National University of Sciences and Technology

Course Description

Course Title	Course Code	Credit Hours
Predictive Modelling in Solid Mechanics with AI	ME-897	3 – 0

Textbook:

- "Machine Learning in Solid Mechanics" edited by Vikas Tomar

Reference Books:

- "Introduction to Solid Mechanics" by Irving H. Shames
- "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
- "Introduction to Python for Engineers and Scientists" by Sandeep Nagar

Course Objective:

- To understand the fundamentals of solid mechanics and predictive modelling using machine learning techniques and to apply machine learning techniques to solve problems in solid mechanics, such as predicting material properties and structural response

Course Outline:

- Introduction to Solid Mechanics
- Stress, strain, and deformation
- Elasticity and plasticity
- Failure modes and criteria
- Introduction to Machine Learning
- Supervised and unsupervised learning
- Regression, classification, and clustering
- Model evaluation and selection
- Predictive Modeling in Solid Mechanics
- Feature engineering and data preprocessing
- Model selection and hyperparameter tuning
- Model interpretation and uncertainty quantification
- Machine Learning Applications in Solid Mechanics
- Material property prediction
- Structural response prediction
- Failure mode prediction and classification
- Case Studies and Applications
- Predictive modeling for composite materials
- Predictive modeling for additive manufacturing
- Predictive modeling for structural health monitoring
- Limitations and Challenges of Machine Learning in Solid Mechanics
- Data quality and quantity
- Model interpretability and transparency
- Generalization and transferability

ASSESSMENTS

Description	Percentage Weightage (%)
Assignments	05-10%
Quizzes	10-15%
Mid Semester Exams	30-40%
End Semester Exam	40-50%