భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

SDP MAE-24

A 5-Day Skill Development Program in Mechanical & Aerospace Engineering

Conducted by
Department of Mechanical & Aerospace Engineering, IIT Hyderabad
from 6-10 May 2024

Brief Report on SDP MAE-2024

Coordinator:

Ashok Kumar Pandey

Prepared by P. Madhu

About the Program

The Program on Skill Development Program in Mechanical and Aerospace Engineering was held at Indian Institute of Technology Hyderabad from May 6th to 10th, 2024. The workshop aims to train the industry and academic workforce about the required skills in Mechanical and Aerospace Engineering over five days.

01 First day covered discussion on Subtractive Manufacturing, Additive Manufacturing, CAD Modelling, 3D-Printing, and Machining Techniques.

02 Second day covered teaching sessions on Applied Fluid flow Concepts, Heat Transfer, IC Engines Combustion, Heat Transfer Lab, Fluid Mechanics Lab

03 Third day covered topics related to Solid and Impact Mechanics, Photoelasticity and DIC, Challenges in Power Value Chain, Solid Mechanic Lab, and Vibration Characterization Lab.

04 Fourth day deals with NVH Fundamentals and Vehicle and Tire Mechanics, Aeroplane Control, Dynamics and Acoustics Lab, Automation and Control Lab,

05 Fifth day covers topics related to Wind Tunnel Lab, Metrology Lab, PV circuits for EV,Combustion Lab, and ESDU and Goldfire Solutions for Industrial Problems, Certification and Closing Ceremony .

Message from Coordinator

The five days workshop organized by the Department of Mechanical and Aerospace Engineering aim to impart practical knowledge to students, staffs and faculties of Mechanical and Non-Mechanical Engineering branches.

The first day was dedicated to CAD modeling and manufacturing. Second day was focused on fluid flow, heat transfer and combustions. Third day elaborated on solid and impact mechanics, Fourth day was for vibration, dynamics, acoustics, aeroplane dynamics and automation. Finally, advanced topics in wind tunnel, metrology lab, concepts are discussed.

The whole program had half day lectures and other half as laboratory visit and demonstration of experiments. The talks were delivered by 11 faculties of Mechanical and Aerospace Engineering and two Industry talks. by Industry expert. Experiments were conducted and demonstrated by eigth technical staff of MAE Department. The whole organization was managed by the staff member of the Department.

The workshop was well attended by 7 external member, 12 non-MAE student and staffs, 13 MAE staff members.

Organizing Team

Prof Ashok Kumar Pandey	**Chair & Co-ordinator**
Prof Gopi nath	Teaching Faculty
Prof Surya Kumar	Teaching Faculty
Prof Harish Dixit	Teaching Faculty
Prof Lakshmana Chandrala	Teaching Faculty
Prof. Sarvanan Baluswamy	Teaching Faculty
Prof. Syed Nizamuddin Khaderi	Teaching Faculty
Prof. Ramji	Teaching Faculty
Mr. Murli Magham- Industry Speaker 1	Industry Talk
Prof. Venkatesham. B	Teaching Faculty
Prof, Ashok Kumar Pandey	Teaching Faculty
Prof. Vishnu Unni	Teaching Faculty
Dr Pramit	Industry Talk
Mr Srikanth Vootla	Lab Instructor
Mr Ramu G	Lab Instructor
Mr Raju P	Lab Instructor
Mr Dhakaih M	Lab Instructor
Mr Vikram R	Lab Instructor
Mr Jagadeesan	Lab Instructor
Mr MadhuSankar Pillai	Lab Instructor
Mr Srikanth Erry	Lab Instructor
Mr Santhosh	Logistics & Accounts
Mr Madhu Sankar	Food & Snacks
Mr Srikanth Vootla	Logistics
Mr Madhu Pandicheri	Logistics
Mr PullaRao	Photography & Logistics
Mr Dinesh	Report & Logistics

List of Participants

Name	Department	Institute
P. Satya Krishna	ME	Marri Laxman Reddy Institute Of Technology and Management
Kesana Rajashekar	ME	Marri Laxman Reddy Institute Of Technology and Management
Nissi Yadidya Borelli	ME	Marri Laxman Reddy Institute Of Technology and Management
K Simhadri	ME	Marri Laxman Reddy Institute Of Technology and Management
Pendli Ramanakar	ME	Marri Laxman Reddy Institute Of Technology and Management
B. Manoj Teja	ME	Gokaraju rangaraju institute of engineering and technology
A. Prakash	ME	Arjun College of Science
Syed Azharuddin Hashmi	Civil	IIT Hyderabad
B Vivekananda Chary	Design	IIT Hyderabad
Sudarshan Khandagale	MSME	IIT Hyderabad
Satyendra R. Nishad	Design	IIT Hyderabad
Satheesh K T	EE	IIT Hyderabad
Thirumurugan	EE	IIT Hyderabad
Mohammed Nadeem	MS	IIT Hyderabad
G Prashanth	Workshop	IIT Hyderabad
Praveen Vankadari	EE	IIT Hyderabad
Gugulothu Vijender Naik	Civil	IIT Hyderabad
Md Emad Uddin	Civil	IIT Hyderabad
Avinash Naramu	EE	IIT Hyderabad
Rekhala Vikram	MAE	IIT Hyderabad
M. Praveen Kumar	MAE	IIT Hyderabad
Darelli Pullarao	MAE	IIT Hyderabad
M Dakaiah	MAE	IIT Hyderabad
Srikanth Erry	MAE	IIT Hyderabad
A Dinesh Chakrapani	MAE	IIT Hyderabad
Pandicheri Madhu	MAE	IIT Hyderabad
S. Jagadeesan	MAE	IIT Hyderabad
Raju Peta	MAE	IIT Hyderabad
Pillai Madhushankar	MAE	IIT Hyderabad
Santhosh V	MAE	IIT Hyderabad
Srikanth Vootla	MAE	IIT Hyderabad
Ramu G	MAE	IIT Hyderabad

Schedule

Date/Time	6 May 2024	7 May 2024	8 May 2024	9 May 2024	10 May 2024
9:30-10:30	**Session 1:** Subtractive Manufacturing **Prof. M. Gopinath**	Session 6: Applied Fluid flow Concepts **Prof. Harish Dixit**	Session 11: Solid and Impact Mechanics **Prof. Syed N. Khaderi**	Session 16: NVH Fundamentals **Prof. B. Venkatesham**	Session 21: Wind Tunnel Lab **Mr. V. Srikanth**
10:30-11:30	Session 2: Additive Manufacturing **Prof. S. Surya Kumar**	Session 7: Heat Transfer **Prof. Lakshmana Chandrala**	Session 12: Photoelasticity and DIC **Prof. M. Ramji**	Session 17: Vehicle and Tire Mechanics **Prof. Ashok Kumar Pandey**	Session 22: Metrology Lab **Mr. G. Ramu**
11:30-12:00	Tea Break				
12:00-13:00	Session 3: CAD Tutorial **Mr. V. Srikanth**	Session 8: IC Engines Combustion **Prof. B. Saravanan**	Session 13: Industry TalkChallenges in Power Value Chain **Mr. Murali Magham (Ex.Tata Motors)**	Session 18: Aeroplane Control **Prof. Vishnu Unni**	Session 23: Combustion Lab **Mr. Madhushankar Pillai**
13:00-14:30	Lunch Break				
14:30-15:45	Demo Session 4: 3D Printing **Mr. G. Ramu**	Demo Session 9: Heat Transfer Lab **Mr. Srikanth**	Demo Session 14: Solid Mechanic Lab **Mr. P. Raju**	Demo Session 19: Dynamics and Acoustics Lab **Mr. Jagadeesan**	Session 24: Industrial Application
15:45-16:00	Tea Break				
16:00-17:30	Demo Session 5: Machining Technique **Mr. M. Dakaiah**	Demo Session 10: Fluid Mechanics Lab **Mr. Srikanth & Mr. Pullarao**	Demo Session 15: Vibration Characterization Lab **Mr. P Raju**	Demo Session 20: Automation and Control Lab **Mr. Vikram**	Session 25: Certification and Closing Ceremony

Subtractive Manufacturing

Prof. M. Gopinath,
Faculty of IIT Hyderabad

In the realm of manufacturing, decisions hinge on selecting the right techniques while considering economic viability. Professor Gopinath Muvvala provides insights into subtractive manufacturing, emphasizing the need to align methods with product design and quantity requirements. Casting, machining, and forging stand out for their unique advantages in producing intricate designs, versatile shaping, and enhancing material properties, respectively. Beyond technical aspects, economic considerations shape manufacturing strategies.

Prof. Gopinath highlights the impact of material costs, labor expenses, and equipment investments on profitability. By conducting thorough cost-benefit analyses, businesses can optimize processes for sustainable growth.

Central to modern manufacturing is LASER technology, leveraging coherent light for precise and efficient operations. LASER's versatility spans automotive, aerospace, electronics, and healthcare industries, revolutionizing production with its cutting, welding, and micro-machining capabilities.

Prof. Gopinath's insights underscore the multifaceted nature of manufacturing, where technique selection, economic imperatives, and technological advancements converge to drive innovation and competitiveness.

Additive Manufacturing

Prof. Suryakumar, Faculty of IIT Hyderabad

Prof S. Surya Kumar delved into additive manufacturing, focusing on the significance of 3D printing. He elucidated the principle and operation of typical 3D printing processes, showcasing its layered construction approach.

Professor outlined various methods within the realm of 3D printing, each offering distinct capabilities and applications.

Highlighting the current landscape, Kumar explored diverse applications of 3D printing across industries, from rapid prototyping in product development to personalized medical implants. He elaborated on the advantages, such as design flexibility and reduced material wastage, while also addressing drawbacks like limited material choices and slower production speeds.

In essence, Kumar's session underscored the growing importance of additive manufacturing, emphasizing its role in fostering innovation and efficiency across multiple sectors.

CAD Tutorial

Mr. Srikanth Vootla,
Technical Officer, IIT Hyderabad

Mr. Srikanth Vootla conducted a demonstration on CAD modeling using Solid Edge, showcasing its practical application in design engineering. Through his presentation, Srikanth illuminated the process of creating 3D models with Solid Edge, emphasizing its intuitive interface and powerful features.
He guided the audience through the principles of CAD modeling, illustrating how .

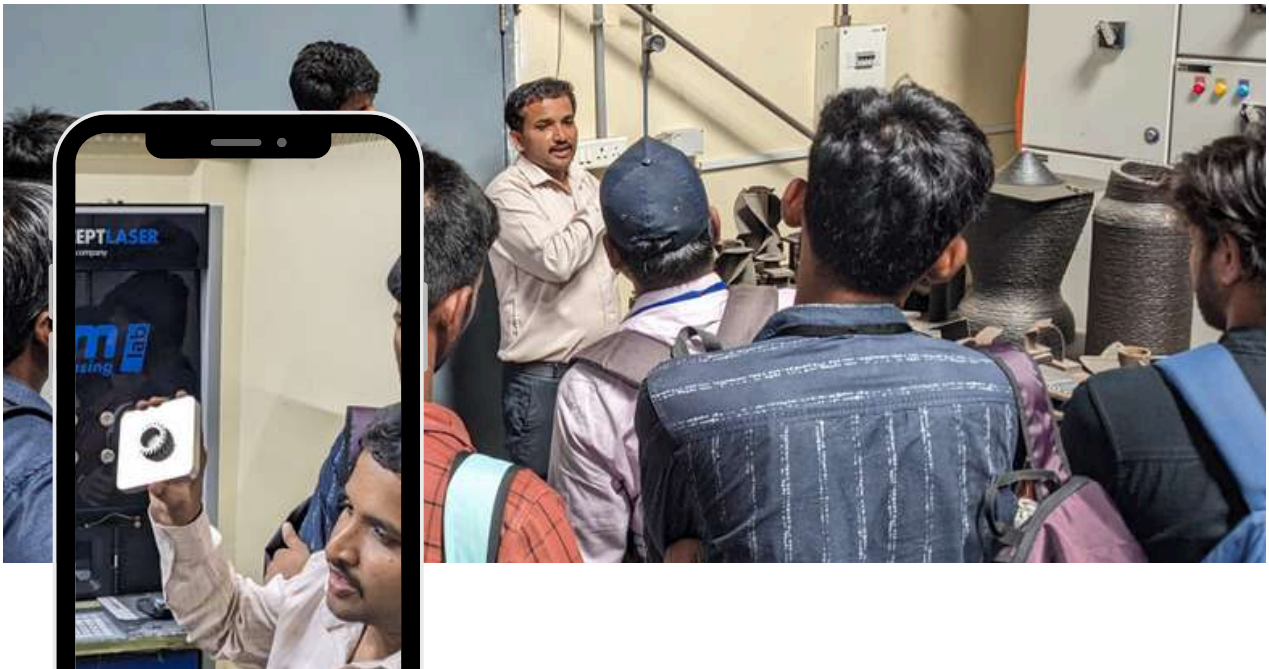
Solid Edge facilitates precise geometric construction and parametric modeling. Mr Srikanth also highlighted the software's robust capabilities in assembly design, simulation, and rendering, providing a comprehensive overview of its functionalities

By demonstrating real-world examples, Srikanth showcased the versatility of Solid Edge across various industries, from automotive and aerospace to consumer electronics and industrial equipment. He elucidated how the software enables engineers to streamline design workflows, iterate rapidly, and validate concepts efficiently.

3D Printing

Mr. Ramu G
Technical Officer, IIT Hyderabad

Mr. Ramu provided a comprehensive overview of metal 3D printing, shedding light on its transformative impact on manufacturing processes. He elucidated the principle of metal 3D printing, wherein metal powders are selectively fused layer by layer to create intricate and durable components.
Throughout his presentation, Mr. Ramu discussed the various techniques employed in metal 3D printing, including selective laser melting (SLM), electron beam melting (EBM), and binder jetting. He highlighted the unique strengths and applications of each method, from producing complex geometries with SLM to achieving high-density parts with EBM.
Moreover, Mr. Ramu delved into the current applications of metal 3D printing across industries such as aerospace, automotive, healthcare, and tooling. He emphasized its ability to reduce lead times, material waste, and production costs while enabling the fabrication of lightweight yet robust components.
However, Mr. Ramu also addressed challenges associated with metal 3D printing, including material limitations, surface finish, and post-processing requirements. Despite these challenges, he underscored the immense potential of metal 3D printing to revolutionize manufacturing and drive innovation in the years to come.crosswind conditions.



Machining Techniques

Mr. Dhakaiah M
jr Technical Superintendent, IIT Hyderabad

Mr. Dakaiah conducted an instructive CNC milling demonstration, illuminating the intricacies of computer numerical control (CNC) milling in modern manufacturing. Throughout the session, he elucidated the operational principles and practical applications of CNC milling, showcasing its significance in precision machining processes.

Using CNC milling machines, Mr. Dakaiah demonstrated how digital designs are translated into physical components with remarkable accuracy and efficiency. He emphasized the versatility of CNC milling, which enables the fabrication of complex geometries and the production of high-quality parts across various materials, including metals, plastics, and composites.

During the demonstration, Mr. Dakaiah navigated through the setup process, toolpath generation, and machining operations, providing insights into the meticulous control and monitoring afforded by CNC technology. He highlighted the importance of tool selection, feed rates, and spindle speeds in optimizing machining performance and achieving desired surface finishes.

he underscored the practical implications of CNC milling in industries such as aerospace, automotive, and medical device manufacturing, where precision and reliability are paramount. By showcasing real-world examples and best practices, he empowered the audience to harness the capabilities of CNC milling to enhance productivity and competitiveness in their respective fields.

Applied Fluid flow Concepts

Prof. Harish N Dixit
Faculty of IIT Hyderabad

Professor Harish delved into "Applied Fluid Flows," unraveling the fundamentals and practical applications of fluid dynamics. He commenced by defining a fluid and tracing the early contributions of eminent scientists to the field. Emphasizing fluid flow's intricate interaction with matter, he highlighted the necessity of establishing a frame of reference for analysis.

Professor Harish elucidated key equations governing fluid dynamics, notably the equation of continuity and the Navier-Stokes equation, which serve as foundational pillars in understanding fluid behavior. He underscored the significance of these equations in predicting fluid motion and elucidated their practical implications across various engineering disciplines.

Furthermore, the session explored techniques for flow visualization, crucial for understanding complex fluid behaviors and optimizing engineering designs. Professor Harish also delved into the concept of boundary layers, illustrating how they influence fluid flow near solid surfaces and impact overall system performance.

In essence, Professor Harish's presentation provided a comprehensive overview of applied fluid flows, from theoretical principles to practical applications, equipping attendees with essential knowledge to tackle real-world engineering challenges effectively.

Heat Transfer

Prof. Lakshmana Dora Chandrala
Faculty of IIT Hyderabad

Professor Lakshmana elucidated the fundamental differences between these modes, highlighting conduction as heat transfer through a material medium, convection as heat transfer through fluid motion, and radiation as energy transfer through electromagnetic waves. He delved into the equations governing each mode, elucidating their significance in predicting and analyzing heat transfer processes.

Moreover, the session addressed temperature gradients and associated heat transfer coefficients, essential parameters in quantifying heat transfer rates across different mediums. Professor Lakshmana also introduced an electrical analogy for heat transfer in layered walls, facilitating a deeper understanding of heat conduction mechanisms.

Furthermore, the discussion extended to practical applications of heat transfer, particularly in the realm of heat exchangers. Professor Lakshmana underscored the significance of heat exchangers in various industries, ranging from HVAC systems to chemical processing, highlighting their role in optimizing energy efficiency and thermal management.

In summary, Professor Lakshmana's session on Heat Transfer provided attendees with a comprehensive understanding of fundamental principles, equations, and applications, equipping them with valuable insights to tackle real-world heat transfer challenges effectively.

IC Engines Combustion

Prof. B. Saravanan
Faculty of IIT Hyderabad

Professor Saravanan delved into the intricacies of combustion within Internal Combustion (IC) engines, offering a comprehensive understanding of engine construction, working principles, and key differentiators between Spark Ignition (SI) and Compression Ignition (CI) engines.

He elucidated the operational differences between SI and CI engines emphasizing their respective ignition methods and fuel delivery systems. Moreover, Professor Saravanan explored essential combustion cycles, notably the Otto cycle for SI engines and the Diesel cycle for CI engines, outlining their thermodynamic processes and efficiency considerations.

The session highlighted the critical role of ignition timing in optimizing engine performance and fuel efficiency, underscoring its impact on combustion stability and power output. Additionally, Professor Saravanan delved into the stoichiometry of fuels, elucidating the ideal air-fuel ratio for efficient combustion and emissions control.

Furthermore, the discussion extended to combustion control mechanisms and challenges such as knocking and pre-ignition, addressing strategies to mitigate these issues and optimize engine operation. Professor Saravanan also underscored the consequences of incomplete combustion, emphasizing the release of harmful exhaust gases and the importance of emission control technologies.

Advanced fluid Physics Lab

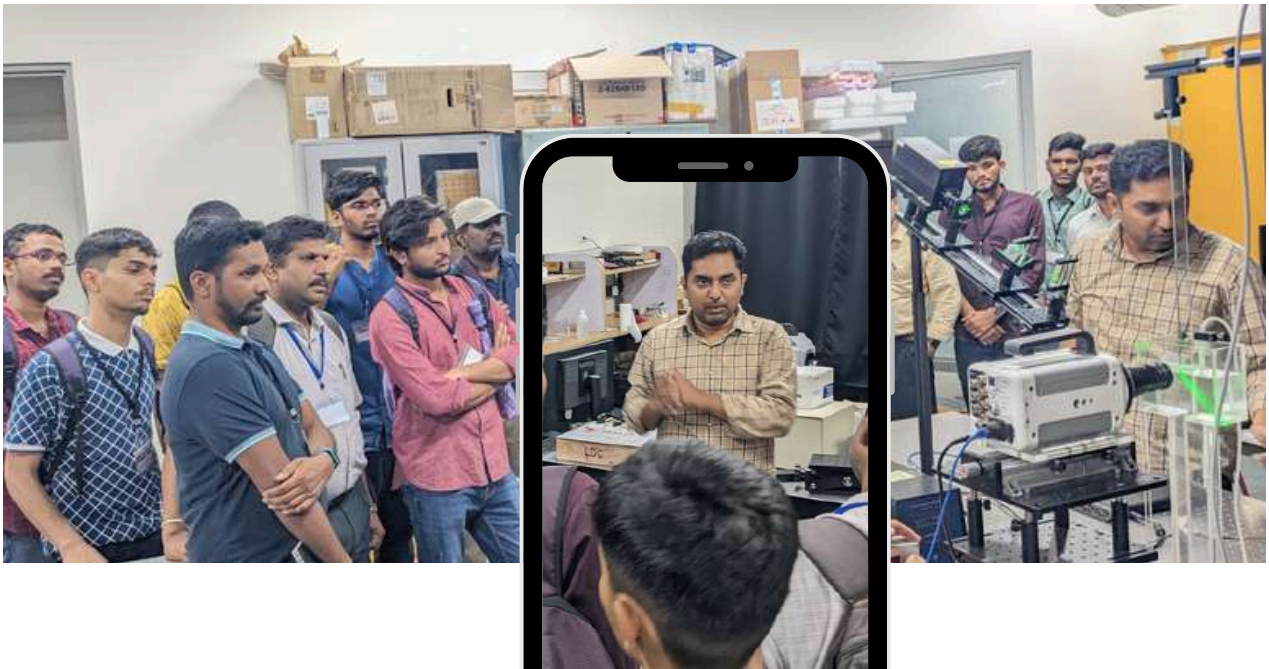
Prof. Lakshmana
Faculty of IIT Hyderabad

In Professor Lakshmana's Advanced Fluid Physics Lab, students embark on an immersive journey into the complexities of fluid dynamics. Through hands-on experimentation and theoretical exploration, participants delve into advanced topics beyond the fundamentals.

The lab encompasses a range of specialized studies, including turbulent flows, multiphase phenomena, and fluid-structure interactions. Under Professor Lakshmana's guidance, students utilize state-of-the-art equipment and computational tools to investigate these intricate aspects of fluid behavior.

The lab's emphasis on practical application extends to diverse fields such as aerospace engineering, environmental science, and biomedical research. Students not only gain theoretical understanding but also develop practical skills essential for addressing real-world challenges.

Professor Lakshmana's Advanced Fluid Physics Lab serves as a dynamic platform for fostering innovation, critical thinking, and interdisciplinary collaboration. It equips students with the knowledge and expertise needed to excel in both academic pursuits and professional endeavors within the ever-evolving realm of fluid dynamics.



Fluid Mechanics Lab

Mr. Srikanth Vootla
Technical Officer, IIT Hyderabad

Mr. Srikanth conducts a comprehensive explanation and demonstration of fluid mechanics in the lab. Through hands-on activities and visual aids, students gain a practical understanding of fundamental concepts in fluid mechanics. During the session, Mr. Srikanth elucidates key principles such as fluid properties, flow behavior, and pressure distribution.

He demonstrates various experimental setups, including flow visualization techniques, velocity measurements, and analysis of fluid forces.

Through interactive demonstrations, students learn to apply theoretical knowledge to real-world scenarios, enhancing their problem-solving skills and critical thinking abilities. Mr. Srikanth emphasizes safety protocols and proper lab techniques, ensuring a conducive learning environment.

Overall, the fluid mechanics lab session led by Mr. Srikanth provides students with valuable practical experience and insights into the fascinating world of fluid dynamics, preparing them for future engineering challenges and research endeavors.

Heat Transfer Lab

Mr. Srikanth Vootla
Technical Officer, IIT Hyderabad

Mr. Srikanth conducts a comprehensive explanation and demonstration of heat transfer principles in the lab. Through hands-on experiments and interactive demonstrations, Students gain practical insights into the mechanisms and applications of heat transfer. During the session, Mr. Srikanth showed fundamental concepts such as conduction, convection, and radiation.

He showcases various experimental setups to measure heat flux, temperature gradients, and thermal conductivity in different materials. Through guided demonstrations, students learn how heat transfer influences engineering systems and everyday phenomena. Mr. Srikanth emphasizes the importance of proper instrumentation and data analysis techniques to accurately assess heat transfer processes.

Overall, the heat transfer lab session led by Mr. Srikanth provides students with valuable practical experience and a deeper understanding of heat transfer phenomena, preparing them for future challenges in engineering, research, and innovation.

Solid and Impact Mechanics

Prof. Syed Nizammuddin Khaderi
Faculty of IIT Hyderabad

Professor Syed delves into the realms of Solid and Impact Mechanics, offering a comprehensive exploration of fundamental principles and advanced concepts. The session begins with an overview of the basics of mechanics, providing students with a solid foundation in the subject.

Professor Syed then delves into the concept of strain, elucidating its definition and various perspectives within the context of solid mechanics. He further explores Newton's laws and their implications for understanding mechanical behavior, fostering critical thinking and problem-solving skills among students.

The session delves into the application of dimensional analysis and dimensionless numbers in solid mechanics, highlighting their significance in characterizing and predicting mechanical phenomena across different scales. Through practical examples and theoretical discussions, students gain insights into the importance of dimensional analysis in simplifying complex problems and deriving meaningful conclusions.

Overall, Professor Syed's session on Solid and Impact Mechanics provides students with a comprehensive understanding of key concepts, theories, and methodologies essential for analyzing and solving mechanical engineering problems effectively.

Photoelasticity & DIC

Prof. Ramji Manoharan
Faculty of IIT Hyderabad

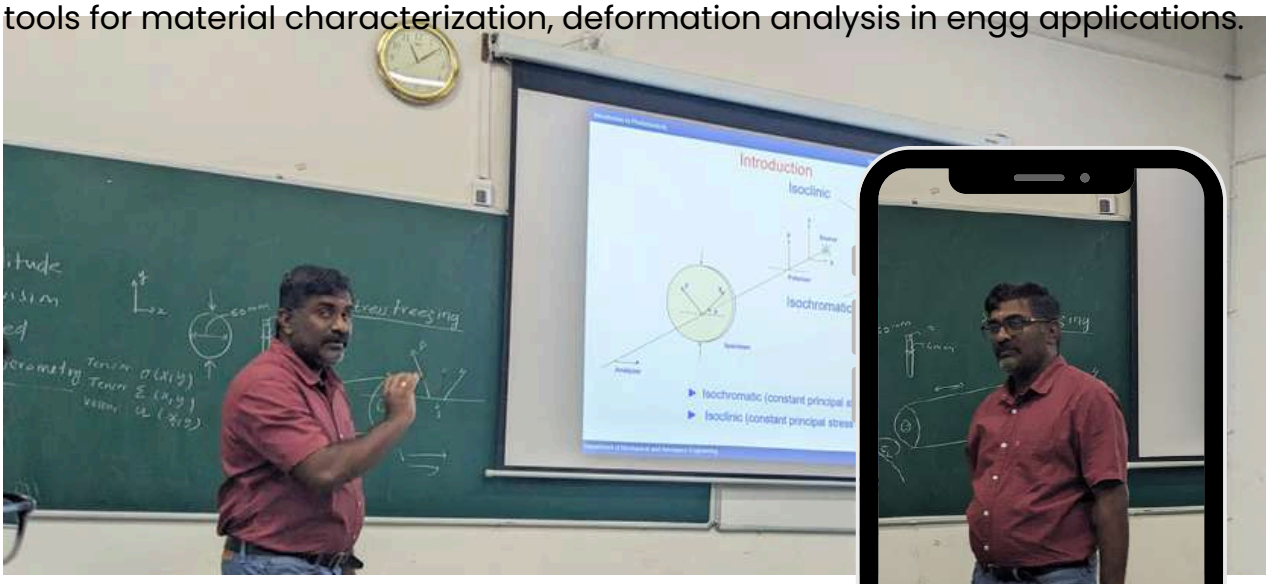
Professor Ramji presents an enlightening session on Photoelasticity and Digital Image Correlation (DIC), offering a profound insight into these advanced techniques for studying material characteristics and deformation analysis.

The session commences with a comprehensive definition of photoelasticity, elucidating its pivotal role in understanding material behavior under stress.

Professor Ramji explores the uses of photoelasticity in analyzing stress distribution and deformation patterns in transparent materials, providing attendees with a nuanced understanding of this powerful technique.

Furthermore, Professor Ramji delves into the properties of birefringent materials and their significance in photoelastic analysis. He elaborates on amplitude division-based interferometry, a sophisticated method employed in quantifying stress distribution in photoelastic specimens.

Moreover, Professor Ramji introduces Digital Image Correlation (DIC) methodology, an advanced optical technique for non-contact deformation measurement. Attendees gain an understanding of how DIC facilitates precise displacement and strain analysis by tracking surface deformation through image processing algorithms. Overall, Professor Ramji's session provides attendees with a comprehensive understanding of photoelasticity, stress analysis techniques, and DIC methodology, equipping them with valuable tools for material characterization, deformation analysis in engg applications.



Challenges in Power Value Chain

Mr. Murali Magham
Ex-employee, Tata Motors

In his session on "Challenges in the Power Value Chain," Mr. Murali addresses the multifaceted issues that confront the power sector. He highlights the complexities and interdependencies within the power value chain, spanning generation, transmission, distribution, and consumption.

Mr. Murali delves into the challenges arising from evolving energy policies, technological advancements, and changing consumer behaviors. He examines issues such as aging infrastructure, grid modernization, renewable energy integration, and regulatory constraints.

Moreover, Mr. Murali discusses the impacts of environmental concerns, geopolitical factors, and economic uncertainties on the power value chain. He emphasizes the need for collaborative efforts among stakeholders to address these challenges and ensure a reliable, affordable, and sustainable energy supply.

Through insightful analysis and practical examples, Mr. Murali's session provides participants with a comprehensive understanding of the complexities and dynamics inherent in the power value chain, empowering them to navigate and overcome the challenges facing the industry.

Vibration characterisation Lab

Prof. Ashok & his Students
Faculty & Students of IIT Hyderabad

In collaboration with his students, Professor Ashok leads a session on "Vibration Characterization & Tyre," delving into the intricate dynamics of vibration and its implications for tire performance. The session encompasses a comprehensive exploration of vibration characterization techniques, including experimental methods and computational simulations.

Professor Ashok and his students elucidate the factors influencing tire vibration, such as road conditions, vehicle speed, and tire design. They discuss the importance of understanding vibration characteristics in optimizing tire performance, enhancing vehicle comfort, and ensuring safety.
Moreover, the session delves into advanced topics like tire modeling and simulation, highlighting the role of computational tools in predicting and mitigating vibration effects. Through practical demonstrations and case studies, participants gain valuable insights into the complexities of tire dynamics and the challenges of vibration characterization.

Overall, Professor Ashok's session provides a holistic perspective on vibration characterization and its relevance to tire engineering, equipping participants with essential knowledge and skills to tackle real-world challenges in the field.

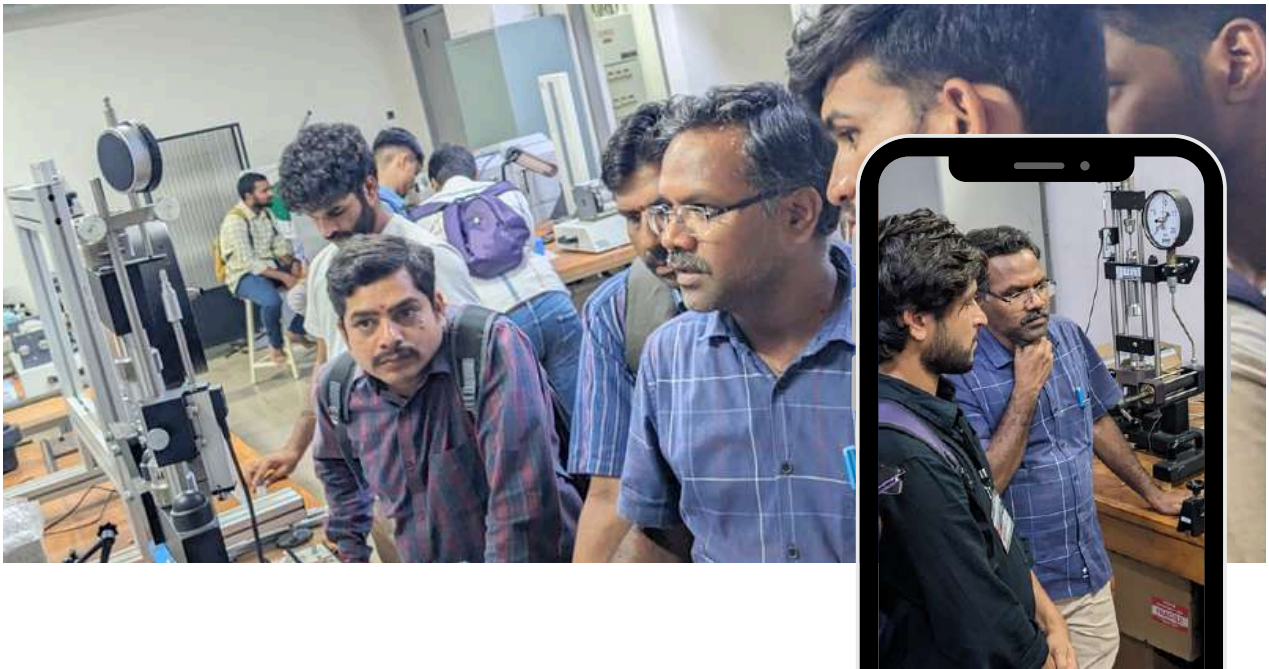
Solid Mechanics Lab

Mr. Raju Peta,
Technical Officer, IIT Hyderabad

In the Solid Mechanics Lab led by Mr. Raju, students engage in practical exploration and experimentation to deepen their understanding of fundamental principles in solid mechanics. Through hands-on activities and demonstrations, participants gain practical insights into the behavior of solid materials under various loading conditions.

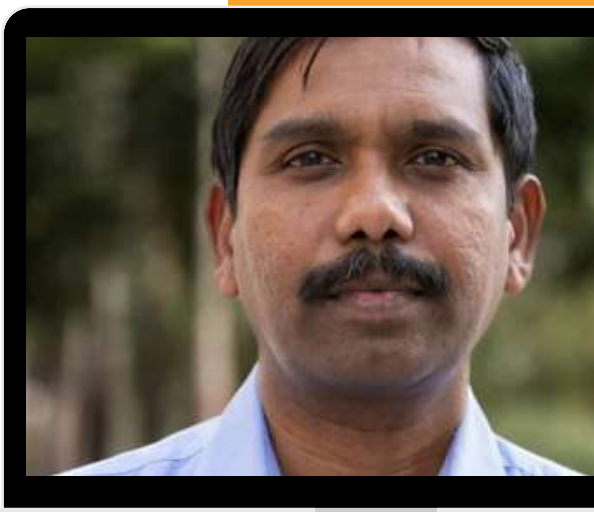
Mr. Raju guides students through a range of experiments designed to illustrate concepts such as stress, strain, deformation, and material properties. Students learn to use state-of-the-art equipment and instrumentation to perform tests on specimens, analyze data, and draw conclusions.

Moreover, the lab provides a platform for students to develop critical thinking skills and problem-solving abilities as they apply theoretical knowledge to real-world scenarios. Mr. Raju ensures a safe and conducive learning environment, where students can explore and experiment with confidence.
Overall, the Solid Mechanics Lab under Mr. Raju's guidance serves as a valuable complement to theoretical coursework, empowering students to gain practical experience and proficiency in the field of solid mechanics.



NVH Fundamentals

Prof. Venkatesham
Faculty of IIT Hyderabad



Professor Venkatesham delves into the fundamentals of Noise, Vibration, and Harshness (NVH), providing students with a comprehensive understanding of these critical aspects in engineering. The session commences by elucidating the static and dynamic nature of systems, laying the groundwork for understanding NVH phenomena.

Professor Venkatesham introduces the principles of acoustics, delineating the properties of sound waves and their interaction with materials and structures. He defines noise, vibration, and harshness, exploring their significance in engineering contexts.

Moreover, the session covers terminology related to sound measurement and the derivation of dB (decibel), a unit crucial for quantifying noise levels. Professor Venkatesham emphasizes the necessity of noise control in engineering applications, illustrating its importance through practical examples and real-world scenarios.

Additionally, the session includes an exemplar numerical demonstrating noise control techniques, providing students with valuable insights into addressing NVH challenges in engineering design and implementation. Overall, Professor Venkatesham's session equips students with foundational knowledge and practical skills essential for managing NVH in engineering systems.

Vehicle and Tire Mechanics

Prof. Ashok Kumar Pandey
Faculty of IIT Hyderabad

Professor Ashok provides a comprehensive exploration of Vehicle Dynamics, elucidating its crucial role in ensuring the safety and comfort of passengers onboard. He emphasizes how understanding vehicle dynamics is essential for designing vehicles that perform optimally under various conditions.

Professor Ashok discusses the evolution of vehicle dynamics literature, highlighting standard textbooks by early authors and the use of software tools such as CarSim in modern vehicle dynamics analysis.

The session delves into the forces acting on a moving vehicle at different points, categorizing vehicle movement into rolling, yawing, and pitching motions. Professor Ashok explains key concepts such as slip angle, slip ratio, and camber angle, which play pivotal roles in understanding tire behavior and vehicle stability.

Moreover, the session covers tire characteristics, including tire rating and the magic formula for tire modeling. Practical demonstrations using simulation software like CarSim provide students with hands-on experience in analyzing vehicle dynamics and optimizing vehicle performance.

By the end of the session, participants gain a comprehensive understanding of vehicle dynamics principles, tire behavior, and simulation techniques, empowering them to design safer and more comfortable vehicles.

Flight Dynamics & Control

Prof. Vishnu Rajasekharan Unni
Faculty of IIT Hyderabad

Professor Vishnu conducts a comprehensive session on Flight Dynamics and Control, offering students a deep dive into the principles governing the motion and stability of aircraft. He underscores the critical role of flight dynamics and control in ensuring the safe and efficient operation of aircraft. The session begins with an overview of the fundamental concepts underlying flight dynamics, including aerodynamics, propulsion, and aircraft performance. Professor Vishnu explores the forces acting on an aircraft in flight, such as lift, weight, thrust, and drag, and discusses their influence on aircraft behavior.

Furthermore, the session delves into the principles of aircraft stability and control, addressing topics such as longitudinal, lateral, and directional stability, as well as control surfaces and flight control systems. Professor Vishnu elucidates the importance of stability augmentation systems and fly-by-wire technology in modern aircraft.

Through theoretical explanations, practical examples, and interactive discussions, Professor Vishnu equips students with the knowledge and skills to analyze aircraft behavior, design control systems, and ensure the safe handling of aircraft in various flight regimes. Overall, the session provides a solid foundation in flight dynamics and control, preparing students for careers in aerospace engineering and related fields.

Dynamics and Acoustics Lab

Mr. Jagadeesan,
Senior Technician, IIT Hyderabad

Mr. Jagadeesan leads students through an immersive session in the Vibration & Acoustics Lab, focusing on practical experimentation and exploration of fundamental principles. Under Mr. Jagadeesan's guidance, participants engage in hands-on activities using specialized equipment to investigate vibration and acoustics phenomena.

In the lab, students learn to measure and analyze vibration characteristics, such as frequency, amplitude, and resonance, using accelerometers, vibration sensors, and signal analyzers. They also delve into the study of sound propagation and behavior, experimenting with sound sources, microphones, and acoustic measurement devices.

Through interactive demonstrations and data interpretation exercises, students gain a deeper understanding of the principles governing vibration and acoustics. Mr. Jagadeesan ensures a conducive learning environment where students can apply theoretical concepts to real-world scenarios, fostering critical thinking and problem-solving skills essential for careers in mechanical engineering and related fields.

Automation and Control Lab

Mr. Vikram Rekhal,
Jr Technical Superintendent, IIT Hyderabad

In the Automation & Control Lab led by Mr. Vikram, students immerse themselves in practical experiments and projects aimed at understanding the principles of automation and control systems. Under Mr. Vikram's guidance, participants explore a range of topics, including PLC programming, sensor interfacing, and control system design.

In the lab, students have access to state-of-the-art equipment and software tools, allowing them to design, implement, and analyze control systems in real-time. They learn to integrate sensors, actuators, and controllers to automate industrial processes and enhance system performance.
Through hands-on activities and project-based learning, students develop essential skills in system integration, troubleshooting, and optimization. Mr. Vikram fosters a collaborative learning environment where students can apply theoretical concepts to practical applications, preparing them for careers in automation engineering and related fields.

Overall, the Automation & Control Lab under Mr. Vikram's guidance provides a valuable platform for students to gain practical experience and proficiency in automation and control systems, empowering them to tackle real-world engineering challenges with confidence.

Combustion Lab

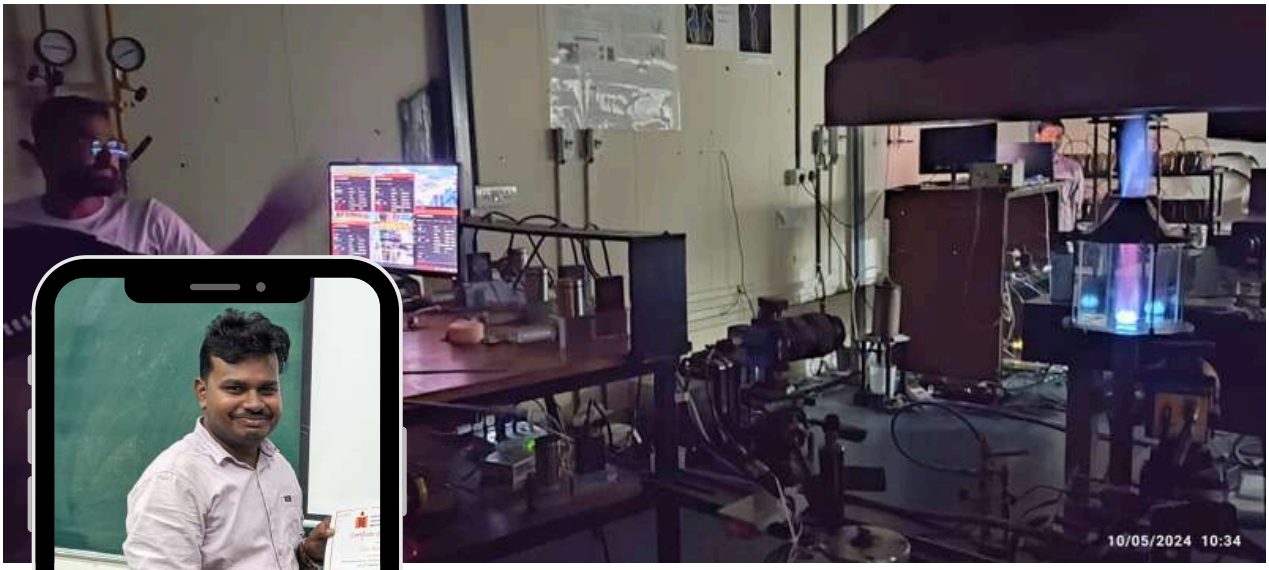
Mr. Madhu Shankar Pillai,
Junior Technician, IIT Hyderabad

In Mr. Madhushanker's Combustion Lab, students delve into the intricacies of combustion processes through hands-on experimentation and analysis. Under Mr. Madhushanker's guidance, participants explore various aspects of combustion, including combustion kinetics, flame dynamics, and emissions characterization.

The lab provides students with access to specialized equipment and instrumentation, allowing them to conduct experiments to study combustion phenomena in controlled environments. Students learn to analyze combustion efficiency, flame stability, and pollutant emissions using state-of-the-art measurement techniques.

Through practical exercises and data interpretation, students gain insights into the factors influencing combustion performance and environmental impact. Mr. Madhushanker fosters a collaborative learning environment where students can explore the complexities of combustion science and engineering, preparing them for careers in energy, environmental, and combustion-related industries.

Overall, the Combustion Lab under Mr. Madhushanker's guidance serves as a valuable platform for students to gain practical experience and expertise in combustion processes, empowering them to address critical challenges in energy production and environmental sustainability.



Metrology Lab

Mr. Ramu G,
Technical Officer, IIT Hyderabad

In the Metrology Lab supervised by Mr Ramu G, students engage in practical experiments and exercises to develop skills in precision measurement and quality control. Under Mr Ramu's guidance, participants learn to use a variety of metrology instruments and techniques to accurately measure dimensions, tolerances, and surface characteristics of manufactured components.

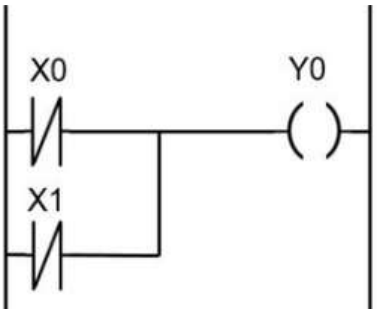
The lab is equipped with advanced metrology equipment, including coordinate measuring machines (CMMs), optical comparators, and surface profilometers. Students gain hands-on experience in performing measurements using these instruments and interpreting measurement data.
Through laboratory activities and projects, students learn about the importance of metrology in manufacturing processes and quality assurance. Mr Ramu ensures a supportive learning environment where students can apply theoretical concepts to real-world applications, preparing them for careers in industries such as aerospace, automotive, and precision engineering.

Overall, the Metrology Lab under Mr Ramu's supervision provides students with essential skills and knowledge in precision measurement, contributing to their proficiency in ensuring product quality and reliability.

Quiz Time!

1. Project.vi is the file name in Labview. what does .vi stands for? [ ]
   - Vital Instruments
   - Virtue Instruments
   - Virtual instruments
   - Viral Instruments

2. The below image represents which logic gate? [ ]



   - NOR Gate
   - AND Gate
   - OR Gate
   - NAND Gate

3. What is the logarithmic sum of 78, 78, and 81 dB?
   - 237 dB
   - 84 dB
   - 90 dB
   - 92 dB

4. Which of the following variable can be measured directly?
   - Acoustic Power
   - Acoustic Pressure
   - Acoustic Intensity
   - None of the above

5. What is the primary mode of heat transfer in a metal rod when one end is heated?
   - Conduction
   - Convection
   - Radiation
   - Advection

6. Which of the following best describes convection?
   - Heat transfer through direct contact between molecules
   - Heat transfer through electromagnetic waves
   - Heat transfer through the movement of a fluid
   - Heat transfer through a solid medium

7. Which of the following statements accurately describes the concept of "knocking" in an internal combustion engine?
   - Knocking occurs when the air-fuel mixture ignites too early in the compression stroke.
   - Knocking happens when the air-fuel mixture detonates simultaneously across the combustion chamber.
   - Knocking results from insufficient fuel supply to the engine during combustion.
   - Knocking is a desirable phenomenon that improves engine efficiency.

8. In a spark ignition internal combustion engine, the term "stoichiometric ratio" refers to:

- The ideal ratio of air to fuel for complete combustion.
- The maximum temperature attainable during combustion.
- The minimum temperature required for combustion to occur.
- The ratio of fuel to air required for partial combustion.

9. Strain gauge is a

- Passive device and converts electrical displacement into a change of resistance
- Active device and converts electrical displacement into a change of resistance
- Active device and converts mechanical displacement into a change of resistance
- Passive device and converts mechanical displacement into a change of resistance

10. Which of the following techniques is used to measure the whole field stress

- Strain gauge
- Photo elasticity
- Digital image correlation
- Laser Doppler Vibrometer

11. Which of the following techniques is used to measure the whole field strain?

- Strain gauge
- Photo elasticity
- Digital image correlation
- Laser Doppler Vibrometer

12. Which of the following non contact techniques is used to measure Natural frequency of a structure?

- Strain gauge
- Photo elasticity
- Digital image correlation
- Laser Doppler Vibrometer

13. What is the unit in which fuel is sent while testing burners through mass flow controllers?

- kg/hr
- m/s
- slpm
- gm/s

14. What is the unit in which fuel is sent while testing burners through mass flow controllers?

- Mass flow meter
- Mass flow controller
- Pilot tube
- Thermocouple

15. What does the acronym “LASER” stand for?

- Light Amplification by Stimulated Energy of Radiation
- Light Amplification by Structured Emission of Radiation
- Light Amplification by Stimulated Emission of Radiation
- Light Amplification by Stimulated Efficient Radiation

16. What is the cheapest known additive manufacturing technique?

- Selective Laser Sintering
- Stereolithography
- Fused Deposition Modelling
- Laminated Object Manufacturing

17. With which letter is the diameter represented in an engineering drawing/ draft?

- Φ
- θ
- d
- δ

18. What is the approach used in Solidworks/Catia?

- Constructive Solid Geometry(CSG)
- Finite Element Method (FEM)
- Boundary representation (B rep)
- Finite Volume Approach

19. Inertial force to elastic force is called?

- Inertial number
- sperm number
- both
- none

20. What is/are the device/s used for measuring setting up & calibrating inspection gauges?

- Vernier Calipers
- Micrometer
- Sine Bar
- Slip Gauge

Valedictory

Participants expressed gratitude to the organizing team and provided positive feedback, acknowledging the well-executed event. They appreciated the valuable insights gained and the interactive learning experience facilitated by the organizers.

Lunch Time!

Participants & Organizing Team

Thank You!

We all worked together and made this SDP successful.

Let's Get In Touch

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