



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Aerodynamics Role in Sports

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
ACCREDITED WITH GRADE "A" BY NAAC APPROVED BY AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119
www.sathyabama.ac.in

AERODYNAMICS ROLE IN SPORTS

CHIEF PATRONS
Dr. Mariazeena Johnson
Chancellor
Dr. Marie Johnson
Vice chancellor

COORDINATORS
Mr. P. Gunasekar
Prof, Aero
Mr.R. Gokulnath
Prof, Aero

CONVENORS
Dr. P. Boomadevi
HOD, Aero
Dr. A. Anderson
Prof, Aero

ORGANIZED BY SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY BY DEPARTMENT OF AERONAUTICAL ENGINEERING

24.06.2019 – 27.07.2019

Course Information

This course explains basic aspects of bluff body aerodynamics, wind tunnel testing and Computational Fluid Dynamics (CFD) simulations with application to sports and building aerodynamics.

Course Layout

Week	Time	Topic
Week 1	5 hrs	Basic aspects of fluid flow.
Week 2	5 hrs	Wind-tunnel testing.
Week 3	5 hrs	Computational Fluid Dynamics.
Week 4	5 hrs	Building aerodynamics.
Week 5	5 hrs	100 m sprint aerodynamics.
Week 6	5 hrs	Cycling aerodynamics.

Aerodynamics is related to the flow of air around a projectile, which can influence the speed and direction of the object. For objects in water, it is called hydrodynamics. The air flow around a ball thrown through the air differs greatly depending on whether it has a smooth surface or a rough surface (e.g. stitches on a baseball or cricket ball, dimples on a golf ball. In the flight of a smooth ball, the air molecules travel around the ball to the back where they meet and mingle and combine to push the ball forward. The pressure behind the ball is less than the pressure in front. In speed sports as cycling and



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 / 3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



skating, aerodynamics plays a crucial role: aerodynamic drag is up to 90% of the resistive force the athlete has to overcome. A reduction of aerodynamic drag can result in the difference between winning and losing a race.

In this course, large-scale Particle Image Velocimetry is employed to conduct aerodynamic investigation in speed sports. The measurements are carried out in large-scale wind tunnels such as the Open Jet Facility (OJF) and the Low Turbulence Tunnel (LTT). The velocity measurements provide information on the areas that are most critical for the generation of drag, thus enabling design optimizations that enhance the athlete's performance.

	SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY) Accredited with Grade 'A' by NAAC 12B Status by UGC Approved by AICTE	
CERTIFICATE OF PARTICIPATION		
THIS IS PRESENTED TO <u>KONDETI GAGAN KUMAR</u> FOR HIS/HER		
PARTICIPATION DURING WORKSHOP ON "AERODYNAMICS ROLE IN SPORTS".		
THE COURSE DURATION WAS FROM 24.06.2019 - 27.07.2019		
CONDUCTED BY THE DEPARTMENT OF AERONAUTIC ENGINEERING.		
 Convenor		 Head of the Department



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



List of Participants

S.No	Roll.No	Name
1	16SAE004	Ajith Kumar. F
2	16SAE501	Akondi Venkata Sai Charan Anudeep
3	16SAE027	Alice Selvan
4	16SAE002	Calvin A Raja
5	16SAE502	Dhanush Kumar.R
6	16SAE903	Dinesh Kumar.R
7	16SAE003	Gajavilli Durga Ravi Kumar
8	16SAE009	Gopal Krishna. K
9	16SAE006	Grandhi Durga Revanth
10	16SAE029	Hari Haran. L
11	16SAE507	Jakka Prem Tej
12	16SAE007	Jakkampudi Mouliithya
13	16SAE008	Joseph Raj. S
14	16SAE011	Kancherla B C V V N Rama Satya Sai
15	16SAE801	Kaushali Aich
16	16SAE012	Kondeti Gagan Kumar
17	16SAE906	Krishnashis Mohanty
18	16SAE028	Kullappagari Priyadarshini
19	16SAE013	Meesala Pavan Kumar
20	16SAE014	Mohammed Rahmathunnisa

21	16SAE904	Muthiaya Ramanathan
22	16SAE015	Mylapalli Bindu Sagar
23	16SAE016	Nawajsharif Yasin Magdum
24	16SAE017	Nimmana Narayana Venkat
25	16SAE018	Pothureddy Holy Sophia
26	16SAE019	Pujari Krishna Murty
27	16SAE020	Raavi Jayanthkumar
28	16SAE506	Sai Adhitya
29	16SAE022	Sarakam Jayanth Vinay Siddhardha
30	16SAE023	Sathya. K
31	16SAE902	Shaikh Mohd Farooque Haji Noman Ahmed
32	16SAE503	Sirikoori Divyaswejan
33	16SAE031	Smruti Chandrasekaran
34	16SAE802	Sruthi Sree. K. N
35	16SAE024	Syed Khaja Nizamuddin
36	16SAE901	Tadepalli Pavan Kumar
37	16SAE025	Vaddi Leela Vishnu Vardhan
38	16SAE026	Vasimkhan. K
39	16SAE951	Venkatraman. N
40	16SAE010	Vignesh. K



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Role Of CFD In Aviation Industry



SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC

ROLE OF CFD IN AVIATION INDUSTRY

ORGANIZED BY
SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

ORGANIZERS
Dr.P.Boomadevi
Dr.A.Anderson

DATE: 29.07.2019 - 30.08.2019

VENUE: DEPARTMENT OF AERONAUTICAL ENGINEERING

Course description:

The emergence of Computational Fluid Dynamics in the last 60 years is fantastic, especially in providing a complete low-cost technical solution to the Aerospace and Defense sectors, compared to the previous experimental and numerical techniques. Starting from the formulation of the governing equations (potential flow, Euler, RANS), the combination of advances in computer power and algorithms, Riemann-based schemes for gas dynamics (Godunov), 2nd-order dissipative schemes for hyperbolic equations (Lax-Wendroff), efficient explicit methods for Navier-Stokes (MacCormack), panel method (Hess-Smith), type-dependent differencing (Murman-Cole), complex characteristics (Garabedian), rotated difference (Jameson), multigrids (Brandt), flux splitting (Steger-Warming), shock capturing via controlled diffusion (Jameson-Schmit-Turkel), approximate Riemann solver (Roe), total



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



variation diminishing (Harten), multigrids (Jameson, Ni), and up to the solution of a complete airplane (Jameson-Baker Weatherill) are the milestones of CFD. Since CFD is a numerical technique, especially for dealing the applications in Aerospace and Defence, there is a challenge in computing technique. Let us have a quick look into the development of computers in 30 years, 1970-CDC6600 (birth of supercomputer)-1 Megaflops, 1980-Cray 1 Vector Computer-100 Megaflops, 1994-IBM SP2 Parallel Computer-10 Gigaflops, 2007-Linux Clusters-100 Teraflops, 2007-Box Cluster Four 3 GHz dual-core CPUs (24 Gigaflops peak)- 2.5 Gigaflops, 2009-HP Pavilion Quad-core Notebook 1 Gigaflops, 2011-MacBook Pro Quad-core Laptop-2.5 Gigaflops, etc., where Flops – Floating point operations per second. A typical CFD analysis begins at problem identification with defining goals and identifying the domain, pre-processing with geometry, mesh, physics, solver settings, solving the problem with computing solution, and finally ending with simulation to examine and interpret the results. The CFD for Aerospace and Defence will provide solutions in the areas such as aerodynamics (Fluid Analysis), structure-fluid interface analysis, heat transfer analysis, etc., Here the heat transfer analysis is done not only in engines (propulsion) but also in the components such as de-icing unit, heat in avionics system, heat in electrical and electronics systems, heat in landing gear wheels, air-conditioning unit, fuselage and cockpit pressurization units, etc.

Since the association of CFD with fluid analysis, a discussion about Aerodynamics, Aerodynamic analysis in Aircraft comprises pressure, velocity, lift, drag, etc., at the significant points. Before CFD, analysis was done by some other numerical techniques and was especially carried out with the help of wind tunnels. The Wind Tunnel is a device where the prototype of the object will be tested or the original object will be mounted (static) in the



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



test section and the flying environment will be created inside the tunnel. With the help of sensors, the above said required parameters could be experimentally measured.

Why this course ?

The prime advantage is the fact that the CFD is a whole-field technique (comprehensive information). That is, all the above-said properties can be found in each point of the tested object. Moreover, it is cost-wise cheap; time taken is less (speed); suitable for any scale; repeatable; from the security point of view safe; and has ability to simulate actual conditions.

The CFD contribution to the periodical technology developments in Airbus and Boeing aircraft is extraordinary. The design of high-speed wing, wingtips, vortex generators, high lifting devices, wing-body fairing, environmental control system inlet, engine-airframe integration, nacelle, control surfaces failure analysis, flutter, vertical tail & aft body, avionics cooling, stability & control, APU inlet & ducting, exhaust system, engine bay thermal analysis, APU & propulsion fire suppression, cabin ventilation, cabin noise, ice prediction, belly fairing, nozzle, fuel system, flow control devices (VG/Strakes), engine core compartment, pack bay thermal analysis, performance prediction, etc., are some of the parameters completely streamlined and improvised both in Airbus and Boeing with the help of CFD. So, after CFD, the utility of a wind tunnel for testing the aircraft is drastically reduced. Especially in the growth and development of Boeing, the contribution of wind tunnel testing was reduced from 77 during the 1980-s to 11 during 2005. Technically and economically, it was a viable option. A502, A488, TRANAIR, TLNS3D, TRANAIR optimization, TLNS3D-MB/ZEUS, CFL3D/ZEUS overflow CFD++, and Unstructured



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



adaptive grid 3-D N-S were some of the Boeing CFD tools utilized. Let us discuss one case study. In 20 years, from 1955 to 1975, wind-tunnel-based development indicated nacelles could not be placed too close to the wing without excessive drag. Then, within the next two years, 1975 to 1977, joint CFD/Wind Tunnel studies unlocked the secret of nacelle/wing interference drag. The interference drag is the net effect and impact in drag of any integrated parts design. Around 1980, 707/CFM56 design and flight test validated CFD concepts. Now, it was about the impact of CFD on a Boeing series B737- 300 program. “Without the understanding gained from CFD, there would not have been a 737-300 program!”, was the statement of Walt Gillette, Manager, 737 Aerodynamics – then Vice President, 787 Engineering. Some modifications in the B737-300 program from the previous versions with the help of CFD were the success of that aircraft, as exclaimed by Mr. Walt Gillette. The improvisation of design promoted the sales of B737-300. Now the case study. In the early 1980s, CFM56-3 was selected by Boeing to exclusively power the latest Boeing 737 variant, the 737-300. In Boeing 737, several modifications to the engine were required as the wings were closer to the ground than previous applications of the CFM56. The fan’s diameter was reduced, which resulted in decreased bypass ratio, along with the movement of the engine accessory gearbox from the bottom of the engine to the side of the engine, which gave the engine nacelle its distinctive flat bottomed shape. The reduction of the bypass ratio caused a reduction in overall thrust, from 24,000 to 20,000 lbf (107 to 89 kN). Another significant change was the attachment of the engine with wing, without pylon. Because of all these changes in design, the interference drag was very much minimized to improve forward thrust. This was the success of the Boeing 737-300 with the technology of CFD.

Now a brief about CFD in Aero-Engines. CFD modeling needs to be specifically addressed to



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Compressor – RANS / URANS / LES; to Combustion Chamber – RANS/LES; to Turbine – RANS / URANS / LES; to Afterburner – RANS/LES, where RANS is Reynolds-averaged Navier–Stokes equations; URANS – Unsteady Reynolds-averaged Navier–Stokes equations; and LES – Large Eddy simulation. Each component has distinct flow physics such as Flow separation and Transition, Multi-phase Flows, Chemical Reaction, Mixing, Cooling, Heat Transfer, etc. Turbulence modeling is required since most flows in practice are turbulent, and a very fine grid necessary to describe all length scales. It is a fact that most engineering combustion systems involve turbulent flames. The bottleneck of CFD combustion solvers is the modeling of turbulence – chemistry interaction. Some of the chemical reactions modeling approaches are the Eddy-Break up model, Flamelet model, and detailed chemistry. Modern CFD codes for the formulation of field equations using the Eulerian approach are Fluent, CFD, CFD++, CFD-ACE+, etc.

Course contents

Week	Time	Topic
Week 1	6hrs	Applications Of CFD For Helicopter Design And Development
Week 2	6 hrs	Internal And External Flow Concerns Of The Helicopter And Its Systems
Week 3	6 hrs	Convergence-Related Issues Of Higher-Order Schemes And Turbulence Models
Week 4	6 hrs	Developing And Maintaining An Integrated Simulation And Software Development Infrastructure To Enable Rapid CFD Technology Maturation
Week 5	6 hrs	The Future Of CFD In Aerospace And Defence



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved By AKTE

CERTIFICATE OF PARTICIPATION

THIS IS PRESENTED TO KINNAKE JAI MANOJ FOR HIS/HER

PARTICIPATION DURING WORKSHOP ON "ROLE OF CFD IN AVIATION INDUSTRY".

THE COURSE DURATION WAS FROM 29.07.2019 - 30.08.2019

CONDUCTED BY THE DEPARTMENT OF AERONAUTIC ENGINEERING.

Convenor

Head of the Department

List of Participants

S.No	Roll.No	Name
1	17SAE517	Adharsh Leewvan.L
2	17SAE801	Afsal.K
3	17SAE001	Aldin Revan Paul V
4	17SAE501	Anish Soloman Tigga
5	17SAE502	Arvind Siddharth J
6	17SAE503	Arijith Praison
7	17SAE518	Avinashkumar K
8	17SAE901	Carthy E
9	17SAE902	Ravurinagalakshmichittitali
10	17SAE015	Parmar Daniel Samuel
11	17SAE008	Durga Prasad G
12	17SAE006	Emmanuel Wilson P
13	17SAE007	Ezra Sylvan Raj P
14	17SAE504	Girish Kumar G S
15	17SAE505	Gokulakrishnan S
16	17SAE513	Vichare Hrithik Shirish
17	17SAE021	Saladi Issac
18	17SAE802	Kinnake Jai Manoj
19	17SAE020	Komesh S
20	17SAE028	Yelugubanti Leelaprasad
21	17SAE803	Mannan Ajitsingh Sukhpalsingh
22	17SAE013	Mudraboina Mohan Rao
23	17SAE516	Mugesh D
24	17SAE014	Naga Bhushana Rao Telagathoti

25	17SAE012	Mopidevi Narasimhanaidu
26	17SAE0029	Nikhil Kumar
27	17SAE019	Nikita S
28	17SAE506	Nitheeshkumar S
29	17SAE025	Telagamsetti Pavan Sai
30	17SAE003	Bashetty Pavan
31	17SAE017	Pulkit Bhardwaj
32	17SAE010	Geddada Raghava Raju
33	17SAE018	Ravi Kumar Singh
34	17SAE026	Veeranki Sai Tharun
35	17SAE507	Sairam Suraj
36	17SAE002	Bantumilli Sarath Chandra
37	17SAE509	Sasidhar Rajan.G.M
38	17SAE022	Shlok Srivastava
39	17SAE004	Chougule Shrawani Shriprasad
40	17SAE510	Shreejesh Muruges
41	17SAE511	Sonu Parihar
42	17SAE023	Sowmya S
43	17SAE005	Danaboyina Sri Vardhan
44	17SAE024	Subhash P Kumar
45	17SAE326	Sundar
46	17SAE805	Vaishnavi B Iyer
47	17SAE011	Koduri Vasanth
48	17SAE009	Gajula Veerabhadra Rao
49	17SAE016	Pepakayala Vijaykumar
50	17SAE806	Vishwak Sen Vikram



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Space And Digitisation - Changing Paradigms And Challenges

The poster features a satellite in orbit over Earth. Text on the poster includes: SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY, ACCREDITED WITH GRADE "A" BY NAAC, APPROVED BY AICTE, JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600119, www.sathyabama.ac.in, SPACE AND DIGITISATION-CHANGING PARADIGMS AND CHALLENGES, ORGANIZED BY SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY BY DEPARTMENT OF AERONAUTICAL ENGINEERING, CHIEF PATRONS: Dr. Mariazeena Johnson (Chancellor), Dr. Marie Johnson (Vice Chancellor), MODULE 1: DIGITAL TRANSFORMATION IN SPACE INDUSTRY, MODULE 2: GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSS) FOR EFFICIENT AND FLEXIBLE, MODULE 3: DIGITISATION IN EARTH OBSERVATION, 20.01.2020 - 28.02.2020, COORDINATORS: Mr. P. Gunasekar (Prof, Aero), Mr.R. Gokulnath (Prof, Aero), CONVENORS: Dr.P. Boomadevi (HOD, Aero), Dr. A. Anderson (Prof, Aero).

Course Layout

Week	Time	Topic
Week 1	6 hrs	Digital Transformation in the Space Industry.
Week 2	6 hrs	Navigation Satellite Systems (GNSS) for efficient and flexible air navigation.
Week 3	6 hrs	Classical and Performance-Based Navigation
Week 4	6 hrs	Digitization in Earth Observation.
Week 5	6 hrs	Data Archives & Access and Processing Services

Week 1 : Digital Transformation in the Space Industry

The digital revolution has an impact on many levels of space business and space technology. The advent of "New Space" is strongly connected to digitalization, a game changer challenging long standing paradigms such as in spacecraft mission and system design. This module illustrates the innovative effects of digitalisation in various areas such as earth observation, downstream services and mission and system design. The module also examines digitalization challenges in the space sector including cyber threats and the sector's increasing strategic and commercial value

Week 2 : Global Navigation Satellite Systems (GNSS) for efficient and flexible air navigation

Civil aviation is a multi-trillion-dollar market projected to grow continuously until at least 2040. Aircraft navigation and guidance from terminal to terminal is the determining cost factor for individual flights.



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Thus any savings resulting from the introduction of new digital technology will yield an extremely high return on investment due to economies of scale. This course outlines the specific navigation context before identifying where conventional navigation means (flight routes) are insufficient for achieving further increases in capacity, flexibility and performance.

Week 3 : Classical and Performance-Based Navigation

The concept of performance-based navigation (PBN) is outlined and why positioning needs to be available everywhere (area navigation - RNAV). The GNSS basic positioning principle is described and the relatively frequent satellite failures and anomalies are explored which are the reason why stand-alone GNSS cannot be used directly for a safety-critical application. The concept of solution separation statistics combined with the use of multiple GNSS constellations is introduced (Advanced Receiver Autonomous Integrity Monitoring – ARAIM) which in the long term may replace conventional navigation technology. The lecture concludes with a look at limiting factors, the current planning of civil aviation authorities and the European GNSS Galileo project

Week 4 : Digitisation in Earth Observation

This online course is about the advances made in Earth Observation (EO) over the last few years. No other area of space applications has seen so much advancement in recent decades. The objective of this course is to explore the major trends in the collection, storage, distribution and analysis of remote sensing data. The complementary data sources introduced in the course include satellites, high-altitude platforms (HAPSs), planes and unmanned aerial vehicles (UAVs). The European Copernicus System is the world's largest free and open monitoring system for environmental and security purposes.

Week 5 : Data Archives & Access and Processing Services

It is cited throughout the course as an example of the technological cutting edge, presented together with a commercial case study. Cloud-based access, archiving and processing technologies are introduced and discussed and basic terminology like DaaS, SaaS and PaaS is explained in the specific context of EO. The advent of Artificial Intelligence represents the dawn of a new era in data analysis. AI4EO provides additional analysis tools beyond physical algorithms. AI makes it possible to work on extremely big data volumes and combine very different data types such as images and social media data.

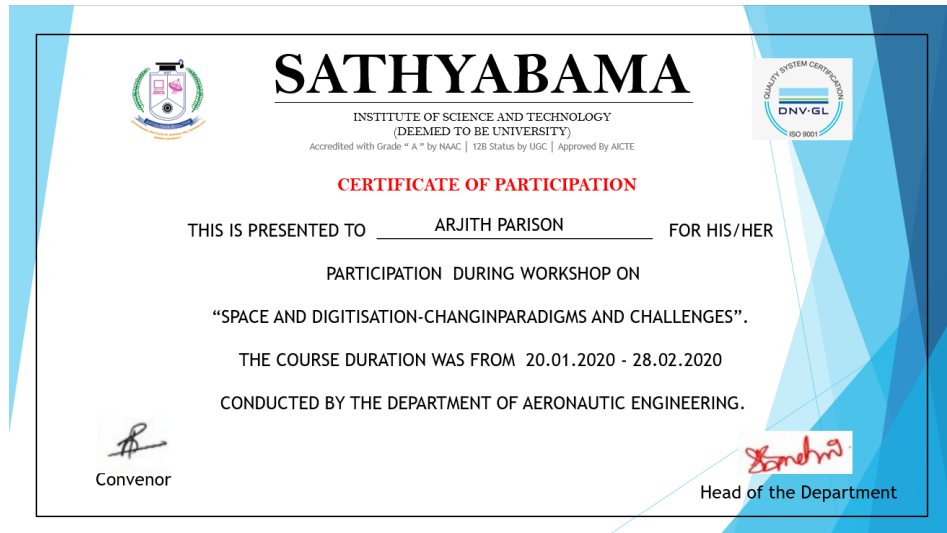


SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



List of Participants

S.No	Roll.No	Name
1	17SAE517	Adharsh Leewvan.L
2	17SAE801	Afsal.K
3	17SAE001	Aldin Revan Paul V
4	17SAE501	Anish Solomon Tigga
5	17SAE502	Arvind Siddharth J
6	17SAE503	Arjith Praison
7	17SAE518	Avinashkumar K
8	17SAE901	Carthy E
9	17SAE902	Ravurinagalakshmichittitalli
10	17SAE015	Parmar Daniel Samuel
11	17SAE008	Durga Prasad G
12	17SAE006	Emmanuel Wilson P
13	17SAE007	Ezra Sylvan Raj P
14	17SAE504	Girish Kumar G S
15	17SAE505	Gokulakrishnan S
16	17SAE513	Vichare Hrithik Shirish
17	17SAE021	Saladi Issac
18	17SAE802	Kinnake Jai Manoj
19	17SAE020	Komesh S

20	17SAE028	Yelugubanti Leelaprasad
21	17SAE803	Mannan Ajitsingh Sukhpalsingh
22	17SAE013	Mudraboina Mohan Rao
23	17SAE516	Mugesh D
24	17SAE014	Naga Bhushana Rao Telagathoti
25	17SAE012	Mopidevi Narasimhanaidu
26	17SAE0029	Nikhil Kumar
27	17SAE019	Nikita S
28	17SAE506	Nitheeshkumar S
29	17SAE025	Telagamsetti Pavan Sai
30	17SAE003	Bashetty Pavan
31	17SAE017	Pulkit Bhardwaj
32	17SAE010	Geddada Raghava Raju
33	17SAE018	Ravi Kumar Singh
34	17SAE026	Veeranki Sai Tharun
35	17SAE507	Sairam Suraj
36	17SAE002	Bantumilli Sarath Chandra
37	17SAE509	Sasidhar Rajan.G.M



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Advances in Aerospace Materials

The poster features a wireframe illustration of a modern fighter jet in flight. Text is overlaid on the image. At the top, it states: 'SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY ACCREDITED WITH GRADE "A" BY NAAC APPROVED BY AICTE JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119 www.sathyabama.ac.in'. Below this, it says: 'ORGANIZED BY SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY BY DEPARTMENT OF AERONAUTICAL ENGINEERING'. The title 'ADVANCES IN AEROSPACE MATERIALS' is prominently displayed in the center. The dates '24.06.2019 – 27.07.2019' are at the bottom. Two boxes on the sides list the coordinators and convenors. The top right corner features the Sathyabama logo.

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
ACCREDITED WITH GRADE "A" BY NAAC APPROVED BY AICTE
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI – 600119
www.sathyabama.ac.in

ORGANIZED BY SATHYABAMA INSTITUTE OF SCIENCE AND
TECHNOLOGY BY DEPARTMENT OF AERONAUTICAL ENGINEERING

ADVANCES IN AEROSPACE MATERIALS

CHIEF PATRONS
Dr. Mariazeena Johnson
President
Dr. Marie Johnson
President

COORDINATORS
Mr. P. Gunasekar
Prof, Aero
Mr.R. Gokulnath
Prof, Aero

CONVENORS
Mr. Alexander
HOD, Aero
Dr. A. Anderson
Prof, Aero

24.06.2019 – 27.07.2019

Modules

Week	Time	Topic
Week 1	6hrs	Classification of aerospace materials.
Week 2	6 hrs	Aluminum and aluminum alloys
Week 3	6 hrs	Titanium and titanium alloys.
Week 4	6 hrs	High strength steels.
Week 5	6 hrs	Powder materials

Week 1 Module 1. Classification of aerospace materials

This module will introduce you to the classification of aerospace materials. You will learn about the requirements for these materials. Technologies always affect the structure and properties of materials. You will learn about the main forming technologies (metal forming, hot and cold working, and machining) and their effects on the structure of aerospace materials. Phenomena that accompany the machining operations will be examined as well.

Week 2 Module 2. Aluminum and aluminum alloys

This module will introduce you to aluminum alloys, which are crucial aerospace materials.



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



Aluminum alloys were the first to be used in the manufacture of aircraft. The use of aluminum in revolutionized the aircraft industry. Its advantages are high manufacturability and specific strength (the ratio of maximum stresses to weight). We will study various classifications and designations of aluminum alloys as well as the basics of heat treatment. We will learn how alloying elements affect the structure and properties of aluminum alloys.

Week 3 Module 3. Titanium And Titanium Alloys

We will learn about the role of titanium in the aircraft industry, its advantages and disadvantages for aerospace applications, the structure and properties of titanium alloys. We will examine promising titanium aluminides and shape-memory titanium alloys. Titanium alloys have unique properties and are very promising as aerospace materials. Titanium alloys are used in heavily loaded airframe sections, undercarriage parts, skins to high Mach speed aircraft, jet engines, and many other aircraft components requiring high strength, fracture toughness and resistance to fatigue, creep and corrosion. These mechanical properties are superior to lightweight structural materials, including aluminum alloys and magnesium alloys.

Week 4 Module 4. High strength steels

This module will introduce you to high strength steels. Steel is used as an aerospace material, but to a lesser extent than titanium, aluminum, and composites. High strength steel cannot be replaced with other materials. Advantages of using steel in highly-loaded aircraft structures include high stiffness, strength, fatigue resistance and fracture toughness. In this part of the video course, we will deal with steels used in landing gear and other high-strength components, namely: maraging steels, medium-carbon low-alloy steels, and stainless steels.

Week 5 Module 5. Powder materials

This module will introduce you to powder metal materials and modern technologies used to manufacture them. Powders are used in the manufacture of complex parts or when increased heat resistance is required. "Sweating" highly porous materials are used to prevent icing on aircraft. Metal powder compositions are of particular interest due to the rapid development of additive technologies. You will learn about the requirements for powders used in additive manufacturing.



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.

Phone: 044 - 2450 3150 /3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved By AICTE



CERTIFICATE OF PARTICIPATION

THIS IS PRESENTED TO JOSELINE X FOR HIS/HER

PARTICIPATION DURING WEBINAR ON "ADVANCES IN AEROSPACE MATERIALS".

THE COURSE DURATION WAS FROM 02.03.2020 - 27.03.2020

CONDUCTED BY THE DEPARTMENT OF AERONAUTIC ENGINEERING.


Convenor


Head of the Department

List of Participants

S.No	Roll.No	Name
1	18SAE5013	Adithya M
2	18SAE1001	Angadala Ganesh
3	18SAE5001	Anirudh Ashok
4	18SAE5002	Athyala Anoushka Dev
5	18SAE9003	Balasubramaniy N R
6	18SAE1002	Bhoye Harshad Bharat
7	18SAE5027	Bolla Deepthi Chowdary
8	18SAE5014	Chode Satya Manikumar
9	18SAE5020	Dipesh Ranjan
10	18SAE5026	Gabrielhoseadoss K
11	18SAE5003	Genesisgodwin Bs
12	18SAE5004	Gokulakrishnan K
13	18SAE5016	Gokulakannan V
14	18SAE1003	Gursharan Kaur Pabla
15	18SAE5011	Hariharan V
16	18SAE9001	Infant Rainia L
17	18SAE8001	Joseline X
18	18SAE5005	Karthikeyan R
19	18SAE1004	Kelli Karthikeyan
20	18SAE5006	Konchada Uday Kumar

21	18SAE5025	Kuppalasubhramanyakarthish
22	18SAE1005	Majella Riona R
23	18SAE1006	Mangina Leela Krishna
24	18SAE5017	Mohamed Ansaf
25	18SAE5007	Mohamed Asif S
26	18SAE1007	Navale Rupesh Vilas
27	18SAE9002	Neeja R
28	18SAE5008	Neeraja Medim
29	18SAE1010	Kuddru Nevis Ammal Raj
30	18SAE5029	Nikhil Shankar Arisella
31	18SAE1009	Pattem Purnasekhar
32	18SAE5015	Pothys M A
33	18SAE5009	Ragavendhar K A
34	18SAE5018	Rohit Rathore
35	18SAE5022	Roopa Bj
36	18SAE5024	Saindankar Devang Kishor
37	18SAE1008	Sakshar Ghosh
38	18SAE5023	M Sailesh Kumar
39	18SAE5012	Ven K Ata Subramanian
40	18SAE5028	Yaparala Malleesh Babu