JAIPURENGINEERINGCOLLEGEANDRESEARCHCENTRE

JECRCCampus,ShriRamkiNangal,Via-Vatika,TonkRoad,Jaipur

DepartmentofMechanicalEngineering

NameofSubject:Basic Mechanical Engineering

Subject Code: (2FY3-07)

Year:1stYear,IISemester

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

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DepartmentofMechanicalEngineering

VisionandMissionof Institute:

Vision: To become a renowned center of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

Mission:

M1:Focusonevaluationoflearningoutcomesandmotivatestudentsto inculcateresearch aptitude by project based learning.

M2:Identify,basedoninformedperceptionofIndian,regionalandglobalneeds,areasof focus and provide platform to gain knowledge and solutions.

M3:Offeropportunitiesforinteractionbetween academiaandindustry.

M4:Develophumanpotentialtoitsfullestextentsothatintellectuallycapableand imaginatively gifted leaders can emerge in a range of professions.

VisionandMissionof Department:

Vision: The Mechanical Engineering Department strives to be recognized globally for outcomebasedtechnicalknowledgeandtoproducequalityhumanresource,whocan manage the advance technologies and contribute to society.

Mission:

M1:Toimpartqualitytechnicalknowledgetothelearners tomakethemgloballycompetitive mechanical engineers.

M2:Toprovidethelearnersethicalguidelinesalongwithexcellentacademicenvironmentfor a long productive career.

M3:To promoteindustry-institute relationship.

PROGRAMEDUCATIONAL OBJECTIVES(PEOS)

PEO1: To equip graduates with a strong foundation in engineering sciences, with an emphasis on mechanical engineering principles, enabling them to analyze, design, and solve real-world engineering challenges.

PEO2: To prepare graduates with sound scientific and engineering fundamentals to innovate and deliver effective solutions addressing practical challenges in mechanical engineering

PEO3: To inculcate in graduates a professional and ethical attitude, effective communication and teamwork skills, a multidisciplinary approach, entrepreneurial mindset, and the ability to connect engineering solutions with societal and environmental concerns.

PEO4: To provide students with an academic environment that fosters excellence, leadership, adherence to ethical standards, and encourages self-motivated lifelong learning essential for a successful professional career in mechanical

PEO5: To prepare students to excel in industry and higher education by providing quality education grounded in strong technical knowledge and high moral values

Program Specific Outcomes (PSOs)

PSO1: Graduates will be able to design, analyze, and fabricate electric and hybrid vehicles using modern engineering tools and sustainable practices.

PSO2: Graduates will be able to apply design principles and computational techniques, including programming and data structures, to analyze and solve mechanical engineering problems.

ProgramOutcomes(POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4:ConductInvestigationsofComplexProblems: Conductinvestigationsof complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide validconclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture andenvironment. (WK1, WK5, and WK7).

PO7:Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8:Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentationsconsidering cultural, language, and learning differences

PO10:Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11:Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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SYLLABUS2FY3-07: Basic Mechanical Engineering

SN	CONTENTS
1	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.
2	**Pumps and IC Engines:** Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.
3	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.
4	**Transmission of Power:** Introduction and types of Belt and Rope Drives, Gears.
5	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.
6	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.

REFERENCEBOOKS(BME)

1. G. Shanmugam and S Ravindran, Basic Mechanical Engieering, McGraw hill, fourth edition.
2. K VenuGopal and Prabhu Raja V, Basic Mechanical Engineering, Anuradha agencies pub, Chennai.
3. Dr.A. K. Rajvanshi, Mechanical Engineeing, Genius Publications.

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COURSEOUTCOME

Subject: Basic Mechanical Engineering **Code**:2**FY3-07**

Basic Mechanical Engineering

CO1: Explain fundamental principles of mechanical engineering, thermal engineering, machine design, industrial engineering, and manufacturing technology.
CO2: Differentiate and analyze boilers, turbines, and power generation systems based on design and application.
CO3: Demonstrate the working of pumps and IC engines and analyze their operational characteristics.
CO4: Select and justify appropriate refrigeration and air-conditioning systems for industrial and domestic applications.
CO5:Analyze, design, and evaluate basic power transmission mechanisms for engineering applications.
CO6: Choose and apply suitable manufacturing processes and materials for practical applications.

CO-POMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1	1	1	1	1	1	1	1	3
CO2	3	2	3	2	2	1	1	2	1	1	1	2	3
CO3	3	2	3	2	2	1	1	2	1	1	1	2	3
CO4	3	2	3	2	3	2	2	2	2	1	1	2	3
CO5	3	2	3	3	3	2	2	2	2	1	1	3	3
CO6	3	2	3	3	2	2	1	2	2	1	1	3	3

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Course Plan

Name of the Course: **Basic Mechanical Engineering**
Code of the course: **1FY3-07**
Name of Faculty: **Hukam chand**

Course Outcome

CO1: Explain fundamental principles of mechanical engineering, thermal engineering, machine design, industrial engineering, and manufacturing technology.
CO2: Differentiate and analyze boilers, turbines, and power generation systems based on design and application.
CO3: Demonstrate the working of pumps and IC engines and analyze their operational characteristics.
CO4: Select and justify appropriate refrigeration and air-conditioning systems for industrial and domestic applications.
CO5:Analyze, design, and evaluate basic power transmission mechanisms for engineering applications.
CO6: Choose and apply suitable manufacturing processes and materials for practical applications.

Unit	Topic	Lec.	CO	Specific Objectives	Expected Outcomes	Primary Reference (Dr. A K Rajvanshi)
Intro	Introduction to Mechanical Engineering	1	CO1	Explain scope & branches	Understand role of ME	Ch.1
1	Thermal, Design & Industrial Engineering Concepts	2	CO1	Describe domains	Differentiate fields	Ch.1 p. 1.1-1.12
1	Steam Boilers	3	CO2	Explain types & working	Identify boiler types	Ch.6 p. 6.7-6.42
1	Steam Turbines & Power Plants	4	CO2	Explain turbines & plants	Compare systems	Ch.6 p.6.44-6.45
2	Reciprocating Pumps	5	CO2	Explain working	Understand mechanism	G. Shanmugam Ch.3 P. 3.1-3.2
2	Centrifugal Pumps	6	CO2	Explain construction	Compare pumps	G. Shanmugam Ch.3 P. 3.4-3.6
2	Introduction to IC Engines	7	CO2	Explain classification	Identify engines	Ch.4 p. 4.1
2	IC Engine Components & Working	8	CO2	Describe parts & cycles	Analyze engine	Ch.4 p.4.13-4.49
3	Introduction to Refrigeration	9	CO3	Explain basics	Understand cooling	Ch.7 p.7.1-7.14
3	Refrigeration Systems	10	CO3	Classify systems	Identify methods	Ch.7 p.7.15-7.24
3	Air Conditioning	11	CO3	Explain AC working	Understand AC	Ch.7 p.7.35-7.39
3	Applications	12	CO3	Explain uses	Relate to practice	Ch.7 p.7.14 & P.7.35
4	Belt Drives	13	CO4	Explain types	Understand belts	Ch.9 p.9.1-9.19

4	Rope Drives	14	CO4	Explain rope drives	Compare drives	Ch.9 p.9.23-9.24
4	Gears	15	CO4	Explain gears	Identify gear systems	Ch.9 p.9.31–9.42
5	Casting Process	16	CO5	Explain casting	Understand process	Ch.8 p.8.47-8.54
5	Patterns & Molding	17	CO5	Explain patterns	Identify types	Ch.8 p.8.54-8.59
5	Furnaces	18	CO5	Explain furnaces	Understand melting	G. Shanmugam Ch.7 P.7.14-7.17
5	Metal Forming	19	CO5	Explain forging/rolling	Compare processes	Ch.8 p.8.41-8.47
5	Extrusion & Drawing	20	CO5	Explain methods	Understand shaping	Ch.8 P. 8.35-8.40
5	Welding	21	CO5	Explain welding	Identify types	Ch.8 p.8.65-8.73
5	Brazing, Soldering	22	CO5	Explain joining	Differentiate	Ch.8 p.8.88-8.92
6	Engineering Materials	23	CO6	Classify materials	Identify types	G. Shanmugam Ch.11 P.11.1-11.2
6	Material Properties	24	CO6	Explain properties	Compare	G. Shanmugam Ch.11 P.11.3-11.7
6	Heat Treatment of Steel	25	CO6	Explain processes	Understand treatment	G. Shanmugam Ch.12 P.12.1-12.4
6	Applications	26	CO6	Relate materials	Select materials	G. Shanmugam Ch.12 P.12.5

Reference Books

1. Dr.A. K. Rajvanshi, Mechanical Engineeing, Genius Publications.
2. G. Shanmugam and S Ravindran, Basic Mechanical Engieering, McGraw hill, fourth edition.
3. K VenuGopal and Prabhu Raja V, Basic Mechanical Engineering, Anuradha agencies pub, Chennai.