GMR Institute of Technology
An Autonomous Institute Affiliated to JNTU-GV

GMRIT Training Tomorrow's Engineers Today

DEPARTMENT OF MECHANICAL ENGINEERING

MAPPING OF CURRICULUM AND ACTIVITIES TO SUSTAINABLE DEVELOPMENT GOALS (SDGS)

SDG	Title of the Course	Topics Contributing to the SDG	Activities Suggested Relevant to the SDG
4- Quality education	Computer Aided Machine Drawing	Principles of Drawings, Fasteners, Shaft couplings, Assembly Drawings	Construction of part drawings, Construction of assembly drawing
	Fundamentals of Python Programming	Data analysis using Pandas, Numpy and visualize data with Matplotlib	-
6-Clean water and sanitation	Fluid Mechanics and Hydraulic Machines	Properties of fluids flow, rates and pressure drops in pipelines, water flow characteristics	-Determination of coefficient of discharge of flow meters - Verification of Bernoulli's theorem -Analyse major and minor losses of fluid flow through pipes
	Piping & Pressure Vessel Engineering	Design, construction, and maintenance of piping and pressure vessels, Pipe hydraulics, and static stress analysis	Pressure Vessel Software Demo using PVElite Software
7-Affordable and Clean Energy	Power Plant Engineering	1. Utilization of Solar Collectors 2. Wind Energy – HAWT, VAWT 3. Tidal Energy 4. Fuel Cells and MHD Generation	- Seminar on renewable energy technologies - Design a simple wind turbine prototype - Prepare a case study on fuel cell applications
	Mini Project	1. Solar PV System Design 2. Wind Turbine Blade Design	- Develop a working model of a small hybrid system

7-Affordable and Clean Energy		3. Hybrid Renewable Energy Systems	- Simulation of solar PV generation - Poster presentation on hybrid energy solutions
	Main Project	1. Biomass Power Generation 2. Solar Thermal Power Plants	- Design and feasibility analysis of a biomass plant - Prototype solar thermal collector design
	Applied Thermodynamics	1. Testing and Performance of Engines 2. Emission and Pollution Norms 3. Heat Balance Sheet Preparation 4. Engine Emission Control Techniques	- Conduct engine testing and prepare a heat balance sheet - Workshop on emission reduction technologies - study on emission norms compliance (term paper)
	Mini Project	1. Engine Heat Recovery Systems 2. Improving IC Engine Efficiency 3. Emission Reduction Strategies	- Design a basic heat recovery system - Simulation of engine performance improvements - Awareness material on emission control technologies
	Main Project	1. Energy Audit of an Industrial System 2. Turbocharging and Supercharging in Engines 3. Comparative Analysis of Engine Emission Technologies	- Prepare an energy audit report - Develop a comparative study on turbocharging efficiency - Project on emission reduction in transport sector
	Term Paper	1. Micro Hydro Power Systems 2. Off-Grid Solar PV Systems 3. Biomass Gasifiers	- Prepare a term paper on micro hydro implementation - Feasibility study of off-grid solar PV - Report on biomass gasifier technology
	Mini Project	1. Standalone Solar PV System Design 2. Wind-Solar Hybrid Microgrid	- Develop a standalone PV prototype - Simulate a microgrid operation - Case study on smart metering solutions

		3. Smart Metering and Demand Management	
	Main Project	1. Decentralized Energy Storage Systems 2. Smart Grids Integration 3. Demand-Side Management in Rural Areas	- Design a decentralized energy storage model - Prepare a project report on smart grid integration - Community survey on demand-side management practices
8-Decent work and economic growth	Additive Manufacturing	1. Principles and Classification of AM Processes 2. Materials Used in AM 3. Design for Additive Manufacturing 4. Sustainability in AM	- Develop a 3D-printed component reducing material waste - Case study on AM's role in sustainable supply chains
	Mini Project	1. Process Optimization in AM 2. Topology Optimization for Lightweight Structures 3. Recycling of AM Materials	- Design and print a lightweight bracket using topology optimization - Report on recycling practices in AM facilities
	Main Project	1. Large-Scale AM Applications 2. AM for Tooling and Fixtures 3. Life Cycle Analysis of AM Components	- Complete a life cycle assessment for a selected AM part - Develop a prototype of a tooling insert with minimal material
	Term Paper	1. Future Trends in AM 2. Skill Development for AM Workforce 3. Economic Impact of AM Adoption	- Prepare a term paper on skill development programs needed for AM - Case study on AM's impact on job creation
		1. Solar Energy Systems for Industrial Use 2. Wind Energy in Sustainable Manufacturing	- Prepare a term paper on integrating solar energy in manufacturing plants - Evaluate wind energy feasibility in factories

		3. Energy Management in Factories	
9-Industry, innovation, and infrastructure	Additive Manufacturing	1. Fundamentals of Additive Manufacturing Processes 2. 3D Printing Technologies (FDM, SLS, SLA) 3. Design for Additive Manufacturing 4. Materials for AM	- Prepare a 3D printed prototype of an engineering component - Workshop on design optimization for AM - Poster presentation on AM materials
	Mini Project	1. Reverse Engineering using 3D Scanning 2. Rapid Prototyping Applications 3. Post-processing in Additive Manufacturing	- Develop a reverse-engineered model - Conduct a project on rapid prototyping for replacement parts - Prepare a report on sustainable manufacturing benefits
	Main Project	1. Large-scale Additive Manufacturing Systems 2. Hybrid Manufacturing (AM + Subtractive) 3. Topology Optimization in Design	- Design and fabricate a complex component using AM - Simulation of hybrid manufacturing workflows - Case study on lightweight design for aerospace components
	Student Seminar	1. Emerging Trends in Industry 4.0 2. IoT and Smart Manufacturing 3. Digital Twins in Production 4. Blockchain Applications in Supply Chain	- Deliver a seminar on Industry 4.0 innovations - Prepare a technical paper on smart manufacturing case studies - Group discussion on digital twin applications
	Mini Project	1. Automation and Robotics in Manufacturing 2. Smart Sensors and Data Analytics	- Build a basic automated system prototype - Conduct an analysis of sensor data in a pilot setup

		3. Sustainable Product Development	- Prepare a report on sustainable product lifecycle management
	Main Project	1. AI Applications in Manufacturing Process Control 2. Predictive Maintenance Systems 3. Virtual Reality for Product Development	- Develop an AI-based monitoring prototype - Simulation of predictive maintenance scenarios - Case study on VR-assisted product development
12-Responsible consumption and production	Responsible consumption and production	Paper Presentation	Presentation on water reduction and recycling
		Community project	Organize a community awareness campaign on recycling.
		Paper Presentation	Compare LCA outcomes for two different materials used in manufacturing.
13-Climate action	Thermal Engineering Lab	Exhaust gas recirculation (EGR) system	Design an exhaust gas recirculation (EGR) system for an IC engine.
	Term Paper	Emissions reduction	Study emission trends and mitigation strategies in the automotive sector.
	Power Plant Engineering	1. Utilization of Solar Collectors 2. Wind Energy – HAWT, VAWT 3. Tidal Energy 4. Fuel Cells and MHD Generation	- Seminar on renewable energy technologies - Design a simple wind turbine prototype - Prepare a case study on fuel cell applications
	Renewable sources of Energy	Hybrid energy system	Set up a hybrid energy system combining solar and wind for lab use.