



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: UG

Branch: All

Course / Subject Code : BE01000081

Course / Subject Name : Basic Mechanical Engineering

w. e. f. Academic Year:	2024-25
Semester:	1 <sup>st</sup> Year
Category of the Course:	ESC

<b>Prerequisite:</b>	Nil
<b>Rationale:</b>	Knowledge of basic principles of Mechanical Engineering is required in various fields of engineering.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Explain the various sources of energy and basic terminology of Mechanical engineering	Understand
2	Make calculations for commonly used working fluids i.e. ideal gases and steam	Apply
3	Make use of various heat engine cycles and explain construction and working of IC engines	Apply
4	Explain working and applications of steam boilers and various energy conversion systems	Understand
5	Explain various power transmission elements, construction and working of various clutches; couplings and brakes, and properties of various engineering materials with their applications	Understand

## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: UG

Branch: All

Course / Subject Code : BE01000081

Course / Subject Name : Basic Mechanical Engineering

## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<b>Basic Terminology and Energy:</b> Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth law and First law Applications of Energy sources like Fossil fuels, Nuclear fuels, Hydrogen fuel, Hydro, Solar, Wind, and Bio-fuels, Environmental issues like Global warming and Ozone depletion	8	14
2.	<b>Properties of gases:</b> Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between $c_p$ and $c_v$ , Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytropic process <b>Properties of Steam:</b> Steam formation, Types of steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of steam tables, steam calorimeters	12	22
3.	<b>Heat Engines:</b> Heat engine cycle and Heat engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles <b>Internal Combustion Engines:</b> Introduction, Classification, Engine details, four-stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies	10	20
4.	<b>Steam Boilers:</b> Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, Functioning of different mountings and accessories	-	10
5.	<b>Air compressors and pumps:</b> Types and operation of Reciprocating and Rotary air compressors, significance of Multistage, Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming	6	10
6.	<b>Refrigeration &amp; Air Conditioning:</b> Refrigerant, Vapor compression refrigeration system, Vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners	4	8



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: UG

Branch: All

Course / Subject Code : BE01000081

Course / Subject Name : Basic Mechanical Engineering

7.	<b>Couplings, Clutches and Brakes:</b> Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc) <b>Transmission of Motion and Power:</b> Shaft and axle, Different arrangement and applications of Belt drive; Chain drive; Friction drive and Gear drive	-	10
8.	<b>Engineering Materials:</b> Types, properties and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer	5	6
<b>Total</b>		<b>45</b>	<b>100</b>

Note: Topic No. 4 and 7 of the above syllabus must be covered in Practical Hours.

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

1. Elements of Mechanical Engineering by N M Bhatt and J R Mehta, Mahajan Publishing House
2. Basic Mechanical Engineering by Pravin Kumar, Pearson Education
3. Fundamental of Mechanical Engineering by G.S. Sawhney, PHI Publication New Delhi
4. Elements of Mechanical Engineering by Sadhu Singh, S. Chand Publication
5. Introduction to Engineering Materials by B.K. Agrawal, McGraw Hill Publication, New Delhi

### (b) Open source software and website:

1. <https://nptel.ac.in>
2. [www.vlab.co.in](http://www.vlab.co.in)

## Suggested Course Practical List:

1. To understand construction and working of various types of boilers.
2. To understand construction and working of different boiler mountings and accessories.



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Engineering**

**Level: UG**

**Branch: All**

**Course / Subject Code : BE0100081**

**Course / Subject Name : Basic Mechanical Engineering**

---

3. To understand construction features of two/four stroke petrol/diesel engines
4. To determine brake thermal efficiency of an I. C. Engine.
5. To understand construction and working of different types of air compressors.
6. To demonstrate vapor compression refrigeration cycle of domestic refrigerator OR window air conditioner OR split air conditioner.
7. To understand construction, working and application of clutches, couplings and brakes
8. To understand different arrangement and application of various power transmission drives

### **List of Laboratory/Learning Resources Required:**

Models of Cochran, Lancashire and Babcock and Wilcox boilers, models of various mountings and accessories, Models of various types of IC engines, Single cylinder two stroke /four stroke petrol/diesel engine, models of pumps, compressors, Domestic refrigerator/window air conditioner/split air conditioner, models of various types of brakes, coupling, clutches, drives

### **Suggested Project List:**

\* \* \* \* \*