NPR College of Engineering and Technology
(AN AUTONOMOUS INSTITUTION)
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Natham, Dindigul (Dist.) - 624 401, Tamil Nadu.

Department of Mechanical Engineering

Course Code and Title

NPRCET (Autonomous) Regulation 2023

Table 1.1 - List of Courses with Course Code

S/N.	COURSE CODE (NBA)	COURSE CODE (UNIVERSITY)	TITLE OF THE COURSE
Semester – I			
1.	C101	23HS101	Professional English-I
2.	C102	23MA101	Matrices and Calculus
3.	C103	23PH101	Engineering Physics
4.	C104	23CY101	Engineering Chemistry
5.	C105	23GE102	Problem Solving and Python Programming
6.	C106	23GE103	தமிழர்மரபு /Heritage of Tamils
7.	C107	23GE111	Problem Solving and Python Programming Laboratory
8.	C108	23BS111	Physics and Chemistry Laboratory
9.	C109	23GE112	English Laboratory - I
Semester – II			
10.	C110	23HS201	Professional English-II
11.	C111	23MA201	Statistics and Numerical Methods
12.	C112	23PH204	Materials Science and Technology
13.	C113	23BE201	Basic Electrical and Electronics Engineering
14.	C114	23ME201	Engineering Mechanics
15.	C115	23GE202	Engineering Graphics
16.	C116	23GE211	Engineering Practices Laboratory
17.	C117	23BE212	Basic Electrical and Electronics Engineering Laboratory
18.	C118	23GE212	English Laboratory - II

Semester – III			
19.	C201	23MA301	Transforms and Applications of Partial Differential Equations
20.	C202	23ME301	Engineering Thermodynamics
21.	C203	23ME303	Manufacturing Processes
22.	C204	23GE902	Human Values and Ethics
23.	C205	23MC903	Disaster Risk Reduction and Management
24.	C206	23ME302	Strength of Materials
25.	C207	23ME311	Computer Aided Machine Drawing
Semester – IV			
26.	C208	23ME401	Thermal Engineering
27.	C209	23ME402	Manufacturing Technology
28.	C210	23GE901	Environmental Sciences and Sustainability
29.	C211	23MC908	Industrial Safety
30.	C212	23ME403	Theory of Machines
31.	C213	23ME404	Fluid Mechanics and Machinery
32.	C214	23ME411	Thermal Engineering Laboratory
33.	C215	23ME412	Manufacturing Technology Laboratory
Semester – V			
34.	C301	23ME501	Design of Machine Elements
35.	C302	23ME502	Metrology and Measurements
36.	C303	23ME503	Computer Aided Design and Manufacturing
37.	C304		Professional Elective-I
38.	C305		Professional Elective-II
39.	C306		Open Elective–I~
40.	C307	23ME512	Metrology Laboratory
41	C308	23ME513	CAD/CAM Laboratory

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Semester – VI			
41	C307	23ME601	Heat and Mass Transfer
42	C308	23ME602	Design of Transmission System
43	C309	23ME603	Hydraulics and Pneumatics
44	C310		Professional Elective-III
45	C311		Professional Elective-IV
46	C312		Open Elective–II~
47	C313	23ME611	Heat Transfer Laboratory
48	C314	23ME612	Mini Project

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Department of Mechanical Engineering

Course Outcomes with K – Level Mapping for all Courses (Regulation 2021)

SEMESTER 1

Course Code & Name: C101 & 23HS101 Professional English-I		
	CO Statements	**Knowledge Level**
The students should be able to		
C101.1	To use appropriate words in a professional context and communicate in a professional context.	Applying (BL 3)
C101.2	To gain understanding of basic grammatic structures and use them in right context.	Understanding (BL 2)
C101.3	To read and infer the denotative and connotative meanings of technical texts and use technical words in describing products with appropriate definitions.	Applying (BL 3)
C101.4	To write definitions, descriptions, narrations and essays on various topics.	Creating (BL 6)
C101.5	To express their opinions effectively in both oral and written medium of communication.	Creating (BL 6)

Course Code &Name: C102 & 23MA101 Matrices and Calculus		
	CO Statements	**Knowledge Level**
The students should be able to		
C102.1	Use the matrix algebra methods for solving practical problems.	Applying (BL 3)
C102.2	Able to use differential calculus ideas on several variable functions.	Applying (BL 3)
C102.3	Apply integral calculus and multiple integral tools in solving various application problems.	Applying (BL 3)
C102.4	Understand the concepts of Gradient, divergence and curl of a vector point function and related applications.	Understanding (BL 2)
C102.5	Apply various techniques in solving ordinary differential equations.	Applying (BL 3)

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Course Code &Name: C103 & 23PH101 Engineering Physics		
	CO Statements	**Knowledge Level**
The students should be able to		
C103.1	Choose the correct materials based on their qualities for any intended applications and learn the basics of elasticity and its engineering-related applications.	Applying (BL 3)
C103.2	Express their knowledge in electromagnetic waves.	Understanding (BL 2)
C103.3	Infer the characteristics of laser for various Engineering applications and expand the understanding of optical fibers use in communications.	Understanding (BL 2)
C103.4	Apply quantum theory's sophisticated physics notions to the matter's characterization.	Applying (BL 3)
C103.5	Know the fundamentals of crystal formations and growth methods.	Understanding (BL 2)

Course Code &Name: C104 & 23CY101 Engineering Chemistry		
	CO Statements	**Knowledge Level**
The students should be able to		
C104.1	Summarize the water related problems in boilers and their treatment techniques.	Remembering (BL 1)
C104.2	Discuss the applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.	Understanding (BL 2)
C104.3	Discuss the types, properties and applications of polymers and composites.	Applying (BL 3)
C104.4	Summarize the fuels used for engineering processes and applications of fuels.	Understanding (BL 2)
C104.5	Summarize the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.	Applying (BL 3)

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Course Code &Name: C105 & 23GE102 Problem Solving and Python Programming		
	CO Statements	**Knowledge Level**
The students should be able to		
C105.1	Understand the concepts of computational thinking and algorithmic problem-solving techniques.	Understand (BL 2)
C105.2	Develop simple python programs for applying the concepts of datatypes, expressions, and python statements.	Applying (BL 3)
C105.3	Develop Python programs for solving real-time computational problems by using conditionals, looping, functions, and strings.	Applying (BL 3)
C105.4	Understand the concepts of compound data using Python lists, tuples, and dictionaries.	Understand (BL 2)
C105.5	Develop python programs for solving computational problems by using modules, files, and python packages.	Applying (BL 3)

Course Code and Name: C107 & 23GE111 Problem Solving and Python Programming Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C107.1	Develop simple python programs for applying the concepts of datatypes, expressions, and python statements.	Applying (BL 3)
C107.2	Develop Python programs using conditionals, looping, functions, and strings for solving real-time computational problems.	Applying (BL 3)
C107.3	Understand the concepts of compound data using Python lists, tuples, and dictionaries.	Understand (BL 2)
C107.4	Develop python programs for solving problems by using modules, files, and python packages.	Applying (BL 3)
C107.5	Utilize Python packages for developing real-world software applications.	Applying (BL 3)

Course Code and Name: C108 & 23BS111 Physics and Chemistry Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C108.1	Understand the fundamental concepts of **wave optics (interference, diffraction, resonance)**, **thermal behavior of materials**, and **basic methods for nanoparticle synthesis**.	(Understanding – BL 2)
C108.2	Apply the principles of **optical fibers, semiconductors, elastic properties, and electrochemical techniques** to analyze physical and chemical systems using standard experimental procedures.	(Applying – BL 3)
C108.3	Measure and estimate **mechanical properties (elastic moduli, moment of inertia)** and **thermal properties** of materials using appropriate laboratory techniques and calculations.	(Applying – BL 3)
C108.4	Analyze the **interaction of light with matter**, **properties of liquids**, **composition of alloys**, and **quality of water samples** with respect to acidity, alkalinity, hardness, and dissolved oxygen (DO).	(Analyzing – BL 4)
C108.5	Quantitatively analyze **metal ions and impurities** in solutions using **volumetric, spectroscopic, and electroanalytical methods**, and interpret the experimental results scientifically.	(Analyzing – BL 4)

Course Code and Name: C109 & 23GE112 English Laboratory - I		
	CO Statements	**Knowledge Level**
The students should be able to		
C109.1	To listen to and comprehend general as well as complex academic information.	Understanding (BL 2)
C109.2	To listen to and understand different points of view in a discussion.	Understanding (BL 2)
C109.3	To speak fluently and accurately in formal and informal communicative contexts.	Applying (BL 3)
C109.4	To describe products and processes and explain their uses and purposes clearly and accurately.	Creating (BL 6)
C109.5	To express their opinions effectively in both formal and informal discussions.	Creating (BL 6)

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SEMESTER 2

Course Code and Name: C110 & 23HS201 Professional English-II		
	CO Statements	**Knowledge Level**
The students should be able to		
C110.1	To compare and contrast products and ideas in technical texts and write analytical essays.	Applying (BL 2)
C110.2	To identify and report cause and effects in events, industrial processes through technical texts and draft a report with suggestions.	Creating (BL 6)
C110.3	To analyze problems in order to arrive at feasible solutions and communicate them in the written format.	Analyzing (BL 4)
C110.4	To present their ideas and opinions in a planned and logical manner in industrial nature.	Creating (BL 6)
C110.5	To draft effective resumes in the context of job application.	Creating (BL 6)

Course Code and Name: C111 & 23MA201 Statistics and Numerical Methods		
	CO Statements	**Knowledge Level**
The students should be able to		
C111.1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	Applying (BL 3)
C111.2	Apply the basic concepts of classifications of design of experiments in the field of agriculture.	Applying (BL 3)
C111.3	Apply the basic concepts and Techniques of solving algebraic and transcendental equations.	Applying (BL 3)
C111.4	Understand the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	Understanding (BL 2)
C111.5	Solve the ordinary differential equations with initial conditions by using certain techniques with engineering applications.	Analysing (BL 4)

Course Code and Name: C112 & 23PH204 Materials Science and Technology		
	CO Statements	**Knowledge Level**
The students should be able to		
C112.1	To inferring the fundamental knowledge in phase diagrams and explain its application in the field of materials science and engineering.	Understand (BL 2)
C112.2	To interpret the fundamentals of the Fe-Fe3C phase diagram, diverse microstructures, and alloys for engineering designs.	Apply (BL 3)
C112.3	To understand the fundamental mechanical properties of materials and their methods of measurement.	Understand (BL 2)
C112.4	To gain knowledge on dielectric, super conducting and their properties.	Understand (BL 2)
C112.5	To apply the suitable nanomaterials and shape memory alloys for specific engineering applications.	Apply (BL 3)

Course Code and Name: C113 & 23BE201 Basic Electrical and Electronics Engineering		
	CO Statements	**Knowledge Level**
The students should be able to		
C113.1	Compute the electric circuit parameters for simple problems	Applying (BL 3)
C113.2	Examine the working principle and applications of electrical machines	Understanding (BL 2)
C113.3	Illustrate the characteristics of analog electronic devices	Understanding (BL 2)
C113.4	Examine the basic concepts of digital electronics	Analyzing (BL 4)
C113.5	Apply the concepts of principles of measuring instruments for real time applications	Applying (BL 2)

Course Code and Name: C114 & 23ME201 Engineering Mechanics		
	CO Statements	**Knowledge Level**
The students should be able to		
C114.1	Identify various force system in a plane.	Understanding (BL 2)
C114.2	Solve equilibrium of rigid bodies in two dimensions.	Applying (BL 3)
C114.3	Calculate the centroid, areas and mass moment of inertia for surface and solids.	Applying (BL 3)
C114.4	Apply the concept of dynamics for particle motions.	Applying (BL 3)
C114.5	Determine the friction of elements and dynamics of rigid bodies.	Applying (BL 3)

Course Code and Name: C115 & 23GE202 Engineering Graphics		
	CO Statements	**Knowledge Level**
The students should be able to		
C115.1	Construct the conic curves, involutes and cycloid.	Applying (BL 3)
C115.2	Solve practical problems involving projection of lines, points and plane surfaces	Applying (BL 3)
C115.3	Draw orthographic projection of solids and freehand sketch of simple objects.	Applying (BL 3)
C115.4	Draw the sectioning and development of simple solids.	Applying (BL 3)
C115.5	Draw isometric and perspective projections of simple solids.	Applying (BL 3)

Course Code and Name: C116 & 23GE211 Engineering Practices Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C116.1	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.	Applying (BL 3)
C116.2	Wire various electrical joints in common household electrical wire work.	Applying (BL 3)
C116.3	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.	Applying (BL 3)
C116.4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	Applying (BL 4)

Course Code and Name: C117 & 23BE212 Basic Electrical and Electronics Engineering Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C115.1	Perform the Verification of Ohm's and Kirchhoff's Laws for DC circuits.	Applying (BL 3)
C115.2	Analyze experimentally the load characteristics of electrical machines	Analyzing (BL 4)
C115.3	Analyze the characteristics of basic electronic devices	Analyzing (BL 4)
C115.4	Demonstrate use of DSO to measure the various parameters	Applying (BL 3)

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Course Code and Name: C118 & 23GE212 English Laboratory - II		
	CO Statements	**Knowledge Level**
The students should be able to		
C116.1	Speak effectively in group discussions held in ~~a~~ formal/semi formal contexts.	Creating (BL 6)
C116.2	Discuss, analyze and present concepts and problems from various perspectives to arrive at suitable solutions.	Analyzing (BL 4)
C116.3	Make effective presentations in an attractive way using appropriate vocabulary.	Applying (BL 3)
C116.4	Attend job interviews and be successful in them.	Creating (BL 6)
C116.5	Develop adequate Soft Skills required for the workplace.	Applying (BL 3)

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SEMESTER 3

Course Code and Name: C201 & 23MA301 Transforms and Applications of Partial Differential Equations		
	CO Statements	**Knowledge Level**
The students should be able to		
C201.1	Design general periodic functions and apply in problems of Fourier series, which are sums of sines and cosines.	Apply (BL 3)
C201.2	Use the Fourier transform as the tool to connect the time domain and frequency domain in signal processing.	Apply (BL 3)
C201.3	Use the effective mathematical tools for the solutions of partial differential equations by using Z - Transform techniques for discrete time systems.	Apply (BL 3)
C201.4	Understand how to solve the given standard partial differential equations.	Understand (BL 2)
C201.5	Describe real time engineering problems using PDE in 1-D wave vibrating membrane and heat passing through rod two-dimensional heat conduction problems.	Understand (BL 2)

Course Code and Name: C202 & 23ME301 Engineering Thermodynamics		
	CO Statements	**Knowledge Level**
The students should be able to		
C202.1	Explore the fundamental concepts of thermodynamics.	Understanding (BL 2)
C202.2	Apply the first law of thermodynamics to both closed and open systems.	Applying (BL 3)
C202.3	Determine the thermodynamic properties of pure substances and analyze their phase change processes.	Applying (BL 3)
C202.4	Solve problems related to thermodynamics devices by employing the second law of thermodynamics.	Applying (BL 3)
C202.5	Evaluate thermodynamic relations and quantify changes in properties of atmospheric air undergoing psychrometric processes using equations and charts.	Applying (BL 3)

Course Code and Name: C203 & 23ME303 Manufacturing Processes		
	CO Statements	**Knowledge Level**
The students should be able to		
C203.1	Explain the principle of different metal casting processes.	Understanding (BL 2)
C203.2	Describe the various metal joining processes.	Applying (BL 3)
C203.3	Illustrate the different bulk deformation processes.	Applying (BL 3)
C203.4	Apply the various sheet metal forming process.	Applying (BL 3)
C203.5	Apply suitable moulding technique for manufacturing of plastics components	Applying (BL 3)

Course Code and Name: C204 & 23GE902 Human Values and Ethics		
	CO Statements	**Knowledge Level**
The students should be able to		
C204.1	Explain how democratic values like equality, liberty, and justice enhance governance and citizen participation.	Understand (BL 2)
C204.2	Apply secular values to ensure acceptance of all faiths and non-discrimination.	Apply (BL 3)
C204.3	Apply scientific thinking and methods to assess and promote transparency, fairness, and ethical use of scientific inventions for societal benefit.	Apply (BL 3)
C204.4	Explain how ethical reasoning applies to social issues and constitutional protections.	Understand (BL 2)
C204.5	Apply professional ethics to address issues such as honesty, confidentiality, and conflicts of interest in the workplace.	Apply (BL 3)

Course Code and Name: C205 & 23MC903 Disaster Risk Reduction and Management		
	CO Statements	**Knowledge Level**
The students should be able to		
C205.1	Impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)	Understanding (BL 2)
C205.2	Enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction	Applying (BL 3)
C205.3	Develop disaster response skills by adopting relevant tools and technology	Applying (BL 3)
C205.4	Enhance awareness of institutional processes for Disaster response in the country	Applying (BL 3)
C205.5	Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity	Applying (BL 3)

Course Code and Name: C206 & 23ME302 Strength of Materials		
	CO Statements	**Knowledge Level**
The students should be able to		
C206.1	Understand the basic principles of stress and strain to both simple and composite bars, explore various techniques for assessing mechanical properties, and grasp the importance of principal stresses and principal planes	Understanding (BL 2)
C206.2	To plot the variation of shear force and bending moments over the beams under different types of loads.	Applying (BL 3)
C206.3	Use the fundamental torsion equations to determine torsional shear stress and stiffness when designing shafts and helical springs.	Applying (BL 3)
C206.4	Determine the slope and deflection of beams using different methods, and then perform a practical test to measure the actual deflection of the beam.	Applying (BL 3)
C206.5	To analyze the cylindrical shells under circumferential and radial loading	Applying (BL 3)

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Course Code and Name: C207 & 23ME311 Computer Aided Machine Drawing		
	CO Statements	**Knowledge Level**
The students should be able to		
C207.1	To draw orthographic projections of simple components using geometric modeling software.	Understanding (BL 2)
C207.2	To create three-dimensional assembly models of automotive and machine components using CAD software.	Applying (BL 3)
C207.3	To generate 3D assembly models of machine elements using CAD software.	Applying (BL 3)

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SEMESTER 4

Course Code and Name: C208 & 23ME401 Thermal Engineering		
	CO Statements	**Knowledge Level**
The students should be able to		
C208.1	Apply thermodynamic concepts to analyze various gas power cycles and solve related engineering problems.	Applying (BL 3)
C208.2	Solve problems in vapor power cycles and steam nozzles, including calculation of critical pressure ratios.	Applying (BL 3)
C208.3	Analyze the flow characteristics in steam turbines, construct velocity diagrams to understand turbine performance, and evaluate gas turbines through cycle analysis to solve performance-related problems.	Applying (BL 3)
C208.4	Explain the functioning and features of IC engines, including their components and auxiliary systems, and evaluate various performance parameters.	Applying (BL 3)
C208.5	Analyze the performance of refrigeration and air conditioning systems in various applications.	Applying (BL 3)

Course Code and Name: C209 & 23ME402 Manufacturing Technology		
	CO Statements	**Knowledge Level**
The students should be able to		
C209.1	Apply the mechanism of metal removal process and to identify the factors involved in improving machinability	Apply (BL 3)
C209.2	Describe the constructional and operational features of centre lathe and other special purpose lathes.	Understand (BL 2)
C209.3	Describes the construction and operational features of reciprocating machine tools, grinding and fine finishing processes, and develops practical skills in grinding machine operations.	Understand (BL 2)
	Apply the constructional features and working principles of CNC machine tools to plan, write codes, and set up CNC machines, demonstrating the ability to manufacture a given component effectively.	Apply **(BL 3)**
	Understand the impact of modern technologies on manufacturing, including automation, robotics, and smart manufacturing trends.	Understand **(BL 2)**

Course Code and Name: C210 & 23GE901 Environmental Sciences and Sustainability		
	CO Statements	**Knowledge Level**
The students should be able to		
C210.1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation	Remember (BL 1)
C210.2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	Understand (BL 2)
C201.3	To identify the causes, effects of natural disasters and contribute to the preventive measures in the society.	Apply (BL 3)
C201.4	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	Understand (BL 2)
C210.5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	Apply (BL 3)

Course Code and Name: C211 & 23MC908 & Industrial Safety		
	CO Statements	**Knowledge Level**
The students should be able to		
C211.1	Understand the basic concept of safety.	Understanding (BL 1)
C211.2	Obtain knowledge of Statutory Regulations and standards.	Applying (BL 1)
C211.3	Know about the safety Activities of the Working Place.	Applying (BL 1)
C211.4	Analyze on the impact of Occupational Exposures and their Remedies.	Applying (BL 2)
C211.5	Obtain knowledge of Risk Assessment Techniques.	Applying (BL 2)

Course Code and Name: C212 & 23ME403 Theory of Machines		
	CO Statements	**Knowledge Level**
The students should be able to		
C212.1	Design and analyze mechanisms, including kinematic inversions and apply these concepts to mechanical systems.	Analyze (BL 4)
C212.2	Examine and design spur gears and gear train systems, including parallel axis and epicyclic types, for automotive applications.	Applying (BL 3)
C212.3	To analyze dynamic forces, apply D'Alembert's principle, study engine dynamics, interpret torque diagrams, and design flywheels.	Applying (BL 3)
C212.4	To analyze and apply balancing techniques for rotating masses, single and multi-cylinder engines, linkages, and rotors using balancing machines and field balancing methods.	Applying (BL 3)
C212.5	To analyze vibratory systems, free and damped vibrations, torsional vibrations, forced vibrations, and apply vibration isolation and measurement techniques.	Analyze (BL 4)

Course Code and Name: C213 & 23ME404 Fluid Mechanics and Machinery		
	CO Statements	**Knowledge Level**
The students should be able to		
C213.1	Understand fluid properties, distinguish them from solids, and examine their behavior under both static and dynamic conditions.	Understanding (BL 2)
C213.2	Calculate pipeline losses under laminar and turbulent flow conditions, analyze pipes in series and parallel, and determine the associated losses in circular conduits	Applying (BL 3)
C213.3	Apply dimensional analysis and model testing techniques to establish relationships among parameters and assess prototype performance through model studies	Applying (BL 3)
C213.4	Apply performance calculations to turbines and analyze the associated velocity triangles	Applying (BL 3)
C213.5	Perform calculations to evaluate performance of pumps, analyze their characteristics, and interpret the associated velocity triangles.	Applying (BL 3)

Course Code and Name: C214 & 23ME411 Thermal Engineering Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C214.1	Conduct tests to evaluate performance characteristics of IC engines	Applying (BL 3)
C214.2	Conduct tests to evaluate the performance of refrigeration cycle	Applying (BL 3)
C214.3	Conduct tests to evaluate Performance and Energy Balance on a Steam Generator	Applying (BL 3)

Course Code and Name: C215 & 23ME412 Manufacturing Technology Laboratory		
	CO Statements	**Knowledge Level**
The students should be able to		
C215.1	Demonstrate the safety precautions exercised in the mechanical workshop and join two metals using GMAW.	Applying (BL 3)
C215.2	The students able to make the work piece as per given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.	Applying (BL 3)
C215.3	The students become make the gears using gear making machines and analyze the defects in the cast and machined components	Applying (BL 3)