Special lecture on Intellectual Property Rights (IPR),
Seminar Hall, Mechanical Sciences Block

Report

Day of event	: **09.06.2023**
Mode of conduct	: Offline
No. of students attended	: **108 from M.Sc., Chemistry (II semester), Biotechnology, Biochemistry, Microbiology, M. Sc., Physics and Actuarial Science**
Semester	: **II**
Course Code & Name	: **GEE6202 & Research Methodology**

Event Details:

As part of the syllabus of Research Methodology course, a special lecture related to IPR was arranged by **Dr. M. Asha Jhonsi (AP, Sr. Gr.)/ Course Coordinator** with the prior permission from **Dr. N. Hajarabeevi, HoD/Chemistry** through Crescent Innovation and Incubation Council on **9th June 2023 at Seminar Hall of Mechanical Sciences, BSACIST.**

Dr. Sudarkodi, Patent Officer, CIIC has been identified as is the invited speaker to deliver a lecture **"A short course on INTELLECTUAL PROPERTY RIGHTS"**. Around **108** Post graduate students from science streams and 4 faculties were attended the session from **11.00 AM – 12.40 PM.**

Outcomes:

Fundamentals related to IPR such as **Patent, copyrights, trademarks, trade secrets, industrial design, TRIPS** were covered with real time examples. Students were motivated by the session and encouraged to think innovatively to **convert their research ideas into product level.**

One of the outcome of the course Research Methodology is finding a solution to the specific problem and converting it to research proposal through transformation of research ideas into **patenting and commercialization (Entrepreneurship)** was clearly explained to

the students. The session was good with fundamental details which are much needed for the PG students and it was appreciated by the students also.

Pictures of special lecture on IPR Awareness at seminar hall of Mechanical Sciences

List of students attended the special lecture: Copy of the attendance is Enclosed

Dr. M. Asha Jhonsi

(Course Coordinator
GEE6202, Research Methodology and IPR)

Dr. N. Hajarabeevi
HoD/Chemistry

Ref. : 440A/Dean(Sol)/0423 Date: 29.04.23

Report on

Electrochemical Corrosion Techniques:Theory and Hands on Training

March 17-18, 2023

Jointly Organized by

Department of Civil Engineering & Chemistry

BSA Crescent Institute of Science and Technology

Supported By

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Dr. T. Murugesan
Vice-Chancellor

Dr. N. Raja Hussain
Registrar

Conveners

Dr. M. S. Haji Sheik Mohammed
Dean, School of Infrastructure

Dr. I. Raja Mohammed
Dean, SPCS

Co- Convener

Dr. N. Hajara Beevi
Prof & Head, Department of Chemistry

Coordinators

Dr. N. S. Shafeer Ahamed
Assistant Professor (Sel.Gr)
Department of Civil engineering

Dr. N. Vasimalai
Asst. Professor (Sl.Gr.)
Department of Chemistry

Introduction

Corrosion can be viewed as a universal problem. It is a dynamic problem that needs multi- disciplinary approach to solve it. It has an adverse effect on the economy of the world.Corrosion costs of $2.5 trillion annual cost worldwide, which is equivalent to 3-4% of the global Gross Domestic Product (GDP). In India, corrosion expenses of $2.5 trillion each year create a 4% loss in India's GDP.

Every year on April 24th, World Corrosion Organization (WCO) commemorates “World Corrosion Awareness Day” to underline the impact of corrosion.

The detrimental effect of corrosion has caused multiple disasters and deterioration of various important infrastructures worldwide. To list a few, the Bhopal gas tragedy that resulted in the deaths of 3000 people caused by both methyl isocyanide chemical and corrosion of the stainless -steel tank wall, the galvanic corrosion of the iron armature in contact with the copper skin made the restoration of Statue of Liberty most necessary and the restoration of the Queen of Indian bridges, the Pamban Bridge made indispensable.

Objectives of the workshop:

The workshop has provided a platform to get knowledge on the latest advancement in electrochemical corrosion and its control techniques in the field of science and technology.This workshop was planned in order to provide an introduction to the use of electrochemical techniques in corrosion applications.

- Emphasis is placed on the use of modern instruments to acquire pertinent data.
- This will provide an insight knowledge on practical aspects of corrosion.
- Participants will have the opportunity to acquire state-of-the-art instruments inlaboratory sessions designed to complement the lecture sessions.
- Techniques for proper interpretation of data for use in corrosion prediction,prevention and monitoring will also be emphasized.

The two-day workshop is aimed to train the postgraduate students, research scholars, faculty of arts & science and engineering colleges, and industry personnel in electrochemical analytical equipment’s.

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PROGRAMME SCHEDULE

2nd Two Day Workshop on ELECTROCHEMICAL CORROSION TECHNIQUES: THEORY AND HANDS ON TRAINING

March 17 & 18, 2023

BSA Crescent Institute of Science and Technology, Vandalur, Chennai

DAY 1 – March 17, 2023 (Friday)

Venue: Seminar Hall 1, Convention Centre

Time	Topic	Resource Person (s)
08:30 to 9:00 am	Registration	
09:00 to 9:45 am	Inaugural function	
09:45 to 10:45 am	Basics of Corrosion & its Forms	Dr. A. Poonguzhali, Scientific Officer(F), CSTD, Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam.
10:45 to 11:00 am	Tea Break	
11:00 to 12:00 pm	Basics of Electrochemistry, Testing & Monitoring	Dr. S. Rangarajan, Former Head, Water and Steam Chemistry Division, BARCF Kalpakkam.
12:00 to 1:00 pm	Advanced Electrochemical Techniques	Dr. S. Ningshen, Head, CSTD & CEPS, Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam
01:00 to 2:00 pm	Lunch Break	
02:00 to 4:00 pm	Hands on Training – Chemistry and Civil Engg. Department Laboratories	Research scholars of Anna University and BSACIST & M/s. Metrohm India Pvt. Ltd., Chennai

DAY 2 – March 18, 2023 (Saturday)

Venue: CSB Seminar Hall, 6th floor, Architecture Block

Time	Topic	Resource Person(s)
08:45 to 09:15 am	QUIZ 1	
09:15 to 10:00 am	Cathodic Protection: Galvanization vs Sacrificial Anodes	Dr. M.S. Haji Sheik Mohammed, Professor, Department of Civil Engineering BSACIST
10.10 to 10.45 am	Corrosion Inhibitors and its Applications	Dr. S. Kutti Rani, Professor, Department of Chemistry, BSACIST
10:45 to 11:00 am	Tea-break	
11:00 to 12:00 pm	Electronically Conductive Coatings for Corrosion Protection	Dr. Raman Vedarajan, Scientist, Centre for Fuel Cell Technology, International Advanced Research Centre for Powder Metallurgy and New Materials, Chennai
12:00 to 01:00 pm	Advanced Techniques for Monitoring – Electrochemical Impedance Spectroscopy	Dr. S. Ramanathan, Professor, Department of Chemical Engineering, IIT Madras
01:00 to 02:00 pm	Lunch Break Interaction with Students	Dr. S. Ramanathan, Professor, Department of Chemical Engineering, IIT Madras
02:00 to 03:30 pm	Hands on Training – Chemistry and Civil Engg. Department Laboratories & Quiz 2	Research scholars of IIT, Madras and BSACIST & M/s. Metrohm India Pvt. Ltd., Chennai
03:30 to 03.45 pm	Tea break	
03.45 to 04.15 pm	Valedictory Function (Certificate Distribution)	

Supported By Metrohm India Private Ltd.

Figure 1: Photo taken during the inauguration of the workshop

Figure 2: Welcome address by Dr. M.S. Haji Sheik Mohammed / Dean (SOI)

Figure 3 : Felicitation by Dr. S. Rangarajan / Former Head, WSCD, BARCF

Figure 4 : Presenting Memento to Dr. S. Ningshen / Head, CSTD & CEPS, IGCAR

DAY 1 – SESSION 1

TOPIC: Basics of Corrosion and its Forms

Dr. A. Poonguzhali presented on the topic “Basics of Corrosion and its forms” which gave a clear understanding about types of corrosion, factors influencing corrosion, prevention and control of corrosion. She started the presentation with the inputs on major impact of corrosion on industries and economic sectors.

She stated that thermodynamically corrosion can never be prevented. She then discussed about the interdisciplinary nature of corrosion and their synergistic influence of various parameters of material, environment and their interfaces playing a key role in the failure of components due to corrosion.
She then explained the various types of corrosion, electrochemical nature of corrosion with relevant chemical equations.

She then highlighted the various factors influencing corrosion, which includes

- Solution pH
- Oxidizing agent
- Temperature
- Velocity
- Surface films

Further, she discussed about various types of corrosion in detail and their prevention and control measures. To list a few, Galvanic corrosion, Dealloying / selective leaching, Graphite corrosion, Localized corrosion, Pitting corrosion, Crevice corrosion, Filiform corrosion, Erosion corrosion, Cavitation corrosion, microbiologically induced corrosion, High temperature corrosion etc.,
Later, she concluded the presentation with various measures to control corrosion, which includes

- Selection of proper material
- Proper design of equipment
- Altering environment
- Cathodic protection
- Sacrificial anode method
- Anodic protection

DAY 1 – SESSION 2

TOPIC: Basics of Electrochemistry, Testing & Monitoring

Dr. S. Rangarajan gave a lecture on the topic "Basics of Electrochemistry, Corrosion Testing and Monitoring". He had begun the presentation with the basics of electrochemistry which gave an adequate input on metal/solution and solution/solution interfaces. He then discussed the electrode potential measurement along with Electromotive Series of metals, Effect of concentration on electrode potentials: The Nernst equation for better understanding. He stated Faraday's first and second law of electrolysis.

He explained the various corrosion testing techniques with many illustrations.In LPR method, the two electrode and three electrode system were discussed. LPR method is very quick, direct reading and recording of corrosion rate is possible. But it can only be used to liquids that conduct electricity.

He then talked about Tafel Extrapolation method and its limitations. He introduced Electrochemical Impedance Spectroscopy which uses sinusoidal voltage and current perturbations to study electrode processes at equilibrium conditions by understanding electrochemical relaxation phenomena with varying orders of magnitude of frequency from 10^{-4} Hz to 80 MHz.

Further he described the electrochemical noise analysis and its application in Pit inhibition, SCC crack propagation, MIC in buried pipelines, inhibitor evaluation, weld corrosion, biocide efficacy etc.

He then talked about the mostly widely used method for measuring material loss occurring in the interior of plant and pipelines which is Electrical Resistance Monitoring where it utilizes an ER probe comprises of a sensing element, as a loop material made from wire or strip which is used to conduct an electrical signal.

Later, he concluded the session by suggesting books for future references. Few books he cited are list below:

- Mars G. Fontana, "Corrosion Engineering", third edition, Mc Graw hill Inc.,1987
- ASM handbook – Vol 13: Corrosion, ASM International,2001

DAY 1 – SESSION 3

TOPIC: Advanced Electrochemical Techniques

Dr. S. Ningshen, started the session with his lecture on the topic "Advanced Electrochemical Techniques for Corrosion Monitoring". He emphasized on the significance of corrosion monitoring techniques in combating corrosion, which can have major economic and safety implications. He discussed the statistics of global cost of corrosion which is estimated to be US$2.5 trillion which could be minimized by 15 to 35% of the cost of corrosion if available corrosion control practices are utilized

properly. He addressed some of the infamous corrosion catastrophes like Aloha Airlines Flight-243 incident, Silver bridge collapse, Erika sinking etc., which should be known to avoid in future with proper corrosion monitoring.

He stated that corrosion monitoring is the practice of acquiring information on the progress of corrosion-induced damage to material. He also highlighted the several other benefits of corrosion monitoring techniques like

- To inspect and predict the corrosion damage level of structures
- To obtain information on the state of equipment by providing an early detection to the damaging process.
- To improve operational reliability of new and/or modified plants andprocesses.

Further he discussed the corrosion testing methods which was classified into three major types. They are: 1.Laboratory tests, 2. Field tests 3. Service tests.

He then discussed the Standard of corrosion testing methods and their types like ASTM, NACE, SSPC, API, AWS, SO etc., for corrosion testing. He gave a detailed talk on Electrochemical noise (ECN) for corrosion monitoring, Field corrosion detection of nuclear materials using ECN, EN-based corrosion monitoring system, their advantages and disadvantages.

Lastly, he gave inputs on future developments, such as wireless, intelligent and automatic electrochemical measurement, that will augment the present electrochemical methods of evaluating corrosion degradation.

DAY 1 – SESSION 4 (Post Lunch)

Hands on Training – Chemistry and Civil Engg. Department Laboratories

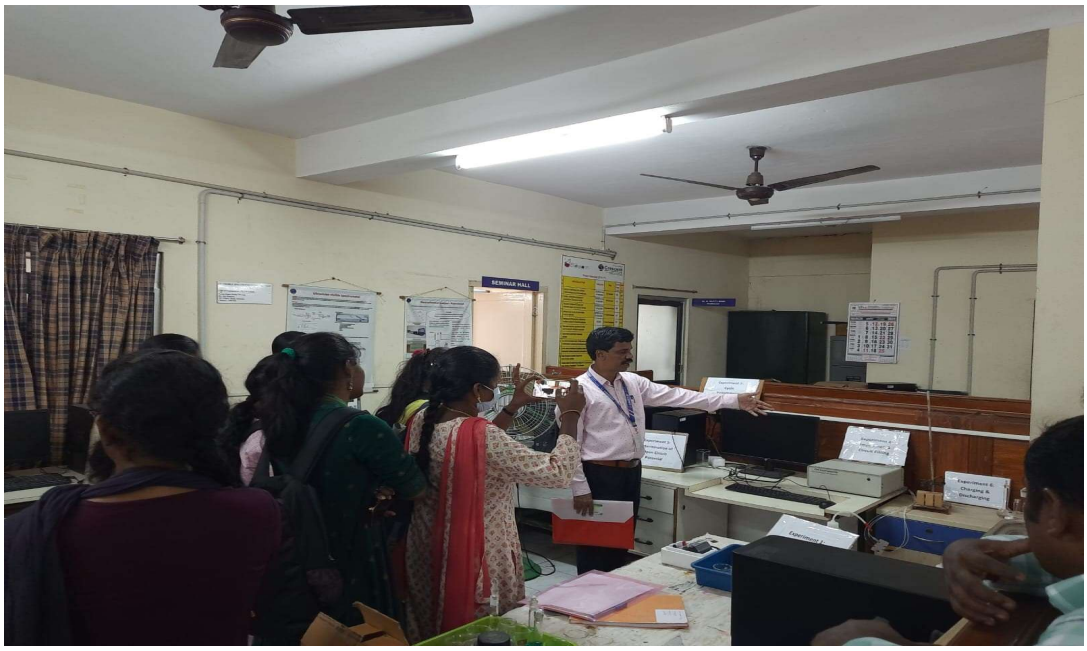

Figure 5: Hands on Training on Electrochemical corrosiontechniques at Chemistry lab, BSACIST

DAY 2 – SESSION 1

TOPIC: Cathodic Protection: Galvanization vs Sacrificial Anodes

Dr. M.S. Haji Sheik Mohammed presented on the topic "Cathodic Protection: Galvanization Vs Sacrificial Anode". He started the lecture with the various infrastructure developments in India and the budget allocated by the Government of India. He emphasized the balanced approach needed to enhance the durability and service of buildings. The major consequences of corrosionlike reduction in original diameter, cracking, rust stains were also discussed. He discussed the major causes and types of corrosion in concrete structures which includes carbonation-induced corrosion, chloride-induced corrosion.

He then explained about the Galvanized steel rebars and its mechanism of corrosion resistance. The two manufacturing procedures are Hot Dip Galvanization and Continuous Galvanization. The advantages of galvanized rebars are

- Uniform thickness
- Sacrificial protection to steel
- Bond strength development

Further he highlighted various performance evaluation tests like Chemical resistance test, applied voltage test, Open circuit potential test and so on indetail.

He introduced the Sacrificial Anode Cathodic Protection with its advantages and disadvantages. Anode galvanically protects surrounding rebar. He talked about the performance of SACP system against stimulated marine exposurewith its experimental procedure. Later he has mentioned various research findings on galvanized rebars like

- Excellent chemical resistance in 3M $CaCl_2$, Sat.Ca $(OH)_2$ and distilled water medium.
- Impact & adhesion test results satisfy the codal requirements

Finally, he concluded with some inputs on major constraints in the application of SACP system.

DAY 2 – SESSION 2

TOPIC: Corrosion inhibitors and its application

Dr. S. Kutti Rani started the presentation with the quote of Ratan Tata which was stated as, “None can destroy iron but its own rust can. Likewise, none can destroy a person but his own mindset can”. She presented on the topic “Corrosion inhibitors and its application”. She discussed about the basics of corrosion and the factors influencing corrosion. She also discussed some facts about corrosion like

- Corrosion is a natural process
- It is the reverse of metal extraction
- It is an electrochemical process

She highlighted the economic impact of corrosion in India. According to National Association of Corrosion Engineers (NACE), the annual loss of corrosion is estimated to be 3 to 5 % of GDP.

She explained about the inhibitors and their role in corrosion control. Inhibitoris a substance which effectively decreases the corrosion rate of a metal when added in small amount to the corrosive environment. Different types of inhibitors are: Anodic inhibitors, cathodic inhibitors, Inorganic inhibitors and Organic inhibitors.

She spoke about the criteria for inhibitor selection where the solubility of the inhibitor in water or alcohol is an important factor. The solvent in which the inhibitor is applied should be expensive, non-toxic and non-hazardous. Among the alternative corrosion inhibitors, organic products containing one or more polar functions (with N,O and S atoms) have shown to be quite efficient to prevent corrosion, as well as heterocyclic compounds containing polar groups and pi-electrons.

Finally, she discussed about the application of nanomaterial in corrosion protection inhibitors and coatings. The difference between nano-coating and conventional coating were also discussed. The extract of naturally occurring substances such as seeds, peels, fruits of some plants proved a good inhibition efficiency for metal corrosion in various media.

DAY 2 – SESSION 3

TOPIC: Electronically conductive coatings for corrosion protection

The presentation on “Electronically conductive coatings for corrosion protection” was given by **Mr. Raman Vedarajan** which gave a wide understanding on polymer electrolyte membrane fuel-cells. He started the presentation with the input of various centres at ARCI which work on coatings like Centre for Carbon Materials (CCM), Centre for Nanomaterials (CNM),and Centre for Solar Energy Materials (CSEM) and so on.

He then highlighted the key applications requiring conductive protection like artificial skin, solar cell, supercapacitor, drug delivery and battery. He gave a detailed lecture on Polymer Electrolyte Membrane Fuel Cell, its component, functions, design and manufacture. For full market implementation of PEM fuel cells to become a reality, two main limiting technical issues must be overcome – cost and durability. Further, he discussed the electrochemical corrosion of carbon in PEMFC and its limitations. He explained about the bipolar plate durability and challenges and conductive coatings on metallic bipolar plate.

He then talked about carbon coatings which is a suitable surface modification process that have been tried. In amorphous carbon coating, the composite coating is stable, corrosion resistant and adherent under both cathodic and anodic environments of the fuel cell.

He then mentioned about the oxynitrides which are of special interest in energy conversion and storage techniques. CrON an electrocatalyst for OER reaction.He illustrated the experimental setup of oxynitrides with relevant chemical equations.

He concluded the lecture with the inputs of current project work of Chromium nitride and titanium nitride utilized coatings.

DAY 2 – SESSION 4

TOPIC: Electronically conductive coatings for corrosion protection

The final lecture was delivered by **Dr. S. Ramanathan** on the topic "Electrochemical Impedance Spectroscopy – An Introduction". He started the presentation by discussing the basics of electrochemistry which included the components of Electrode Electrolyte Interface with pictorial representation.

He then highlighted the Electrochemical Techniques like

- DC – Potential, Current, Time
    - Linear Polarization
    - Chrono amperometry, Chrono potentiometry
    - Cyclic voltammetry
- AC Technique
    - Impedance Spectroscopy
    - AC Voltammetry

He gave a detailed lecture on Electrochemical Impedance Spectroscopy about its principle, components, working and impedance calculation. He thenmentioned about data acquisition in EIS, its instrumentation in particular about their frequency range.

Further Dr. S. Ramanathan, explained about data representation using anexample circuit and its graphical representation and gave few more inputs ondata analysis. The important parameter in corrosion is Polarization Resistance (R_P) which influences the low frequency limit of faradaic impedance.

He talked about the pitfalls of EIS – Data analysis. Some of the pitfalls are:

- If time constants are close to each other, we cannot distinguish them easily.
- A circuit fitting program can be used – A circuit with one time constant willnot fit the data. We will need two-time constants to model the data.

He then discussed the pros and cons of EEC. He concluded the presentation stating that EIS alone is not sufficient to identify the process. It can help eliminate some possibilities and narrow down the choices. To obtain clear insights, often we need to analyse in combination with other techniques (XPS, Potentiodynamic polarization)

DAY 2 – Post Lunch

Hands on Training – Chemistry and Civil Engg. Department Laboratories

Figure 6: Hands on Training on Electrochemical corrosiontechniques at CMTL lab, BSACIST

Figure 7: Valedictory Function

Dr. M.S. Haji Sheik Mohammed

Dean, School of Infrastructure

Annexure

Brochure of the program

Important Dates

Submission of Application: 06th March 2023
Intimation of Acceptance : 08th March 2023
Workshop : 17th and 18th March 2023

Venue

Seminar Hall, Convention Centre,
B.S. Abdur Rahman Crescent Institute of Science and Technology, Chennai.

Registration Fees

Students/Research Scholars	: Rs. 750
Faculty from Institutions	: Rs. 1,500
Delegates from Industries	: Rs. 2,500

Registration link

https://forms.gle/J5XDc5ZfGTugN7e96

OR

(Crossed Demand Draft in favour of "Dept of Civil Engineering, B.S. Abdur Rahman Crescent Institute of Science & Technology" payable at Chennai-48)

For NEFT Transfer:

Name of a/c Holder : Dept of Civil Engineering, B.S. Abdur Rahman Crescent Institute of Science & Technology
Account No. : 165701000019251
Nature of Account : Savings Account
Bank Name & Branch : Indian Overseas Bank, Vandalur
IFSC Code : IOB0001657
MICR Code : 600020102

PATRONS

Dr. T. Murugesan, Pro Vice-Chancellor
Dr. N. Raja Hussain, Registrar

CONVENERS

Dr. M.S. Haji Sheik Mohammed, Dean, School of Infrastructure
Dr. I. Raja Mohamed, Dean, SPCS

CO-CONVENER

Dr. N. Hajara Beevi, Head, Department of Chemistry

ADVISORY COMMITTEE

Dr. U. Kamachi Mudali, Former Chairman & Chief Executive of Heavy Water Board, Govt. of India & Advisor, NIGIS-SZ
Dr. Radhakrishna G. Pillai, Professor, Department of Civil Engineering, IIT Madras
Dr. N. Rajendran, Professor & Head, Department of Chemistry, Anna University

Address for Correspondence:

COORDINATORS

Dr. N. S. Shafeer Ahamed, Assistant Professor, Department of Civil Engineering
Dr. N. Vasimalai, Assistant Professor (Sl. Gr.), Department of Chemistry

B.S. Abdur Rahman Crescent Institute of Science and Technology, Vandalur, Chennai-600048.

Contact Details:

vasimalai@crescent.education / 9884871402
shafeer@crescent.education / 9952196629

B.S. Abdur Rahman Crescent Institute of Science & Technology

2nd Two Day Workshop on Electrochemical Corrosion Techniques: Theory and Hands on Training

(17th & 18th March, 2023)

Jointly Organised by

Department of Civil Engineering & Department of Chemistry

B.S. Abdur Rahman Crescent Institute of Science and Technology, Chennai - 48

AMPP India Section
NACE GATEWAY INDIA SECTION NIGIS South Zone

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About the Institution

B.S. Abdur Rahman Crescent Institute of Science and Technology, (deemed to be University), Vandalur, Chennai-48, formerly acclaimed as B.S. Abdur Rahman Crescent Engineering College, blossomed into a premier institution for higher education and research in the year 2009. Being an anchor institution in Chennai, it has attracted many students nationwide. The University was accredited with grade 'A+' by NAAC. The University envisages upholding excellence in its entire three dimensional focal areas namely Education, Research and Consultancy. Most of the UG and PG programmes have been accredited by NBA. More than 580 scholars are pursuing Ph.D./ M.S. programme in this Institution. Recently started the UGC entitled & AICTE approved MBA/MCA programmes (online & open distance Programmes). The Quality Management System of the college conforms to the ISO standards and certified accordingly by the Det Norske Veritas (DNV), Netherland.

About the Department of Civil Engineering

The Department of Civil Engineering started in 1984 is one of the Oldest departments of this Institute. The department offers B.Tech. in Civil Engineering, M.Tech. in Structural Engineering and M.Tech in Construction Engineering & Project Management. Also offers Ph.D. in various disciplines of Civil Engineering. The department gives emphasis on 'quality and skill based education', 'application-oriented research' (through network with eminent academic institutions and research laboratories) for the holistic development of students. The department also offers testing & consultancy services to government, semi-govt., and private sectors.

About the Department of Chemistry

The Department of Chemistry emerged as a full-fledged Department in 2009 to offer programs leading to M.Sc. and Ph.D. (part time and full time) degrees. The Department has 18 faculty members with Ph.D. qualification. Faculty members are having expertise in contemporary research areas such as the development of solar and dye sensitized solar cells, wastewater treatment, photocatalysis, synthesis of catalytic, semi-conducting, nano and polymeric materials for various applications and synthesis of novel organic compounds for pharmacological applications. The department is well-equipped with several sophisticated instruments.

About AMPP

The Association for Materials Protection and Performance (AMPP), is a global community of professionals dedicated to materials protection through the advancement of corrosion control and protective coatings. AMPP has accomplished its eminence by increasing its membership and provides members with the knowledge and resources to ensure high performance materials are used to build and maintain sustainable infrastructure. AMPP protects infrastructure and assets worldwide through member and workforce education and credentialing, company accreditation, technological innovation, and global standardization.

About the Workshop

The workshop provides an opportunity to seek knowledge on the latest advancement in electrochemical corrosion and its control techniques in fields of science and technology. This workshop is intended as an introduction to the use of electrochemical techniques in corrosion applications.

Emphasis is placed on the use of modern instruments to acquire pertinent data. This will provide an insight knowledge on practical aspects of corrosion. Participants will have the opportunity to acquire state-of-the-art instruments in laboratory sessions designed to complement the lecture sessions. Techniques for proper interpretation of data for use in corrosion prediction, prevention and monitoring will also be emphasized.

The two-day workshop is aimed to train the postgraduate students, research scholars, faculty of arts & science and engineering colleges, and industry personnel in electrochemical analytical equipments.

Who can Participate

Post Graduate Students / Research Scholars / Faculty members of Chemistry, Civil Engineering, Mechanical Engineering and Metallurgy streams and Industry Personnel.

LECTURE TOPICS

Advanced Electrochemical Techniques
Dr. S. Ningshen
Head, CSTD & CEPS, IGCAR, Kalpakkam

Advanced Techniques of Monitoring -Electrochemical Impedance Spectroscopy
Dr. S. Ramanathan
Professor, Department of Chemical Engineering, IIT Madras

Basics of Corrosion and its Forms
Dr. A. Poonguzhali
Scientific Officer-F, CSTD, IGCAR, Kalpakkam

Coatings for Corrosion Protection
Dr. N. Rajendran
Professor and Head, Department of Chemistry, Anna University

Basics of Electrochemistry, Testing & Monitoring
Dr. S. Rangarajan
Former Head, Water & Steam Chemistry Division, BRCF, Kalpakkam

Cathodic Protection: Galvanization vs Sacrificial Anodes
Dr. M.S. Haji Sheik Mohammed
Professor, Department of Civil Engineering, BSACIST

Corrosion Inhibitors and its applications
Dr. S. Kutti Rani
Professor, Department of Chemistry, BSACIST

Hands on Training on Basic Tests & Advanced Techniques

17.3.2023 (AN)	18.3.2023 (AN)
Dr. N. Vasimalai, Asst. Prof. (Sl.Gr), Dept. of Chemistry, BSACIST & Research Scholars of Anna University, Chennai and BSACIST.	Dr. N. S. Shafeer Ahamed, Asst. Prof., Dept. of Civil Engg., BSACIST & Research Scholars of IIT Madras and BSACIST.

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Department of Civil Engineering
&
Department of Chemistry

Inauguration of 2nd Two Day Workshop on

Electrochemical Corrosion Techniques: Theory and Hands on Training

March 17, 2023 - 09.15 a.m. *Venue: Seminar Hall - 1, Convention Centre*

09:15 to 09:20 a.m.	Quirath	**Mr. Mohammed Ibrahim** *Final Year, B.Tech. Civil Engineering.*
09:20 to 09:25 a.m.	Tamizhthai Vazhthu	
09:25 to 09:30 a.m.	Welcome Address	**Dr. M.S. Haji Sheik Mohammed** *Dean, School of Infrastructure* *BSACIST*
09:30 to 09:40 a.m.	Felicitation	**Dr. I. Raja Mohammed** *Dean, School of Physical and Chemical Sciences*
09:40 to 10:10 a.m.	Address by Chief Guest	**Dr. M. Joseph** *Former Director* *Material Chemistry & Metal Fuel Cycle,* *IGCAR, Kalpakkam.*
10:10 to 10:15 a.m.	Vote of Thanks	**Dr. N. Hajara Beevi** *Head, Department of Chemistry.*

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Department of Civil Engineering
&
Department of Chemistry

Cordially invites you for the Inauguration of
2nd Two Day Workshop on

Electrochemical Corrosion Techniques: Theory and Hands on Training

On 17th March 2023, at 9.15 a.m.
Venue: Seminar Hall I - Convention Centre

Dr. M. Joseph

Former Director, Materials Chemistry & Metal Fuel Cycle
Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam.

has kindly consented to be the chief guest and deliver the inaugural address

Co-ordinators

Dr. N. Vasimalai
Assistant Professor (Sl. Gr)
Department of Chemistry

Dr. N. S. Shafeer Ahamed
Assistant Professor,
Department of Civil Engineering

Co-Convener

Dr. N. Hajara Beevi
Professor & Head,
Department of Chemistry

Conveners

Dr. I. Raja Mohammed
Dean, School of Physical and Chemical Sciences

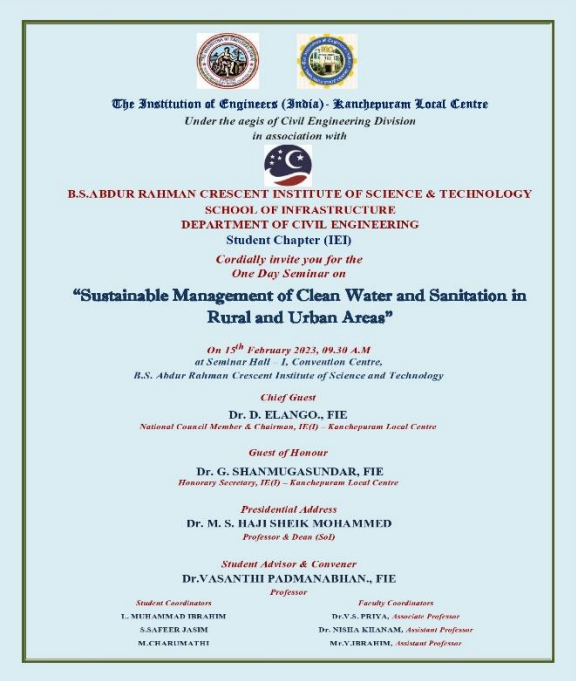
Dr. M. S. Haji Sheik Mohammed
Dean, School of Infrastructure

Supported by : Metrohm India Private Ltd.

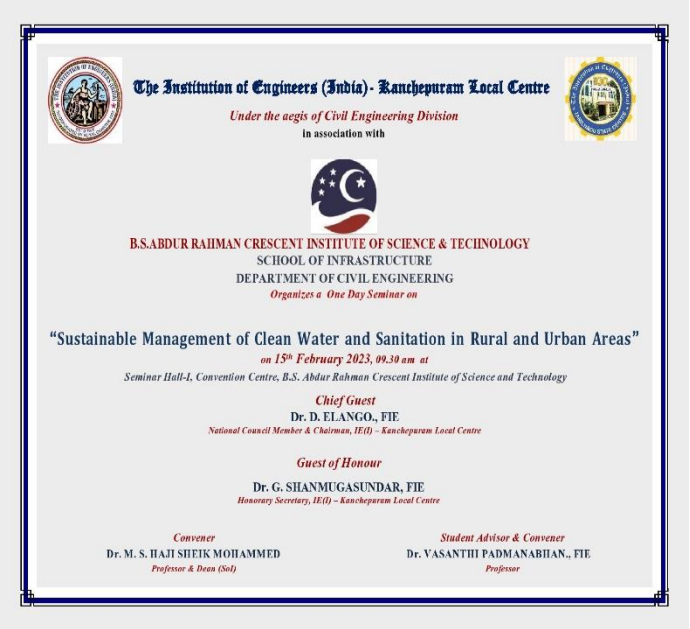
REPORT ON ONE DAY SEMINAR ON SUSTAINABLE MANAGEMENT OF CLEAN WATER & SANITATION IN RURAL AND URBAN AREAS

Name of Centre / Overseas Chapter:	**Kancheepuram Local Centre**

Title of Activity:	**One Day Seminar on Sustainable Management of Clean Water & Sanitation in Rural and Urban Areas**		
Date:	**15-02-2023**	Venue:	**B. S. Abdur Rahman Crescent Institute of Science & Technology, Vandalur, Chennai-600 048.**



Invitation for One Day Seminar on Sustainable Management of Clean Water & Sanitation in Rural and Urban Areas



Banner for One Day Seminar on Sustainable Management of Clean Water & Sanitation in Rural and Urban Areas

Thamizh Thai Vaazthu by Mr.Safeer Jasim, Join Secretary IE(I)

Welcome address by Dr.Vasanthi Padmanabhan, Professor & Student Advisor IE(I)

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<tr><td>Presidential Address by Dr.M.S.Haji Sheik Mohammed, Professor & Dean (School of Infrastructure)</td><td>Chief Guest Introduction by Mr.Muhammad Ibrahim IV year, General Secretary, IE(I)</td></tr>
<tr><td colspan="2"> 
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<tr><td colspan="2">Honouring the Chief Guest by Dr.M.S.Haji Sheik Mohammed, Professor & Dean (School of Infrastructure) and Dr.Vasanthi Padmanabhan, Professor & Student advisor</td></tr>
</table>

Inaugural Address and Keynote Lecture by Dr.D.Elango, FIE
National Council Member & Chairman IE(I)-Kanchepuram Local Centre on the topic "Water Quality and Treatment facilities forUrban and Rural areas"

Guest lecture by Dr.T.Selvakumar
Retd.Engineer (CMWSSB) and Research Consultant on the topic
"Urban Water Supply & Sanitation in Rural & Urban Areas in India"

Guest lecture by Dr. Suneethi Sundar Research Scientist, Water & Effluent Treatment IC, L&T Construction on the topic
"Faecal Sludge and Septage Management in Rural and Urban areas"

	
Guest Lecture by Dr.V.S.Priya Associate Professor, Civil Engineering, BSACIST, on the topic “Urban Sanitation in India: Opportunities and challenges”	Vote of Thanks by Mr.Safeer Jasim(III Year) Joint Secretary IE(I)

Report of Engineer's Day

Brief details about the programme:

One day Seminar on **"Sustainable Management of Clean Water & Sanitation in Rural and Urban Areas"** sponsored by the Institution of Engineers (India) and was organized by the Institution of Engineers (India), Kanchepuram Local Centre in association with the Department of Civil Engineering, School of Infrastructure, B.S.Abdur Rahman Crescent Institute of Science & Technology held on 15th February,2023. Dr.Vasanthi Padmanabhan, Professor & Student Advisor IE(I) School of Infrastructure, B.S.Abdur Rahman Crescent Institute of Science & Technology welcomed the chief guest Dr.D.Elango, FIE,National Council Member & Chairman IE(I)-Kanchepuram Local Centre and the audience. Dr.M.S.Haji Sheik Mohammed, Professor & Dean, School of Infrastructure, B.S.Abdur Rahman Crescent Institute of Science & Technology gave presidential address to the gathering. He insisted that there is a lot of opportunities in the field of Civil Engineering, and also stated about the importance of water and the sanitation both in urban and rural areas.

Dr.D.Elango, FIE,National Council Member & Chairman IE(I)-Kanchepuram Local Centre inaugurated and delivered the keynote address. He stated that the Institution of Engineers (India) is the National organization of engineering professionals in India. It is the largest multi-disciplinary engineering professional society. He insisted everyone to become member of IEI and encouraged the students to apply for the project proposal for which the fundings are given inorder to motivate the students. The response of the participants was astounding and their spirit last until last session.

Universal access to both water and sanitation still remains an issue in India. 40% of the Indian households do not have access to public piped water supply. Water quality is also major aspect of concern. At the city level, another major problem is the high distribution losses of water. Likewise, only one third of the only 15% of the wastewater is treated. The environmental concerns posed by urban sanitation and clean water supply are two-fold. There is inadequate attention paid to protection of water sources, and there are hardly any efforts to move towards conjoint management of water and sanitation. Some of the key challenges in this include lack of awareness on sanitation, lack of integrated city-wide approach, limited technology choices and lack of knowledge and skill levels related to both technical and managerial aspects. This seminar will serve as a comprehensive programme to introduce the thrust areas and opportunities that need to be focused on in urban and rural areas with respect to water supply, water management, wastewater treatment, individual faecal sludge management and collective urban sanitation.

PROGRAMME SCHEDULE

09.30	**QIRATH**	**Mr. L. MUHAMMAD IBRAHIM** **IV Year**
09.33	**STATE SONG**	**Thamizh Thai Vazhthu**
09.35	**WELCOME ADDRESS**	**Dr.VASANTHI PADMANABHAN., FIE** **Professor**
09.40	**PRESIDENTIAL ADDRESS**	**Dr. M.S. HAJI SHEIK MOHAMMED** **Professor & Dean (SOI)**
09.45	**INAUGURAL ADDRESS BY CHIEF GUEST**	**Dr. D. ELANGO., FIE** ***National Council Member & Chairman, IE(I) – Kanchepuram Local Centre***
09.50	**SPECIAL ADDRESS BY GUEST OF HONOUR**	**Dr. G. SHANMUGASUNDAR, FIE** ***Honorary* Secretary, *IE(I) – Kanchepuram Local Centre***
10.00	**GUEST LECTURE - I** **Water Quality and Treatment facilities for Urban and Rural areas**	**Dr. D. ELANGO., FIE** ***National Council Member & Chairman, IE(I) – Kanchepuram Local Centre***
10.45	**TEA BREAK**	
11.00	**GUEST LECTURE - II** **Urban Water Supply & Sanitation in Rural & Urban Areas in India**	**Dr.T.SELVA KUMAR** ***Retd.Engineer (CMWSSB) and Research Consultant***
12.00	**GUEST LECTURE - III** **Faecal Sludge and Septage Management in Rural and Urban areas**	**Dr. SUNEETHI SUNDAR** ***Research Scientist, Water & Effluent Treatment IC, L&T Construction***
01.00	**LUNCH BREAK**	
02.30	**GUEST LECTURE - IV** **Urban Sanitation in India: Opportunities andchallenges**	**Dr.V.S.PRIYA** ***Associate Professor, Civil Engineering, BSACIST***
03.30	**VOTE OF THANKS**	**Mr.SAFEER JASIM** **Joint Secretary, III Year**
03.40	**NATIONAL ANTHEM**	**Third Year Students**

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SCHOOL OF INFRASTRUCTURE

DEPARTMENT OF CIVIL ENGINEERING

Ref. : 482A/Dean(SoI)/0623 **Date : 03.07.2023**

REPORT ON TWO DAY ALL INDIA SEMINAR ON RECENT ADVANCEMENTS IN GROUND IMPROVEMENT TECHNIQUES FOR PROBLEMATIC SOIL

ORGANISED IN ASSOCIATION WITH INSTITUTION OF ENGINEERS, KANCHEEPURAM LOCAL CENTRE

Date: **23-05-2023 & 24-05-2023**

Two day national Seminar on "Recent Advancements in Ground Improvement Techniques for Problematic Soil" sponsored by the Institution of Engineers (India) was organized by the Department of Civil Engineering, School of Infrastructure in association with Kanchepuram Local Centre during on 23rd May 2023 and 24th May 2023.

Dr. D. Elango, FIE, National Council Member & Chairman IE(I)-Kanchepuram Local Centre welcomed the Chief Guest Dr. C. Sivathanupillai, Former Chief Engineer (Civil), Associate Director, CEG, IGCAR, Kalpakkam, and the audience. He stated that the Institution of Engineers (India) is the National organization of engineering professionals in India. It is the largest multi-disciplinary engineering professional society. Dr.M.S.Haji Sheik Mohammed, Professor & Dean, School of Infrastructure, B.S. Abdur Rahman Crescent Institute of Science & Technology delivered presidential address. He insisted that there is a lot of opportunities in the field of Civil Engineering, and also stated about the importance of geotechnical engineering. Dr. C. Sivathanupillai, Former Chief Engineer (Civil), Associate Director, CEG, IGCAR, Kalpakkam inaugurated and delivered the keynote address. Dr. P. Vasanthi, Professor & Student Advisor IE(I)

School of Infrastructure, B.S. Abdur Rahman Crescent Institute of Science & Technology explained about the overview of two days seminar and topics covered in each session.

ABOUT THE SEMINAR

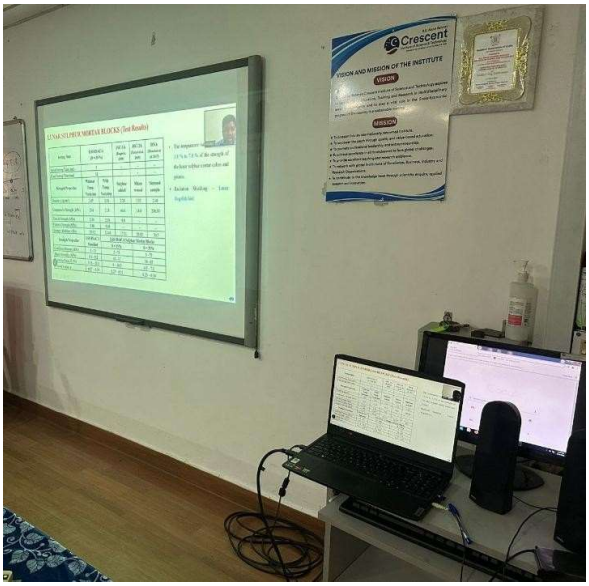
The ground improvement techniques play a vital role in ensuring the stability and suitability of soil for construction purposes. The need for ground improvement techniques arises from various factors, including unstable soil conditions, risk of liquefaction, high water table, flood-prone areas, and soft soil. The objectives of ground improvement techniques are to increase the load-bearing capacity, reduce the risk of settlements and soil failure, reduce the risk of liquefaction, reduce the risk of flooding, and protect against erosion and landslide. Ground improvement techniques are often necessary in areas where the soil is either too weak, too soft, or has poor load-bearing capacity to support the weight of a building. This seminar served as a comprehensive programme to learn about new innovative techniques available for improvement of problematic soil.

PROGRAMME SCHEDULE

DAY 1 – May 23, 2023 (Tuesday)		
Time	**Topic**	**Speaker**
09.30 a.m.	QIRATH	Mr. L. MUHAMMAD IBRAHIM (IV Year) General Secretary, IE(I) Student Chapter
09.33 a.m.	STATE SONG	Thamizh Thai Vazhthu
09.35 a.m.	WELCOME ADDRESS & PRESIDENTIAL ADDRESS	Dr. D. ELANGO., FIE National Council Member & Chairman, IE(I) –Kancheepuram Local Centre
09.50 a.m.	FELICITATION	Dr. N. RAJA HUSSAIN *Registrar*
09.55 a.m	RELEASE OF SOUVENIOR	Dr. C. SIVATHANUPILLAI, B.E (Civil), M.E (Structure),M.S (Civil), Ph.D (Civil) Former Chief Engineer (Civil), Associate Director,CEG, IGCAR, Kalpakkam.
10.00 a.m.	INAUGURAL ADDRESS	Dr. C. SIVATHANUPILLAI, B.E (Civil), M.E (Structure),M.S (Civil), Ph.D (Civil)Former Chief Engineer (Civil), Associate Director, CEG, IGCAR, Kalpakkam.
10.15 a.m	VOTE OF THANKS	Dr. VASANTHI PADMANABHAN, FIE Professor

10.30 to 11:30 a.m	Geosynthetics for Sustainable InfrastructureDevelopments	Dr. P.T. RAVICHANDRAN, Professor & Head, S.R.M University, Chennai.
11:30 to 11:45 a.m	Tea Break	
11:45 to 12:45 p.m	Ground Improvement using GeosyntheticsEncased Stone Columns - Online	Dr. MOHAMMED SHAKEEL ABID, Assistant Professor, Kakatiya Institute of Technologyand Science, Warangal
12:45 to 01:45 p.m	Lunch Break	
01:45 to 02:45p.m	Innovative Materials For Stabilization ofProblematic Soil	Dr. SIVAPRIYA S.V, Associate Professor, S.S.N College of Engineering, Chennai.
02:45 to 03:00 p.m	Tea Break	
03:00 to 4:00 p.m	Soil Stabilization Techniques and Geotechnical Applications.	Dr. S. BHUVANESHWARI, Assistant Professor, CEG Campus, Anna University, Chennai.
DAY 2 – May 24, 2023 (Wednesday)		
Time	Topic	Speaker
09:30 to 11:00 a.m	Emerging Trends in Sustainable Foundation Technologies for Complex Ground Conditions	Er. MADAN KUMAR, Head of Engineering,Keller India, Chennai.
11:00 to 11:15 a.m	Tea-break	
11:15 to 12:30 p.m	Recent Soil Improvement Techniques	Dr. V. BALAKUMAR, Senior Consultant,Simplex Infrastructure Limited, Chennai.
12:30 to 01:30 p.m	Lunch Break	
01:30 to 02:30 p.m	Advanced Techniques in Soil Improvementand Reinforcement	Er. M. KUMARAN, Head - Engg & Tech,L&T Geo Structure, Chennai.
02:30 to 03:30 p.m	Lunar Soil Improvement Techniques forLunar Structures - Online	Dr. T. PRABU, Post-Doctoral Associate,Newyork University, Abu dhabi.
03:30 to 03.45 p.m	Tea break	
03.45 to 04.00 p.m	Valedictory Function (Certificate Distribution)	

	
Inaugural address by **Dr. C. Sivathanu Pillai,** Former Chief Engineer (Civil), Associate Director, IGCAR, Kalpakkam.	Lecture by **Dr. P.T. Ravichandran**, Professor & Head, S.R.M University, Chennai. On the topic “Geosynthetics for SustainableInfrastructure Developments”
	
Lecture by **Dr. Sivapriya S.V** Associate Professor, S.S.N College of Engineering,Chennai, on the topic “Innovative Materials For Stabilization of Problematic Soil”	Lecture by **Dr. S. Bhuvaneshwari,** Associate Professor, CEG Campus, Anna University,Chennai, on the topic “Soil Stabilization Techniques and Geotechnical Applications”

	
Lecture by **Er. Madan Kumar**, Head of Engineering, Keller India, Chennai, on the topic“Emerging Trends in Sustainable Foundation Technologies for Complex Ground Conditions”	Lecture by **Dr. V. Balakumar**, Senior Consultant, Simplex Infrastructure Limited, Chennai. on the topic “Recent Soil ImprovementTechniques”
	
Lecture by **Er. M. Kumaran**, Head - Engg & Tech, L&T Geo Structure, Chennai,on the topic “Advanced Techniques in Soil Improvement and Reinforcement”	Lecture by **Dr. T. Prabu**, Post-Doctoral Associate, Newyork University, Abu dhabi, on thetopic “Lunar Soil Improvement Techniques for Lunar Structures” through online

Participants of Two Day All India Seminar on Recent Advancements in Ground ImprovementTechniques for Problematic Soil

BRIEF DESCRIPTION ABOUT LECTURES DELIVERED

TOPIC: GEOSYNTHETICS FOR SUSTAINABLE INFRASTRUCTURE DEVELOPMENTS

Day –I (Date: 23.05.2023, Time: 10.30 a.m to 11:30 a.m)

Presented by :Dr. P.T.Ravichandran,Professor & Head, S.R.M University,Chennai.

The talk covered, geosynthetics which are synthetic materials that are used in various civil engineering and environmental applications to improve the performance and durability of soil, rock, and other geotechnical materials. These materials are typically made from polymers such as polyethylene, polypropylene, or polyester. Geosynthetics can be categorized into several types based on their functions:

Geotextiles: These are permeable fabrics made of synthetic fibers. They are used to separate, filter, reinforce, and protect soil or other materials. Geotextiles are commonly used in road construction, erosion control, drainage systems, and landfill liners.

Geogrids: Geogrids are rigid or flexible mesh-like materials made of polymer or fiberglass. They provide tensile reinforcement and improve soil stability. Geogrids are often used in retaining walls, embankments, and soil reinforcement applications.

Geomembranes: These are impermeable sheets or liners made of flexible

synthetic materials. They are used to prevent the seepage of liquids, gases, or contaminants. Geomembranes are commonly employed in landfill liners, wastewater treatment plants, and containment ponds.

Geocells: Geocells are three-dimensional honeycomb-like structures made of plastic. They are used to confine and stabilize soil or aggregate materials. Geocells find applications in slope stabilization, load support, and erosion control.

Geosynthetic clay liners (GCLs): GCLs are composite materials that consist of bentonite clay sandwiched between geotextiles or geomembranes. They provide both hydraulic barrier properties and reinforcement. GCLs are often used in landfill caps, canals, and secondary containment systems. The use of geosynthetics offers several advantages, including improved soil stability, increased load-bearing capacity, enhanced drainage, reduced erosion, and environmental protection. These materials provide cost-effective solutions and can significantly extend the service life of geotechnical projects.

TOPIC: GROUND IMPROVEMENT USING GEOSYNTHETICS ENCASED STONE COLUMNS

- ONLINE

Date: 23.05.2023, Time: 11.45 a.m to 12:45 p.m

Presented by: Dr. Mohammed Shakeel Abid, Assistant Professor, Kakatiya Institute of Technology and Science, Warangal

The talk covers, the potential use of a woven polypropylene textile for encapsulating stone columns and improving the performance of a local soft soil in Warangal city of India. A series of axial load tests were performed on stone columns of various diameters and under various encapsulation conditions that include single and double layers and other combinations. Load carrying capacity of stone column increased twice its original capacity when encapsulated with different geofabric materials. Performance enhancement strongly correlated to the tensile strength of encasement material and encapsulation condition. In addition, the influence of lateral thrust on group of stone columns arranged in square and triangular patterns were investigated. Irrespective of the material used, lateral displacement was reduced by half for encased stone columns. Apart from tensile strength of encasing material, the amount of material used for

encasement in the form of additional encasement layer was found to be crucial. The cost of using the polypropylene encasing material is only a third of the commercial geotextiles; however, the performance is inferior to woven geotextiles but far superior to non-woven geotextiles.

The behavior of annulus stone columns in soft clays is significantly influenced by the outer-to-inner diameter ratio. For this reason, a comprehensive experimental investigation program was undertaken in the laboratory on a soft clay from Warangal, India, by varying its water content for achieving different undrained shear strength values and to determine the load-carrying capacity of conventional and annulus stone columns with different outer-to-inner diameter ratios that were double-encapsulated with geotextile. Investigations were also extended to determine the optimum L/D ratio and spacing between the groups of annulus stone columns. Based on these studies, a theoretical framework is developed for interpreting and determining the load-carrying capacity of the stone columns. The studies presented in this paper offer a novel ground improvement technique to enhance the load-carrying capacity of soft soils.

TOPIC: INNOVATIVE MATERIALS FOR STABILIZATION OF PROBLEMATIC SOIL

Date: 23.05.2023, Time: 01.45 p.m to 02:45 p.m

Presented by: Dr. Sivapriya S.V, Associate Professor, Department of Civil Engineering, SSN College ofEngineering, Chennai.

The talk covers the introduction about the types of soil and most problematic soil not suitable for construction. That includes about Collapsible Soil, Expansive Soil and Dispersive Soil. The speaker further discussed about the difference between the conventional chemical soil stabilizer (lime and cement). Addressing the given topic, the speaker spoke about natural waste, industrial waste as a partial replacement material along with conventional material for soil stablization. The natural material discusses are Tamarind Kernel Powder, Eggshell powder/ Eggshell ash (ESA), Sugarcane Bagasse Ash (BA), Rice Husk Ash (RHA), Groundnut shell Ash (GSA) and Straws as reinforcement. The industrial waste includes Fly Ash (FA), Ground granulated Blast Furnace Slag (GGBS), Marble Dust (MD), Copper and Steel Slag, Cement Kiln Dust (CKD), Glass Powder (GP). The function of nano material is also discussed in the session. The material discussed are nano – Alumina and nano- Silica.

TOPIC: SOIL STABILIZATION TECHNIQUES AND GEOTECHNICAL APPLICATIONS.

Date: 23.05.2023, Time: 03.00 p.m to 04:00 p.m

Presented by: Dr. S. Bhuvaneshwari, Assistant Professor, CEG Campus, Anna University, Chennai.

The talk covers, expansive soils are one among the problematic soils which can imbibe large amount of water when it comes in contact with water. This phenomenon causes a large volume increase which manifests as heaving phenomenon and imposes a very high swelling pressure on structures. Besides, on removal of moisture content due to evaporation, the soil shrinks and there is a volume reduction. This behaviour of volume increase and decrease can cause huge damage on light weight structures and pavement surfaces. The most frequent method to counter the behaviour of the expansive soil is to resort to chemical stabilization methods. Over the years, the chemical stabilization methods have been very effective in curtailing the swelling behaviour of the soil. The conventional additives which are efficiently used are lime, cement, flyash and other industrial by-products. These additives, curtail the swelling behaviour and increase the mechanical properties of the amended soil. However, can cause leaching of the heavy metals, impart alkaline environment to the soil and cause corrosion of buried pipelines. An alternative solution could be non-traditional additive such as biopolymers, resins, ionic compounds and agricultural waste. The stabilization mechanism is greatly influenced by the soil type, mineralogy, additive composition, quantity and the interaction between the soil and the additive.

The efficiency of any additive to curtail the swelling mechanism is evaluated through basic index property tests and mechanical property determination. The change in the properties and increase in the strength magnitude can be effective markers of stabilization mechanism. A comparative analysis is made between lime, a conventional additive and lignosulphonate, non- traditional additive through index, engineering and microstructure analysis. The microstructural analysis through analytical techniques such as the X-Ray diffractograms, SEM analysis and BET surface area could depict the changes at the microstructural level of the additive-amended soil. Lime amended soil depicts a typical brittle behaviour and profound increase in strength due to the pozzolanic reaction mechanism and

long-term strength development. However, the non-traditional stabilizer does not depict an equivalent strength development due to the absence of time bound pozzolanic reactions. Thus it has to be understood that for any traditional or non-traditional additive to come into practical application, the understanding of the reaction mechanism with soil is very crucial, in addition to the focus on the magnitude of the improvement of the properties.

TOPIC: EMERGING TRENDS IN SUSTAINABLE FOUNDATION TECHNOLOGIES FORCOMPLEX GROUND CONDITIONS

Day II (Date: 24.05.2023, Time: 09.30 a.m to 11:00 a.m)

Presented by: Er. Madan Kumar, Head of Engineering, Keller India, Chennai.

The talk covers the types of Ground Improvement Densification • Principle: Reduction of voids between particles (coarse grained soils) • Example: VibroCompaction, Blast Densification, Compaction Grouting

1. Reinforcement • Principle: Introduction of reinforcing element to carry the loads • Example: Vibrostone columns, geogrids
2. Consolidation • Principle: Shortening of Drainage Paths + Increase of Effective Stress • Example: PVD
   + Surcharge; Vacuum Consolidation
3. Chemical Modification • Principle: Introduction of Chemical Binder that causes with time • Example: Injection Grouting, Deep Mixing, Jet Grouting
4. Ground Improvement Techniques such as Deep Vibro Techniques can be used to provide Optimal Foundation Solutions • Design & Build expertise with Reliable Soil Investigation data will ensure savings in Cost & Time • International Standard of Practices using latest equipment ensures the successof a project
5. Execution of Specialized Foundation Techniques requires state-of-the-art experience with Operational Excellence and Best Practices • Usage of Native Materials are economical and influential in Carbon Reduction.

TOPIC: RECENT SOIL IMPROVEMENT TECHNIQUES

Date: 24.05.2023, Time: 11.15 a.m to 12:30 p.m

Presented by: Dr. V. Balakumar, Senior Consultant, Simplex Infrastructure Limited, Chennai.

The presentation covers the every structure has got two essential requirements to be satisfied during its lifespan. They are •Serviceability requirement •Ultimate failure conditions

On many occasions the loading on the structure never reaches the ultimate limit state, but the serviceability conditions can get affected. In foundation design the serviceability is governed by the permissible settlement, which is a function of performance requirement. The settlement can be short term and then long term as in the case of compressible deposits, and immediate settlement in the case of cohesion less deposits. More than the total settlement it is the differential settlement, which will create the problem. Hence the foundation design for supporting the structures sensitive for settlement becomes a challenging assignment, particularly when the supporting soil is problematic. Presently there are various methods of ground improvement, the application of which largely depends upon the soil condition, the serviceability requirements and the time frame. In the present, we shall concentrate on drains, stone column sand compaction as they are very popular in our country. We still will have a basic study on the other methods depending on the time. This presentation has made an attempt to provide the audience a glimpse of various ground improvement methods. Still there are few more methods like jet grouting and soon. The design methods adopts one dimensional consolidation theory and earth pressure theory.

TOPIC: ADVANCED TECHNIQUES IN SOIL IMPROVEMENT AND REINFORCEMENT

Date: 24.05.2023, Time: 01.30 p.m to 02:30 p.m

Presented by: Er. M. Kumaran, Head - Engg & Tech, L&T Geo Structure, Chennai.

The talk covers, the deep soil mixing (DSM) is a ground improvement technique that involves mechanically mixing or blending the soil in situ with a binder material to improve its engineering properties. It is commonly used in construction projects to enhance the stability, load-bearing capacity, and stiffness of soft or loose soils. Geostructural elements, also known as soil mix columns or soil crete columns,

are created through deep soil mixing. These elements are formed by injecting a cementitious or lime-based binder into the soil while simultaneously rotating a mixing tool. The binder material reacts with the soil particles, resulting in the formation of columns with improved strength and stiffness. Geostructural elements offer several benefits and are used for various applications:

Ground improvement: Deep soil mixing with geostructural elements can significantly increase the strength and stiffness of weak or loose soils, enabling them to support heavy structures or loads.

Foundation support: The columns can be designed to provide support for foundations, reducing settlement and improving overall stability. They are commonly used for buildings, bridges, and other infrastructure projects.Slope stabilization: Geostructural elements can be installed horizontally to stabilize slopes and prevent landslides. The improved shear strength of the soil helps maintain slope stability.

Seismic mitigation: Deep soil mixing can enhance the soil's resistance to seismic forces, reducing the potential for liquefaction and improving the overall seismic performance of the ground.

Environmental applications: The use of geostructural elements can be beneficial in environmental remediation projects. They can provide a barrier to contain contaminants and prevent their migration into the surrounding soil or groundwater.Overall, deep soil mixing with geostructural elements is a versatile ground improvement technique that offers effective solutions for a wide range of geotechnical challenges. It can be tailored to meet specific project requirements and has been successfully applied in various construction and infrastructure projects around the world.

TOPIC: LUNAR SOIL IMPROVEMENT TECHNIQUES FOR LUNAR STRUCTURES - ONLINE

Date: 24.05.2023, Time: 02.30 p.m to 03:30 p.m

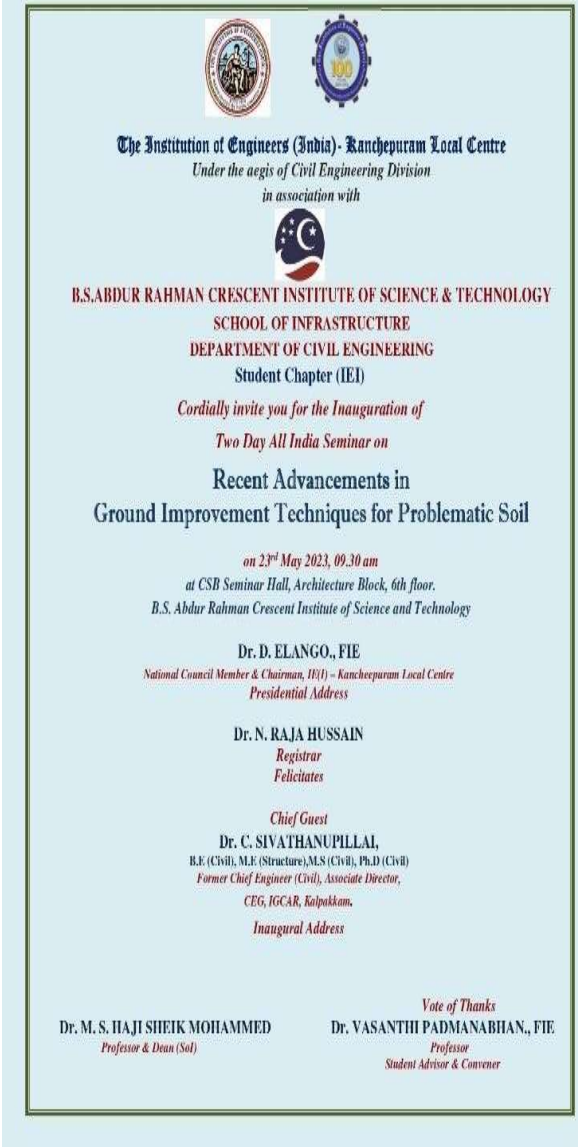
Presented by: Dr. T. Prabu, Post-Doctoral Associate, Newyork University, Abu dhabi.

The talk covers, the establishment of lunar structures for human-crewed missions and lunar habitation on the lunar surface was the planned Global Exploration Roadmap of space research organizations (SRO). Lunar habitation was the most

challenging task that included all engineering disciplines for developing lunar structures, construction materials, metals, alloys, and basic needs such as water, oxygen, etc., for human life. In that, the design of lunar structures will differ from the terrain structures, which are not designed to adopt the most extreme lunar environmental conditions such as radiation, temperature, vacuum, low gravity, moonquakes, etc. Also, it necessitated a unique design, analysis, construction materials, and methods for the lunar structures. The possible extraction of metals and binders, such as polymers, sulphur, etc., from lunar soil narrates the possible production of ISRU-based habitation materials such as concrete, mortar, bricks, blocks, etc. In connection with the lunar structures, proposing a suitable foundation system was utterly dependent on the geo mechanical properties such as shear strength parameters (angle of internal friction and cohesion), bulk density, relative density, compressibility, bearing capacity, and static and dynamic properties of the lunar soil. So far, lunar soil simulants (mare land & highland) have been developed to represent the actual lunar soil properties and used for lunar missions, ISRU-based research, and assessing the geotechnical and geo mechanical properties of the lunar soil.

In this respect, the Indian Space Research Organization (ISRO) has developed a lunar highland soil simulant (LSS-ISAC-1) and performed lander rover wheel and lunar soil interaction studies to execute their planned Chandrayaan Missions. In such a way, this presentation explains the possible use of LSS-ISAC-1 for ISRU-based research by assessing the similarity in bulk chemistry and mineralogy of LSS-ISAC-1 with actual lunar soil and past-developed lunar highland soil simulants. The geotechnical, geomechanical, and dynamic properties of the LSS-ISAC-1 under different relative densities and confining pressures. Also, the bearing capacity and slope stability of the LSS-ISAC-1 were assessed considering the low gravity (1/6g) effect on the lunar surface for the possible design of foundation systems of the lunar structures. In the view of lunar material production, the LSS-ISAC-1 was mixed with sulphur to make the lunar material, such as concrete, cube, and blocks for lunar habitation. The mechanical strength properties of the developed lunar sulphur mortar blocks and cubes were determined and compared with the past-developed blocks and cubes using other lunar soil simulants. Also, the blocks were subjected to assess the effect of the

temperature variationon the lunar surface. Then an attempt was made to make a lunar pile using the lunar sulphur mortar for the foundation systems of the proposed lunar structures of the ISRO. The uplift capacity of the lunar pile foundation system was estimated theoretically and experimentally for the developed lunar pile to suggest a suitable foundation system. Overall, the essential properties of the LSS-ISAC-1 for the design of lunar structures were determined for the possible making of lunar structures using ISRU techniques and to adoptthe lunar environmental conditions.



Invitation for Two Day All India Seminar on Recent Advancements in Ground Improvement Techniquesfor Problematic Soil

Banner for Two Day All India Seminar on Recent Advancements in Ground Improvement Techniques forProblematic Soil

The Institution of Engineers (India)

A Century of Service to the Nation

All India Seminar On

Recent Advancements in Ground Improvement Techniques for Problematic Soil

[23.05.2023 to 24.05.2023]

Organized by

The Institution of Engineers (India)

Hosted by

Kancheepuram Local Centre

Under the aegis of Civil Engineering Division, IEI

& In association with

SCHOOL OF INFRASTRUCTURE

DEPARTMENT OF CIVIL ENGINEERING

B.S. Abdur Rahman ™ Crescent Institute of Science & Technology

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Er Nripendra Nath Patwari, FIE Member, CVDB,IEI
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Er Rakesh Kumar Rathore, FIE, Member, CVDB, IEIDr. S. M. Goel, FIE, Member, CVDB, IEI
Prof (Dr) S Shanmugam, FIE, Member, CVDB, IEIEr Sandeep B Vasava, FIE, Member, CVDB, IEI
Er Shivanand Roy, FIE, Member, CVDB, IEI
Er Sukhvir Singh Mundi, FIE, Member, CVDB, IEIEr. Toli Basar, FIE, Member, CVDB, IEI
Er. V B Singh, FIE, Member, CVDB, IEI
Er. Vishwa Mohan Joshi, FIE, Member, CVDB, IEI

Honorary Secretary:
Dr. Shanmugasundar, M.E, Phd., FIE, IEI KLC

RESOURCE PERSONS

Dr. V. Balakumar, Senior Consultant, Simplex Infrastructure Ltd, Chennai.
Dr. V.K. Stalin, Professor, CEG, Anna University, Chennai.
Er. Madan Kumar, Head of Engineering, Keller India, Chennai.
Er. M. Kumaran, Head, Engg& Tech, L&T Geo Structure, Chennai.
Dr. PT. Ravichandran, Professor & Head, SRM University, Chennai.
Dr. S. Bhuvaneshwari, Associate Professor, SRM University, Chennai.
Dr. Sivapriya.S.V, Associate Professor, SSN College of Engineering, Chennai.
Dr. T. Prabu, Post-Doctoral Associate, Newyork University, Abu Dhabi.

ORGANIZING COMMITTEE

Chairman: **Dr. D. Elango**, FIE, IEI, KLC

Convener & IEI Advisor: **Dr. P. Vasanthi,** FIE
Professor, Civil, BSACIST

ABOUT THE INSTITUTION OF ENGINEERS (INDIA):

The Institution of Engineers (India) or IEI is the largest multidisciplinary professional body that encompasses 15 engineering disciplines and gives engineers a global platform to share professional interest. IEI has membership strength of over 0.8 million.

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ABOUT THE ASSOCIATE ORGANIZATION

B.S. Abdur Rahman Crescent Institute of Science and Technology, a deemed to be University in Chennai is a 4-Star rated QS world university Rankings varsity with over 38 years of academic excellence. The institute aspires to be a leader in education, Training and Research in Engineering, Science, Technology and management, and play a vital role in the socio-economic progress of the country. B.S. Abdur Rahman Crescent Institute of Science and Technology, Vandalur is located in the outskirts of Chennai city on the G.S.T. Road, (Chennai-Trichy National Highway). Since being adjacent to the Arignar Anna Zoological Park, it is easily accessible by city buses.

ABOUT THE DEPARTMENT

The Department of Civil Engineering started in 1984 is one of the oldest departments of this Institute. The department offers B.Tech. in Civil Engineering, M.Tech. in Structural Engineering, M.Tech in Construction Engineering & Project Management and Ph.D. in various disciplines of Civil Engineering. The department gives emphasis on 'quality and skill based education', 'application-oriented research' (through network with eminent academic institutions and research laboratories) for the holistic development of students. The department also offers testing & consultancy services to government, semi-govt., and private sectors.

AIM OF THE PROGRAM

The ground improvement techniques play a vital role in ensuring the stability and suitability of soil for construction purposes. The need for ground improvement techniques arises from various factors, including unstable soil conditions, risk of liquefaction, high water table, flood-prone areas, and soft soil. The objectives of ground improvement techniques are to increase the load-bearing capacity, reduce the risk of settlements and soil failure, reduce the risk of liquefaction, reduce the risk of flooding, and protect against erosion and landslide. Ground improvement techniques are often necessary in areas where the soil is either too weak, too soft, or has poor load-bearing capacity to support the weight of a building. This seminar will serve as a comprehensive programme to learn about new innovative techniques available for improvement of problematic soil.

Topics Covered

- Advanced techniques in soil improvement and reinforcement
- Development of new experimental techniques for soils
- Prefabricated vertical drains
- Geosynthetics for sustainable infrastructure developments
- Use of geosynthetics for coastal zone stabilisation
- Modern soft ground tunneling technology
- Encased stone columns
- Software and numerical modelling for stabilisation of soil
- Innovative materials for stabilisation of problematic soil

FEE:
Member of IEI : Rs 100 /-
Non Member of IEI : Rs 150 /-

SPEAKERS

Speakers and Delegates are invited from various reputed Institutions & Organizations.

IMPORTANT DATES:

Workshop Dates: 23 & 24 May, 2023
Last date of Registration: 21 May, 2023

CONTACT PERSON AND NUMBERS:

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Dr. Vasanthi Padmanabhan, Professor

Convenor

Dr. M.S. Haji Sheik Mohammed

Dean, School of Infrastructure