(Approved by AICTE & Affiliated to JNTUH)

179, Chilkur (V), Moinabad (M), Ranga Reddy Dist. TS. Phone: 8790101015 / 9959250205

JNTUH Code (U6)

e-mail: principal.giet.u6@gmail.com
CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech. EAMCET Code- GLOB

### **Department of Mechanical Engineering**

Mr. D V Ramana Rao B. Tech, M. Tech **Assistant Professor & Head** 

Lr.No: GIET/ME/Brdg Cour/001/05/2015-16

Date 22/06/2015

To

The Principal Global Institute of Engineering & Technology Moinabad

Madam.

Sub: Permission to Conduct Bridge Course for Students of ME-III Semister reg..

This is to get it to your kind notice that we Department of Mechanical Engineering are interested to conduct a Bridge Course On ANSYS to the students of ME-III Sem from 29/06/2015 to 03/07/2015, which is undertaken for students benefit as a value addition to curriculum of course.

These classes help students to strengthen their basics and bridge gap between intermediate and engineering. These classes give them a brief idea of Mechanical Engineering.

Kindly accord approval so as to make necessary arrangements for conducting the classes for students of Mechanical Engineering -III Sem - Academic Year: 2015-16.

Thanking you.

HEAD Department of Mechanical Engg. Global Institute of Engineering & Technology Chilkur (V)., Moinabad(M)., R.R. Dist.T.S.-501504.

Cc to:

Director - for information

Dy. Director- for information

Dean - for information

Head H&S - for information

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# **Department of Mechanical Engineering**

Lr.No: GIET/ME/Brdg Cour/002/05/2015-16

Date 22/06/2015

# OFFICE ORDER

Sub: Appointment of Coordinator for Bridge Course Students of ME-III-Reg

This is to state that Ms.G Tejaswi is appointed as Coordinator for Bridge Course Classes for students of Mechanical Engineering- III Sem from 29/06/2015 to 03/07/2015. Further you will be responsible for checking the status of classes, strength of students and Syllabus coverage status and all other issues related to the conduct of classes.

It is here by informed to take charge immediately and initiate the work accordingly.

To Ms.G Tejaswi **Assistant Professor** Department Mechanical Engineering Global Institute of Engineering & Technology.

Global Institute of Engg. & Tech Chilkur (V), Moinabad (M) R. R. Dist

Cc to

Principal-for information

Dean-for information

Dy Director- for information

Director-for information



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CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech. EAMCET Code- GLOB

Secretary:

K.M. ARIFUDDIN B.A., LL.M

Principal:

Lr.No: GIET/ME/Brdg Cour/003(a)/05/2015-16

Date 22/06/2015

To

Mr. Pavan B Asst. Professor Dept.of Mechanical Engineering CMREC Hyderabad.

Respected Sir,

SUB: Invitation as a Speaker for Bridge Course on 'ANSYS-Reg Academic Year: 2015-16

Global Institute of Engineering and Technology is a self financed Non-Minority Institution established in the year 2006 with a vision to promote quality education.

Global Institute of Engineering and Technology is managed by Madina Education and Welfare Society which is a four decades old society. Global Institute of Engineering and Technology offers B.Tech in Civil Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Mechanical Engineering, Computer Science and Engineering and Masters in Embedded Systems, Electrical Power Engineering, Computer Science and Engineering, Structural Engineering and MBA.GIET is also approved Nodal Center for running skill development courses under Pradhan Mantri Kaushal Vikas Yojana.

It is to humbly invite you to Speaker for Bridge Course on **ANSYS** in the Institution for our students of ME-III Sem, which is undertaken for students benefit as a value addition to curriculum of course.

I on behalf of the students of department of Mechanical Engineering request you grace the occasion as Speaker on 29/06/2015 to 03/07/2015 At College Campus Moinabad to take a Session on "ANSYS".

It is humbly requested to accept our invitation. Thank you for your time and consideration.

Yours sincerely

Principal

Global Institute of Engg. & Tec Chilkur (V), Moipsbad (M)

R. R. Diet

(Approved by AICTE & Affiliated to JNTUH)

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Secretary:

K.M. ARIFUDDIN B.A., LL.M

Principal:

Lr.No: GIET/ME/Brdg Cour/003(a)/05/2015-16

Date 22/06/2015

Mr. Dayanand Reddy MD, Vasantha tools crafts Pvt.Limited Hyderabad.

Respected Sir,

SUB: Invitation as a Speaker for Bridge Course on 'ANSYS-Reg Academic Year: 2015-16

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Global Institute of Engineering and Technology is managed by Madina Education and Welfare Society which is a four decades old society. Global Institute of Engineering and Technology offers B.Tech in Civil Engineering, Electrical and Electronics Engineering, Electronics and Communication Engineering, Mechanical Engineering, Computer Science and Engineering and Masters in Embedded Systems, Electrical Power Engineering, Computer Science and Engineering, Structural Engineering and MBA.GIET is also approved Nodal Center for running skill development courses under Pradhan Mantri Kaushal Vikas Yojana.

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It is humbly requested to accept our invitation. Thank you for your time and consideration.

Yours sincere

PRINCIPAL Global Institute of Engg. & Tec Chilkur (V), Moinabad (M)

R. R. Dist



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e-mail: principal.giet.u6@gmail.com JNTUH Code(U6) CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech.

# Department of Mechanical Engineering

Mr. D V Ramana Rao B. Tech, M. Tech Assistant Professor & Head

Lr.No: GIET/ME/Brdg Cour/006/07/2015-16

Date 26/06/2015

EAMCET Code-GLOB

### **CIRCULAR**

All the students of ME-III Sem are informed to express their interest by enrolling their name for the One week Bridge course on "ANSYS" starting from 29/06/2015 to 03/07/2015. The detailed syllabus for the course is attached for your information. Concerned mentors are instructed to submit the list of students enrolled within two days to the undersigned. For further information, you can contact the Course Coordinator.

Department of Mechanical Engg. Global Institute of Engineering & Technology Chilkur (V)., Moinabad(M)., R.R. Dist.T.S.-501504.

Cc to:

Principal – for information

**IQAC-** for information

Mentor-for information

Head H&S - for information

Notice board

File

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JNTUH Code (U6)

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CIVIL - CSE - MECH - ECE - EEE - MEA - M.Tech. EAMCET Code- GLOB

Secretary:

K.M. ARIFUDDIN B.A., LL.M

Principal:

Lr.No: GIET/ME/Brdg Cour/004(a)/05/2015-16

Date 03/07/2015

To Mr. Dayanand Reddy MD, Vasantha tools crafts Pvt.Limited Hyderabad.

SUB: Thanking for accepting invitation as a Speaker-Reg.

Respected Sir,

With all our due respect, we would like to thank you for your kind acceptance of invitation as a Speaker for Bridge Course on "ANSYS". Presence of a Speaker like you certainly will enhance the moral of our students and give them a new perspective on this topic.

It would be a pleasure to have you with us in this course and for our students to extract maximum possible information. Hope you will have a great time with us.

Thanking you.

Yours Sincerely

PRINC Global institute of Engg & Chilkur (V), Moinabad (IVI)

R. Dist

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Secretary:

K.M. ARIFUDDIN B.A., LL.M

Principal:

Lr.No: GIET/ME/Brdg Cour/004(b)/06/2015-16

Date 03/007/2015

To Mr. Pavan B Asst. Professor Dept.of Mechanical Engineering CMREC Hyderabad.

Respected Sir.

SUB: Thanking for accepting invitation as a Speaker-Reg. \*\*\*\*

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Thanking you

Yours Sincerely

Global Institute of Engg Chilkur (V), Moinabad (IV

R. R. Dist



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# **Department of Mechanical Engineering**

# **COURSE SYLLABUS FOR "ANSYS"**

S.no	Topics to delivered	Duration Class work +Lab Practice
1	Introduction to Finite Element Analysis	(in hours)
2	Introduction to ANSYS	6
3	Difference Between FDM FEM And FEA	6
4	General procedure in FEM	6
5	Working in ANSYS	6

Department of Mechanical Engg.
Global Institute of Engineering & Technology
Chilkur (V)., Moinabad(M)., R.R. Dist.T.S.-501504.



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EAMCET Code- GLOB

**Department of Mechanical Engineering** 

# LIST OF STUDENTS ENROLLED FOR BRIDGE COURSE

### **ACADEMIC YEAR: 2015-2016**

S.No	Roll no	Name of the student	Year	Dept
1	14U61A0301	ABDUL RAHAMAN SK	II	ME
2	14U61A0302	ABHISHEK DAS	II	ME
3	14U61A0303	AFTAB ALAM	II	ME
4	14U61A0304	CHIRANJIT MONDAL	П	ME
5	14U61A0305	HABEEB AHMED SHOAIB	II	ME
6	14U61A0306	M A SAUD SIDDIQUI	II	ME
7	14U61A0307	MD ABDUL AHMED	II	ME
8	14U61A0308	MD AFREED	II	ME
9	14U61A0309	MD EMDADUL SK	II	ME
10	14U61A0310	MD KAIFY SHADAB	II	ME
11	14U61A0311	MD KAMRAN KHAN	II	ME
12	14U61A0312	MD NURUDDIN KHAN HAYAT FAROOQUE	П	ME
13	14U61A0313	MD SOHEL HASSAN SARDAR	II	ME
14	14U61A0314	MD TUFAIL HUSSAIN	II	ME
15	14U61A0315	MOHAMMED KHASIM HUSSAIN	П	ME
16	14U61A0316	MOHAMMED ABDUL KHADER	П	ME
17	14U61A0317	MOHAMMED FAREED KHAN	П	ME
18	14U61A0318	MOHAMMAD GHOUSE KHAN	II	ME
19	14U61A0319	MOHAMMED MUDASSIRALI	П	ME
20	14U61A0320	MOHAMMED QUTUBUDDIN	II	ME
21	14U61A0321	MOHAMMED YOUSHA MIRZA	II	ME
22	14U61A0322	MOHAMMED ZAKRIYA	П	ME
23	14U61A0323	MOHD AMIR ALI KHAN	II	ME
24	14U61A0324	MOHD DAUD	II	ME
25	14U61A0325	MOHD KAZIM AHMED	II	ME
26	14U61A0326	MOHD NAVEED	II	ME

ME HEAD STREETING DIST

27	14U61A0327	MOHD RASHEED	II	ME
28	14U61A0328	MOHD SOHAIL	П	ME
29	14U61A0329	MOHD TALHA	II	ME
30	14U61A0330	MUJAHEDUL ISLAM	П	ME
31	14U61A0331	NIHAL KHURSHID	П	ME
32	14U61A0332	NURUL HASSAN MALLIK	П	ME
33	14U61A0333	PRIYAJIT CHATTERJEE	II	ME
34	14U61A0334	SADIQUE	II	ME
35	14U61A0335	SOHIB AHMED	II	ME
36	14U61A0336	SYED ALI MOHAMMED	II	ME
37	14U61A0337	SYED ASAD UDDIN	II	ME
38	14U61A0338	SYED MUJEEB UDDIN	II	ME
39	14U61A0339	SYED WASIFULLAH HUSSAINI	II	ME
40	14U61A0340	ZAID DANISH	II	ME





HEAD
Department of Mechanical Engg.
Global Institute of Engineering & Technology
Chilkur (V)., Moinabad (M)., R.R. Dist T.S.-501504.



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Phone: 08417-252233 / 253021

Department of Mechanical Engineering

EAMCET Code-GLOB

Attendance Sheet of Bridge course on " ANSYS"

S. NO	H.T.No	NAME OF THE PARTICIPANT	Year	Dept	29/06/2015	30/6/2015	07-01-2015	07-02-2015	07-03-2015	Total	Percentage
1	14U61A0301	ABDUL RAHAMAN SK	II	ME	6	6	6	6	6	30	100
2	14U61A0302	ABHISHEK DAS	II	ME	6	6	6	6	6	30	80
3	14U61A0303	AFTAB ALAM	II	ME	6	6	6	6	0	24	80
4	14U61A0304	CHIRANJIT MONDAL	II	ME	6	6	6	6	6	30	80
5	14U61A0305	HABEEB AHMED SHOAIB	II	ME	6	6	6	6	6	30	100
6	14U61A0306	M A SAUD SIDDIQUI	II	ME	6	6	6	6	6	30	80
7	14U61A0307	MD ABDUL AHMED	II	ME	6	0	6	6	6	24	80
8	14U61A0308	MD AFREED	II	ME	6	6	6	6	0	24	80
9	14U61A0309	MD EMDADUL SK	П	ME	6	6	6	6	6	30	100
10	14U61A0310	MD KAIFY SHADAB	II	ME	6	6	6	6	6	30	100
11	14U61A0311	MD KAMRAN KHAN	II	ME	6	0	6	6	6	24	80
12	14U61A0312	MD NURUDDIN KHAN HAYAT FAROOQUE	II	ME	6	6	6	6	6	30	80
13	14U61A0313	MD SOHEL HASSAN SARDAR	II	ME	6	6	6	0	6	24	80
14	14U61A0314	MD TUFAIL HUSSAIN	П	ME	6	6	6	6	6	30	100
15	14U61A0315	MOHAMMED KHASIM HUSSAIN	II	ME	6	6	6	6	6	30	80
16	14U61A0316	MOHAMMED ABDUL KHADER	II	ME	6	6	6	6	6	30	100
17	14U61A0317	MOHAMMED FAREED KHAN	II	ME	6	6	0	6	6	24	80
18	14U61A0318	MOHAMMAD GHOUSE KHAN	II	ME	6	6	0	6	6	24	80
19	14U61A0319	MOHAMMED MUDASSIRALI	II	ME	6	6	0	6	6	24	80
20	14U61A0320	MOHAMMED QUTUBUDDIN	П	ME	6	6	0	6	6	24	80
21	14U61A0321	MOHAMMED YOUSHA MIRZA	II	ME	6	6	6	6	6	30	100
22	14U61A0322	MOHAMMED ZAKRIYA	II	ME	6	6	6	6	6	30	100
23	14U61A0323	MOHD AMIR ALI KHAN	II	ME	6	6	6	6	6	30	100
24	14U61A0324	MOHD DAUD	II	ME	6	6	0	6	6	24	80
25	14U61A0325	MOHD KAZIM AHMED	II	ME	6	6	6	6	6	30	100
26	14U61A0326	MOHD NAVEED	II	ME	6	6	0	6	6	24	80
28	14U61A0327 14U61A0328	MOUD SOLLAH	II	ME	6	6	6	6	6	30	100
. 29	14U61A0329	MOHD SOHAIL MOHD TALHA	П	ME ME	6	6	6	6	6	30	100
30	14U61A0329	MUJAHEDUL ISLAM	II	ME	6	6	6	6	6	30	100
31	14U61A0331	NIHAL KHURSHID	II	ME	6	6	6	6	6	30	100
32	14U61A0331	NURUL HASSAN MALLIK	II	ME	6	6	6	6	6	30	100
33	14U61A0333	PRIYAJIT CHATTERJEE	II	ME	6	6	6	6	6	30	100
34	14U61A0334	SADIQUE	П	ME	6	6	6	6	6	30	100
35	14U61A0335	SOHIB AHMED	II	ME	6	6	6	6	6	30	100
36	14U61A0336	SYED ALI MOHAMMED	П	ME	6	6	6	6	6	30	100
37	14U61A0337	SYED ASAD UDDIN	II	ME	6	6	6	6	6	30	100
38	14U61A0338	SYED MUJEEB UDDIN	II	ME	6	6	6	6	6	30	100
39	14U61A0339	SYED WASIFULLAH HUSSAINI	II	ME	6	6	6	6	6	30	100
40	14U61A0340	ZAID DANISH	П	ME	6	6	0	6	6	24	80



H.O.D

Department of Mechanical Engy.
Global Institute of Engineering & Technology
Chilkur (V).. Moinabad(M)., R.R. Dist.T.S.-501504.



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JNTUH Code(U6) CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech.

EAMCET Code- GLOB

**Department of Mechanical Engineering** 

**Bridge Course** On ANSYS (29<sup>th</sup> June to 03<sup>rd</sup> July 2015)

## PROGRAMME SCHEDULE

	Forenoon (F	FN)	Afternoon(AN)
Day1	INAUGURATION	Introduction to Finite Element Analysis  Mr. Dayanand Reddy MD Vasantha tools crafts Pvt.Limited Hyderabad.	Introduction to Finite Elemen Analysis Lab Practice
Day2	Mr. Pavan B Asst. Professor Dept.of Mechanica CMREC Hyderaba	al Engineering	ANSYS Lab Practice
Day3	Mr. Davanand Red	IFDM FEM And FEA	-
Day4	Mr. Pavan B Asst. Professor Dept.of Mechanica CMREC Hyderab	al Engineering	General procedure in FEM Lab Practice
Day5	Working in ANSY  Mr. Dayanand Re MD Vasantha too Hyderabad.		Working in ANSYS Lab Practice

Geo- Ordinator Ms.G Tejaswi Assistant Professor Department of ME



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# Department of Mechanical Engineering

**Bridge Course** On **ANSYS** 

(29th June - 3rd July 2015)

### FEEDBACK FORM

Please valuate your rating of the course by placing a tick in the appropriate box. 1. Poor 2. Satisfactory 3. Good 4. Very good 5. Excellent

Branch and Year: Mechanical IInd year

Date: 03/07/2015

ASPECTS			RATING		
	Excellent 5	Very good	Good 3	Satisfactory	Poor
Relevance of contents				2	1
Trainer was knowledgeable and skillful					
Quality of input provided					
Quality of presentations					
Adherence to the time schedule		1			
Opportunity given to participant to clear doubts					
Identify ways to build on current skills and knowledge					
Overall learning experience					

How has the course enhanced your skills or understanding of this topic?

VexU	Conno	ı
Very	9000	١

Specify problems faced by you during the course?

Any Other Comments:

No

Department of Mechanical Engg. Global Institute of Engineering & Technology Chilkur (V)., Moinabad(M)., R.R. Dist.T.S-501504.



(Approved by AICTE & Affiliated to JNTUH)

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e-mail: principal.giet.u6@gmail.com

JNTUH Code(U6) CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech. EAMCET Code- GLO

Branch and Year: MECHANICAL (II-Year)

EAMCET Code- GLOB

Date: 3/7/2015

# Department of Mechanical Engineering

**Bridge Course** ANSYS

(29th June - 3rd July 2015)

### **FEEDBACK FORM**

Please valuate your rating of the course by placing a tick in the appropriate box. 1. Poor 2. Satisfactory 3. Good 4. Very good 5. Excellent

ASPECTS			RATING		
	Excellent 5	Very good	Good 3	Satisfactory 2	Poor 1
Relevance of contents					
Trainer was knowledgeable and skillful	/				
Quality of input provided	/				
Quality of presentations	/				
Adherence to the time schedule					
Opportunity given to participant to clear doubts	/				
Identify ways to build on current skills and knowledge	./.	A			
Overall learning experience	1	0			
II	4 31				
How has the course enhanced your skills or und AWCSOMC	derstanding o	f this topic?			
Specify problems faced by you during the cours	se?				
- NO -					
Any Other Comments:					
- Nothing.					

Department of Mechanical Engg. Global Institute of Engineering & Technology Chilkur (V)., Moinabad (M)., R.R. Dist.T.S. 301304. Bridge Course On ANSYS

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				Day-1		Day-2 (30/06/2015)	2,015)	Day-3 (01/07/2015)	15)	(2/07/2015)	.015)	07-03-2015	2015
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n-II M.	Name of the Farticipain	Programme	Year	Z.	NA.	N.C	AN	NH	AN	FN	NA	N-A	AN
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14U61A0304	$\neg$	B.Tech	II	2	1	-	-	2	4		1	9	A
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14U61A0306		B.Tech	II	0	2	4	7	4	4	5	-	6	4
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14U61A0312		B.Tech					0		4	9	Q.	d	0
14H61A0313		B.Tech			-	C	0	Z	A	0	NO	P	0
14161A0314		B.Tech	=			30	6	a	4	0	0 ,	00	d'
41161A0315		B. Lech		1				A	6	00	A	(A)	+
14U61A0316		B.Tech	=		0	0	9		9	3	D	0	-
14U61A0317		B. I ecn		1<	0	7	9	1	di	0	9	0 0	2
14U61A0318		B.1ecn	-	4	C	0	0	(I)	4	1	0	2	2
14U61A0319		D.Tech	=	-		4	7	82	4	0	2		
14U61A0320		B Tech		10	0	0	0	7	2	OR	200		1
14U61A0321		B Tech		C	0	0	4	1	A	A	2	-	,
14U61A0322		B Tech		0	A		0	1	-	7	4	F	1
14U61A0323		B Tech	-	4	d	0	17	0	4		7	2	4
14U61A0324		B.Tech	=	0	0	1	4	d			,	<b>T</b>	7
14U61A0325		B Tech	F	0	0	4	4	7	0	2	*	7	-
14U61A0326		B.Tech	F	1	0	0	do	4	0	1	4	4	+6
14U61A0327	MOHD KASHEED	B.Tech	=	A	4	2	7		+	10	4	-	4
14U61A0328	$\neg$	B.Tech	=	Q	A	7	7	1	4	9	5	9	4
14U61A0329		B.Tech	=	00	1	4	2	4	4	-6	1	4	0
14U61A0330	$\neg$	B.Tech	=	2	0	0	1	4	+	40	-	-	S
14U61A0331		B.Tech	=	2	4	2		1	4		*	00	
14U61A0332	Т	B.Tech	=	0.	F	2	2	+			-	-	
14U61A0333		B.Tech		0	1	2	-		\$	* 5	Ç		0
14U61A0334	$\neg$	B.Tech	=	0	A	0	7		4	+	4	0	4
14U61A0335	Т	B.Tech	=	0	0	7	2	7	7	+		4	•
14U61A0336		B.Tech	=	0	101	3	29		1	7		11.31	2
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14U61A0339	SYED WASIFULLAH HUSSAI									į			



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(Approved by AICTE & Affiliated to JNTUH)

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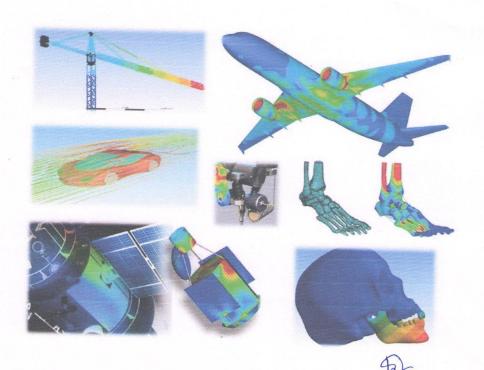
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CIVIL - CSE - MECH - ECE - EEE - MBA - M.Tech.

Department of Mechanical Engineering

Bridge Course On "ANSYS"



Department of Mechanical Engg.
Global Institute of Engineering & Technology
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About Bridge Course: The Bridge Course is aimed to act as a buffer for the new entrants, with an objective to provide adequate time for the transition to hard-core engineering courses. During this interaction of bridge course week with the faculty and their classmates, the students will be equipped with the knowledge and the confidence needed to take on bigger challenges as future engineers of this country.

### Objectives:

- > To act as a buffer for the new entrants.
- > To provide adequate time for the transition to hard-core engineering courses.
- > Focus on fostering a strong sense of ethical judgment and moral fortitude.
- Applications based self-learning and intermingling of a large cross section of students from vastly varying backgrounds.
- A breather, to prepare themselves before courses for first year engineering commence.
- The students will be equipped with the knowledge and the confidence needed to take on bigger challenges.
- Nurture a deeper understanding of the local and global world and our place in at as concerned citizens of the world.
- Interactive and Active Learning by Doing have been weaved into the Bridge Course.
- Active learning with the help of other students

### **Chapter1: Introduction to Finite Element Analysis**

### What is FEA?

**Finite Element Analysis** is a way to simulate loading conditions on a design and determine the design's response to those conditions.

The design is modeled using discrete building blocks called **elements**. Each element has exact equations that describe how it responds to a certain load. The "sum" of the response of all elements in the model gives the total response of the design. The elements have a finite number of unknowns, hence the name **finite elements**.

The **finite element model**, which has a finite number of unknowns, can only approximate the response of the physical system, which has infinite unknowns.

So the question arises: How good is the approximation?

Unfortunately, there is no easy answer to this question. It depends entirely on what you are simulating and the tools you use for the simulation. We will, however, attempt to give you guidelines throughout this training course.

**Physical System** 



F.E. Model



Most often the mathematical models result in algebraic, differential or integral equations or combinations thereof. Seldom these equations can be solved in closed form (Exact form), and hence numerical methods are used to obtain solutions. Finite difference method is a classical method that provides approximate solutions to differential equations with reasonable engineering accuracy. There are other methods of solving mathematical equations that are taught in traditional numerical methods courses. Finite Element Method is one of the numerical methods of solving differential equations. The FEM originated in the area of structural mechanics, and has been extended to other areas of solid mechanics and later to other fields such as heat transfer, fluid dynamics and electromagnetic devices. In fact FEM has been recognized as a powerful tool for solving partial differential equations and integral-differential equations. And in the near future it may become the numerical method of choice in many engineering and applied science areas. One of the reasons for Fem.'s popularity is that the method results in computer programs versatile in nature that can be used to solve many practical problems with least amount of training. Obviously there is a

danger in using computer programs without proper understanding of the theory behind them, and that is one of the reactions to have a thorough understanding of tile theory behind the Finite Element Method.

### **Brief History of the FEM**

Academic and industrial researchers created the finite element method of structural analysis during the 1950s and 1960s. The underlying theory is over 100 years old, and was the basis for pen-and-paper calculations in the evaluation of suspension bridges and steam boilers.

- 1. 1943 Courant (Variational Methods)
- 2. 1960 Clough ("Finite Element", plane problems)
- 3. 1970 Applications on mainframe computers
- 4. 1980 Microcomputers, pre- and postprocessors
- 5. 1990 Analysis of large structural systems
- 6. 1996 Partition of unity method (PUM) Melenk and Babuska
- 7. 1996 h-p Cloud Method of Duarte and Oden
- 8. 1996 Meshless methods by Belytschko et.al

### Why is FEA needed?

- To reduce the amount of prototype testing Computer simulation allows multiple "what-if" scenarios to be tested quickly and effectively.
- •To simulate designs that are not suitable for prototype testing Example: Surgical implants, such as an artificial knee.
- The bottom line:
  - -Cost savings
  - -Time savings... reduce time to market!
  - -Create more reliable, better-quality designs

### FEM TO DESIGNERS:

- Easily applied to complex, irregular shaped objects composed of several different materials and having complex boundary conditions.
- Applied to steady state time dependent, Eigen Value problems.
- Applicable to linear and non-linear problems.
- Number of general-purpose FEM packages are available.
- FEM can be coupled to CAD programs to facilitate Solid modeling and mesh generations.
- Many FEM software packages feature GUI interfaces, automeshers and sophisticated post processors and graphics to speed the analysis and makes Pre and post processing more user friendly.

### FEM TO DESIGN ORGANISATION:

- Reduced Testing and Redesign costs thereby shortening of product development cycle.
- Identify issues in designs before tooling is committed.
- Refine components before dependencies to other components prohibit change.
- Optimize performance before prototyping.
- Discovers design problems before litigations.
- Allows more time for designers to use engineering judgment and less time for further thinking.