



## **ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY**

(Unit of Alva's Education Foundation (R), Moodbidri)

Affiliated to Visvesvaraya Technological University, Belagavi & Approved by AICTE, New Delhi. Recognized by Government of Karnataka.

**A+, Accredited by NAAC & NBA (ECE & CSE)**

Shobhavana Campus, MIJAR-574225, Moodbidri, D.K., Karnataka

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# **DEPARTMENT OF MECHANICAL ENGINEERING**

**A TALK ON “ELECTRICAL EXPLOSION  
PHENOMENON AND IT'S APPLICATION ON SYNTHESIS OF  
CARBON NANO MATERIALS”**



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### Department of Mechanical Engineering

To

Date 16/12/22

IQAC Chairman

AIET, Mijar

Respected Sir

**Sub: Seeking Permission to conduct a technical talk on  
19/12/2022**

We are happy to inform you that Department of Mechanical Engineering technical  
forum is conducting a technical talk on 19/12/22.

Title of The Talk: **Electrical Explosion Phenomenon & its application on  
Synthesis of carbon nano materials**

**Mode: Online**

The details are mentioned below, kindly request you do the needful.

#### Resource person details

Name: **Dr. Xin Gao**

Designation: **Assistant Professor, Shock Physics & amp Chemistry lab,**

Organization/Company/details: **Beijing University ,Beijing , China**

Venue: **CAMD lab**

Date/month/year: 19/12/2022

PRINCIPAL

Alva's Institute of Engg. & Technology,  
Mijar, MOODBIDRI - 574 225, D.K.

HOD

Dept. Of Mechanical Engineering  
Alva's Institute of Engg. & Technology  
Mijar, MOODBIDRI - 574 225



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**DEPARTMENT OF MECHANICAL ENGINEERING**

alet/Mech/AY2022-23/005

Date: 19/12/2022

**CIRCULAR**

It is hereby informed to all that Department of Mechanical Engineering, is organising a Technical talk on **"Electrical Explosion Phenomenon & its application on Synthesis of carbon nano materials"** is arranged on 19/12/22.


Venue: CAMD Lab

Mode: Online

Talk By: **Dr. Xin Gao,**

Assistant Professor, Shock Physics & amp Chemistry lab,  
Beijing University , Beijing , China

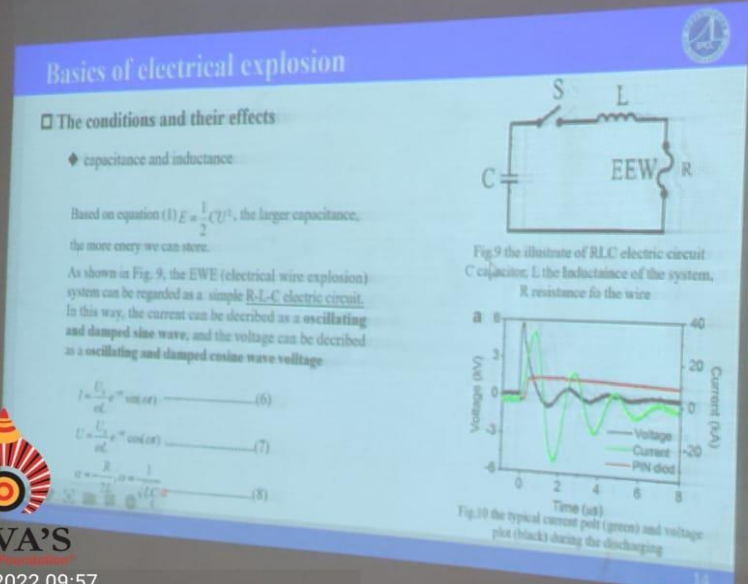
It is mandatory for all Students to attend the technical talk

  
**HOD. D.**  
Dept. Of Mechanical Engineering  
Alva's Institute of Engg. & Technology  
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Copy to

  
**Principal**  
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Principal table/Deans/HODs/AO/Office/---

## A TALK ON “ELECTRICAL EXPLOSION PHENOMENON AND IT'S APPLICATION ON SYNTHESIS OF CARBON NANO MATERIALS”



**Basics of electrical explosion**

□ The conditions and their effects

◆ capacitance and inductance

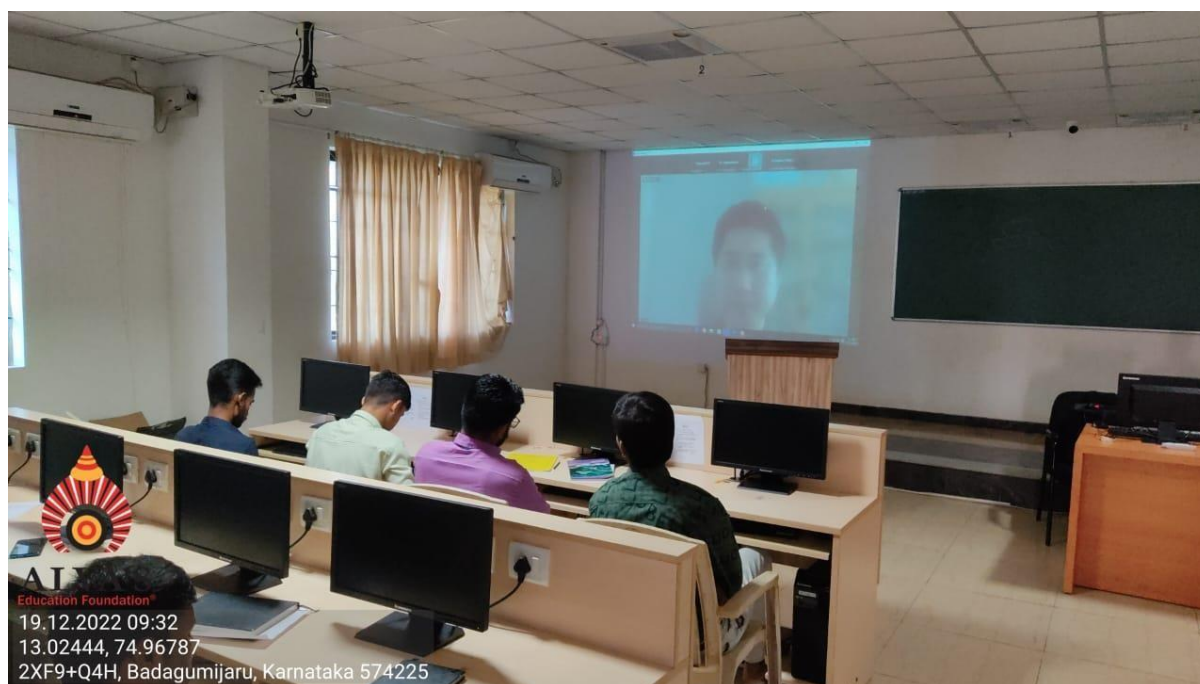
Based on equation (1)  $E = \frac{1}{2} C U^2$ , the larger capacitance, the more energy we can store.

As shown in Fig. 9, the EWE (electrical wire explosion) system can be regarded as a simple R-L-C electric circuit. In this way, the current can be described as an oscillating and damped sine wave, and the voltage can be described as an oscillating and damped cosine wave voltage.

Fig.9 the illustrate of RLC electric circuit  
C capacitor; L the Inductance of the system,  
R resistance to the wire

Fig.10 the typical current plot (green) and voltage plot (black) during the discharging

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2XF9+Q4H, Badagumijaru, Karnataka 574225



Dr. Xin Gao, briefing the students

A Webinar on “Electrical explosion phenomenon and it's application on Synthesis of Carbon Nano materials” was organized on 19 December 2022 at Alva's Institute of Engineering and Technology college at 10:00 am and the the talk was given by Dr. Xin Gao,



Assistant Professor, Shock Physics & amp, chemistry lab, state key, Beijing Institute of Technology, Beijing, China.

His talk contained five main areas such as Basic of electrical explosion, Synthesis of graphene by electrical explosion, Synthesis of Fe/FeO/graphene by electrical explosion, Synthesis of TiO<sub>2</sub> nano powder by electrical explosion, Synthesis of Si nano powder by electrical explosion. So started explaining about the Electrical wire explosion. He told that when a strong current produced by the discharge of a capacitor passes through a wire, the wire is evaporated in burst with bright flash by joule heating. He also told that it can be divided into joule heating process and then explosion process he also showed us the animation of electrical explosion, also he displayed us the pictures of x ray of different process which occurred in electrical explosion. Next he explained about the different types of discharge he explained about the R-L-C circuit. He also told us about the Underdamping pulse waveform. The different types of discharge phenomena is Matched type, Current interrupt and Arc-discharge. He also showed us the schematic of the electric wire explosion system it mainly consist of a power supply, a capacitor, an explosion chamber the measuring devices consist of Rogowski coil, voltage probe, pressure gauge, infrared monitor, high speed camera. Also he told us about the facilities in Beijing Institute of Technology and Kumamoto University. He explained the characteristics of electrical wire explosion they are the discharge and explosion duration are extremely short, the product usually is spherical nano powders, the distribution of particle size along with the log-normal distribution, high usage of the energy, Environmental friendly, overheat effect is high. He explained about the various nanoparticles synthesized by electrical wire explosion the various nanoparticles are AlN nano powder, TiO<sub>2</sub> nano powder, co nano powder, needle-like CuO nano powder, BN/Fe nanocomposite and CNT. He also discussed about the conditions and their effects firstly is the energy density, secondly is the capacitance and inductance, thirdly is the medium. He also explained about how energy density equation is obtained also he expressed us about the importance of k value. He explained how capacitance and inductance is obtained. Lastly he explained about the Synthesis of Si nanopowder by electrical wire explosion. He showed us the graphical representation of formation mechanism. He also told us about the plasma formation like semiconductor joule heating followed by conductor joule heating followed by formation of plasma.

After the talk the interaction section was held a lot of students asked the questions regarding the topic. Final year mechanical students and faculties benefitted by this talk.



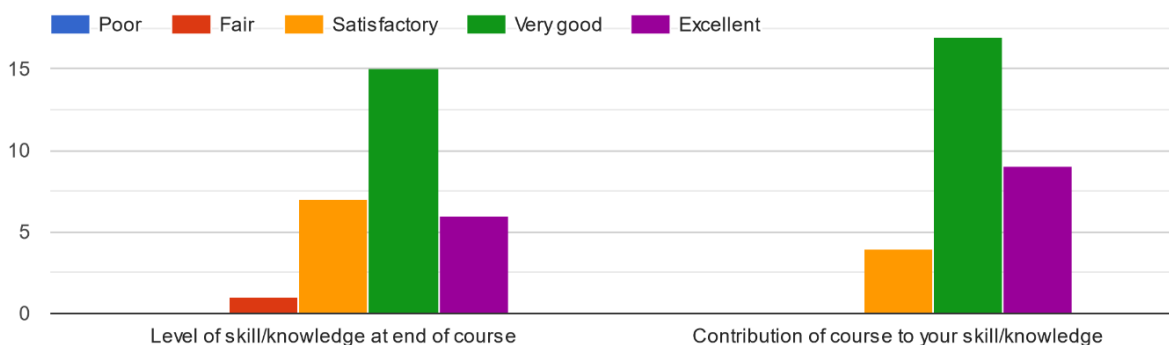
## TECHNICAL TALK ON "ELECTRICAL EXPLOSION PHENOMENON & ITS APPLICATIONS IN SYNTHESIS OF CARBON NANO MATERIALS"

Dept. of Mechanical Engineering

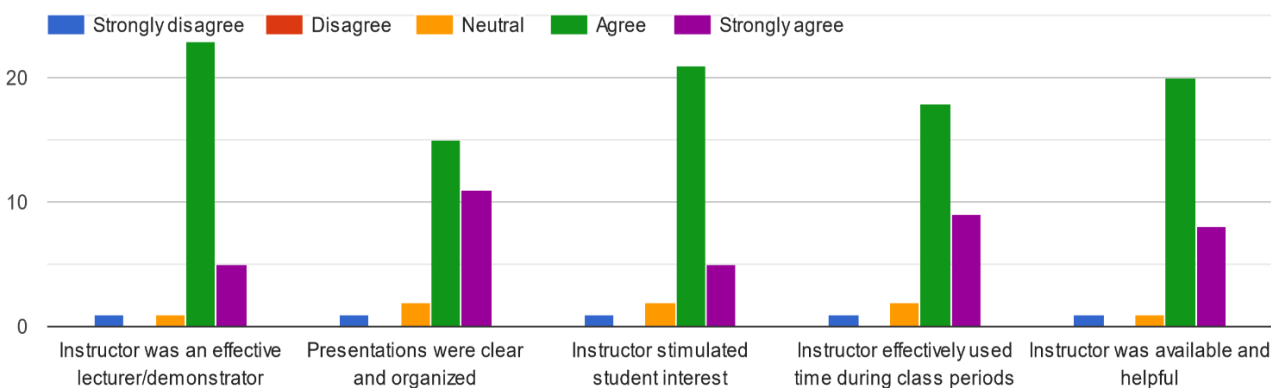
Please submit feedback regarding the course you have just completed, including feedback on course structure, content, and instructor.



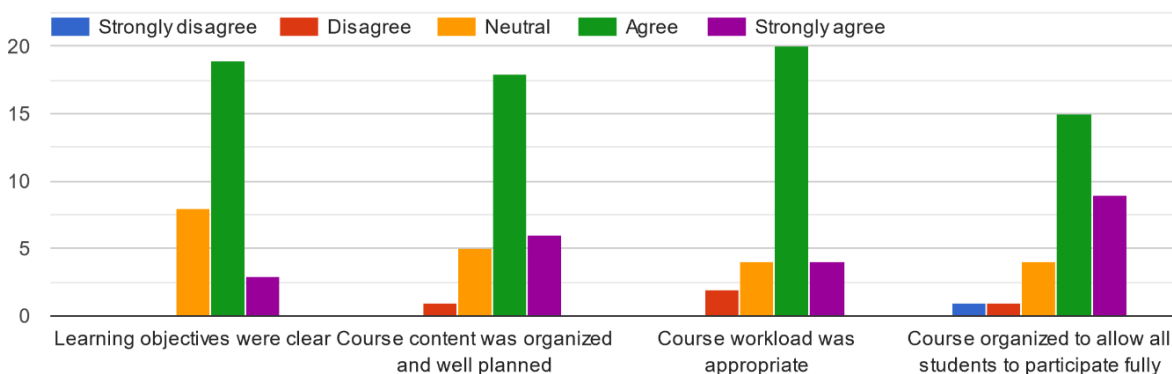
### Contribution to learning



### Skill and responsiveness of the instructor



## Course content



  
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