Karlsruhe of Germany, UC of Italy and JPU of Peoples Republic of China etc.

- **Tribhuvan University, Centre for Disaster Studies (CDS), Nepal:**

The Center for Disaster Studies (CDS) is one of the Centers under the Institute of Engineering at Tribhuvan University along with the Center for Energy Studies and the Center for Pollution Studies. This Center has been established to carry out research, deliver academic courses and offer consultancies related to disaster risk reduction. This is in view of Nepal's vulnerability of different kinds of disasters. It has also been working as a secretariat of the Center for Natural Resources and Development (CNRD) program. CNRD is an international knowledge hub and network with a thematic focus on sustainable water, land and energy management within the context of global change and development issues. CDS is seeking to offer Master Course on Disaster Risk Management for which the syllabus has already been prepared.

**Prof. Dr. Jiba Raj Pokharel** is Professor in the Department of Architecture and Urban Planning. He is also the Director of the Center for Disaster Studies. He specializes in architecture conservation in general and the likely disaster risk reduction to the architectural monuments in particular.

**Mr. Ajaya Chandra Lal** is the Deputy Director of the Center for Disaster Studies. He has done Masters in Urban Planning from School of Planning and Architecture, New Delhi, India. At the present he is doing a PhD on a climate change related topic. He is an Assistant Professor in the Department of Architecture and Urban Planning.

- **The National Institute of Engineering (NIE), Mysore, India:**

The National Institute of Engineering (NIE) is one of the prestigious autonomous Institutions in Mysore, India. NIE is permanently affiliated to Visvesvaraya Technological University (VTU) Belgaum, Karnataka, India and accredited by National Board of Accreditation (NBA), New Delhi, India and recognised by All India Council for Technical Education (AICTE), New Delhi, India. NIE offers undergraduate programmes in major engineering disciplines. NIE also offers Master's degree (M.Tech) programme and is a recognised research institute offering doctoral programmes in civil,

electrical, computer science, mechanical and industrial production engineering. NIE has many centres of excellence engaged in research and consultancy viz NIE-Eicher Centre for Automobile Technology (NECAT), Centre for Renewable Energy and Sustainable Technologies (NIE-CREST), Centre for Material Research, Center for Energy Management & Test Systems for Electrical Apparatus, Center for Artificial Intelligence Application to Power Systems, Building Fire Research Center and Centre for Research and Consultancy. NIE has three sister institutes viz, NIE Institute of Technology, NIE Industrial Training Institute, NIE College of Science. NIE has signed MoU with McMaster University, Ontario, Canada and Univ. of Minnesota, Canada, on academic cooperation concerning the development of international academic linkages ([www.nie.ac.in](http://www.nie.ac.in)).

**Prof. Dr. Ganesh Prasad**, Dept. of Civil Engineering, obtained B.E. degree in Civil Engineering from University of Mysore in the year 1987 and M.E. (remote sensing) from the University of Roorkee (presently Indian Institute of Technology (IIT) Roorkee) in the year 1997. He has obtained Ph.D. in the year 2009 from IIT Roorkee and his research area is uncertainty modelling in remote sensing data. He has to his credit over 23 years of academic experience. His areas of interest are surveying and mapping, remote sensing, digital image classification, GIS and GPS applications, LIDAR mapping. His professional skills include use of total station instrument for all types of surveying, GPS data collection, competency in Erdas Imagine, ENVI, IDRISI, Arc View (image processing and GIS software). He has been nominated as a member of Board of Studies, Bangalore University for the period 2011-14. He has delivered over 50 expert lectures on topics of GIS, remote sensing, GPS and surveying at various institutes all over the state. He is a life member of ISTE and Institution of Engineers.

**Eng. Shamsundar Subbarao**, Associate Professor, Dept. of Mechanical Engineering, obtained his B.E degree in mechanical engineering from Karnatak Univ., India in the year 1989 and Masters Degree in renewable energy (2000) from University of Oldenburg, Germany, under DAAD scholarship (German Academic Exchange programme). Currently he is pursuing his Doctoral degree under the supervision of Prof. Dr. Jurgen Schmid, Head, Fraunhofer IWES, University of Kassel, Germany. He is also the Director of the NIE-Centre for Renewable Energy & Sustainable Technologies (NIE-CREST). He is involved in consultancy and dissemination of renewable & sustainable technologies. He has participated in many rural development programs in rural India and has conducted many workshops and training programmes under service to community projects. He played a major role in inviting “German Advisory Council on Global Change “ a high level delegation from Germany to his institute in 2008. He has also established a good network with some German universities / institutions viz. Univ. of Kassel, Univ. of Oldenburg, German Development Institute, Bonn. He is also a core member of FANSA (Fresh Water Action Network), South Asia.

**Prof. Dr. G.L. Shekar**, Principal and Professor at the National Institute of Engineering, Mysore, obtained Ph.D. from Indian Institute of Science, Bangalore, M.Tech. from Indian Institute of Technology, Kanpur and B.E. in mechanical engineering from National Institute of Engineering, Mysore. His research interests are in systems modelling and decision support systems in operations management with applications in capacity planning and production scheduling, and technology in education. A recipient of a gold medal for his doctoral thesis, Dr. Shekar has many papers and popular articles published in national and international journals. He was the Special Officer at the E-Learning Centre of the Visvesvaraya Technological University, Karnataka. He is championing the satellite and web based education in India. His book, “EDUSAT: Indian Satellite in Education” is the first of its kind in the country written from a user’s



perspective. Then President of India, Dr. APJ Abdul Kalam, released this book in Bangalore on July 23, 2004. Currently he is working on applications of educational technologies in higher education and industry-institute interface in India. He was also the founding director of the NIE-Eicher Centre for Automobile Technology.

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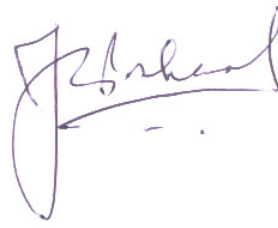
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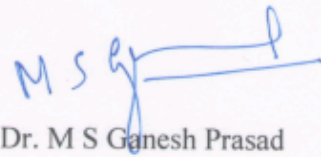
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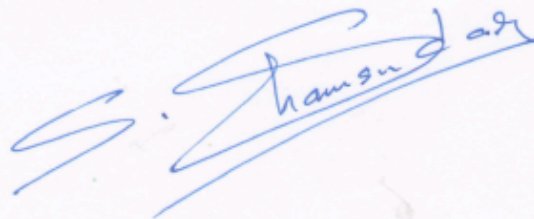
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