



# MANIPAL INSTITUTE OF TECHNOLOGY

BENGALURU

(A constituent unit of MAHE, Manipal)

MME\_1051

B.Tech. First Year: Department of Mechanical and Manufacturing Engineering

## Course Handout

Session (Semester): October-2021 to Feb-2022

Branch: Physics Cycle

Class: Theory Regular

Course Name (Code): Basic Mechanical Engineering (MME\_1051)

Contact Hours/Week:	L	T	P	C
	3	0	0	3

Course Coordinator: Mr. Adithya G S S

Course Instructor: Mr. Adithya G S S

**A. Introduction:** Basic Mechanical Engineering is a brief overview of mechanical engineering that makes the students familiar with the basic concepts of Mechanical Engineering. It provides a systematic introduction to the basic elements of mechanical systems while emphasizing the underlying working principles important in understanding the functioning of mechanical systems and processes which involves energy carrier (working fluid i.e. steam), energy and its transformation, steam generator, refrigeration, and air-conditioning, power-producing and consuming devices, power transmission devices, and manufacturing processes.

## B. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	In-session Exam (Close Book)	20
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged) *	30
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination, but this attendance limit is not mandatory for the online classes as guided by AICTE. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	



Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.			
Components	Quiz 1 (online)	Continuous Assessment (online)	In-Semester Examination (online)	End-Semester Examination (offline)
Duration	30 minutes	10 to 15 minutes after every class	90 minutes	180 minutes
Weightage	10% (10 marks)	20% (20 marks)	20% (20 marks)	50% (50 marks)
Typology of Questions	Understanding/ Comprehension; Application; Analysis; Synthesis; Evaluation	Knowledge/ Recall; Understanding/ Comprehension; Application	Understanding/ Comprehension; Application; Analysis; Synthesis; Evaluation	Understanding/ Comprehension; Application; Analysis; Synthesis; Evaluation
Pattern	MCQ and/or fill in the blanks using MS Forms	MCQ and/or fill in the blanks using MS Forms - 2 marks for each class quiz	Answer all 4 full questions of 10 marks each. Each question will have 2 parts of 4 and 6 marks	Answer all 5 full questions of 10 marks each. Each question will have 2 parts of 4 and 6 marks
Schedule	6 <sup>th</sup> week of academic calendar	Every class from 7 <sup>th</sup> week to 16 <sup>th</sup> week of academic calendar	13 <sup>th</sup> week of academic calendar	Between 21 Feb 2022 & 5 Mar 2022
Topics Covered	L 1-8 & T 1-2 (CO1)	L 9 onwards (CO2-4)	Comprehensive examination covering L 1-18 & T 1-5 Students are expected to answer all questions (CO1-3)	Comprehensive examination covering full syllabus. Students are expected to answer all questions (CO1-5)

### C. Syllabus

**Properties of Steam and Boilers:** Steam properties Working principle of Babcock & Wilcox Boiler; **Prime Movers:** Classification, working principle of steam, gas and water turbines; **Power plants:** Working principle of thermal, nuclear, hydel and solar power plants; **Refrigeration:** Principle and working of vapour compression refrigeration system; **I.C. Engines:** Classification, Working of 2-stroke, 4 - stroke C.I and S.I Engines; **Power Transmission:** Belt drives, Introduction to rope drive and chain drives, Gear Drives; **Machine Tools:** Introduction to Lathe, Drilling Machine and operations; **Casting and Forging:** Two box moulding procedure, moulding sand and its desirable properties, Pattern allowances, **Introduction to forging & welding:** Principle of Resistance spot welding, Electric arc welding and Oxy-acetylene gas welding, Introduction to soldering and brazing.



### D. Text Books

- T1.K. R.Gopalakrishna, Text book of elements of Mechanical Engineering, Subhash Publications, Bangalore, 2005.
- T2.Roy & Choudhury, Elements of Mechanical Engineering, Media Promoters & Publishers Pvt. Ltd, Mumbai, 2000.
- T3.Mishra B.K., Mechanical Engineering Sciences, Kumar & Kumar Publishers (P) Ltd, Bangalore, 1999.
- T4.Trymbaka Murthy S., A text book of elements of Mechanical Engineering, I. K. International Publishing House Pvt. Ltd, 2010.

### E. Reference Books

- R1. Rajput R. K., Elements of Mechanical Engineering, Fire Wall Media, 2005.
- R2. B.S. Raghuvanshi, A course in Workshop Technology, Vol. 1, Dhanpat Rai & sons, New Delhi, 2005

### F. Course Outcomes: At the end of the course, students will be able to

- [CO.1] Apply laws of thermodynamics on Thermal Engineering processes.
- [CO.2] Differentiate between two-stroke / four-stroke engine and SI / CI engine.
- [CO.3] Discuss concepts of lubrication, power transmission, and steam turbine.
- [CO.4] Explain elementary manufacturing machines and processes.
- [CO.5] Describe Foundry, Welding, and Forging processes.

### G. Program Outcomes and Program Specific Outcomes

- [PO.1]. Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- [PO.2]. Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- [PO.3]. Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
- [PO.4]. Conduct investigations** of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.



- [PO.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.
- [PO.6]. The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- [PO.7]. Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- [PO.8]. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- [PO.9]. Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
- [PO.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.
- [PO.11]. Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- [PO.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.



### H. Lecture Plan:

Lec. No	Topics	Lecture Outcome	Mode of Delivery	Corresponding CO
L0	Introduction, aims and objectives of the course and elementary fundamentals of thermodynamics		Lecture	
L1	<b>Properties of steam:</b> formation of steam experiment	Discuss the terms system and surroundings, thermodynamic properties and describe their use	Lecture	CO.1
L2	Different states of steam, enthalpy of steam and Measurement of Dryness fraction	Understand the type of steams	Lecture, solving problems	CO.1
L3	Numerical on properties of steam	Estimating the properties of steam using steam tables.	Lecture, solving problems	CO.1
L4	<b>Steam Boilers</b> – definition, function and classification	Know the basics of the steam boiler and understand its applications	Lecture	CO.1
L5	Lancashire boiler – construction, working principle and applications	Understand the concept of Lancashire boiler	Lecture	CO.1
L6	Boiler mountings & accessories, Comparison between boiler mountings & accessories	Know the basics of the Boiler its accessories and mounting	Lecture	CO.1
L7	Steam turbines :definition, function, classification and comparison with steam engine	Know the basics of the steam turbine and understand its applications	Lecture, Quiz	CO.1
L8	Impulse turbine - working principle and P – V diagram, Reaction turbine - working principle,	Understand the impulse and reaction turbine	Lecture	CO.1
L9	Reaction Turbine-PV diagram (Continued),Difference between impulse & reaction turbine	Compare and understand the steam turbines	Lecture	CO.1
L10	Working Principle of water Turbine	Understand the working Principle of water Turbine	Lecture	CO.1
L11	Power plants: Working principle of thermal & nuclear power plants	Understand the power plants: Working principle of thermal & nuclear power plants	Lecture	CO.2
L12	Power plants: Working principle of hydel & solar power plants	Understand the power plants: Working principle of hydel & solar power plants	Lecture	CO.2
L13	Refrigeration: Principle and major parts of an refrigeration system and Air Conditioner	Understand various thermodynamic principles related with refrigeration	Lecture	CO.2
L14	Vapour compression refrigeration system: working principle	Know the basics of the Vapour compression refrigeration system	Lecture	CO.2
L15	Classification of refrigerants and properties of an ideal refrigerant Commonly used refrigerants	Know the criteria in selection of refrigerants and their use	Lecture	CO.2
L16	I. C. Engines: classification, parts and I.C Engine terms	Know the basics of the I.C. Engine and understand its applications	Lecture	CO.2
L17	working of four stroke petrol engine	Know the basics of the four S SI engine and understand its applications	Lecture	CO.3
L18	Working of four stroke diesel engine	Know the basics of the four S CI engine and understand its applications	Lecture	CO.3



# MANIPAL INSTITUTE OF TECHNOLOGY

BENGALURU

(A constituent unit of MAHE, Manipal)

MME\_1051

L19	Two stroke engines and Working of two stroke petrol engine, Working of two stroke diesel engine	Know the basics of the two S Engine and understand its applications	Lecture	CO.3
L20	Power Transmission: Introduction, Significance and definitions, Different methods of power transmission, types of belt drives,	Know the basics of power transmission and understand its applications	Lecture	CO.3
L21	types of pulleys and its application, V – belt introduction and advantages	Know the type of belt and its use	Lecture	CO.3
L22	Derivation of length of belt (open and cross)	Estimate the length of belt drives	Lecture	CO.3
L23	Calculation of Velocity ratio for belt drive, introduction of slip and creep	Estimating the velocity ratio of belt drive	Lecture, solving problems	CO.3
L24	Calculation of Tension in belt drive (open), Power transmitted in belt drive and Numerical on belt drives	Estimating the tension in belt	Lecture, solving problems	CO.3
L25	Gear drives, types of gears and their application	Know the basics of the gear drives and understand its applications	Lecture	CO.3
L26	Machine tools: Introduction Lathe-Basic introduction , explanation of principal parts of lathe with the help of diagram and working principle	Know the basics of the machine tool and understand its applications	Lecture,	CO.3
L27	Specification of lathe Machine, Types of operations- Turning, Facing, Knurling, Parting, Grooving, Chamfering, taper turning	Analyse the Lathe Machine and its operation	Lecture,	CO.4
L28	Drilling: Introduction, classification of drilling machines, operations	Know the basics of the Drilling and understand its applications	Lecture	CO.4
L29	Introduction to Shaper and Milling machine	Know the basics of the Milling and shaper and understand its applications	Lecture	CO.4
L30	Foundry: Usage of Foundry tools and equipments,	Know the basics of the Foundry and understand its applications	Lecture	CO.4
L31	Procedure of moulding process	Know the Procedure for moulding.	Lecture	CO.4
L32	Welding: Definition, Classification majorly Gas and Arc welding,	Know the basics of the welding and understand its applications	Lecture	CO.4
L33	Principle of Oxy-Acetylene gas welding, flames and its application	Understand the gas welding	Lecture	CO.5
L34	Principle of electric arc welding, Soldering and Brazing.	Understand the arc welding	Lecture	CO.5
L35	Forging: Definition, applications, tools Different Forging operations	Know the basics of the forging and understand its applications	Lecture	CO.5
L36	Revision	Revision		
L37	Revision	Revision		



# MANIPAL INSTITUTE OF TECHNOLOGY

BENGALURU

(A constituent unit of MAHE, Manipal)

MME\_1051

## I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12
CO.1	Apply laws of thermodynamics on Thermal Engineering processes.	3	1	2			1						1
CO.2	Differentiate between two-stroke / four-stroke engine and SI / CI engine.	1	3		1								
CO.3	Discuss concepts of lubrication, power transmission, and steam turbine.	2		3									
CO.4	Explain elementary manufacturing machines and processes.	3			1								
CO.5	Describe Foundry, Welding, and Forging processes.	1		1	2								1

Note: CO to PO & PSO mapping level (1 – low, 2- moderate and 3 – substantial).