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**GUEST LECTURE ORGANIZED BY THE
DEPARTMENT OF MECHANICAL ENGINEERING**

GUEST LECTURE ON ‘SMART DESIGN METHODS AND PROCESS IN AEROSPACE AND AUTOMOTIVE INDUSTRY’

The Department of Mechanical Engineering, MVJCE, organised a Guest Lecture on ‘Smart Design Methods and Process in Aerospace and Automotive Industry’ by Mr. Srinivas Kirthy, Department of Aerospace Engineering, IISc, Bangalore.

The session was conducted at Smt. Rajalakshmi Seminar Hall, from 9.00 am to 12.40 pm, on 30.03.2019.

Participants

The lecture was attended by 350 students of the 6th Semester and 4th Semester, and faculty members of the Department of Mechanical Engineering.

About the Speaker

Mr. Srinivas Kirthy holds a Postgraduate degree in Applied Mathematics and Physics, from Moscow Institute of Physics and Technology in collaboration with Central Institute of Aviation Motors (CIAM) Moscow, Russia. He has specialized in Gas Dynamics, and Heat Exchange and Combustion. Mr. Srinivas completed his Bachelor of Technology in Mechanical Engineering, from NITK Surathkal. His areas of research interests are Hydrodynamic Stability and Turbulent and Reacting Flows.



Guest Lecture on " Smart Design Methods and Process in Aerospace and Automobile Industry " on 30th March 2019 at Smt. Rajalakshmi Seminar Hall organised by Mechanical Engineering Department MVJCE. The Guest Speaker Mr. Srinivas Kirthy from IISc, Department of Aerospace Engineering Bangalore. All the faculty of Mechanical Engineering Department and students of fourth and sixth semester Mechanical Engineering Department at the event.

Mr. Srinivas Kirthy has many awards and honours to his credit. To mention a few:

- Certificate of appreciation from BMS College of Engineering for 'Design and fabrication of a 3cc Internal Combustion Engine-driven Radio Controlled scaled down model of a four wheeled vehicle'.
- Certificate of appreciation from IIT Madras, for the event 'Fire and ICE'.
- Certificate of Commendation by Defence Research and Development Organization (DRDO), Ministry of Defence, for Design of the MAV as a solution to a Deployable Low Cost Outdoor Surveillance System set by the DRDO.

He has worked as Research Assistant at:

- IISc, Department of Aerospace
- Gas Turbine Research Establishment (GTRE) Bengaluru
- Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR)

A brief synopsis of the Lecture

The Lecture started at 9:00 am., with students of 4th , 6th and 8th Semesters, and the faculty of the Mechanical Engineering Department participating. The event started with the welcoming of the guest Mr. Srinivas Kirthy, by the HoD of the Mechanical Engineering Department, Dr. S Marimuthu, by presenting a bouquet.



Guest Lecture on "Smart Design Methods and Process in Aerospace and Automotive Industry" on 30th March 2019 at Smt Rajalakshmi Seminar Hall organised by Mechanical Engineering Department MVJCE. The Guest Speaker was Mr. Srinivas Kirthy from Department of Aerospace Engineering IISc, Bangalore. To the right we have HoD of Mechanical Engineering Department Mr. Marimuthu M handing over the flower bouquet to the Guest Speaker Mr. Srinivas Kirthy at the start of the event

This was followed by lighting of the lamp by the Guest Speaker, HoD of Mechanical Engineering Department, faculty members and students. Fourth semester student Ms. Madhuri rendered an invocation song on goddess Saraswathi after the lamp was lit.



Guest Lecture on " Smart Design Methods and Process in Aerospace and Automotive Industry" at Smt Rajalakshmi Seminar Hall, MVJCE on 30th March 2019. The Guest Speaker was Mr. Srinivas Kirthy from Aerospace Engineering Department, IISc. The Guest Speaker, HoD of Mechanical Engineering Department Dr. S Marimuthu along with Asst. Professor Mrs Shewatha Agarwal are lighting the lamp at the event.

In the inauguration speech, the HoD Mr. S Marimuthu addressed the participants on the importance of being abreast with the current trends in aerospace and automotive industries, and the importance of mastering the methods and process in these industries. He also emphasized on learning more tools in the fields, for strengthening the skillset in the related field.

Mr. Srinivas Kirthy was then introduced to the audience by Ms. Navya R M, student of 6th Semester.



Guest Lecture on "Smart Design Methods and Process in Aerospace and Automotive Industry" on 30th March 2019 at Smt Rajalakshmi Seminar Hall. The Guest Lecture was organised by Mechanical Engineerin Department, MVJCE. The Guest Speaker was Mr. Kirthy Srinivas from Aerospace Engineering Department, IISc. The 4th Sem Student Ms Madhuri to the left delivering the invocation song after the lighting of lamp The Mechanical Engineering Department HoD Dr. S Marimuthu and Guest Speaker Mr. Srinivas are to the right.

The stage was then handed over to the Mr. Srinivas Kirthy for the lecture on ‘Smart Design Methods and Process in Aerospace and Automotive Industry’.

The speaker Mr. Srinivas Krithy started his lecture, by explaining the concepts of science, engineering and design, and moved on to computational fluid dynamics in the aerospace and automotive industry. He dealt with the concepts of Navier Stokes Equation and its importance in computational fluid dynamics. Further, he gave a lot of information about the discretization of equations and its application in design of automobile and aerospace products.

He then elaborated on the concepts of Numerical Grid Generation and properties of numerical solution methods to the problems in Aerospace and Automotive components.

The commercial software available like ANSYS Fluent, STAR CMM+, Numeca Turbo and open source software Gerris, Pencil, OpenFOAM, SU2 and Octave were discussed, relating to the application of these software in Aerospace and Automotive components.

Aeriums Ornithopter was discussed with reference to the design methods, working and application methods. The Speaker said the actual use of CFD by Aerospace companies is a consequence of the trade-off between perceived benefits and costs. While the benefits are widely recognized, computational costs cannot be allowed to swamp the design process. The need for rapid turnaround, including the setup time, is also crucial. In current industrial practice, the design process can generally be divided into three phases: conceptual design, preliminary design, and final detailed design. In order to realize the advantages, it is essential to move beyond flow simulation to a capability for aerodynamic shape optimization, and ultimately, multidisciplinary system optimization.

Mr. Srinivas said that in the development of commercial aircraft, aerodynamic design plays a leading role, during the Preliminary design stage, in the course of which the definition of the external aerodynamic shape is typically finalized.

He added that the reduction of the weight of body, frame and engine components should translate to fuel economy improvements. As light-weight materials with better strength and stiffness to weight ratios, such as composites, aluminum, titanium and magnesium alloys, are more widely adopted in automotive designs, the knowledge, tools and data required to design with these materials become increasingly crucial to engineers.



The Guest Speaker Mr. Srinivas Kirthy delivering his talk on "Smart Design Methods and Process in Aerospace and Automotive Industry" at Smt. Rajalakshmi Seminar Hall on 30th March 2019.

He talked about the concepts of optimizing the flow of fuel and air into the engine, turbocharging, supercharging and increasing engine speeds, all of which are potential methods to improve fuel efficiency. As engine speeds or torque increases and component sections decrease, fatigue from rotational and vibrational stresses becomes an increasing concern during design. The concepts of design and operating standards and codes used in the automotive industry were highlighted by the speaker. The validated methodologies provide a reliable source of engineering knowledge for design, within the targets set by international standards and codes.

The methodologies are based on experimental data, analytical Methods and computational techniques, such as Computation Fluid Dynamics (CFD) and Finite Element Analysis (FEA), and represent industry best practices and validated design methods.

The Speaker said the strength analysis of the components used in general Mechanical Engineering were analyzed by different software's of CFD and FEA. The information has been evaluated by engineers, to ensure soundly based analysis, leading to safe, cost-effective design. The information is divided into three principal types. Firstly, the design of commonly used components is

considered. The data include stiffness, static stresses and deflections, buckling loads and fatigue strengths. Design notes and methodology are covered. Secondly, data for certain stress intensity factors are given. Lastly, data are presented on the fatigue strength of materials, both as constant amplitude stress versus endurance (S-N) curves, and in terms of linear elastic fracture mechanics.

Mr. Srinivas concluded his lecture, by pointing out that CFD researchers have been trying to prove the capability of CFD, showing examples for complex body configurations. However, there may be other types of research necessary for CFD to become a really useful tool for design.

Optimization becomes really useful when combined with Reliability-based Design, which requires another computational mechanics analysis.

Since the bottleneck is the time required for the flow simulation, the period required for preparing the surface and volume grid data from the CAD geometry, revolution may occur there. A major drawback of massively parallel vector supercomputers is the cost: machines like the ES or the Cray X1 use custom components at all levels. Other strategies are being pursued to achieve high performance at a lower cost.

A Question and Answer session followed after the completion of the talk by the Guest. Questions from the participants were on dynamics of the design of the components in the aerospace and automotive industry. Questions were also asked on aero foil structures and the way to start off with the concepts of Computational Fluid Dynamics. Few questions were raised on the open source software and the reliability of their results.



Guest Lecture on "Smart Design Methods and Process in Aerospace and Automotive Industry" at Smt. Rajalakshmi Seminar Hall on 30th March 2019 organised by Mechanical Engineering Department, MVJCE. The participant at the left asking a question to the Guest Speaker Mr. Srinivas Kirthy at the right during the question and answer session.

A vote of thanks was delivered by Ms. Vijeta Mishra and the Guest Lecture on 'Smart Design Methods and Process in Aerospace and Automotive Industry' concluded.

Outcome of the Event:

The lecture would enable students to delve deep into smart design methods used in aerospace and automotive industries, by working on fluid dynamics and computational fluid dynamics. The students have had an introduction to the finite difference method involved in computational method and application of Navier Stokes Equation. The students were exposed to various methods of grid generation in Computational Fluid Dynamics.