Guru Gobind Singh Foundation's

Guru Gobind Singh College of Engineering and Research Centre, Nashik

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering(Theory | Regular)
Course Code : 402049_Th

CO Id	Course Outcome
CO1	Understand the power generation scenario, role of Govt., energy policies, layout, components of power plant and Evaluate the performance of Rankine cycle applied to thermal power plant
CO2	Evaluate performance of steam condensers, Understand the cooling tower system and Recognize environmental impact of energy systems and methods to control the same.
CO3	Evaluate the performance of diesel power plant and understand the hydel and nuclear energy systems.
CO4	Evaluate the performance of the gas turbine power plant, understand the cogeneration process and evaluate the steam power plant with process heating
CO5	Understand the thermal energy storage system, power plant instrumentation and analyze the cost of electricity based on load and its demand
CO6	Analyze the various renewable energy sources

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

CO PO Desired Mapping Report

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Theory
Faculty : Milind Patil
Course Code : 402049_Th

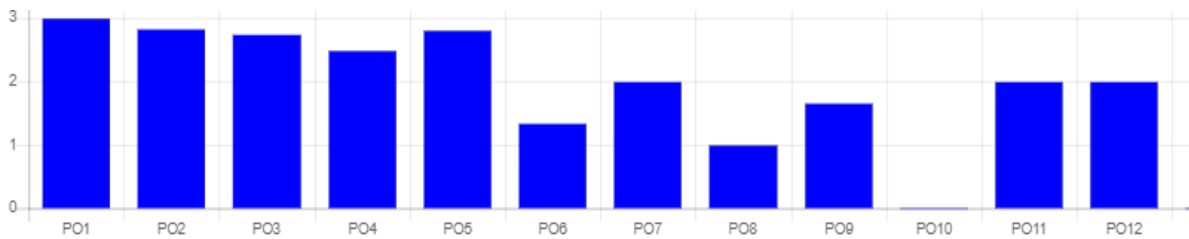
Course Outcome Details

#	Course Outcome	Description
1	CO1	Understand the power generation scenario, role of Govt., energy policies, layout, components of power plant and Evaluate the performance of Rankine cycle applied to thermal power plant
2	CO2	Evaluate performance of steam condensers, Understand the cooling tower system and Recognize environmental impact of energy systems and methods to control the same.
3	CO3	Evaluate the performance of diesel power plant and understand the hydel and nuclear energy systems.
4	CO4	Evaluate the performance of the gas turbine power plant, understand the cogeneration process and evaluate the steam power plant with process heating
5	CO5	Understand the thermal energy storage system, power plant instrumentation and analyze the cost of electricity based on load and its demand
6	CO6	Analyze the various renewable energy sources

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	1	1	1	2					
CO2	3	3	3	3	3	1	3							
CO3	3	3	2		2	1	3							
CO4	3	3	3	2	3	1	1		1					
CO5	3	3			3	2		1	2		2			
CO6	3	2		2		2						2		
Average	3.00	2.83	2.75	2.50	2.80	1.33	2.00	1.00	1.67		2.00	2.00		

Desired Attainment Average : 2.17



Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Theory
Faculty : Milind Patil
Course Code : 402049_Th

Justification

Course Outcome	Program Outcome	Level	Justification
CO1	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex Rankine cycle applied to thermal power plant.
CO1	PO2	3	Student will Identify, formulate, review literature, and analyze thermal power plant cycle reaching substantiated conclusions of optimum operating parameters using fundamentals of engineering.
CO1	PO3	3	Student will design solutions for reheat and regenerative Rankine cycle that meets the specified needs like power generation and maximum efficiency with appropriate consideration for minimum energy consumptions and environmental considerations
CO1	PO4	3	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for reheat and regenerative Rankine cycle %u2022 Provide valid conclusions for appropriate working variables for maximum efficiency
CO1	PO5	3	Student will use engineering software to create mathematical model for analysis of the reheat and regenerative Rankine cycle
CO1	PO6	1	Student will conversant to assess societal, health, and safety issues and the consequent responsibilities relevant to the engineering practices in thermal power plant
CO1	PO7	1	Understand the impact of thermal power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO1	PO8	1	Apply ethical principles and commit to professional ethics and responsibilities while preparing the energy review, understanding the role of government and energy policies

Course Outcome	Program Outcome	Level	Justification
CO1	PO9	2	Student will work in group to create a review report on Indian energy scenario
CO2	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex condensing system applied to thermal power plant.
CO2	PO2	3	Student will Identify, formulate, review literature, and analyze steam condensers reaching substantiated conclusions of operating parameters and minimum cooling water requirement.
CO2	PO3	3	Student will design solutions for steam condensers that meets the specified needs like minimum water requirement maximum condenser efficiency and minimum size of air extraction pump
CO2	PO4	3	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for condenser performance %u2022 Provide valid conclusions for appropriate working variables
CO2	PO5	3	Student will use engineering software to create mathematical model for analysis of the steam condensers
CO2	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO2	PO7	3	Understand the impact of thermal power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO3	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex diesel engine and hydro power plant.
CO3	PO2	3	Student will Identify, formulate, review literature, and analyze hydro graph reaching substantiated conclusions of hydro power plant selection.
CO3	PO3	2	Student will design solutions for hydro power plant site selection that meets the specified needs of power plant output and selection of turbine.
CO3	PO5	2	Student will use hydrographs, flow and mass curves for the selection of hydro power plant
CO3	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO3	PO7	3	Understand the impact of diesel, hydro and nuclear power plant in societal and environmental contexts, and demonstrate the need for sustainable development.

Course Outcome	Program Outcome	Level	Justification
CO4	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex gas turbine and cogeneration power plant.
CO4	PO2	3	Student will Identify, formulate, review literature, and analyze gas turbine power plant reaching substantiated conclusions of operating parameters.
CO4	PO3	3	Student will design solutions for gas turbine and steam power plant with process heating application that meets the specified needs like maximum condenser efficiency and minimum energy consumption
CO4	PO4	2	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for gas turbine performance %u2022 Provide valid conclusions for appropriate working variables
CO4	PO5	3	Student will use engineering software to create mathematical model for analysis of the gas turbine power plant for optimum pressure ratio
CO4	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO4	PO7	1	Understand the impact of gas turbine power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO4	PO9	1	Student will work in group to create a energy analysis software programming
CO5	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of cost of electricity
CO5	PO2	3	Student will Identify, formulate, review literature, and analyze electrical energy cost and tariff based on fluctuating load power plant.
CO5	PO5	3	Student will use engineering software to create mathematical model for analysis of the electricity cost
CO5	PO6	2	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO5	PO8	1	Apply ethical principles and commit to professional ethics and responsibilities while preparing the energy cost analysis report
CO5	PO9	2	Student will work in group to create a review report on Indian energy economics report

Course Outcome	Program Outcome	Level	Justification
CO5	PO11	2	Demonstrate knowledge and understanding of the engineering and management principles for understanding the economics of power generation
CO6	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of various renewable energy sources applications, economics and technical feasibility
CO6	PO2	2	Student will Identify, formulate, review literature, and compare the different renewable energy sources
CO6	PO4	2	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for renewable energy systems %u2022 Provide valid conclusions on technical feasibility and economics
CO6	PO6	2	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to non conventional energy resources
CO6	PO12	2	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : SECOND YEAR - SEM-3 : SEME
Subject : Engineering Thermodynamics(Practical | Regular)
Course Code : 202043_Pr

CO Id	Course Outcome
PR-CO1	Apply engineering fundamentals to Understand and Validate First law of thermodynamics.
PR-CO2	Identify, Understand and Select various thermocouples for temperature measurement and control
PR-CO3	Apply engineering fundamentals for Evaluation of steam properties and evaluate the boiler performance
PR-CO4	Create EES engineering program for the evaluation of energy and exergy analysis of steam generator and any thermal system
PR-CO5	Apply engineering fundamentals to determine heating value of fuel and analyzing the products of combustion

CO PO Desired Mapping Report

Year : SECOND YEAR - SEM-3 : SEME
Subject : Engineering Thermodynamics - Practical
Faculty : Milind Patil,Vidyasagar Gavali
Course Code : 202043_Pr

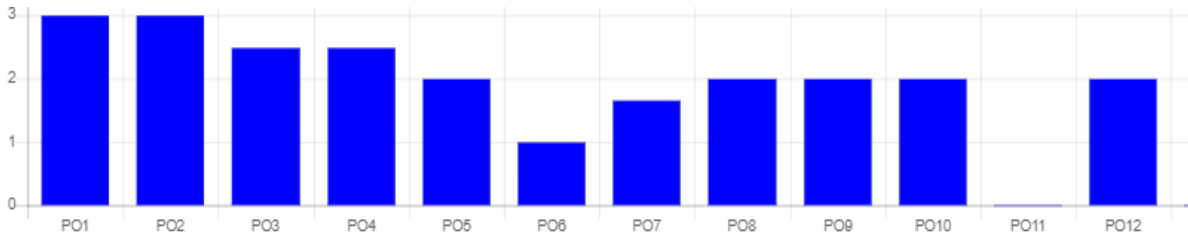
Course Outcome Details

#	Course Outcome	Description
1	PR-CO1	Apply engineering fundamentals to Understand and Validate First law of thermodynamics.
2	PR-CO2	Identify, Understand and Select various thermocouples for temperature measurement and control
3	PR-CO3	Apply engineering fundamentals for Evaluation of steam properties and evaluate the boiler performance
4	PR-CO4	Create EES engineering program for the evaluation of energy and exergy analysis of steam generator and any thermal system
5	PR-CO5	Apply engineering fundamentals to determine heating value of fuel and analyzing the products of combustion

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PR-CO1	3	3					2		2	2		2		
PR-CO2	3	3						2	2	2		2		
PR-CO3	3	3	3	3	1	1	1	2	2	2		2		
PR-CO4	3	3	2	2	3				2	2		2		
PR-CO5	3	3					2	2	2	2		2		
Average	3.00	3.00	2.50	2.50	2.00	1.00	1.67	2.00	2.00	2.00		2.00		

Desired Attainment Average : 2.15



Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : SECOND YEAR - SEM-3 : SEME
Subject : Engineering Thermodynamics - Practical
Faculty : Milind Patil,Vidyasagar Gavali
Course Code : 202043_Pr

Justification

Course Outcome	Program Outcome	Level	Justification
PR-CO1	PO1	3	Student applies, the fundamentals of engineering thermodynamics, energy interaction and energy conservation principle for the given system and validate the first law of thermodynamics.
PR-CO1	PO2	3	Student identifies the system, review the books for the principles of thermodynamics and analyze the heat and work energy interaction to validate the energy conservation law
PR-CO1	PO7	2	Student understands the impact of energy interaction on the system and environment
PR-CO1	PO9	2	Student works in group to obtain the magnitude heat and work energy interaction for the given system
PR-CO1	PO10	2	Student uses effective communication by writing the conclusions of the findings in their own words
PR-CO1	PO12	2	Student develops the lifelong learning approach by knowing the heat and work energy fundamentals and the first law of thermodynamics
PR-CO2	PO1	3	Student applies the knowledge fundamentals of the temperature and its measurement for the solution of selection of temperature measuring instruments for the given system.
PR-CO2	PO2	3	Student identifies the system and its temperature range, review literature of the various temperature measuring sensors and devices, and select the temperature measuring devices.
PR-CO2	PO8	2	Student applies ethical principles and commit to professional ethics for the norms of the engineering practice in the areas of temperature and its measurements.

Course Outcome	Program Outcome	Level	Justification
PR-CO2	PO9	2	Student works in group for the internet based survey and preparation of the presentation
PR-CO2	PO10	2	Student uses effective communication by writing the conclusions of the findings in their own words
PR-CO2	PO12	2	Student develops the lifelong learning approach by understanding the various temperature sensors and instruments for selection of appropriate one for given thermal system
PR-CO3	PO1	3	Student applies fundamentals of thermodynamics energy transfer for the determination of the properties of the steam and evaluation of the boiler performance
PR-CO3	PO2	3	Student identifies the system, formulate the thermal system analysis procedure for the boiler, research the literature, and analyze the boiler system reaching to the conclusions using first principles energy and its interaction
PR-CO3	PO3	3	Student prepares the design solutions for boiler performance that meets the needs of steam generation at the given pressure, temperature, quality and mass flow rate with the consideration of minimum fuel consumption and complete combustion to minimize concerns of pollutions and public health and environmental considerations.
PR-CO3	PO4	3	Student conducts the experiment, analysis and interpret data and synthesis the available information to provide valid conclusions for the boiler performance and heat energy balance
PR-CO3	PO5	1	Student uses the computer engineering program EES for the evaluation of the properties and boiler perfromance
PR-CO3	PO6	1	Student applies the reasoning informed by the legal requirements of the IBR
PR-CO3	PO7	1	Student understand the heat balance and its impact on the thermal system and the environment
PR-CO3	PO8	2	Student applies the ethical principle by understanding the IBR act and the IS code for the heat balance of the boiler
PR-CO3	PO9	2	Student works in group to obtain the observations during the trial on boiler and evaluation of the boiler performance
PR-CO3	PO10	2	Student uses effective communication by writing the conclusions of the findings in their own words
PR-CO3	PO12	2	Student develops the lifelong learning approach by understanding the various elements to be considered for the comparison of the boilers and conducting heat balance

Course Outcome	Program Outcome	Level	Justification
PR-CO4	PO1	3	Student applies the engineering fundamentals for the development of mathematical model for energy and exergy analysis of the given system
PR-CO4	PO2	3	Student will Identify, formulate and review literature for the development of EES program for energy and exergy analysis of the boiler system
PR-CO4	PO3	2	Student will design the engineering program for the contemporary analysis of the boiler
PR-CO4	PO4	2	Student will prepare the mathematical model for the evaluation of heat distribution and efficiency of the boiler plant
PR-CO4	PO5	3	Student will develop the EES program and validate the results analytically and prepares the performance curve by variation of the pressure of boiler
PR-CO4	PO9	2	Student works in group to EES program for the performance
PR-CO4	PO10	2	Student uses effective communication by writing the conclusions of the findings in their own words
PR-CO4	PO12	2	Student develops the lifelong learning approach by understanding the various elements to be considered for the for the contemporary analysis of the boiler
PR-CO5	PO1	3	Student applies the knowledge of chemical combustion for analyzing the products of combustion and minimum air quantity required
PR-CO5	PO2	3	Student identify the basic chemical combustion equation, formulate the combustion equations for the hydrocarbons, review the books, to analyze complex combustion process reaching substantiated conclusions using first principles of thermodynamics
PR-CO5	PO7	2	Student understands the chemical combustion process and understands the impact of products of combustion on the environment and ways to control the pollutants
PR-CO5	PO8	2	Student understands the engineering ethics related to combustion norms and environmental pollution
PR-CO5	PO9	2	Student works in group to determine the heating value of fuel and analyzing the products of combustion
PR-CO5	PO10	2	Student uses effective communication by writing the conclusions of the findings in their own words
PR-CO5	PO12	2	Student develops the lifelong learning approach by understanding the method of determination of HCV and flue gas analysis

Guru Gobind Singh Foundation's

Guru Gobind Singh College of Engineering and Research Centre, Nashik

Vision, Mission and Program Educational Objectives

Vision and Mission of the Institute

Vision

An institute striving for excellence in providing transformative academic education and stimulating environment for research to enhance skills for developing intellectuals and to inculcate quality education with social and technical knowledge which will benefit the society and industrial challenges.

Mission

- To be a technical educational institute in transforming aspiring engineers through rigorous course work and technical skills.
- To benchmark with the best global standards of quality education
- To enhance commitment of the faculty, staff and students by inculcating the spirit of inquiry, team work and professionalism
- Establish a centre of excellence to enhance academia-industry partnership, work on collaborative projects, and develop new products, services and patents.
- To develop globally competent students by enhancing indigenous technologies and inculcate entrepreneurship in them

Vision, Mission and Program Educational Objectives

Vision and Mission of Department of Mechanical Engineering

Vision

Mechanical engineering program strives for excellence in value based quality technical education and research environment with entrepreneurship and sustainable development approach to satisfy industrial and social needs.

Mission

Mission of Mechanical engineering program is:

M1. To transform aspiring Mechanical engineers through course work and industrial exposure

M2. To establish academia-industry partnership, work on various projects, and develop new products, services and patents.

M3. To develop quality mechanical engineering undergraduate to accept societal challenges

M4. To enhance commitment of the professionalism among faculty, staff and students by inculcating team work.

Program Educational Objectives

Program Educational Objectives for the program B.E. (Mechanical Engineering)

PEO1	An ability to practice as skilled technocrats to cater the needs of Industries
PEO2	An ability to pursue higher studies and to work in research and development, with innovative efforts for professional careers
PEO3	An ability to express an attitude with responsible, professional and ethical manner to address social and technical challenges through lifelong learning
PEO4	An ability to work as leaders that supports service, economic and sustainable development with high human and ethical values

Statements of Program Outcomes

Engineering Graduates will be able to:

1.**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2.**Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4.**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5.**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6.**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7.**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8.**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9.**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10.**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11.**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12.**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Statements of Program Specific Outcome:

1. Ability to develop mechanical engineering system using software techniques and knowledge of automation
2. Exhibit the ability in higher studies, research and other continuous professional development activities

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence & Machine Learning(Theory | Regular)
Course Code : 302049

CO Id	Course Outcome
CO1	DEMONSTRATE fundamentals of artificial intelligence and machine learning.
CO2	APPLY feature extraction and selection techniques
CO3	APPLY machine learning algorithms for classification and regression problems
CO4	DEVISE AND DEVELOP a machine learning model using various steps
CO5	EXPLAIN concepts of reinforced and deep learning
CO6	SIMULATE machine learning model in mechanical engineering problems

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

CO PO Desired Mapping Report

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence - Theory
Faculty : Vishal Dhore,Pradnya Bachhav
Course Code : 302049

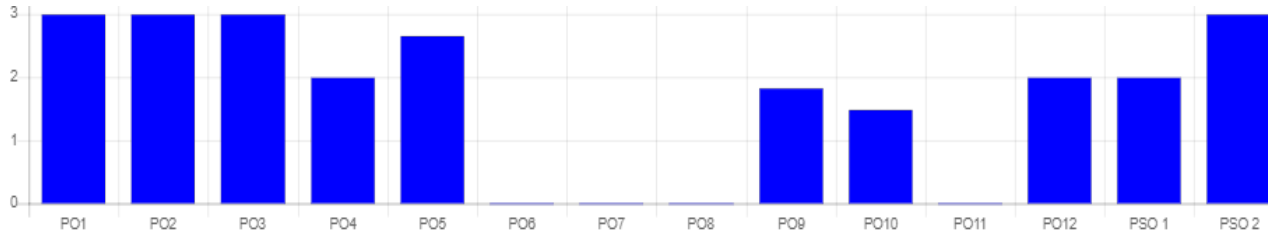
Course Outcome Details

#	Course Outcome	Description
1	CO1	DEMONSTRATE fundamentals of artificial intelligence and machine learning.
2	CO2	APPLY feature extraction and selection techniques
3	CO3	APPLY machine learning algorithms for classification and regression problems
4	CO4	DEVISE AND DEVELOP a machine learning model using various steps
5	CO5	EXPLAIN concepts of reinforced and deep learning
6	CO6	SIMULATE machine learning model in mechanical engineering problems

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3				1				1	2		2	2	3
CO2	3	3	3		3				2	2		2	2	3
CO3	3	3	3	2	3				2	2		2	2	3
CO4	3	3	3		3				2	1		2	2	3
CO5	3	3	3	2	3				2	1		2	2	3
CO6	3	3	3	2	3				2	1		2	2	3
Average	3.00	3.00	3.00	2.00	2.67				1.83	1.50		2.00	2.00	3.00

Desired Attainment Average : 2.40



Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence - Theory
Faculty : Vishal Dhore,Pradnya Bachhav
Course Code : 302049

Justification

Course Outcome	Program Outcome	Level	Justification
CO1	PO1	3	Understanding AI/ML fundamentals is crucial in modern engineering practices, enabling engineers to develop and incorporate intelligent systems into designs, enhancing efficiency, and functionality.
CO1	PO5	1	Proficiency in AI/ML tools and techniques empowers engineers to utilize cutting-edge technology, optimizing processes, and creating more efficient, intelligent systems.
CO1	PO9	1	Proficiency in AI/ML fosters collaboration within teams, enabling engineers to work effectively on projects involving intelligent systems, contributing to collective success.
CO1	PO10	2	Engineers proficient in AI/ML can effectively communicate complex technical concepts to diverse audiences, facilitating understanding and collaboration among stakeholders.
CO1	PO12	2	AI/ML is an evolving field, demonstrating fundamentals signifies an openness to continuous learning and adaptation to new technologies and methodologies.
CO1	PSO 1	2	AI/ML skills enable engineers to automate processes, optimize mechanical systems, and enhance efficiency, contributing to the advancement of mechanical engineering.
CO1	PSO 2	3	AI/ML expertise enables engineers to engage in advanced studies, cutting-edge research, and ongoing professional development in a rapidly evolving field.
CO2	PO1	3	Utilizing feature extraction and selection techniques demonstrates a deep understanding of data preprocessing in engineering, allowing for more informed decision-making based on relevant features and data patterns.

Course Outcome	Program Outcome	Level	Justification
CO2	PO2	3	Applying these techniques aids in identifying critical features within complex datasets, streamlining problem analysis by focusing on pertinent information and reducing noise or irrelevant data.
CO2	PO3	3	Feature extraction and selection techniques contribute to creating more efficient and optimized designs by selecting the most relevant features, improving system performance and reducing resource requirements.
CO2	PO5	3	Proficiency in feature extraction and selection tools signifies the ability to employ advanced data processing methods, optimizing the use of modern technology in engineering applications.
CO2	PO9	2	Proficiency in these techniques enables effective collaboration within teams, as it streamlines data analysis and enhances collective problem-solving abilities.
CO2	PO10	2	Demonstrating the application of feature extraction and selection techniques involves effectively communicating the importance and implications of selected features in datasets to diverse stakeholders.
CO2	PO12	2	Apply feature extraction and selection techniques while demonstrating an appreciation for technological change and the importance of lifelong learning.
CO2	PSO 1	2	Leveraging feature extraction and selection techniques aids in automating data-driven processes, enhancing efficiency and performance in mechanical engineering systems.
CO2	PSO 2	3	Proficiency in applying these techniques showcases readiness for advanced studies, research endeavors, and ongoing professional growth in engineering fields reliant on data analysis and optimization.
CO3	PO1	3	Applying machine learning algorithms for classification and regression problems demonstrates a comprehensive understanding of algorithmic functionalities and their application in engineering systems to predict, classify, and optimize based on data patterns.
CO3	PO2	3	Utilizing these algorithms aids in dissecting complex problems by analyzing and categorizing data, enabling a deeper understanding of the underlying patterns and relationships within datasets.
CO3	PO3	3	Implementing machine learning algorithms allows for the creation of intelligent systems and solutions, enhancing designs by predicting behavior or classifying elements crucial for system development.

Course Outcome	Program Outcome	Level	Justification
CO3	PO4	2	Leveraging these algorithms assists in investigating intricate problems by modeling and predicting outcomes based on complex datasets, offering insights for problem resolution.
CO3	PO5	3	Proficiency in applying machine learning algorithms represents the adept use of cutting-edge technology and tools to analyze and make informed decisions based on data-driven models.
CO3	PO9	2	Proficiency in applying these algorithms fosters collaborative efforts within teams, enhancing collective problem-solving capabilities and facilitating data-driven decision-making.
CO3	PO10	2	Effective communication of the outcomes derived from machine learning algorithms is crucial in conveying insights and predictions to stakeholders with varying technical backgrounds.
CO3	PO12	2	Continuously applying and exploring various machine learning algorithms signifies a commitment to ongoing learning and adapting to new methodologies and technologies.
CO3	PSO 1	2	Application of machine learning algorithms aids in automating processes within mechanical engineering systems, optimizing performance and efficiency.
CO3	PSO 2	3	Proficiency in applying machine learning algorithms showcases readiness for advanced studies, research pursuits, and ongoing professional development in engineering fields reliant on data-driven insights and optimization.
CO4	PO1	3	Creating a machine learning model involves understanding algorithm selection, data preprocessing, model training, and evaluation, showcasing expertise in applying theoretical knowledge to practical engineering solutions.
CO4	PO2	3	Developing a machine learning model starts with a deep analysis of the problem domain, understanding data requirements, and defining objectives, refining problem analysis skills to identify the most effective model approach.
CO4	PO3	3	Devising a machine learning model involves designing and implementing algorithms, contributing to innovative solutions by translating conceptual designs into functional models that address specific engineering challenges.
CO4	PO5	3	Utilizing various steps in developing a machine learning model signifies adept usage of modern tools and technologies, optimizing data processing, and model development for engineering solutions.
CO4	PO9	2	Collaborating on machine learning model development showcases teamwork, where individuals contribute diverse skills to create robust models, enhancing collective problem-solving capacities.

Course Outcome	Program Outcome	Level	Justification
CO4	PO10	1	Effectively communicating the process, outcomes, and implications of a developed machine learning model to diverse stakeholders is crucial for transparency and understanding of its applications.
CO4	PO12	2	Continuously devising and developing machine learning models signifies a commitment to ongoing learning, adapting to new methodologies, and staying updated with technological advancements.
CO4	PSO 1	2	Applying machine learning models aids in automating processes within mechanical engineering systems, optimizing performance and efficiency.
CO4	PSO 2	3	Proficiency in developing machine learning models demonstrates readiness for advanced studies, research initiatives, and continuous professional growth in engineering and data-driven fields.
CO5	PO1	3	Explaining reinforced and deep learning concepts demonstrates a strong grasp of advanced machine learning techniques, essential in developing intelligent systems for engineering applications.
CO5	PO2	3	Understanding these concepts aids in analyzing complex problems where traditional approaches might fall short, identifying scenarios where reinforced and deep learning methods are suitable for addressing specific engineering challenges.
CO5	PO3	3	Knowledge of reinforced and deep learning informs the design and development of innovative solutions by utilizing these advanced techniques to create intelligent and adaptive systems tailored to engineering needs.
CO5	PO4	2	Explaining reinforced and deep learning concepts enables investigation of intricate problems by understanding the applicability of these methods in processing complex data and deriving insights.
CO5	PO5	3	Proficiency in explaining these concepts reflects the adept usage of modern machine learning tools and libraries specialized for reinforced and deep learning applications, optimizing data analysis and model development.
CO5	PO9	2	Explaining these concepts fosters collaborative efforts within teams, where individuals with diverse skills can collaborate effectively to leverage reinforced and deep learning techniques for collective problem-solving.
CO5	PO10	1	Effectively explaining reinforced and deep learning concepts involves communicating complex technical ideas in a comprehensible manner to diverse stakeholders, facilitating understanding and collaboration.

Course Outcome	Program Outcome	Level	Justification
CO5	PO12	2	Continuously exploring and explaining reinforced and deep learning concepts signifies a commitment to ongoing learning and adapting to new methodologies and technologies in the rapidly evolving field of machine learning.
CO5	PSO 1	2	Applying concepts of reinforced and deep learning facilitates the development of automated systems within mechanical engineering, enhancing efficiency and performance.
CO5	PSO 2	3	Proficiency in explaining these concepts showcases readiness for advanced studies, research pursuits, and continuous professional development in the field of machine learning and engineering.
CO6	PO1	3	Simulating machine learning models demonstrates a profound understanding of applying advanced algorithms to solve mechanical engineering challenges, leveraging data-driven approaches for problem-solving.
CO6	PO2	3	Simulation of machine learning models aids in analyzing mechanical engineering problems by identifying patterns in complex data, extracting insights, and narrowing down factors crucial for effective problem-solving.
CO6	PO3	3	Simulating machine learning models contributes to designing innovative solutions in mechanical engineering by predicting outcomes, optimizing designs, and improving system performance through data-driven models.
CO6	PO4	2	Simulated machine learning models assist in investigating intricate mechanical engineering problems, providing deeper insights into system behavior and performance based on data analysis.
CO6	PO5	3	Proficiency in simulating machine learning models showcases the adept usage of modern tools and software, optimizing simulations for mechanical engineering applications.
CO6	PO9	2	Simulating machine learning models encourages collaborative efforts within teams, leveraging collective skills to create accurate models for solving mechanical engineering problems.
CO6	PO10	1	Effectively communicating the outcomes and implications of simulated machine learning models to various stakeholders in mechanical engineering is crucial for transparency and understanding.
CO6	PO12	2	Continuously exploring and simulating machine learning models signifies a commitment to ongoing learning and adapting to new methodologies and technologies in the field of mechanical engineering.
CO6	PSO 1	2	Simulation of machine learning models aids in developing automated systems within mechanical engineering, enhancing efficiency and performance.

Course Outcome	Program Outcome	Level	Justification
CO6	PSO 2	3	Proficiency in simulating machine learning models showcases readiness for advanced studies, research pursuits, and continuous professional development in the field of mechanical engineering and data-driven applications.

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence &Machine Learning(Practical | Regular)
Course Code : 302049

CO Id	Course Outcome
CO1	DEFINE the machine learning and DESCRIBE its type
CO2	APPLY feature selection and extraction techniques.
CO3	APPLY machine learning algorithms for classification and regression problems
CO4	Develop a machine learning algorithms using various steps
CO5	ANALYZE a various machine learning algorithms results
CO6	SIMULATE machine learning algorithms/model for mechanical engineering domain problems

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

CO PO Desired Mapping Report

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence - Practical
Faculty : Vishal Dhore
Course Code : 302049

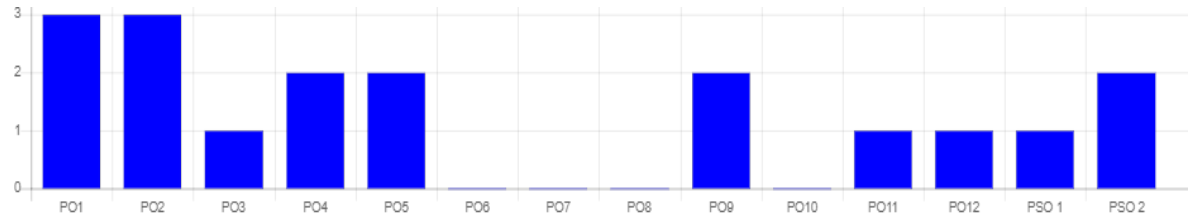
Course Outcome Details

#	Course Outcome	Description
1	CO1	DEFINE the machine learning and DESCRIBE its type
2	CO2	APPLY feature selection and extraction techniques.
3	CO3	APPLY machine learning algorithms for classification and regression problems
4	CO4	Develop a machine learning algorithms using various steps
5	CO5	ANALYZE a various machine learning algorithms results
6	CO6	SIMULATE machine learning algorithms/model for mechanical engineering domain problems

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3		2	2				2			1	1	2
CO2	3	3		2	2				2			1	1	2
CO3	3	3		2	2				2		1	1	1	2
CO4	3	3		2	2				2			1	1	2
CO5	3	3	1	2	2				2			1	1	2
CO6	3	3	1	2	2				2			1	1	2
Average	3.00	3.00	1.00	2.00	2.00				2.00		1.00	1.00	1.00	2.00

Desired Attainment Average : 1.80



Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : THIRD YEAR - SEM-6: TEME
Subject : Artificial Intelligence - Practical
Faculty : Vishal Dhore
Course Code : 302049

Justification

Course Outcome	Program Outcome	Level	Justification
CO1	PO1	3	Understanding machine learning and its types demonstrates knowledge of utilizing algorithms to enable systems to learn from data, essential in designing intelligent systems for engineering applications.
CO1	PO2	3	Defining machine learning and its types aids in analyzing problems where data-driven solutions are applicable, enabling the identification of suitable approaches for addressing engineering challenges.
CO1	PO4	2	Understanding machine learning and its types facilitates investigation of complex engineering problems by recognizing scenarios where data-driven methods can provide deeper insights.
CO1	PO5	2	Proficiency in defining and describing machine learning types reflects adeptness in using modern tools and libraries specialized for different machine learning algorithms, optimizing data analysis for engineering applications.
CO1	PO9	2	Understanding machine learning types fosters collaborative efforts within teams, where individuals contribute diverse expertise in selecting suitable algorithms for collective problem-solving.
CO1	PO12	1	Continuously exploring and understanding machine learning types signifies a commitment to ongoing learning and adapting to new methodologies and technologies in the rapidly evolving field of machine learning.
CO1	PSO 1	1	Knowledge of machine learning types aids in developing automated systems within mechanical engineering, enhancing efficiency and performance.

Course Outcome	Program Outcome	Level	Justification
CO1	PSO 2	2	Proficiency in understanding machine learning and its types showcases readiness for advanced studies, research endeavors, and continuous professional development in engineering fields reliant on data-driven insights and optimization.
CO2	PO1	3	Applying these techniques demonstrates a deep understanding of data preprocessing in engineering, essential for making informed decisions based on relevant features and patterns.
CO2	PO2	3	Utilizing feature selection and extraction techniques aids in analyzing problems by narrowing down essential features, streamlining analysis by focusing on critical information and reducing noise.
CO2	PO4	2	Feature selection and extraction techniques assist in investigating intricate problems by refining data to its most significant elements, facilitating clearer insights and solutions.
CO2	PO5	2	Proficiency in these techniques signifies the adept use of modern technology, optimizing processes, and creating more efficient systems in engineering applications.
CO2	PO9	2	Proficiency in these techniques fosters collaboration within teams, enabling more effective problem-solving and enhancing collective capabilities.
CO2	PO12	1	Continuous application and refinement of feature selection and extraction techniques reflect a commitment to ongoing learning, adapting to new technologies and methodologies.
CO2	PSO 1	1	These techniques aid in automating processes within mechanical engineering systems, optimizing performance and efficiency.
CO2	PSO 2	2	Proficiency in applying feature selection and extraction techniques showcases readiness for advanced studies, research initiatives, and continuous professional development in engineering fields reliant on data-driven insights and optimization.
CO3	PO1	3	Application of these algorithms showcases understanding in utilizing machine learning techniques to categorize and predict data, crucial for developing intelligent systems in engineering.
CO3	PO2	3	Applying machine learning algorithms aids in analyzing complex problems by categorizing data for classification or predicting continuous outcomes for regression, refining problem analysis through data-driven approaches.
CO3	PO4	2	Machine learning algorithms assist in investigating intricate problems by modeling and predicting outcomes based on complex datasets, providing insights for problem resolution.

Course Outcome	Program Outcome	Level	Justification
CO3	PO5	2	Proficiency in applying machine learning algorithms signifies the use of cutting-edge tools and techniques, optimizing data analysis and model development for engineering solutions.
CO3	PO9	2	Proficiency in applying these algorithms fosters collaborative efforts within teams, enhancing collective problem-solving capabilities and facilitating data-driven decision-making.
CO3	PO11	1	Applying machine learning algorithms can lead to better project planning and financial management by leveraging data-driven insights and optimizing resource allocation in engineering projects.
CO3	PO12	1	Continuously applying and refining machine learning algorithms signifies a commitment to ongoing learning and adaptation to new methodologies and technologies in engineering.
CO3	PSO 1	1	Application of machine learning algorithms aids in automating processes within mechanical engineering systems, optimizing performance and efficiency.
CO3	PSO 2	2	Proficiency in applying machine learning algorithms showcases readiness for advanced studies, research endeavors, and continuous professional development in engineering fields reliant on data-driven insights and optimization.
CO4	PO1	3	Developing a machine learning algorithm showcases a comprehensive understanding of algorithmic principles and their application in engineering, essential for creating intelligent systems.
CO4	PO2	3	The process of developing an algorithm involves analyzing the problem domain, understanding data requirements, and defining objectives, refining problem analysis skills for effective algorithm design.
CO4	PO4	2	Developing an algorithm assists in investigating complex problems by modeling and predicting outcomes, offering insights and solutions to intricate engineering problems.
CO4	PO5	2	Proficiency in developing algorithms represents adept usage of modern tools and libraries, optimizing algorithm development for engineering applications.
CO4	PO9	2	Collaborative efforts in developing algorithms foster teamwork, where individuals contribute diverse skills to create robust models, enhancing collective problem-solving capacities.
CO4	PO12	1	Continuously developing and refining algorithms signifies a commitment to ongoing learning and adapting to new methodologies and technologies in the field of machine learning and engineering.

Course Outcome	Program Outcome	Level	Justification
CO4	PSO 1	1	Developing machine learning algorithms aids in creating automated systems within mechanical engineering, optimizing performance and efficiency.
CO4	PSO 2	2	Proficiency in algorithm development showcases readiness for advanced studies, research endeavors, and continuous professional development in engineering fields reliant on data-driven insights and optimization.
CO5	PO1	3	Analyzing these results demonstrates a deep understanding of algorithm performance, crucial for assessing their suitability and effectiveness in engineering applications.
CO5	PO2	3	Examining machine learning algorithm outcomes aids in refining problem analysis by understanding how different algorithms address specific engineering challenges, guiding the selection of optimal solutions.
CO5	PO3	1	Result analysis contributes to designing effective solutions by evaluating algorithmic performance and choosing the most suitable models for improved system designs in engineering.
CO5	PO4	2	Analyzing algorithm results assists in investigating complex problems by interpreting model outcomes, providing insights into intricate engineering issues.
CO5	PO5	2	Proficiency in result analysis showcases adeptness in using modern tools and techniques to interpret and visualize algorithmic outputs, optimizing data-driven decisions in engineering applications.
CO5	PO9	2	Analyzing results fosters collaborative efforts within teams, enabling effective problem-solving and decision-making based on collective insights derived from various algorithms.
CO5	PO12	1	Continuous analysis of algorithm results signifies a commitment to ongoing learning and adaptation to new methodologies and technologies in the field of machine learning and engineering.
CO5	PSO 1	1	Analyzing algorithm results assists in optimizing automated systems within mechanical engineering, enhancing performance and efficiency.
CO5	PSO 2	2	Proficiency in result analysis showcases readiness for advanced studies, research pursuits, and continuous professional development in engineering fields reliant on data-driven insights and optimization.
CO6	PO1	3	Simulating machine learning algorithms/models in mechanical engineering demonstrates expertise in integrating data-driven approaches with mechanical principles, showcasing proficiency in applying machine learning concepts to solve engineering problems.

Course Outcome	Program Outcome	Level	Justification
CO6	PO2	3	By simulating various machine learning models, a deeper understanding of mechanical engineering problems is attained, aiding in assessing the suitability of algorithms for specific datasets and refining data requirements.
CO6	PO3	1	Through simulating machine learning algorithms, solutions for mechanical engineering are refined, optimizing model performance to enhance system designs and accuracy in engineering applications.
CO6	PO4	2	Simulating these models offers valuable insights into complex mechanical engineering issues, guiding problem-solving strategies by understanding how different algorithms perform in various scenarios.
CO6	PO5	2	Proficiency in simulating machine learning models showcases adeptness in utilizing cutting-edge tools and software, optimizing simulations tailored for mechanical engineering applications.
CO6	PO9	2	Collaborative efforts in model simulation leverage diverse skills within teams, facilitating accurate simulations for effective problem-solving in mechanical engineering.
CO6	PO12	1	Continuous simulation and analysis of models signify a commitment to ongoing learning and adaptation to evolving methodologies and technologies in mechanical engineering.
CO6	PSO 1	1	Simulation aids in developing automated systems within mechanical engineering, enhancing performance and efficiency.
CO6	PSO 2	2	Proficiency in simulation showcases readiness for advanced studies, research, and ongoing professional development in engineering reliant on data-driven insights and optimization.

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Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering(Theory | Regular)
Course Code : 402049_Th

CO Id	Course Outcome
CO1	Understand the power generation scenario, role of Govt., energy policies, layout, components of power plant and Evaluate the performance of Rankine cycle applied to thermal power plant
CO2	Evaluate performance of steam condensers, Understand the cooling tower system and Recognize environmental impact of energy systems and methods to control the same.
CO3	Evaluate the performance of diesel power plant and understand the hydel and nuclear energy systems.
CO4	Evaluate the performance of the gas turbine power plant, understand the cogeneration process and evaluate the steam power plant with process heating
CO5	Understand the thermal energy storage system, power plant instrumentation and analyze the cost of electricity based on load and its demand
CO6	Analyze the various renewable energy sources

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

CO PO Desired Mapping Report

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Theory
Faculty : Milind Patil
Course Code : 402049_Th

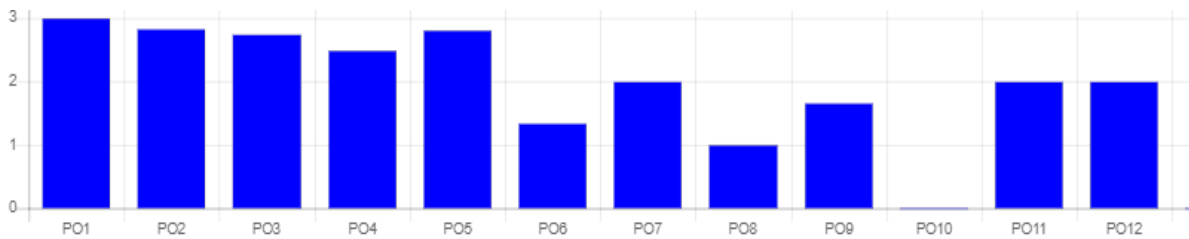
Course Outcome Details

#	Course Outcome	Description
1	CO1	Understand the power generation scenario, role of Govt., energy policies, layout, components of power plant and Evaluate the performance of Rankine cycle applied to thermal power plant
2	CO2	Evaluate performance of steam condensers, Understand the cooling tower system and Recognize environmental impact of energy systems and methods to control the same.
3	CO3	Evaluate the performance of diesel power plant and understand the hydel and nuclear energy systems.
4	CO4	Evaluate the performance of the gas turbine power plant, understand the cogeneration process and evaluate the steam power plant with process heating
5	CO5	Understand the thermal energy storage system, power plant instrumentation and analyze the cost of electricity based on load and its demand
6	CO6	Analyze the various renewable energy sources

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	3	1	1	1	2					
CO2	3	3	3	3	3	1	3							
CO3	3	3	2		2	1	3							
CO4	3	3	3	2	3	1	1		1					
CO5	3	3			3	2		1	2		2			
CO6	3	2		2		2						2		
Average	3.00	2.83	2.75	2.50	2.80	1.33	2.00	1.00	1.67		2.00	2.00		

Desired Attainment Average : 2.17



Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Theory
Faculty : Milind Patil
Course Code : 402049_Th

Justification

Course Outcome	Program Outcome	Level	Justification
CO1	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex Rankine cycle applied to thermal power plant.
CO1	PO2	3	Student will Identify, formulate, review literature, and analyze thermal power plant cycle reaching substantiated conclusions of optimum operating parameters using fundamentals of engineering.
CO1	PO3	3	Student will design solutions for reheat and regenerative Rankine cycle that meets the specified needs like power generation and maximum efficiency with appropriate consideration for minimum energy consumptions and environmental considerations
CO1	PO4	3	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for reheat and regenerative Rankine cycle %u2022 Provide valid conclusions for appropriate working variables for maximum efficiency
CO1	PO5	3	Student will use engineering software to create mathematical model for analysis of the reheat and regenerative Rankine cycle
CO1	PO6	1	Student will conversant to assess societal, health, and safety issues and the consequent responsibilities relevant to the engineering practices in thermal power plant
CO1	PO7	1	Understand the impact of thermal power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO1	PO8	1	Apply ethical principles and commit to professional ethics and responsibilities while preparing the energy review, understanding the role of government and energy policies

Course Outcome	Program Outcome	Level	Justification
CO1	PO9	2	Student will work in group to create a review report on Indian energy scenario
CO2	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex condensing system applied to thermal power plant.
CO2	PO2	3	Student will Identify, formulate, review literature, and analyze steam condensers reaching substantiated conclusions of operating parameters and minimum cooling water requirement.
CO2	PO3	3	Student will design solutions for steam condensers that meets the specified needs like minimum water requirement maximum condenser efficiency and minimum size of air extraction pump
CO2	PO4	3	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for condenser performance %u2022 Provide valid conclusions for appropriate working variables
CO2	PO5	3	Student will use engineering software to create mathematical model for analysis of the steam condensers
CO2	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO2	PO7	3	Understand the impact of thermal power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO3	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex diesel engine and hydro power plant.
CO3	PO2	3	Student will Identify, formulate, review literature, and analyze hydro graph reaching substantiated conclusions of hydro power plant selection.
CO3	PO3	2	Student will design solutions for hydro power plant site selection that meets the specified needs of power plant output and selection of turbine.
CO3	PO5	2	Student will use hydrographs, flow and mass curves for the selection of hydro power plant
CO3	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO3	PO7	3	Understand the impact of diesel, hydro and nuclear power plant in societal and environmental contexts, and demonstrate the need for sustainable development.

Course Outcome	Program Outcome	Level	Justification
CO4	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of complex gas turbine and cogeneration power plant.
CO4	PO2	3	Student will Identify, formulate, review literature, and analyze gas turbine power plant reaching substantiated conclusions of operating parameters.
CO4	PO3	3	Student will design solutions for gas turbine and steam power plant with process heating application that meets the specified needs like maximum condenser efficiency and minimum energy consumption
CO4	PO4	2	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for gas turbine performance %u2022 Provide valid conclusions for appropriate working variables
CO4	PO5	3	Student will use engineering software to create mathematical model for analysis of the gas turbine power plant for optimum pressure ratio
CO4	PO6	1	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO4	PO7	1	Understand the impact of gas turbine power plant in societal and environmental contexts, and demonstrate the need for sustainable development.
CO4	PO9	1	Student will work in group to create a energy analysis software programming
CO5	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of cost of electricity
CO5	PO2	3	Student will Identify, formulate, review literature, and analyze electrical energy cost and tariff based on fluctuating load power plant.
CO5	PO5	3	Student will use engineering software to create mathematical model for analysis of the electricity cost
CO5	PO6	2	Student will conversant to assess societal, health, and safety issues relevant to use of cooling towers in thermal power plant
CO5	PO8	1	Apply ethical principles and commit to professional ethics and responsibilities while preparing the energy cost analysis report
CO5	PO9	2	Student will work in group to create a review report on Indian energy economics report

Course Outcome	Program Outcome	Level	Justification
CO5	PO11	2	Demonstrate knowledge and understanding of the engineering and management principles for understanding the economics of power generation
CO6	PO1	3	Student will apply the knowledge of mathematics, science and engineering fundamentals, for the solution of various renewable energy sources applications, economics and technical feasibility
CO6	PO2	2	Student will Identify, formulate, review literature, and compare the different renewable energy sources
CO6	PO4	2	Student will use research-based knowledge for %u2022 Analysis and interpretation of data for renewable energy systems %u2022 Provide valid conclusions on technical feasibility and economics
CO6	PO6	2	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to non conventional energy resources
CO6	PO12	2	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Course Outcome

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering(Practical | Regular)
Course Code : 402049_Pr

CO Id	Course Outcome
CO1	To design shell and tube condenser for 200 MW thermal power plant with allowable pressure drop of 25 kPA and analyze the performance at different water velocity
CO2	To understand, compare and select methods of production of biodiesel, its properties and analyze the performance as an alternative fuel for IC engine
CO3	To estimate the wind energy from the wind parameters using an ANN and to select the components for wind mill
CO4	Understand the cogeneration process in Sugar industries and evaluation of the performance
CO5	Understand thermal energy storage system, select energy storage materials, evaluate and analyze the system
CO6	To understand the thermal power plant layout, components and their functions and prepare the report on various systems
CO7	Evaluate the performance of the steam power plant
CO8	Evaluate the performance of the diesel power plant

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

CO PO Desired Mapping Report

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Practical
Faculty : Milind Patil
Course Code : 402049_Pr

Course Outcome Details

#	Course Outcome	Description
1	CO1	To design shell and tube condenser for 200 MW thermal power plant with allowable pressure drop of 25 kPA and analyze the performance at different water velocity
2	CO2	To understand, compare and select methods of production of biodiesel, its properties and analyze the performance as an alternative fuel for IC engine
3	CO3	To estimate the wind energy from the wind parameters using an ANN and to select the components for wind mill
4	CO4	Understand the cogeneration process in Sugar industries and evaluation of the performance
5	CO5	Understand thermal energy storage system, select energy storage materials, evaluate and analyze the system
6	CO6	To understand the thermal power plant layout, components and their functions and prepare the report on various systems
7	CO7	Evaluate the performance of the steam power plant
8	CO8	Evaluate the performance of the diesel power plant

Desired Attainment Details

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	2	2	2		2	2				
CO2	3	2	2	3	1	2	2		2	2				
CO3	3	3	3	3	3		2		3	3				
CO4	3	3	2	3	1		2		2	2				
CO5	3	3	2	3	1		2		2	2				
CO6	3	2	1	2	2		3		2	2				
CO7	3	2	2	2	2		2		2	2				
CO8	3	2	2	2	3		2		2	2				
Average	3.00	2.50	2.13	2.63	1.88	2.00	2.13		2.13	2.13				

Desired Attainment Average : 2.28

Guru Gobind Singh College of Engineering & Research Centre, Nashik

Mechanical Engineering [2022-23]

Justification Report for CO-PO/PSO Desired Mapping

Year : FINAL YEAR - SEM-8: BEME-B
Subject : Energy Engineering - Practical
Faculty : Milind Patil
Course Code : 402049_Pr

Justification

Course Outcome	Program Outcome	Level	Justification
CO1	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals for the solution of complex design of shell and tube condenser of 210 MW thermal power plant
CO1	PO2	3	Student identifies need of condenser, formulate the mathematical model, review research literature for heat transfer correlations, and analyze 210 MW thermal power plant condenser reaching substantiated conclusions of number of tubes, shell diameter, length of tube and pump power required.
CO1	PO3	3	Student design solution for thermal power plant condenser that meet the specified need of 210 MW power output and steam flow rate under given conditions of the steam pressure
CO1	PO4	3	Student analyze the complex design of condenser for various velocities of the cooling water that meets the specified need and provide
CO1	PO5	2	Student uses engineering equation solver program for obtaining the various thermal and physical properties of the working fluid and materials
CO1	PO6	2	Student will conversant to relevant to the engineering practices in the design of steam condenser of a thermal power plant
CO1	PO7	2	Student will observe the effect on environment due to use of large cooling water and cooling towers
CO1	PO9	2	Student will work in a team and as a member of team for designing of the condenser and evaluation of the properties for the given constraints
CO1	PO10	2	Student will prepare the comprehensive design report and present the same

Course Outcome	Program Outcome	Level	Justification
CO2	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals for the production of biodiesel and evaluation of properties
CO2	PO2	2	Student identifies need of biodiesel and review research literature for biodiesel production process and understand the methods to evaluate the biodiesel properties reaching substantiated conclusions for its use in diesel engine.
CO2	PO3	2	Student understands the methods and solution for the biodiesel production and use that meet the specified need of alternative fuels for diesel engine
CO2	PO4	3	Student understands and analyze the complex process of evaluation of diesel engine performance using biodiesel and interprets the parameters and their causes
CO2	PO5	1	Student understands the use of computerized diesel engine test setup for the evaluation diesel engine performance
CO2	PO6	2	Student will conversant to assess societal, health, and safety issues and the consequent responsibilities relevant to the use of biodiesel and evaluation of its properties
CO2	PO7	2	Student will understand the impact of biodiesel emissions on the environment
CO2	PO9	2	Student will work in a team and as a member of team for case study report on biodiesel production and performance of diesel engine
CO2	PO10	2	Student will prepare the comprehensive case study report and present the same
CO3	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals for the development of ANN model for wind energy prediction
CO3	PO2	3	Student reviews research literature on ANN application and model development reaching substantiated conclusions for better prediction coefficients.
CO3	PO3	3	Student understands the methods and solution for the wind energy prediction using wind data and the developed ANN model
CO3	PO4	3	Student understands and analyze the complex process of predicting the wind energy and interprets the parameters and their causes
CO3	PO5	3	Student uses MATLAB and EES computer programme for the wind energy prediction

Course Outcome	Program Outcome	Level	Justification
CO3	PO7	2	Student will understand the impact of use of wind energy on the environment
CO3	PO9	3	Student will work in a team and as a member of team for the development of the computer programme
CO3	PO10	3	Student will prepare the comprehensive case study report and present the same
CO4	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals to understand and evaluate the performance of cogeneration and process heat plant
CO4	PO2	3	Student reviews research literature on sugar production, cogeneration system and performance analysis of the system,.
CO4	PO3	2	Student provides the solution of complex cogeneration system for analysis of its performance
CO4	PO4	3	Student understands and analyze the complex process of cogeneration and process heat for evaluating and selecting the optimum parameters
CO4	PO5	1	Student uses EES computer programme for the solution of given case study of cogeneration system
CO4	PO7	2	Student will understand the impact of cogeneration system on the environment
CO4	PO9	2	Student will work in a team and as a member of team for the development of the computer programme
CO4	PO10	2	Student will prepare the comprehensive case study report and present the same
CO5	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals to understand and evaluate thermal energy storage system
CO5	PO2	3	Student reviews research literature on thermal energy storage system, energy storage materials, compare the materials and select based on need
CO5	PO3	2	Student provides the solution of complex thermal energy storage system with an appropriate considerations of need and environmental considerations
CO5	PO4	3	Student understands and analyze the complex process of thermal energy storage system and selecting the optimum parameters
CO5	PO5	1	Student uses EES computer programme for the solution of given case study of thermal energy storage system

Course Outcome	Program Outcome	Level	Justification
CO5	PO7	2	Student will understand the impact of energy storage system on the environment
CO5	PO9	2	Student will work in a team and as a member of team for the development of the computer programme
CO5	PO10	2	Student will prepare the comprehensive case study report and present the same
CO6	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals to understand power plant layout, its components, location and function.
CO6	PO2	2	Student reviews research literature on various systems of the thermal power plant and justify the necessity of the same
CO6	PO3	1	Student provides the solution of complex system layout and opportunities for the energy conservations
CO6	PO4	2	Student understands and analyze the complex thermal power plant and select the optimum operating parameters
CO6	PO5	2	Student reviews the modern PCR and ECR ICT systems used in thermal power plant
CO6	PO7	3	Student will understand the impact of thermal power plant on the environment
CO6	PO9	2	Student will work in a team and as a member of team for the development of the report
CO6	PO10	2	Student will prepare the comprehensive case study report and present the same
CO7	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals to evaluate the performance of a steam power of 1kW capacity.
CO7	PO2	2	Student reviews research literature related to the evaluation of the performance of the steam power plant and develops the equations for the analysis
CO7	PO3	2	Student provides the solution of complex steam power plant system through the development of various equations for the analysis and obtaining the performance characteristics
CO7	PO4	2	Student understands and analyze the complex steam thermal power plant and select the optimum operating parameters
CO7	PO5	2	Student reviews the modern control tools and measuring devices used for steam power plant monitoring

Course Outcome	Program Outcome	Level	Justification
CO7	PO7	2	Student will understand the impact of thermal power plant on the environment
CO7	PO9	2	Student will work in a team and as a member of team to conduct the trial on steam power plant and evaluate the performance
CO7	PO10	2	Student will prepare the comprehensive performance analysis report and present the same
CO8	PO1	3	Student applies the knowledge of mathematics, science, engineering fundamentals to evaluate the performance of a diesel power of 3.5 kW capacity.
CO8	PO2	2	Student reviews research literature related to the evaluation of the performance of the diesel power plant and develops the equations for the analysis
CO8	PO3	2	Student provides the solution of complex diesel power plant system through the development of various equations for the analysis and obtaining the performance characteristics
CO8	PO4	2	Student understands and analyze the complex diesel thermal power plant and select the optimum operating parameters
CO8	PO5	3	Student uses the LABVIEW based computer programming diesel engine system for the analysis of diesel power plant
CO8	PO7	2	Student will understand the impact of diesel power plant emissions on the environment
CO8	PO9	2	Student will work in a team and as a member of team to conduct the trial on diesel power plant and evaluate the performance
CO8	PO10	2	Student will prepare the comprehensive performance analysis report and present the same