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**DR. A. P. J. ABDUL KALAM TECHNICAL UNIVERSITY  
LUCKNOW, UTTAR PRADESH**



**STUDY & EVALUATION SCHEME WITH SYLLABUS**

**FOR**

**B. TECH. 3<sup>rd</sup> YEAR**

**MECHANICAL ENGINEERING**

**[Effective from Session: 2020-21]**

# MECHANICAL ENGINEERING#

## B. Tech Mechanical Engineering Evaluation Scheme

SEMESTER- V														
Sl. No.	Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credits	
			L	T	P	CT	TA	Total	PS	TE	PE			
1	KME 501	Heat and Mass Transfer	3	1	0	30	20	50		100		150	4	
2	KME 502	Strength of Material	3	1	0	30	20	50		100		150	4	
3	KME 503	Industrial Engineering	3	1	0	30	20	50		100		150	4	
4		Departmental Elective-I	3	0	0	30	20	50		100		150	3	
5		Departmental Elective-II	3	0	0	30	20	50		100		150	3	
6	KME 551	Heat Transfer LAB	0	0	2				25		25	50	1	
7	KME 552	Python Lab	0	0	2				25		25	50	1	
8	KME 553	Internet of Things Lab	0	0	2				25		25	50	1	
9	KME 554	Mini Project or Internship Assessment*	0	0	2				50			50	1	
10	KNC501/ KNC502	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			NC	
11	MOOCs (Essential for Hons. Degree)													
		<b>Total</b>	<b>17</b>	<b>3</b>	<b>6</b>							<b>950</b>	<b>22</b>	

\*The Mini Project or internship (4 - 5 weeks) conducted during summer break after IV semester and will be assessed during V semester.

SEMESTER- VI													
Sl. No.	Code	Subject	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KME 601	Refrigeration and Air Conditioning	3	1	0	30	20	50		100		150	4
2	KME 602	Machine Design	3	1	0	30	20	50		100		150	4
3	KME 603	Theory of Machine	3	1	0	30	20	50		100		150	4
4		Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KME 651	Refrigeration and Air Conditioning Lab	0	0	2				25		25	50	1
7	KME 652	Machine Design Lab	0	0	2				25		25	50	1
8	KME 653	Theory of Machine Lab	0	0	2				25		25	50	1
9	KNC601/ KNC602	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			NC
10		<b>Total</b>	<b>17</b>	<b>3</b>	<b>6</b>							<b>900</b>	<b>21</b>

## MECHANICAL ENGINEERING#

It is suggested that the students should choose Departmental Electives Specializationwise that will support them to gain enough learning of the chosen Specialization.

### Department Electives

	Specialization-1	Specialization-2	Specialization-3	Specialization-4	Specialization-5
<b>Specialization</b>	<b>Manufacturing and Automation</b>	<b>Automation and Industry 4.0</b>	<b>Design and Analysis</b>	<b>Thermal Engineering</b>	<b>Automobile Engineering</b>
<b>Sem V Code</b>	KME 051	KME 052	KME 053	KME 054	KAU 051
<b>Departmental Elective-I</b>	Computer Integrated Manufacturing	Mechatronics Systems	Finite Element Methods	I C Engine Fuel and Lubrication	Automobile Engines & Combustion
<b>Sem V Code</b>	KME 055	KME 056	KME 057	KME 058	KAU 052
<b>Departmental Elective-II</b>	Advance welding	Programming, Data Structures And Algorithms Using Python	Mechanical Vibrations	Fuels and Combustion	Automotive chassis and suspension
<b>Sem VI Code</b>	KME 061	KME 062	KME 063	KME 064	KAU 061
<b>Departmental Elective-III</b>	Non destructive Testing	Artificial Intelligence	Tribology	Gas Dynamics and Jet Propulsion	Automotive Electrical and Electronics
<b>Sem VII Code</b>	KME 071			KME 072	KAU 072
<b>Departmental Elective-IV</b>	Additive manufacturing (Common to all Three Specializations)			HVAC systems	Hybrid Vehicle Propulsion
<b>Sem VII Code</b>	KME 073	KME 074	KME 075	KME 076	KAU 073
<b>Departmental Elective-V</b>	Mathematical Modeling of Manufacturing Processes	Machine Learning	Computer Graphics and product modeling	Power Plant Engineering	Vehicle Body Engineering & safety

# MECHANICAL ENGINEERING#

## Semester – V: Departmental Elective – I: Specialization – Thermal Engineering

Subject Code: KME 054	I C Engine, Fuel and Lubrication	L T P : 3 0 0	Credits: 3
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CO	Course Outcome	Bloom Taxonomy
CO 1	Explain the working principle, performance parameters and testing of IC Engine.	K 2
CO 2	Understand the combustion phenomena in SI and CI engines and factors influencing combustion chamber design.	K 2
CO 3	Understand the essential systems of IC engine and latest trends and developments in IC Engines.	K 2
CO 4	Understand the effect of engine emissions on environment and human health and methods of reducing it.	K 2
CO 5	Apply the concepts of thermodynamics to air standard cycle in IC Engines	K 3
CO 6	Analyze the effect of various operating parameters on IC engine performance.	K 4

### Unit-I

(9 Hours)

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram, Valve mechanism- Push rod type, Overhead type (SOHC,DOHC). Thermodynamic analysis of Air standard cycles: Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles Fuel air cycle, factors affecting the fuel air cycle, Actual cycle. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines.

### Unit-II

(7 Hours)

Combustion: Stages of Combustion in SI & CI engine, Factors affecting combustion, Flame speed, Ignition Delay, Abnormal combustion and its control. Combustion chamber: Squish, Swirl & tumble, Combustion chamber design for SI & CI engine & factors affecting it.

### Unit-III

(8 Hours)

Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine, MPFI, Scavenging in 2 Stroke engines.

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings.

Turbocharging & its types- Variable Geometry Turbocharger, Waste Gate Turbocharger, Effect of turbocharging on power & emission.

### Unit-IV

(9 Hours)

Engine Emission and Control: Pollutant - Sources and types – Effect on environment and human health - formation of NO<sub>x</sub> - Hydrocarbon Emission Mechanism - Carbon Monoxide Formation - Particulate emissions - Methods of controlling Emissions - Catalytic converters and Particulate Traps - Selective Catalytic Reduction(SCR) - Diesel Oxidation Catalyst (DOC).

Fuels: Fuels for SI and CI engine, Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

## UNIT-V

(9 Hours)

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.

Ignition System in SI Engine: Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition.

Recent trends in IC engine: Lean burn engine, Stratified charge spark ignition engine, Homogeneous charge spark ignition engine, GDI.

### Text Books

1. A Course in International Combustion Engines, by Mathur & Sharma, Dhanpat Rai & Sons.
2. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.

### Reference Books

1. I.C Engine Analysis & Practice by E.F. Obert.
2. Internal Combustion Engine Fundamentals, by John B. Heywood, Tata McGraw Hill Publishers.
3. Engine Emission, by B. B. Pundir, Narosa Publication.
4. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek, Pearson Education.
5. Fundamentals of Internal Combustion Engine by Gill, Smith, Ziurs, Oxford & IBH Publishing CO.
6. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India.