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A.Y 2025-2026, Even Semester

Academic Staff College in association with the Department of Mechanical Engineering

One-Day Workshop under AICTE–DPS on the topic "The Multidisciplinary Science of Structural Integrity"

Report

The Academic Staff College, in association with the Department of Mechanical Engineering, conducted a one-day workshop under the **AICTE–Distinguished Professional Scheme (AICTE–DPS)** on **30-12-2025**. The workshop was delivered by **Dr. Atmakur Venugopal Rao**, who served as a Scientist 'H' and Outstanding Scientist at the Defence Metallurgical Research Laboratory (DMRL), Hyderabad, until his retirement from DRDO in July 2024. He subsequently served as an Adjunct Professor in the Department of Mechanical Engineering at NIT Warangal.

The workshop, titled **"The Multidisciplinary Science of Structural Integrity,"** was conducted in offline mode from 10:00 A.M. to 04:00 P.M. at Jasmine Hall. A total of 134 participants, comprising 114 students and 20 faculty and staff members from the Mechanical Engineering and Civil Engineering departments, participated in the program.

The workshop began with an introductory address by the speaker, welcoming all the participants and introducing the invited resource person, Dr. A. Venugopal Rao, Principal of the Academic Staff College, Dr. Ch. Radhika Rani, the Head of the Department, Dr. T. Vijaya Kumar, and Professor Dr. B. Nageswara Rao were invited onto the dais. The program was formally inaugurated with the lighting of the lamp.


AICTE sponsored One-Day Workshop on
The Multidisciplinary Science of Structural Integrity
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KL University Main Road, Tadepalle, Guntur,
Andhra Pradesh 522302, India
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Note : Captured by GPS Map Camera


GPS Map Camera
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Andhra Pradesh 522302, India
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AICTE sponsored One-Day Workshop on
The Multidisciplinary Science of Structural Integrity
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Andhra Pradesh 522302, India
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After the lighting of the lamp, the speaker introduced the resource person, Dr. A. Venugopal Rao, following which Dr. A. Venugopal Rao began his presentation on **"The Multidisciplinary Science of Structural Integrity."**

The workshop on "The Multidisciplinary Science of Structural Integrity" provided comprehensive insights into advanced methodologies used for ensuring the safety and reliability of engineering structures. The resource person explained the generic methodology in service life analysis, highlighting the importance of load characterization, material behavior, damage mechanisms, and failure criteria in predicting component durability.

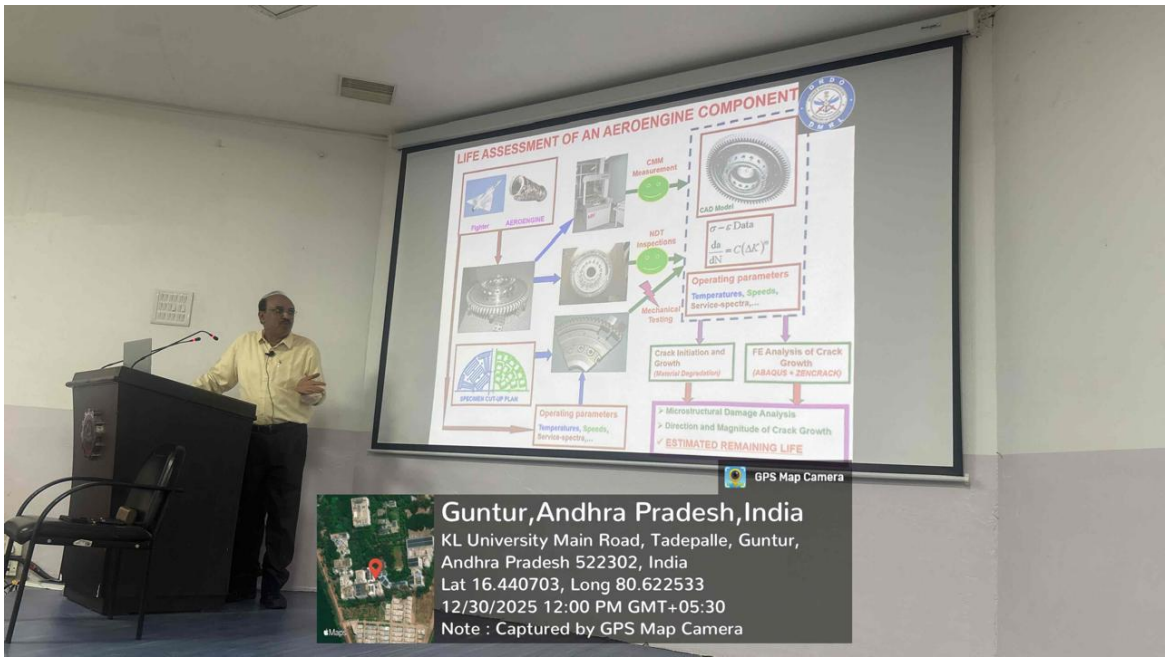
The session also covered the components of a life assessment expert system, including data acquisition modules, material property databases, damage and fracture models, condition monitoring systems, and decision-support tools used for maintenance and life extension strategies.

Further, various life assessment approaches for critical components were discussed, such as deterministic and probabilistic methods, fatigue and creep life estimation, fracture mechanics–based assessments, and remaining useful life prediction, Prediction of crack initiation, emphasizing microstructural considerations, stress–strain analysis, fatigue damage accumulation, and non-destructive evaluation techniques for early detection and prevention of failure.

Fracture mechanics and design, focusing on crack initiation, crack propagation, and the application of fracture mechanics principles in safe structural design. The resource person then explained continuum damage mechanics, emphasizing damage initiation, evolution models, and their role in predicting material degradation under mechanical and thermal loading.

The workshop also included a detailed discussion on finite element (FE) analysis of notch effects on fracture mechanisms, highlighting stress concentration, strain localization, and their influence on crack initiation and growth. The speaker explained the modeling strategies, mesh refinement techniques near notches, and the role of material nonlinearity in accurately predicting fracture behavior.

A case study on the life assessment of an aeroengine component was presented, demonstrating the application of analytical, numerical, and experimental techniques for evaluating structural integrity and ensuring safe operation. The study illustrated the use of fatigue and fracture mechanics approaches, validation through experimental data, and the importance of inspection intervals, damage tolerance philosophy, and life-extension strategies for critical aerospace components operating under complex loading conditions.


LIFE ASSESSMENT OF AN AEROENGINE COMPONENT
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Guntur,Andhra Pradesh,India
KL University Main Road, Tadepalle, Guntur,
Andhra Pradesh 522302, India
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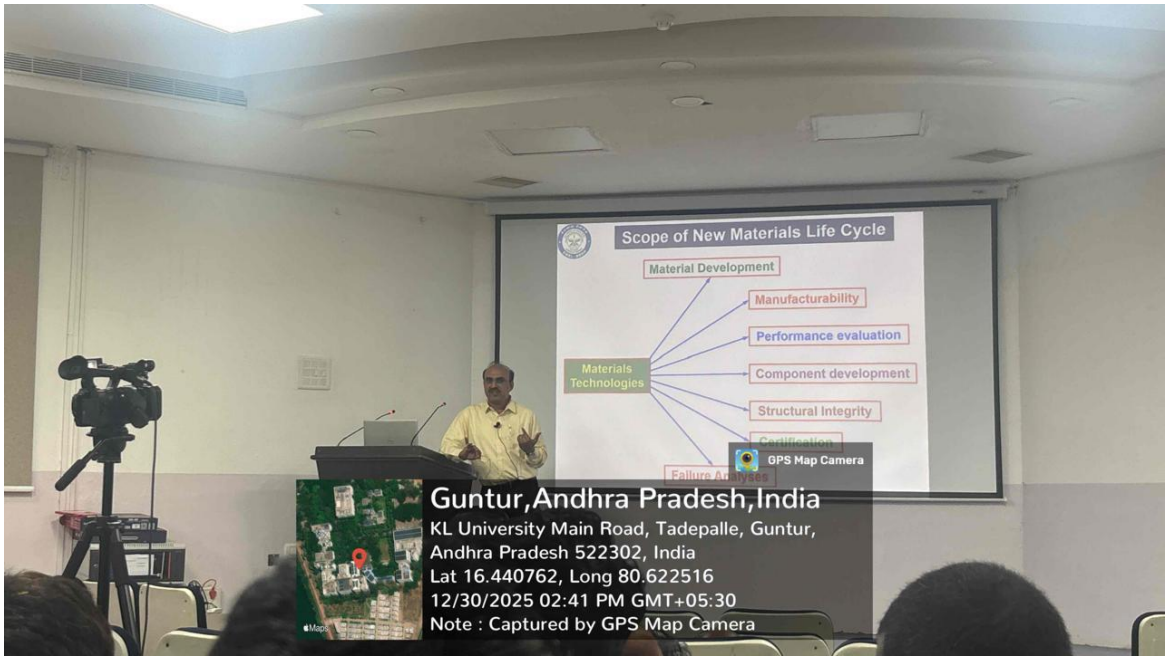
Scope of New Materials Life Cycle
Material Development
Manufacturability
Performance evaluation
Component development
Structural Integrity
Materials Technologies
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The workshop on "The Multidisciplinary Science of Structural Integrity" highlighted the importance of the integration of various models and effective information flow in ensuring accurate life prediction and reliable design of engineering components. The resource person emphasized how material models, process models, structural analysis, and performance data are interconnected to support informed decision-making throughout the product life cycle.

The session further discussed the scope of the new materials life cycle, covering material selection, processing, characterization, performance evaluation, and sustainability considerations.

An overview of Integrated Computational Materials Engineering (ICME) was presented, supported by industry experiences and success stories, demonstrating reduced development time, cost efficiency, and improved product performance.

The workshop concluded with a case study on Integrated Forged Product Development at Rolls-Royce, illustrating the successful application of ICME principles in aerospace component development.

Resource person interacted with participants and clarified their doubts. Feedback collected from all participants.

After the completion of the workshop, the resource person was felicitated by the Principal of the Academic Staff College, Dr. Ch. Radhika Rani, and Professor Dr. B. Nageswara Rao. The program concluded with a group photograph.