**Innovation in teaching learning process**

**[1] Name of the Innovation activity: Case study on 1D structural problem analysis**

**[2] Course code and course name: 1MEPC402 Finite Element Analysis**

**[3] Program and Class: Mechanical Engineering, Final Year B.Tech**

**[4] Name of Faculty: Mr. P.B.Patil**

**[5] Introduction:**

To carry out the analysis of any real life problems finite element method is used. For any physical problem having spread in one direction, numerical analysis is need to carry out considering 1D problem by using FEM. To do 1D structural analysis, let us consider a stepped bar length, area and material properties as per your practical knowledge or by referring any applications. Also consider load on bar either at middle or at end of tensile or compressive in nature.

 **[6] Motivation/Purpose of innovative technique**

* Enhanced Understanding of Finite element method.
* Real-World Relevance using analysis tools

**[7] Procedure Followed**

Students have to select the real problem used in any applications and do the numerical analysis of it using FEM. They have to solve through analysis tools to validate numerical result obtained from FEM.

 **[8] Evaluation process followed**

* Knowledge of FEM and ANSYS used for a selected case study.
* Formulation of problem for given conditions (Mention formulae’s & apply process). Also problem solving skill for selected case study using ANSYS tool.

 **[9] Outcome**

1. Enhanced Engagement: new approach increased student interest and participation in Real life mechanical engineering problems topics.

2. Improved Understanding: students demonstrated deeper comprehension and application of OR concepts.

**Innovation in teaching learning process**

**[1] Name of the Innovation activity: Case study on real life thermal problem analysis**

**[2] Course code and course name: 1MEPC402 Finite Element Analysis**

**[3] Program and Class: Mechanical Engineering, Final Year B.Tech**

**[4] Name of Faculty: Mr. P.B.Patil**

**[5] Introduction:**

To carry out the analysis of any real life problems finite element method is used. For any physical problem having spread in one direction, numerical analysis is needed to carry out considering 1D problem by using FEM. To do 1D thermal analysis, let us consider a required data as per your practical knowledge or by referring any applications.

 **[6] Motivation/Purpose of innovative technique**

* Enhanced Understanding of Finite element method.
* Real-World Relevance using analysis tools

**[7] Procedure Followed**

Students have to select the real problem used in any applications and do the numerical analysis of it using FEM. They have to solve through analysis tools to validate numerical result obtained from FEM.

 **[8] Evaluation process followed**

* Knowledge of FEM and ANSYS used for a selected case study.
* Formulation of problem for given conditions (Mention formulae’s & apply process). Also problem solving skill for selected case study using ANSYS tool.

 **[9] Outcome**

1. Enhanced Engagement: new approach increased student interest and participation in Real life mechanical engineering problems topics.

2. Improved Understanding: students demonstrated deeper comprehension and application of OR concepts.

**Innovation in teaching learning process**

**[1] Name of the Innovation activity: A Case Study on 1D Stepped Bar structural analysis**

**[2] Course code and course name: 1MEPC402 Finite Element Analysis**

**[3] Program and Class: Mechanical Engineering, Final Year B.Tech**

**[4] Name of Faculty: Mr. P.B.Patil**

**[5] Introduction:**

Structural mechanics exploration through a case study on a 1D stepped bar aims to enabling a hands-on learning experience for students. The purpose is to bridge the gap between theoretical knowledge and real-world application, fostering critical thinking and problem-solving skills among learners.

To carry out the analysis of any real life problems finite element method is used. For any physical problem having spread in one direction, numerical analysis is carried out considering it as 1D problem by FEM. To do 1D structural analysis, students need to consider a stepped bar length, area and material properties as per your practical knowledge or by referring any applications. Also students need to consider load on bar either at middle or at end of tensile or compressive in nature.

**[6] Purpose:**

The purpose of this case study is multifaceted. Firstly, it aims to deepen students' understanding of structural mechanics principles by applying them to a real-world example. Secondly, it seeks to enhance student’s analytical and problem-solving abilities through practical experimentation and data analysis. Lastly, it aims to cultivate a holistic approach to learning, where theoretical knowledge is complemented by practical application, preparing students for future challenges in engineering and related fields.

**[7] Procedure:**

* Introduction to the 1D Stepped Bar: Begin with a brief overview of the 1D stepped bar, highlighting its significance in structural engineering and its relevance to real-world applications.
* Data Collection: Students will collect data by applying varying loads to the stepped bar and determine corresponding displacements at different points along its length.
* Analysis and Interpretation: Analyzing collected data and emphasizing key parameters such as stress, strain, and deformation.
* Modeling and Simulation: Students should use modeling software or computational tools to simulate the behavior of the stepped bar under different loading conditions.
* Comparison with Theoretical Predictions: Students should compare experimental results with theoretical predictions derived from structural mechanics principles.

**[8] Evaluation Process:**

* Performance in Data Collection: Students' ability to accurately collect data, ensuring proper technique and attention to detail.
* Analysis and Interpretation: Evaluate students' proficiency in analyzing collected data and drawing relevant conclusions.
* Comparison with Theoretical Predictions: Assess students understanding of theoretical concepts by evaluating their ability to compare experimental results with theoretical predictions.
* Engagement and Participation: Evaluate student’s engagement and participation in discussions and activities throughout the case study, assessing their depth of understanding and active involvement in the learning process.

**[9] Outcome:**

Students will gain a comprehensive understanding of structural mechanics principles and their practical applications. They will develop critical thinking skills by analyzing data, interpreting results, and drawing meaningful conclusions. Furthermore, they will acquire hands-on experience in computational modeling, preparing them for future endeavors in engineering and related fields.

**Innovation in teaching learning process**

**[1] Name of the Innovation activity: A Case Study on Wall or any other application of Thermal Analysis Using Theoretical and Computational Software**

**[2] Course code and course name: 1MEPC402 Finite Element Analysis**

**[3] Program and Class: Mechanical Engineering, Final Year B.Tech**

**[4] Name of Faculty: Mr. P.B.Patil**

**[5] Introduction:**

The heat transfer dynamics through a comprehensive case study on thermal wall analysis includes use of theoretical principles and advanced computational software to compute the heat conduction & convection within thermal walls. By combining theoretical knowledge with practical application, it aims to provide students with a holistic understanding of heat transfer phenomena and their implications for real-world engineering applications.

**[6] Purpose:**

The purpose of this case study is twofold: firstly, to deepen students understanding of heat transfers principles through theoretical analysis, and secondly, to equip students with the skills to model and simulate heat transfer phenomena using advanced computational software. By engaging in this integrated approach, students will develop a multifaceted understanding of thermal wall behavior and gain hands-on experience in using computational tools for engineering analysis.

**[7] Procedure:**

Theoretical Analysis: Students should do theoretical calculations and use analytical techniques for predicting heat transfer rates and temperature distributions within thermal walls under various conditions.

Modeling Thermal Wall: A step-by-step demonstration of modeling thermal wall systems using computational software, incorporating material properties, boundary conditions, and environmental factors.

Simulation and Analysis: Students should simulate heat transfer processes within thermal walls using computational software, enabling them to visualize temperature distributions, heat fluxes..

Comparative Analysis: Students should compare results obtained from theoretical analysis with those obtained from computational simulations.

**[8] Evaluation Process:**

Mastery of Theoretical Concepts: Assess student’s understanding of heat transfer theory through theoretical calculations and analytical exercises, evaluating their ability to apply fundamental principles to real-world scenarios.

Proficiency in Computational Modeling: Evaluate student’s competency in using computational software for modeling and simulating heat transfer phenomena, assessing their ability to set up accurate simulations and interpret simulation results.

Comparative Analysis Skills: Assess student’s ability to compare and contrast results obtained from theoretical analysis and computational simulations, identifying discrepancies and analyzing their implications for engineering design and analysis.

 **[8] Outcome:**

Students will develop a deep understanding of heat transfer principles and their practical applications in thermal wall analysis. They will acquire proficiency in both theoretical analysis techniques and computational modeling, enabling them to tackle complex engineering problems with confidence and precision.