

A Certificate Course

## FINITE ELEMENT ANALYSIS USING ANSYS APDL

From 15<sup>th</sup> February 2021 to 20<sup>th</sup> February 2021



## ORGANIZED BY DEPARTMENT OF MECHANICAL ENGINEERING AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY, (Approved by AICTE, Permanently Affiliated to JNT University Kakinada, ACCREDITED BY NAAC and Recognized under 2(f) &12 (b) by UGC New Delhi)

Tamaram, Makavarapalem, Narsipatnam (RD), Visakhapatnam-531113

## **AVANTHI EDUCATIONAL SOCIETY**

Avanthi Educational Society under the Leadership of Sri M. Srinivasa Rao garu as chairman was started in the Year 1991. Within a short span of its establishment, the group has made a remarkable stride in the field of education offering various courses at Under Graduate, Post Graduate, Pharmacy & Engineering levels. This milestone is achieved as the institution carved itself to impart quality and career oriented education, countering the challenges of the modern world through planning, dedication, determination, prompt execution and with the innovative ideas of our advisory board.

Today, Avanthi Educational Society is proud to have a strength of over 16000 students with 15 institutions under its ambit. It is the path of glory towards the success during the last 19 years. The institution has been adjudged many times as the second-best educational institutions in the twin cities and 16th best in all over India through the impartial survey made by the renowned magazine "India Today".

## **AVANTHI INSTITUTE OF ENGINEERING & TECHNOLOGY**

AIET started in the year 1999 and offers various courses at Engineering and PG level. The college is providing with rooms, computer centre, laboratories and seminar hall with audio-visual equipments. Industry Institute interaction is conducted regularly to emphasize on the latest trends in the present market.



It is very near to Narsipatnam. Frequent bus facilities are available both from and to Visakhapatnam and Narsipatnam. Very safe and secure hostel facility is available for Girl students. These are the additional facilities This course is in an example-based format for Finite Element Analysis, besides excellent academic atmosphere in the college campus.

#### **DEPARTMENT OF MECHANICAL ENGINEERING**

Mechanical Engineering department was started in the year 2005 with intake strength of 60 seats, this was increased to 120 students in 2012 and this was increased to 180 students in 2013. The department has well qualified and trained faculty members. It has well equipped laboratories and workshops and be the best way to prove your understanding and knowledge. includes a CAD/CAM laboratory where students are imparted training in advanced production techniques and design and analysis of machine elements.

The department of Mechanical Engineering has been contributing its humble share of the Mechanical Engineering graduates for national needs. Several of the graduates who have passed out of this department are occupying responsible positions in various Engineering Industries like Hindustan Shipyard Limited, Renault Nissan, Varun Motors, Tata Consultancy Services, HP and IBM and holding responsible positions in the premier educational institutes in and outside India.

#### **ABOUT WORKSHOP**

including various examples for 1D Truss, 2D Truss, 3D Truss, 2D plane stress, 2D plane strain, and 3D solid elements. In each example, first, key formulations are provided to summary the theories. Next, you will be clearly instructed to write your FEM codes, ANSYS scripts. Every line of code will be clearly explained. After that, detailed instructions to extract results (displacements, stress, strain) from ANSYS and your FEM codes are provided. From there, you will learn how to make comprehensive comparisons between your FEM results and ANSYS to verify your codes and understanding. This will

Also, by practicing the examples, you can achieve very good or advanced coding skills in MATLAB and scripting in ANSYS.

#### **TOPICS TO BE COVERED**

- Key Formulations in FEA: Truss elements (1D, 2D, 3D), 2D plate (plane strain, plane stress) and 3D Solid elements.
- Practical coding skills in MATLAB for FEA of 1D, 2D, and 3D structures
- Practical skills in ANSYS for FEA of 1D, 2D, and 3D structures
- Advanced skills in writing APDL scripts for Finite Element Analyses
- Source codes (MATLAB + ANSYS) for all FEA examples are available for freely download and modify for future study

For Registration, please contact Mr. M.S.Naidu, Assistant Professor, Department of Mechanical Engineering.

**CHIEF PATRON** 

Smt .M.Gnaneswari President. Avanthi Educational Society

PATRON Dr. C P V N J Mohan Rao Principal, Avanthi Institute Of Engineering And Technology

#### **CHAIRMAN**

Sri. V. Harikiran Head of the Department Mechanical Engineering



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## **DEPARTMENT OF MECHANICAL ENGINEERING**

## <u>CIRCULAR</u>

Date: 08/03/2021

We are happy to inform you that, Department of Mechanical Engineering, AIET is organizing six day certificate course on "Finite Element Analysis using ANSYS APDL Software" from 15<sup>th</sup> March, 2021 to 20<sup>th</sup> March, 2021 in Physical mode for all IV B. Tech students. Interested candidates are directed to enrol above course on or before 14/03/2021. For further details contact Course Coordinator Mr. M.S Naidu, Assistant Professor, Mechanical Engineering Department.

**Resource Person Details:** 

- Sri I. Prakash, Design Engineer, Data Pro, Visakhapatnam.
- Dr. A. Ramki, Assistant Professor, Department of Mechanical Engineering, Raghu Engineering College, Dakamari, Visakhapatnam.

V. Harikiran

HOD of Mechanical Engineering Department

Head of the Department Department of Mechanical Engg. Avanthi Institute of Engg. & Tech., Makavarapalem, Visakhapatnam-531113.

Copy to: Principal, AIET



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## **DEPARTMENT OF MECHANICAL ENGINEERING**

A Six-day workshop on

## Finite Element Analysis using ANSYS APDL Software

From 15th March 2021 to 20th March 2021

## Syllabus of the Workshop:

#### Chapter-1

• Introduction about the workshop and Ansys APDL Fundamentals, Various types of tools in ANSYS APDL and their applications

#### **Chapter-2**

• ANSYS Mechanical APDL for Finite Element Analysis, 1D, 2D and 3D Elements with examples of ANSYS Elements

#### **Chapter-3**

• Introduction to the ANSYS GUI, Enlisting different FEM methods and detailed explanation

#### Chapter-4

• Introduction to Non-Linear Analysis, Coupling & Constraint Equations

#### **Chapter-5**

 Material Properties, Material Library, specifying properties, Boundary Conditions, types of Loads, Applying loads

#### **Chapter-6**

Static Structural Analysis & Thermal Analysis

#### **EXPECTED OUTCOMES**

- To understand how to create a 2D in Ansys APDL
- To create a 2D model using sketch driven features
- Create a 2D model using Material Library.
- Application of Loads
- Analysis of Loads under Static and Thermal Analysis.

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Head of the Department Department of Mechanical Engg. Avanthi Institute of Engg. & Tech., Makavarapalem, Visakhapatnam - 531113.

COORDINATOR



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## DEPARTMENT OF MECHANICAL ENGINEERING

## Finite Element Analysis using ANSYS APDL Software

From 15th March 2021 to 20th March 2021

#### <u>Schedule</u>

#### DAY - 1 (15.03.2021)

09:00AM-09:30AM - Inaugural Session & addressing the Guests

09:30AM-11:00AM - Introduction about the workshop and Ansys APDL Fundamentals

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM – usage of Various types of tools in ANSYS APDL and their applications and create, save various types of APDL documents.

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Explanation about Differentiate and switch between a selection of Materials and Properties. Perform various tasks concerning design parameters and geometry selection

#### <u>DAY - 2 (16.03.2021)</u>

09:00AM-09:30AM - ANSYS Mechanical APDL for Finite Element Analysis

09:30AM-11:00AM - FEA and ANSYS Mechanical APDL

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM - Explanation of 1D, 2D and 3D Elements with examples of ANSYS Elements

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Enlisting different FEM methods and detailed explanation of any one, Introduction to the ANSYS GUI

#### DAY - 3 (17.03.2021)

09:00AM-09:30AM - Introduction to Non-Linear Analysis

09:30AM-11:00AM - Using the Toolbar & Creating Abbreviations

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM - Coupling & Constraint Equations

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Beam Modelling and Practice Session

#### DAY - 4 (18.03.2021)

09:00AM-09:30AM - Solid Modeling

09:30AM-11:00AM - An Overview of Solid Modeling Operations

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM - Working with Boolean operations

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Working Plane, importing of 3D models, The ANSYS Mesh Tool, Smart sizing, Meshing m. Free Meshing

#### DAY - 5 (19.03.2021)

09:00AM-09:30AM - Material Properties

09:30AM-11:00AM - Material Library, Specifying properties

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM - Boundary Conditions, types of Loads, Applying loads

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Solvers a. Types of Solvers, b. Solver Setup, c. Load Step Options, d. Solving Multiple Load Steps

#### DAY - 6 (20.03.2021)

09:00AM-09:30AM - Static Structural Analysis

09:30AM-11:00AM - Modal Analysis - Workshops, Exercises and Case Studies

11:00AM-11:15AM - Tea Break

11:15AM-1:15PM - Thermal Analysis - Workshops, Exercises and Case Studies.

1:15PM-02:15PM - Lunch Break

02:15PM-04:00PM - Workshops, Exercises and Case Studies and Practice Session, Valedictory Session.

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Head of the Department Department of Mechanical Engg. Avanthi Institute of Engg. & Tech., Makavarapalem, Visakhapatnam - 531113.

**COORDINATOR** 



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S.NO	Roll Number	Name of the student	15.03.2021	16.03.2021	17.03.202	18.03.2021	19.03.2021	20.03.2021
1	17811A0303	ALLU HARI BABU		X	~	$\checkmark$	~	$\checkmark$
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5	17811A0307	BESETTY VINAY	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
6	17811A0308	BODDETI NEELESH KUMAR	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
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8	17811A0310	BONDA SWAMY	X	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
9	17811A0311	CHAVVAKULA VASU	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
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11	17811A0313	DADI YUGANDAR	$\checkmark$	~	$\checkmark$	$\checkmark$	~	
12	17811A0314	DANDU PRAVEEN SAI KRISHNA	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
13	17811A0315	DOSURU PAVAN	$\sim$	$\sim$	$\checkmark$	~	X	$\checkmark$
14	17811A0316	GALI SURESH	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~	$\checkmark$
15	17811A0317	GANGULAKURTHI SURYA CHARAN	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
16	17811A0318	GOKIVADA SRAVAN SAI SRINIVAS	$\checkmark$	$\sim$	$\checkmark$	$\sim$	$\checkmark$	~
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18	17811A0320	GORLI RAJESH	$\checkmark$	$\sim$	X	~	~	~
19	17811A0322	GUMULURU YASWANTH	$\sim$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
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129	18815A0368	VILLURI MURALI KRISHNAM NAIDU	$\checkmark$	~	$\sim$	~		~
130	18815A0369	VIYYAPU PRASANNA A N MODAKONDALA RA	0 1	$\checkmark$	$\checkmark$			
131	18815A0370	VODUGONDA MOULI		$\checkmark$	$\checkmark$	X		
132	18815A0371	YALAMANCHILI SRINU		$\checkmark$	$\checkmark$	~	~	~
133	18815A0372	YALLA SANYASINAIDU	$\checkmark$	$\checkmark$	V	$\checkmark$	~	$\sim$
134	18815A0373	YARRAMSETTI LAXMINARAYANA	V	~	$\checkmark$	$\checkmark$	~	
135	18815A0374	YEDLA THRIMURTHULU	V	V	V	$\sim$	~	$\checkmark$
136	18815A0375	YEDURI PRAKASH	$\checkmark$	$\checkmark$	$\checkmark$	$\sim$	X	$\sim$
137	18815A0376	ADARI SRIKANTH	$\checkmark$	$\checkmark$	$\checkmark$	$\sim$	~	~
138	18815A0377	KOILADA PAVAN KALYAN	$\checkmark$	$\checkmark$	X	~	~	
139	18815A0378	SEERAMREDDI SESHADRI	$\checkmark$	$\checkmark$	~	~		
140	18815A0379	GEDELA UDAY CHARAN	$\checkmark$	$\checkmark$	$\checkmark$	$\sim$	$\sim$	$\checkmark$
141	18815A0380	KUPPILI TEJESWAR REDDY	$\checkmark$	$\checkmark$	$\sim$	$\sim$		$\sim$
142	18815A0381	PILLA KIRAN	$\checkmark$	$\sim$	$\sim$	$\checkmark$	$\checkmark$	$\checkmark$
143	18815A0382	TAMANARA RAJESH	$\checkmark$	$\checkmark$	$\sim$	$\sim$	V	~
144	18815A0383	BODDEDA ARAVIND	$\checkmark$	$\checkmark$	$\sim$		V	
145	18815A0384	KANITHI SRINIVAS	$\sim$	$\sim$		~	~	
146	18815A0385	MADDALA BHARGAV	$\checkmark$	X	$\sim$		V	
147	18815A0386	KOTANA SAIRAM	V	~	$\checkmark$	~	V	

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COORDINATOR

HOD Head of the Department Department of Mechanical Engg. Avanthi Institute of Engg. & Tech., Makavarapalem, Visakhapatham-531113.



(Approved by AICTE, Permanently Affiliated to JNT University Kakinada,

ACCREDITED BY NAAC and Recognized under 2(f) &12 (b) by UGC, New Delhi)

Tamaram, Makavarapalem, Narsipatnam (RD), Visakhapatnam-531113

# **CERTIFICATE OF PARTICIPATION**

This is to certify that Mr/Mrs	of	
	has participated in the Certificate C	ourse entitled on
"FINITE ELEMENT ANALYSIS	USING ANSYS APDL SOFTWAR	RE" during from
15 <sup>th</sup> March 2021 to 20 <sup>th</sup> March 20	021 in Department of Mechanical Eng	ineering.
COORDINATOR	HOD	PRINCIPAL



AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY (Approved by AICTE, Permanently Affiliated to INT University Kakinada, ACCREDITED BY NAAC and Recognized under 2(f) &12 (b) by UGC, New Delhi) Tamaram, Makavarapalem, Narsipatnam (RD), Visakhapatnam-531113

#### DEPARTMENT OF MECHANICAL ENGINEERING

Dt:22/03/2021

## BRIEF REPORT

Department of Mechanical Engineering, Avanthi Institute of Engineering and Technology had organized a certificate course on "FINITE ELEMENT ANALYSIS USING ANSYS APDL SOFTWARE" from 15th march 2021 to 20th march 2021

We had Mr. I. Prakash Design Engineer from Data Pro as the speaker to explain each and every detail about ANSYS, APDL fundamentals. He started off with what the course is about and gave a proper definition. Coming to the need ANSYS mechanical APDL for finite element analysis he extensively explained the plus points of this technology. One of the major advantage explained about Avionics & Flight Controls, Beam modelling, solid modelling are also explained.

Dr. A. Ramki, Assistant Professor, Mechanical Engineering Department, Raghu Engineering College as another speaker explained the limitation is Large amount of data is required as input for the mesh used in terms of nodal connectivity and other parameters depending on the problem. They are generally used for Biomedical Applications, Plate Dynamics, Industrial and Business Management. Some of the topics are focused during course Thermal analysis, key formulation, practical coding skills. And also explained about coupling & Constraint Equations, Smart meshing, smart sizing. Finally concluded the real time applications of Finite element Analysis and how it is utilized in mechanical related industries.

COORDINATOR

Head of the Department Department of Mechanical Engg. Avanthi Institute of Engg. & Tech., Makavarapalem, Visakhapatnam-531113.