

**K.E. Society's
Rajarambapu Institute of Technology
Department of Mechanical Engineering**

Innovative Active learning Technique

Problem Based Learning (TY Mechanical)

Presented by

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Associate Professor



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Purpose / Motivation

- Encourage self learning of students via working on small problems.
- Updating the knowledge through technical survey and search for pin pointed material from huge abundant available digital material.
- Develop awareness about use of recent cutting edge software's adopted at global level.
- List of problems displayed helps to connect class room teaching with real best practices in the real world.
- Instigate the urge to contribute to scientific domain knowledge.
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Suitability of Technique

(Mechanics of composite material , Finite Element Method, Biology for Engineers)

- Mechanics of composite material course has wide applications in the automotive sector, medical field, infrastructure, sports, etc. due to remarkable properties (Specific strength and Specific modulus) exhibited by these new material. A small group of students working on each research area and then finally exchanging this knowledge will assist everyone to update.
- Through problem based assignments, they are expected to search correct paper and understand the methodology adopted to solve the problems and also understand the status of ongoing research in global context especially for the human body parts like brain, skull, kidney, chest and heart can be understood.
- This problem based learning techniques helps to develop awareness about importance of biological phenomena's in solving issues related to waste water management, structural design (Crack healing, Bullet train), Biotechnology, Retinal prosthetics, Biosensors, Biochips etc.

Procedure to implement PBL technique

- Course instructor displays the list of problems in the 1st week of the semester beginning.
- Students are instructed to form the groups. (Min 2; max. 4) [2nd to 3rd week].
- Expectation from each of the topic will be discussed [Research Methodology, Outcome of projects].
- Mid review of progress of work [7th -8th Week].
- Discussion on Evaluation criteria (Uniqueness, detailed design with understanding, communication both oral and written, ethics and principles).
- Project presentation from the group during class followed with comments.
- Uploading the report and PPT to moodle server.

Outcome of this technique (PBL)

- Enhanced awareness amongst students regarding utility of softwares (ANSYS, ABAQUS, LSDYNA, etc.).
- Ability to apply fundamental concepts learnt in class to solve real world problems resulted in better learning.
- Many streams which were felt as unrelated to mechanical engineering are converted to passionate field amongst students.
- Students realized that the collaborative work is the only way to handle real world problems which involves complexity and participation of many experts from diversified field is essential rather than peoples from only mechanical engineering stream.

List of Problems (Mechanics of composite material)

MP-1) Development of composite using bidirectional E-glass and chopped E- glass by varying the layers and determining the mechanical properties.

MP-2) Investigating the Influence of Manufacturing Imperfections of thin-ply Composites on the Mechanical Performance of a Structure

MP-3) Investigations on the Flexibility of ultra-thin Fiber Reinforced Plastic Layups for the use in Deployable Structures.

MP-4) Design and Fabrication of Curved Ultra-Lightweight Sandwich Panel Made by CLF

MP-5) Finite element analysis of composite leaf spring for automotive vehicle

MP-6) Finite element analysis of composite wind turbine blade

MP-7) Design and thermal analysis of multilayer high pressure vessel made up of composite

MP-8) Design and analysis of composite disc brake using FEA approach

MP-9) Finite Element Analysis of Bus Body Structure with composite materials

MP-10) Mechanical behavior of E-glass jute natural hybrid composite

MP-11) Mechanical behavior of E-glass sugarcane biogass natural hybrid composite

MP-12) Mechanical behavior of E-glass, epoxy rein forced with filler materials (rubber powder) composite

MP-13) Mechanical behavior of E-glass, epoxy reinforced with filler materials (ewaste) composite

MP-14) Mechanical behavior coconut coir fiber rein forced with epoxy polymer

FEM related Problems

- Stress analysis of tensile test specimen
- Stress analysis of C-Clamp.
- Stress analysis of car wheel.
- Stress analysis of bicycle frame.
- Stress analysis of a tooth.
- Stress analysis of domestic hot water cylinder.
- Stress analysis of a gas turbine blade.
- Stress analysis of suspension bridge.
- Stress analysis of spur gear.
- Stress analysis of motor car motor cars crank shaft.
- Thermal analysis of a central heating radiator.
- Thermal analysis of gas turbine blade.
- Thermal analysis of motor car's piston.
- Acoustic analysis of an aircraft cabin.
- Flow analysis around a long cylinder.
- Flow analysis around around a a motor car in a wind tunnel
- Flow analysis under a dam
- Frequency analysis of a square clamped plate.
- Frequency analysis of a tuning fork.
- Frequency analysis of a helicopter rotor blade

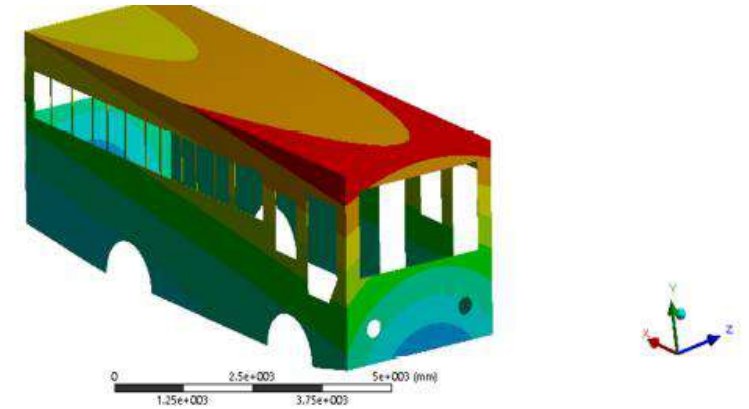
Photographs (MCM/FEM/Biology for Engineers)



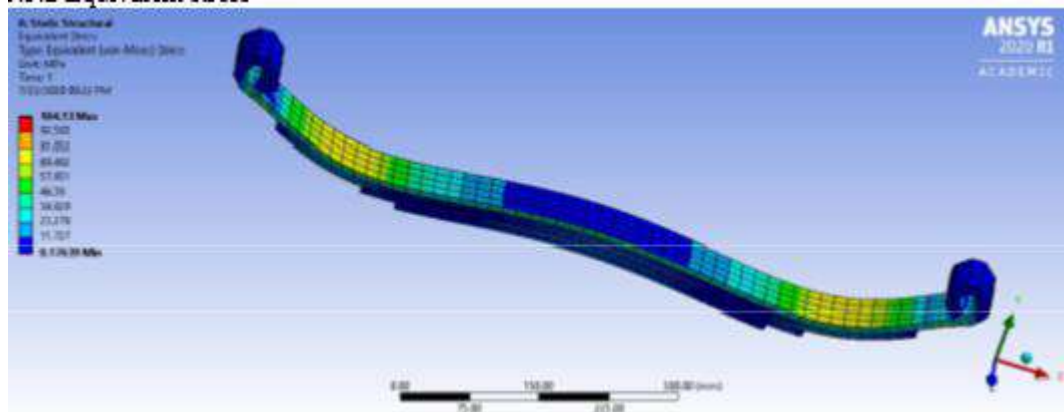
Prediction of Mechanical properties of coconut coir fiber reinforced with epoxy polymer

B: Modal
Total Deformation
Type: Total Deformation
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Unit: mm
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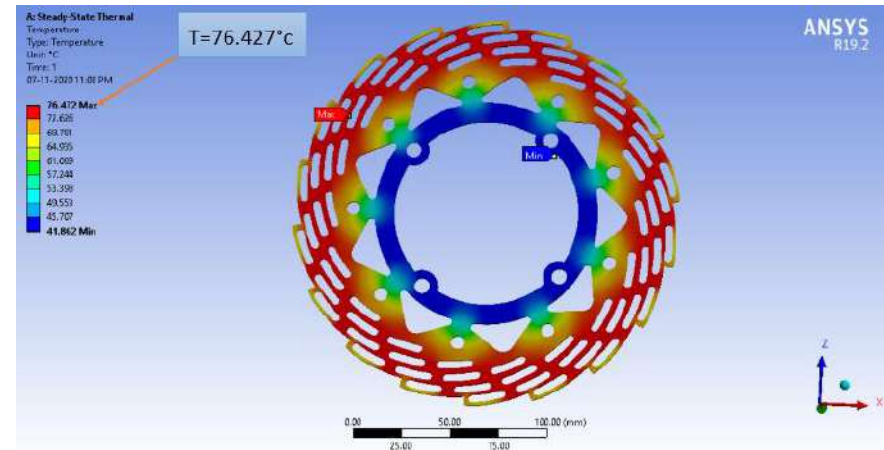
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Modal analysis of Bus body structure using Composite materials

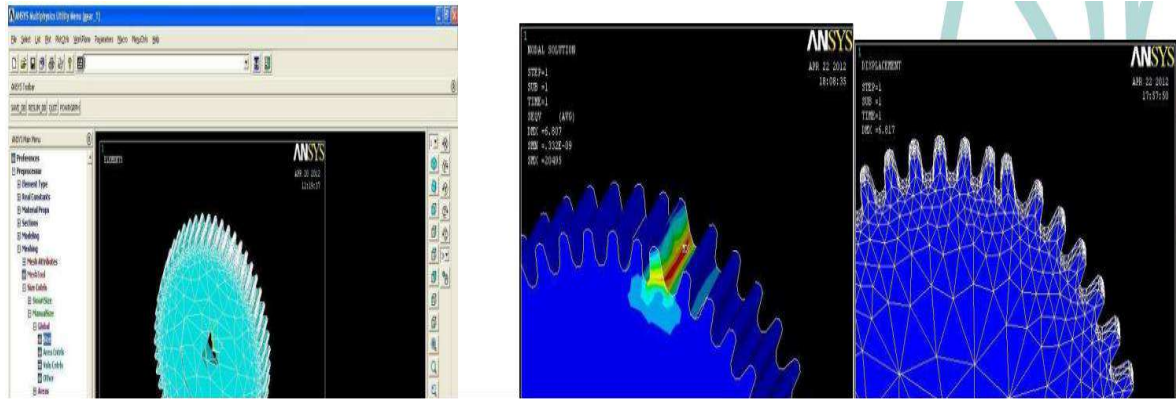


Finite Element Analysis of Composite Leaf Spring for Automotive Vehicle



Design and Analysis of composite disc brake using FEA approach with help of Thermal Analysis.

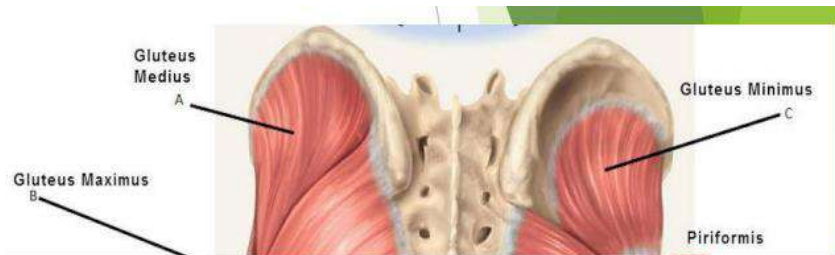
Photographs (MCM/Biology for Engineers/FEM)



Stress Analysis of Spur Gear



Cardiovascular Diseases



Role of Gluetus Muscle

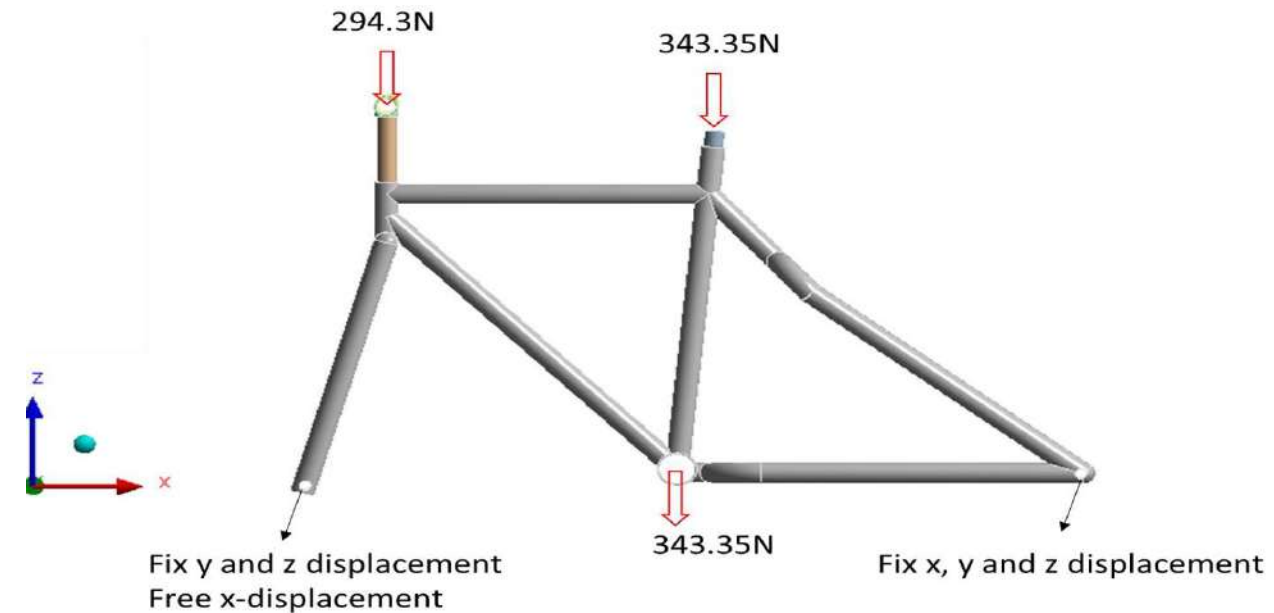
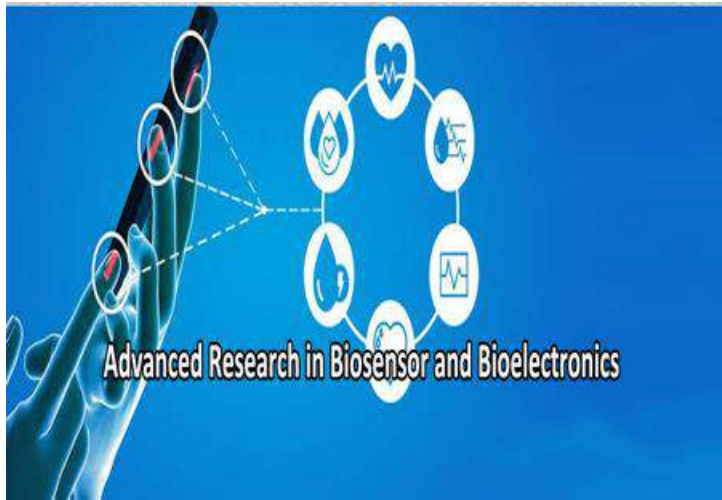


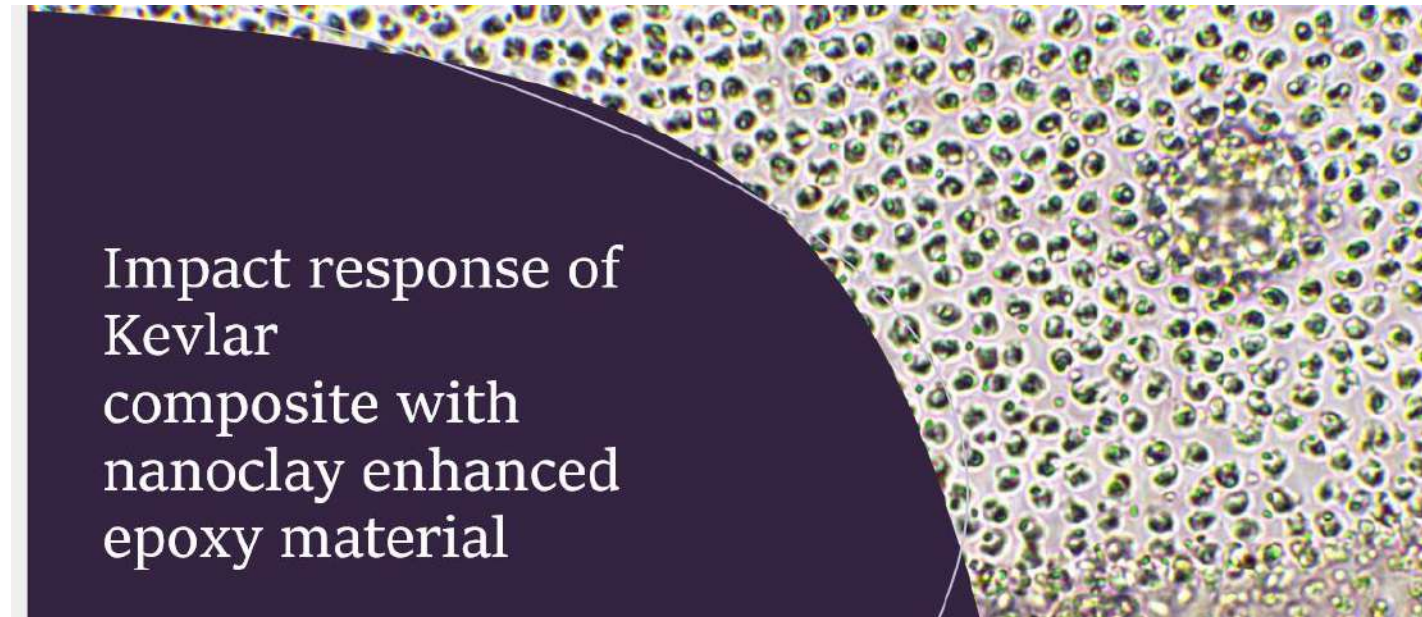
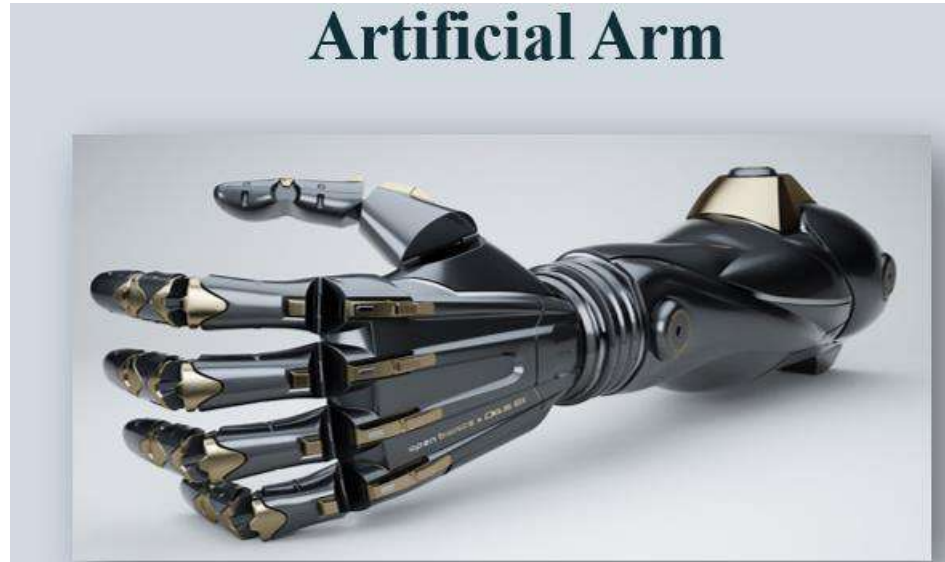
Figure 2. Displacement and load boundary conditions of load case 1

Analysis of Truss

Photographs (MCM/Biology For Engineers/FEM)



Medical Applications of Biosensors



Impact response of Kevlar composite with nanoclay enhanced epoxy material

Responses For FEM

Finite Element Method

Dashboard / My courses / Degree Engineering / Mechanical Engineering / Year 2022-2023 / UG / Third Year / SEM II / Div B / FEM_23_B

Turn editing on

Announcements

Finite element discussion forum group

M.J. Fagan, Text Book, Finite element method

ISE-2 Submission of group members, topic selection and uploading the material

ISE-2 Final submission of one page report and PPTs

TY-3-DIV-ISE-1-MCQ-QUIZ-Dated-05-05-2023-time-7:00 pm to 8:00 pm-duration 20 mins

Reference paper: FEM approach for analysis of turbine blade

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Sudhindra Jalwadi

Select	User picture	First name / Surname	ID number	Email address	Status	Grade	Edit	Last modified (submission)	File submissions	Submission comments	Last modified (grade)
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<input type="checkbox"/>		1906048 1906048		1906048@ritindia.edu	Submitted for grading 13 hours 41 mins late	Grade	Edit	Thursday, 15 June 2023, 1:41 PM	1906048 ise activity report (3).pdf 14 June 2023, 9:15 PM 1906048 ise activity report (3).pptx 15 June 2023, 1:41 PM	Comments (0)	-
<input type="checkbox"/>		2006002 2006002		2006002@ritindia.edu	Submitted for grading	Grade	Edit	Wednesday, 14 June 2023, 10:26 PM	FEM ISE.123-1.pptx 14 June 2023, 10:26 PM	Comments (0)	-
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Response for MCM



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Sudhindra Jalwadi



	2006043		for grading	Grade		January 2023, 12:42 PM	Report and PPT.pptx 19 January 2023, 12:42 PM 19 January 2023, 12:40 PM	Comments (0)
	2006044 2006044	2006044@ritindia.edu	Submitted for grading	Grade	Edit ▾	Thursday, 19 January 2023, 2:15 PM	2006044.pdf 19 January 2023, 2:15 PM 2006044.pptx 19 January 2023, 2:15 PM	Comments (0)
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	2006100 2006100	2006100@ritindia.edu	Submitted for grading	Grade	Edit ▾	Wednesday, 18 January 2023, 11:01 AM	2006100 ISE-II ..pptx 17 January 2023, 9:37 AM Report 2006100.pdf 18 January 2023, 11:01 AM	Comments (0)
	2006112 2006112	2006112@ritindia.edu	Submitted for grading	Grade	Edit ▾	Monday, 23 January 2023, 8:04	2006112 ise report.pdf 23 January 2023, 8:04 AM	Comments (0)

Thank You