



17MEL58

Course Code:

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Course Title:			Energy Lab	
Credit / L-T-P:			2/ 1-0-2	
Total Contact Hours:			30	
Course Plan Author:			APPESE S D	

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VALVE T	VALVE TIME DIAGRAM				
Experime	Experiment 08: SINGLE CYLINDER TWO STROKE PETROL ENGINE				
SINGLE	SINGLE CYLINDER TWO STROKE PETROL ENGINE				
		FROKE SINGLE CYLINDER DIESEL ENGINE			
-					

Note : Remove "Table of Content" before including in CP Book

Each Course Plan shall be printed and made into a book with cover page Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

# 15MEL58: Energy Lab

#### A. LABORATORY INFORMATION

#### 1. Lab Overview

Degree:	B.E	Program:	ME
Year / Semester :	3/V	Academic Year:	2019-20
Course Title:	Energy Lab	Course Code:	17MEL58
Credit / L-T-P:	2/ 1-0-2	SEE Duration:	180 Minutes
Total Contact Hours:	30	SEE Marks:	60 Marks
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	Mr. Appese S D	Sign	Dt:
Checked By:	Mr. Naveen Kumar P	Sign	Dt :

#### 2. Lab Content

Unit	Title of the Experiments	Lab	Concept	Bloom
		Hours		s Level
	PART – A			
1	Lab layout, calibration of instruments and standards to be	3	Standards	L3
	discussed			
2	Determination of Flash point and Fire point of lubricating oil	3	Flash and fire	L3
	using Abel Pensky and Marten's (closed) / Cleveland's (Open		point	
	Cup) Apparatus.			
3	Determination of Calorific value of solid, liquid and gaseous	3	Energy	L3
	fuels.		conversion	
			concept	
4	Determination of Viscosity of a lubricating oil using Redwoods,	3	Fluid	L3
	Say bolt and Torsion Viscometers.		property	
5	Analysis of moisture, volatile matter, ash content and fixed	3	Proximity	L4
	carbon of solid and liquid fuel samples		and ultimate	

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17 8			analysis	
6	Valve Timing/port opening diagram of an I.C. Engine.	3	Thermodyna mics cycle	L4
	PART – B			
7	Performance Tests on I.C. Engines, Calculations of IP, BP, Thermal efficiency, Volumetric efficiency, Mechanical		Performance characteristic	L4
	efficiency, SFC, FP, A:F Ratio, heat balance sheet for; a. Four stroke Diesel Engine	3	s of I.c	
	b. Four stroke Petrol Engine, Multi Cylinder Diesel/Petrol Engine, (Morse test)	3	engines	
	d. Two stroke Petrol Engine	3		
	e. Variable Compression Ratio I.C. Engine.	3		
8	Measurements of Exhaust Emissions of Petrol engine.	3	chemical composition	L4
9	Measurements of Exhaust Emissions of Diesel engine.	3	chemical composition	L4
10	Measurement of $p\theta$ , pV plots using Computerized IC engine test rig	3	Pressure crank angle and pressure volume variation	L4
	PART – C (Optional)			L4
11	Visit to Automobile Industry/service stations.	3	Practical knowledge	
12	CFD Analysis of design, development, performance evaluation and process optimization in I C Engines.	3		L4

# 3. Lab Material

Unit	Details	Available
1	Text books	
	M. L. Mathur And R.P. Sharma A course in internal combustion engines,	In Lib
	Dhanpat Rai& sons- India.	
2	Reference books	
	Ganesan, V., Fundamentals of IC Engines, Tata McGraw Hill, 2003	In dept
3	Others (Web, Video, Simulation, Notes etc.)	
	Lab Manual	Available

# 4. Lab Prerequisites:

-	-	Base Course:		-	-
SNo	Course	Course Name	Topic / Description	Sem	Remarks
	Code				
1	17ME33	Basic and Applied	Explanation of working principle of	$3^{\rm rd}$	

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		Thermo	dynamics	thermodynamic cycles.		and	
						$4^{\text{th}}$	
						-	Plan Gap Course

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

#### **5.** General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
	After completion of the experiments, certification of the concerned staff in- charge in the observation book is necessary.	
	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	
	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	
6	Should attempt all problems / assignments given in the list session wise.	
	It is responsibility to create a separate directory to store all the programs, so that nobody else can read or copy.	
	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	
	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	
	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with comments and output for various inputs given	

#### 6. Lab Specific Instructions

S.	Specific Instructions	Remarks
No		
1	Students should come with thorough preparation for the experiment to	
	be conducted.	
2	Students will not be permitted to attend the laboratory unless they bring	
	the practical record fully completed in all respects pertaining to the	
	experiment conducted in the previous class.	
3	Experiment should be started only after the staff-in-charge has checked	
	the experimental setup.	
4	All the calculations should be made in the observation book. Specimen	
	calculations for one set of readings have to be shown in the practical	
	record.	
5	Wherever graphs are to be drawn, A-4 size graphs only should be used	
	and the same should be firmly attached to the practical record.	

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6	Practi	cal record sh	ould be neatly maintained.		
7	They	should obtain	n the signature of the staff-in-charge in the	observation	
book after completing each experiment.					
8	Theor	v regarding	each experiment should be written in the	he practical	

8 Theory regarding each experiment should be written in the practical record before procedure in your own words.

#### **B. OBE PARAMETERS**

#### 1. Lab / Course Outcomes

#	COs	Teach.	Concept		Assessment	
		Hours		Method		'Leve
1	To determine the flash and fire point of a given fuel	10	Flash and fire point	Demons trate	Slip Test	L3
2	Determination of Energy release per definite amount of fuel burn	06	Energy conversion concept	Demons trate	Assignment	
3	Determination of Viscosity of a lubricating oil using Redwoods, Say bolt and Torsion Viscometers.		Fluid property	trate	Assignment and Slip Test	
4	Analysis of moisture, volatile matter, ash content and fixed carbon of solid and liquid fuel samples		combustion characteristic s		Assignment	L3
5	Draw the actual Valve Timing diagram of an I.C. Engine.	03	Thermodyna mics cycle	Tutorial	Slip test	L3
6	Draw the performance characteristics of 1) Four stroke Diesel Engine 2) Four stroke petrol Engine		Performance characteristic s of I.c engines			
7	Determination of compositions of burnt and unburnt in exhaust gases in petrol engine		chemical composition	Demons trate	Assignment and Slip Test	L3
8	Determination of compositions of burnt and unburnt in exhaust gases in diesel engine		chemical composition	Demons trate	Assignment	L3
9	Measurement of Pressure vs crank angle variation and pressure volume diagram using Computerized IC engine test rig		Pressure crank angle and pressure volume variation	Demons trate	Assignment	L3
10	Understanding about all automobile parts and their service by Visiting Automobile Industry/service stations.		Analysis of engine	Demons trate		L3
11	CFD Analysis of design, development, performance evaluation and process optimization in I C Engines.		CFD analysis of an IC engine	Demons trate		L3
-	Total	60	-	-	-	-

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

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# 2. Lab Applications

SNo	Application Area	CO	Level
1	Fuel preparation	CO1	L3
2	Application of IC engines	CO2	L3
3	the viscosity of paints, varnishes, and similar household products	CO3	L3
4	Application of IC engines	CO4	L3
5	Air craft engines	CO5	L3
6	Automobile industry	CO6	L3
7	Electric power stations industrial and domestic fuel consumers	CO7	L3
8	Electric power stations industrial and domestic fuel consumers	CO8	L3
9	Application of IC engines	CO9	L3

Note: Write 1 or 2 applications per CO.

## **3. Articulation Matrix**

#### (CO – PO MAPPING)

-	Course Outcomes				Р	rogr	am	Outc	come	es				
#	COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	Level
		1	2	3	4	5	6	7	8	9	10	11	12	
15MEL58.1	To determine the flash and fire			-	-	-	-	-	-		-	-	-	L3
	point of a given fuel													
15MEL58.2	Determination of Energy			-	-	-	-	-	-		-	-	-	L3
	release per definite amount of													
	fuel burn		,											
	Determination of Viscosity of a			-	-	-	-	-	-		-	-	-	L3
	lubricating oil using													
	Redwoods, Say bolt and													
	Torsion Viscometers.		,											
15MEL58.4	Analysis of moisture, volatile			-	-	-	-	-	-		-	-	-	L3
	matter, ash content and fixed													
	carbon of solid and liquid fuel													
	samples													
15MEL58.5	Draw the actual Valve Timing		-	-	-	-	-	-	-		-	-	-	L2
	diagram of an I.C. Engine.		,											
15MEL58.6	1			-	-	-	-	-	-		-	-	-	L3
	characteristics of 1) Four													
	stroke Diesel Engine													
	2) Four stroke petrol Engine		,							,				
15MEL58.7	Determination of compositions			-	-	-	-	-	-		-	-	-	L3
	of burnt and unburnt in exhaust													

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	gases in petrol engine													
15MEL58.	.8 Determination of compositio	ns √		-	-	-	-	-	-		-	-	-	L3
	of burnt and unburnt in exhau	st												
	gases in diesel engine													
15MEL58.	.9 Measurement of Pressure	vs √		-	-	-	-	-	-		-	-	-	L3
	crank angle variation and	nd												
	pressure volume diagram usin	ng												
	Computerized IC engine te	st												
	rig													
15MEL58.	10Understanding about	ıll √		-	-	-	I	-	-		-	-	-	L3
	automobile parts and the	eir												
	service by Visiting Automobil	le												
	Industry/service stations.													
15MEL58.	11 CFD Analysis of desig	n, √		-	-	-	-	-	-		-	-	-	L3
	development, performan	ce												
	evaluation and proce													
	optimization in I C Engines.													
		-												

Note: Mention the mapping strength as 1, 2, or 3

# 4. Mapping Justification

Mappi	ng	Mappin	Justification
		g Level	
СО	PO	-	-
CO1	PO1	L3	Knowledge of different fuels is required
CO1	PO2	L3	Analyzing different fuels flash and fire points
CO1	PO9	L3	Individual work, mapping
CO2	PO1	L3	Knowledge of different fuel energy content is required to understand the different
			calorific value of fuels.
CO2	PO2	L3	Analyzing different fuel energy content.
CO2	PO9	L3	Individual work, mapping
CO3	PO1	L3	Knowledge of different fuel properties is required.
CO3	PO2	L3	Analyzing different fuel properties
CO3	PO9	L3	Individual work, mapping
CO4	PO1	L3	Knowledge of different fuels and fuel properties is required.
CO4	PO2	L3	Analyzing different fuel properties
CO4	PO9	L3	Individual work, mapping
CO5	PO1	L3	Knowledge of engine components is required to understand the valve time diagram
CO5	PO9	L3	Individual work, mapping
CO6	PO1	L3	Knowledge of engineering fundamentals required to understand the performance characteristics
CO6	PO2	L3	Analysis of different engine parameters.
CO6	PO9	L3	Team work is require to conduct experiment
CO7	PO1	L3	Knowledge of engineering fundamentals required to understand the performance

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			characteristics							
CO7	PO2	L3	Analysis of different engine parameters.							
CO7	PO9	L3	Team work is require to conduct experiment							
CO8	PO1	L3	Knowledge of engineering fundamentals required to u	inderstand the performance						
			haracteristics							
CO8	PO2	L3	Analysis of different engine parameters.							
CO8	PO9	L3	Team work is require to conduct experiment							
CO9	PO1	L3	Knowledge of engineering fundamentals required to u	inderstand the performance						
			characteristics							
CO9	PO2	L3	Analysis of different engine parameters.							
CO9	PO9	L3	Team work is require to conduct experiment							
CO10	PO2	L3	Analysis of different engine parameters.							
CO10	PO9	L3	Team work is require to conduct experiment							
CO11	PO1	L3	Knowledge of engineering fundamentals required to u	inderstand the performance						
			characteristics							
CO11	PO2	L3	Analysis of different engine parameters.							
CO11	PO9	L3	Team work is require to conduct experiment							

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Advanced IC engine	Seminar	IC Engine		
		/workshop	workshops		

Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Unit	Title	Teachi		No. of question in Exam						CO	Levels
		ng	CIA-	CIA-	CIA-	Asg-	Asg-	Asg-	SEE		
		Hours	1	2	3	1	2	3			
1	Lab layout, calibration of	03	1	-	-	-	-	-	1	CO1	L2
	instruments and standards to be										
	discussed										
2	Determination of Flash point and	03	1	-	-	-	-	-	1	CO2	L3
	Fire point of lubricating oil using										
	Abel Pensky and Marten's										
	(closed) / Cleveland's (Open	-									
	Cup) Apparatus.										

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3	Determination of Calorific value	03	1	-	-	-	-	-	1	CO3	L3
	of solid, liquid and gaseous fuels.										
4	Determination of Viscosity of a	03	1	-	-	-	-	-	1	CO4	L3
	lubricating oil using Redwoods,										
	Say bolt and Torsion										
	Viscometers.										
5	Analysis of moisture, volatile	03	1	-	-	-	-	-	1	CO5	L4
	matter, ash content and fixed										
	carbon of solid and liquid fuel										
	samples										
6	Valve Timing/port opening	03	1	-	-	-	-	-	1	CO6	L4
	diagram of an I.C. Engine.										
	PART – B	03	1	-	-	-	-	-	1	CO7	L4
7	Performance Tests on I.C.	03	-	1	-	-	-	-	1	CO8	
	Engines, Calculations of IP, BP,										
	Thermal efficiency, Volumetric										
	efficiency, Mechanical efficiency,										
	SFC, FP, A:F Ratio, heat balance										
	sheet for;										
	a. Four stroke Diesel Engine										
	b. Four stroke Petrol Engine										
	c. Multi Cylinder Diesel/Petrol										
	Engine, (Morse test)										
	d. Two stroke Petrol Engine										
	e. Variable Compression Ratio I.C. Engine.										
8	Measurements of Exhaust	03	_	1		_			1	CO9	
0	Emissions of Petrol engine.	05	-	T	_	_	_		1	0.09	
9	Measurements of Exhaust	03	_	1	_	_	_	_	1	CO10	
	Emissions of Diesel engine.	05	_	1	_	_	_		I	010	
10	Measurement of $p\theta$, pV plots	03	_	1	_	-	_	_	1	CO11	
10	using Computerized IC engine	05		-					1	0011	
	test rig										
	PART – C (Optional)	03	_	1	_	_	_	_	1	CO12	
11	Visit to Automobile	03	-	1	-	-	-	_	1	CO13	
	Industry/service stations.	-									
12	CFD Analysis of design,	03	-	1	-	-	-	-	1	CO14	
	development, performance										
	evaluation and process										
	optimization in I C Engines.										
-	Total	30								-	-
Note	• Write CO based on the theory co	1200			•		•				

Note: Write CO based on the theory course.

2. Continuous Internal Assessment (CIA)

Evaluation	Weight-age in Marks	СО	Levels
CIA Exam – 1	30	CO1, CO2, CO3, CO4	L23, L3
CIA Exam – 2	30	CO5, CO6, CO7,	L1, L2, L3
CIA Exam – 3	30	CO8, CO9	L1, L2, L3

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Assignment	t _ 1	05	CO1, CO2, CO3, CO4	L2, L3, L4
Assignment		05	C05, C06, C07, C08,	L1, L2, L3
1 issignment	. 2	00	CO9	L1, L2, L3
Assignment	t – 3	05	CO8, CO9	L1, L2, L3
Seminar – 1	1	05	CO1, CO2, CO3, CO4	L2, L3, L4
Seminar – 2	2	05	CO5, CO6,CO7,CO8,	L2, L3, L4
			CO9	
Seminar – 3	3	05	CO8, CO9	L2, L3, L4
Other Activ	vities – defin	e	CO1 to Co9	L2, L3, L4
– Slip test				
Final C	IA Marks	40	-	-

- SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	05 Marks
2	Record Writing	15 Marks for each Expt
3	Internal Exam Assessment	20 Marks
4	Internal Assessment	40 Marks
5	SEE	60 Marks
-	Total	100 Marks

D. EXPERIMENTS

Experiment 01: Determination of Flash point and Fire point of lubricating oil using Abel Pensky and Marten's (closed)

	·										
-	Experiment No.:	1	Marks	30	Date	22/8/2019	Date	22/8/2019			
					Planned		Conducted				
1	Title	Fla	Tash and fire point								
2	Course Outcomes	То	o determine the flash and fire point of a given fuel								
3	Aim	То	o determine the flash and fire point of a given test oil.								
4	Material/										
	Equipment	Per	ensky Martin apparatus, Thermometer, Stop watch								
	Required										
5	Theory, Formula,										
	Principle, Concept	Fla	sh point: It i	is the minim	um temperat	ture at which	the oil vapor	s give out a			
		flas	sh (spark) wh	en a flame is	brought near	it.					
		Fir	re point: It	is the minir	num temper	rature at wh	nich the oil v	vapors give			
		out	a continuou	s flame (fire)	when a flam	e is brought	near it.				
6	Procedure,										
	Program, Activity,	0	I	The given oil	is filled up to	o the mark in	the oil cup an	d is placed in			
	Algorithm, Pseudo	her	hemispherical dome of the apparatus.								
	Code • A thermometer is immersed into the oil.										
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			Ø	The oil cup is	s heated with	h the lid clo	osed and is stirre	d
			continuously.					
			Ū	The rate of heat	ing is carried o	out at an incre	ase in temperature (of
			about 5-6 ⁰ C per 1	ninute.	U			
			Ø	The test flame	is brought nea	ar the slit and	l tested for every 2	0
			C rise in temp.					
			• The flas	sh point is obtain	ned and furthe	er heating is d	lone at same rate ti	11
			fire point is noti	ced.		-		
7	Block,	Circuit,						
	Model	Diagram,						
	Reactio	on Equation,						
	Expect	ed Graph						
8	Observ	ation Table,						
	Look-u	p Table,	SI. <u>No.</u>	TEMP	OBS	ERVATIO		
	Output				Ν			
0	Commit							_
9	Sample		NA					
10	Calcula		NT A					
	-	, Outputs	NA	<u></u>	. 0~			_
11	Results	& Analysis	I J Flash point	of the given oil	18:°C			
4.5				f the given oil is			D <i>A</i>	_
		ation Areas		on, lubricating o	11, used in Al	JTOMOBIL	ES.	
	Remarl		NA					_
14	Faculty	•						
	with D	ate						

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Experiment 02: SAY BOLT VISCOMETER

-	Experiment No.:	2	Marks	30	Date	29/8/2019	Date	29/8/2019	
					Planned		Conducted		
1	Title	SAY	BOLT VIS	COMETER	R				
2	Course Outcomes	Dete	rmination of	Viscosity o	f a lubricatii	ng oil using S	Say bolt visc	cometer.	
3	Aim								
		To de	etermine visc	osity of a giv	en test oil us	sing Say Bolt	viscometer.		
	Material/ Equipment Required	-	ay Bolt viscometer, Measuring jar, Thermometer, Stop watch and weighing nachine.						
		move Temj incre force mole	ement of or perature affe ase of temp s predomina cules and wi	the layer of acts the visc erature. This acts the mol- th the increase	fluid over osity. The v s is due to t ecular mom se in temperat	another adj iscosity of l he reason th entum transf ture, the cohes	acent layer iquids decre hat in liquids fer, due to c sive forces de		

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	-	momentu								
	Procedure, Program, Activity, Algorithm, Pseudo Code.	 To start with, the oil cup is cleaned so that no dust particles are be present in orifice. The orifice is closed by means of a cork and oil is filled up to the mark. A thermometer is introduced into the oil and is heated. A measuring jar is placed below the orifice of the viscometer. The oil is allowed to flow into the collecting jar by opening the cork. The time taken for collecting 60 cc of oil is recorded in seconds using a stop watch. The cork is closed, and then the weight of 60cc is measured using a weighing balance. Same procedure is repeated for different temperatures. 								
	Model Diagram, Reaction Equation, Expected Graph	OBSERV Weight of 1. Densit 2.Kinematic v. Where s Absolute v	ATION: empty jar y (p) in F Vo iscosity (v) in = say bol	Given test (Vi) EQU $Xg/m^3 = Man Subseteques (Vi) $	st oil is JATIONS assofoilingms iil in cm3 i2s - 1.8/s al second	S: = x103=				
8	Observation Table, Look-up Table, Output	Si no	Temper ature	Time (t) for collecti ng 60cc of oil in Sec.	Say bolt univers al Second s = t X 1.005*	Wt. of 60 cc oil +jar (W2) in gms	Weight of oil ^x W= (W2- Wii in gms	Densit	ic viscosit y Viscosi	Absolu te . Viscosi ty poise
		1 2 3								
9	Sample									
,	Calculations									
10	Graphs, Outputs	GRAPH:	1. Temp.	V/s Kine	matic vise	cosity NA	ATURE C	OF GRAF	PH:	
		1] Given								
		2] Viscos		0						
	Application Areas	The visco	osity of p	aints, va	rnishes, a	nd simila	ar househ	old prod	ucts	
14	Remarks Faculty Signature with Date									

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3 30 05/9/2019 05/9/2019 **Experiment No.:** Marks Date Date Planned Conducted Title 1 Red Wood viscometer Course Outcomes Determination of Viscosity of a lubricating oil using Redwoods, Say bolt and 2 Torsion Viscometers. Aim 3 To determine viscosity of a given test oil using Red Wood viscometer. 4 Material/ Red Wood viscometer, Measuring jar, Thermometer, Stop watch and weighing Equipment machine. Required 5 Theory, Formula, 1. Density (p) in Kg/m³ = Mass of oil in gm/ Volume of oil in cm³ =-----X10³ = Principle, Concept 2. Kinematic viscosity (v) in stokes =0.0022t - 1.8/t3. Absolute viscosity (ii) in poise = Kinematic viscosity (v) X density (p) X 10^{-3} 3. Red wood number (RWN)= 100 X (Time for collecting 50 cc of oil) X (Density) 5 535X0.915X1000 6 Procedure, 1. To start with, the oil cup is cleaned so that no dust particles are be present in Program, Activity, orifice. Algorithm, 2. The orifice is closed by means of a cork and oil is filled up to the mark. Pseudo Code 3.A thermometer is introduced into the oil and is heated. 4.A measuring jar is placed below the orifice of the viscometer. 5. The oil is allowed to flow into the collecting jar by opening the cork. 5. The time taken for collecting **50 cc** of oil is recorded in seconds using a stop watch 6. The cork is closed, and then the weight of 50cc is measured using a weighing balance. 7.Same procedure is repeated for different temperatures. 7 Block. Circuit. Model Diagram, Reaction Equation, Expected Graph 8 Observation

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	Table, Look-up	Temn	Time (t)			Densit	Kinema			R
	Table, Output	${}^{0}C$	for	60 cc			tic	Viscosity	in	
	·····	C	collecti			y Kg/m3	Viscosit	•	111	N
				$(W2)_i$		Kg/III.J	y in	poise		11
			50cc of		in gm		stoke			
			oil in	n gm	m gm		STOKE			
			Sec.							
			500.							
9	Sample	<u> </u>					I			
	Calculations									
10	Graphs, Outputs				1.RWN	v/s Kin	ematic vis	scosity.		
								-		
					2.Temperat	ure v/s				
					-					
		Kinema	tic viscosity	7						
11		-	n test oil i							
					the given o	il is :				
		, -	woods Nu				_			
_	Application Areas	the visc	osity of pa	aints, va	rnishes, and	d similar	household	l products		
	Remarks									
14	Faculty Signature									
	with Date									

Experiment 04: Analysis of moisture, volatile matter by using distillation apparatus.

-	Experiment No.:	4 Mar	rks	30	Date	26/9/2019	Date	26/9/2019		
					Planned		Conducted			
1	Title	Analysis o	analysis of moisture, volatile matter by using distillation apparatus							
2	Course Outcomes	•	nalyze the moisture, volatile matter by using distillation apparatus nalysis of moisture, volatile matter by using distillation apparatus							
3	Aim	To determ	determine the distillation characteristics of petroleum products.							
4	Material/ Equipment Required		Heater unit with temperature regulator, S.S condenser bath with cover, Thermometer, Stop watch, Condensing tank, Heater & Flask.							
5	Theory, Formula, Principle, Concept		mpure liquid is purified by the process of distillation the process in which evaporation & condensation are going on side by side is called distillation.							
6	Procedure, Program, Activity,	Keep SS c	conder	nser bath on	stand & fill u	p distilled w	ater up to top	and cover It		

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-	thm, Pseudo	properly.	
Code			
		Place the graduated measuring cylinder near the outer neck of	of condenser tube.
		Fill up to 50ml of sample oil is distillation flask keep flask asbestos board.	inside heater unit on
		Heat the sample oil and inspect when first drop of oil falls Record the initial boiling temperature.	from the condenser.
		Continue to heat the sample oil & record the maximum tem indicator. It is boiling point.	perature observed on
		When last drop of sample oil leaves the flask the dry point of	sample is noted.
		Record the total volume of distillation collected in receiver recovery of sample oil.	r it is known as total
Model Reaction	Circuit, Diagram, on Equation, ed Graph		
	vation Table, 1p Table,		
9 Sample	e		
Calcula			
10 Graphs	s, Outputs		
	s & Analysis	The percentage of purified given sample is	
	ation Areas	Fuel preparation	
13 Remar			
14 Faculty			
with D	ate		

Experiment 05: Ash content & fixed carbon of solid & liquid fuel samples by Canrodson Carbon residue test.

-	Experiment No.:	5	Marks	30	Date	12/9/2019	Date	12/9/2019	
					Planned		Conducted		
1			Ash content & fixed carbon of solid & liquid fuel samples by Canrodson Carbon residue test						
2	Course Outcomes	Per	centage of c	arbon residu	e present in	given test s	ample.		
3	Aim	То	To determine the percentage of carbon residue of the given oil using						
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Pr	repared by	Checked by Approved by							

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Соруне	nt ©2017. CR	43. An fights festived.	carbon residue test apparatus.	111501 102 12.2
4	Materia	al/		
	Equipn		Samples, Thermometer, porcelain crucible, iron crucil	ole and skid mose
	Require		crucible, wire support, hood & burner.	
	-			
5	Theory	, Formula,		
	Princip	le, Concept	Oil contain mainly chemical compounds of carbon & hydr	ogen. If heated in a
			closed vessel in absence of sufficient air, the oil will vaporiz	er & thin deposit of
			carbon residue will be left thus test serves as index & gives	result some relative
			measure of amount of residue to be formed by lubricating	
			Engine.	
6	Proced	ure,		
		n, Activity,	The crucible is weighed accurately.	
	Algorit	hm, Pseudo		
	Code		About 10 gms of oil is to be tested for carbon residue is tal	ken in the crucible &
			weighed.	
			This crucible is placed in the center of the iron crucible. Nov	w sand is taken in the
			spun sheet iron crucible& oil sample crucible is placed.	
			The hood is placed on the block & heat is applied with the bu	urner at the bottom of
			the spun iron crucible.	
			After about 20 to 25 min of heating the cover is slightly d	isplaced to make the
			vapour escape.	
				11.41.40
			The hood is removed first then the cover is lifted the cru	cible is taken out &
			placed in a designation for getting cooled & take weight.	
			The difference between the initial & finial weight of the area	vible give the emount
			The difference between the initial & finial weight of the cruc of earbon residue and is expressed as a percentage of earbon	U
			of carbon residue and is exposed as a percentage of carbon the calculation.	Tesique as shown in
7	Dlash	Circovit		
		Circuit, Diagram,		
		on Equation,		
		ed Graph		
	r · · · ·	· T		
8	Ohaam	otion Table		
		ation Table, p Table,		
	Output	- ·		
-	Sample			
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0	Calcula	ations			
10 0	Graphs	, Outputs			
11 F	Results	& Analysis	Percentage of carbon residue is%		

11	Results & Analysis	Percentage of carbon residue is%
12	Application Areas	Fuel preparation
13	Remarks	
14	Faculty Signature	
	with Date	

Experiment 06: Ash content & fixed carbon of solid & liquid fuel samples by Rams bottom carbon residue test.

-	Experiment No.:	6 Marks	30	Date	03/10/2019		03/10/2019
1	CD' 41			Planned		Conducted	
1	Title	Ash content & Carbon residue		n of solid &	liquid fuel s	amples by I	Rams bottom
2	Course Outcomes	Percentage of c	arbon residu	ie present in	n given test s	ample.	
3	Aim	Ash content & Carbon residue		n of solid &	liquid fuel s	amples by I	Rams bottom
4	Material/ Equipment Required	Samples, Thern crucible, wire st	· 1		cible, iron o	crucible and	l skid mose
5	Theory, Formula, Principle, Concept						
6	Procedure, Program, Activity, Algorithm, Pseudo Code						
	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph						
8	Observation Table, Look-up Table, Output						
9	Sample						
	Calculations						
	Graphs, Outputs						
	Results & Analysis						
	Application Areas	Fuel preparatio	n				
L	Remarks						
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14 Fa	aculty	Signature		
W	vith Da	ite		

Experiment 07: VALVE TIME DIAGRAM

-	Experiment No.:	7	Marks	30	Date Planned	10/10/2019	Date Conducted	10/10/2019		
1	Title	VAL	VALVE TIME DIAGRAM							
2	Course Outcomes	Drav	v the actual	Valve Timin	g diagram of	f an I.C. Engi	ne.			
3	Aim	То	draw a valve	time diagrar	n for a given	engine.				
	Material/ Equipment Required	Fou	Four Stroke single cylinder engine, scale, thread, chalk and protractor.							
5	Theory, Formula, Principle, Concept									
6		2. No 3. W flywl valve betw flywl 4. No fully previ 5.Co exha from 6.Fun valve	ow while rotation while rotation the pistocheel and rotate in the pistocheel and rotate in the two neel). The closes (IV) over rotate the closes (IV) ously marked national rotate the true rotate is the TDC point of the rotate is fully closes for the rotate is fully closes.	ting observe n is at TDC te the flywh to open (IV marked po e flywheel i C), mark th d TDC position ing the flywheel sition on the the flywheel	and identify t (Top dead cer eel in anticlo O), mark this sitions (dista n clockwise is point and on on the flyw wheel in clo (O), mark this flywheel. in clockwise k this positio	the suction stron the mark the pockwise (-ve)d s position and ance along the (+ ve) direction the directi	position wi irection so I measure the circumfe on until the e arc leng ve) direction I measure the ection until	that the inlet he arc length rence of the e inlet valve th from the on until the he arc length the exhaust		
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph		1							

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8	Observation Table, Look-up Table, Output	Valve position	Distance (x) from TDC in cm	Angle from TDC in degrees = (x) X (f)
		Inlet valve open (IVO)	(-ve)	
		Inlet valve close (IVC)	(+ve)	
		Exhaust valve open (EVO)	(+ve)	
		Exhaust valve close (EVC)	(+ve)	
9	Sample Calculations	Diameter of the flywheel	(d)	- cm
		Circumference of flywhe	el (td)	- cm
		Multiplication factor (f) =	$= 360^{\circ} / (td) =$	
		(To convert circumference	(in cm) to angle (in degrees	s))
10	Graphs, Outputs			
11	Results & Analysis			
12		Application of IC engines		
	Remarks	reprivation of ic engines		
	Faculty Signature with Date	<u> </u>		

Experiment 08: SINGLE CYLINDER TWO STROKE PETROL ENGINE

-	Experiment No.:	8	Marks	50	Date	17/10/2019	Date	17/10/2019
					Planned		Conducted	
1	Title	SIN	GLE CYLIN	NDER TWO) STROKE	PETROL I	ENGINE	
2	Course Outcomes	To D	raw the perf	ormance cha	aracteristics			
3	Aim							
				performance	e characterist	tics of a two	stroke singl	e cylinder
		petro	l engine.					

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	Materia								
	Equipn			-	-	al dyn	amon	neter, Measu	urement control
	Requir	ed	panel and El	ectrical Loa	ding.				
5	Theory	, Formula,							
	-	le, Concept							
	Proced	· •							
			Check all a	lectrical co	nnections; ensu	ra fua	1 1000	l in the fuel	tank
	Algorit								
	Pseudo	Code	directly.	ruer lines a	nd open 3 -way	соск	, make	e fuel to flo	w into the engine
			2	the choke a	nd kick start the	engi	ne wi	h the help	of leg crank
						0		in the help	of log claik.
				e	abilizes for a rat	-			
			burette.	e of 3 -way	cock, allow the	ie rue		low into th	e engine through
				the time f	= 10 as of fuel	0000	mati		
					or 10 cc of fuel		-		
			/.NOW SV	vitch on the	electrical loadi	ing to	r first	resistance.	
				0		epeat	expe	iment for	different load by
7	Dlaslr	Cinquit	switching	all switches	one by one.				
	Block, Model	Circuit, Diagram,							
	Reactio	0							
	Equation								
	-	ed Graph							
	P P								
8	Observ								
	Table,	Look-up							
	Table,	Output				L _			1
			Voltag	0e	Time (t) taken		omete	r reading	
			SL. V	Current	for	Cd	TT		BP
			No. (volts) I (amps)	10 cc of fuel		H.	(Hi-H2) X	
			` `	,	consumption	cm	cm	10-2	
			1						
			2						
	a i				• • •				
9	Sample		BRAKE PC	· · ·	1n KW				
	Calcula		$BP = (V X) \\ (1000 X li_g)$	<u>1)</u> K W					
			. 0	TEL CON	SUMPTION (Mf) i	n Ka	/hr Mf– (10 cc X 3600 X
			pf) Kg/hr			.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	n ng	, III IVII — <u>(</u>	10 CC A 3000 A
		F	(t X 1000)						
			AIR FUEL	RATIO					
			A/F Ma /						
•									

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	SPECIFICFUEL CONSUMPTION (SFC)) in Kg/Kw-hr						
	SFC = (Mf / BP)	C						
	BRAKE THERMAL EFFICIENCY (11,0 in	% ribth =BP						
	X 100 %							
	Heat supplied							
	Where, heat supplied = Mf X CV X 3600							
	MECHANICAL EFFICIENCY (1./							
	jimech, -n							
	$T' = 1 - DD X 100 \frac{0}{0}$							
	$Timech = \frac{BP X 100}{IP} \frac{0}{0}$							
	IP							
10 0 1 0 1	Where $IP = BP + FP$							
10 Graphs, Outputs	/"bth							
	1 A							
	\sim							
	/							
11 Results &								
Analysis								
12 Application Areas	Application of IC engines							
13 Remarks								
14 Faculty Signature								
with Date								

Experiment 09: FOUR STROKE SINGLE CYLINDER DIESEL ENGINE

-	Experiment No.:	9	Marks	50	Date Planned	24/10/2019	Date Conducted		
1	Title	4- str	oke single cy	linder diese	l engine				
2	Course Outcomes	To D	To Draw the performance characteristics						
3	Aim		Fo determine the performance characteristics and prepare a heat balance sheet of a 4- stroke single cylinder diesel engine						
4			A Four stroke single cylinder diesel engine with rope brake dynamometer, Control panel with temperature indicators, Stop watch and Loads.						
5	Theory, Formula, Principle, Concept								
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1 1	©2017. cAAS. All rights reserved.	COURSE PLAN – CAY 2019-20 BE-5-ME-SKIT-F	2h5b1-F02-V2.2					
	Procedure,							
P	Algorithm,	1) Check all electrical connections; ensure fuel level in the	fuel tank and water					
		level in the manometer and continuous water flow in the	dynamometer and					
	seddo code	engine cylinder.						
		2) Ensure that there is no air trapped in the engine and keep	p the decompressor					
		lever to OFF position.						
		3) Open 3-way cock and loosen rope on the break drum by rotating the						
		flywheel.						
		4) Allow the water to cool the engine and keep at desired rate rate.	e, and measure flow					
		5) Now with the help of hand crank start the engine, once it is	s started, ON the de-					
		compressor lever.	,					
		6) Allow the engine to attain a rated speed, note down the readings of speed,						
		manometer, load, time take for flow of fuel, all temperatures						
	flow of 1000 cc of cooling water.							
	7) Now add weights and note down all above, repeat it for various load							
		8) Tabulate all readings and calculate various parameters.						
7 E	Block, Circuit,							
	Model Diagram,	BP v/s TFC						
R	Reaction	.,						
	Equation,	BP v/s imth						
E	Expected Graph							
		3) BP v/s imech						
8 C	Observation							
	able, Look-up							
	able, Output							
	ample							
	Calculations	n						
10	Braphs, Outputs	$\eta_{\rm m}$						
		SFC						
		TFC						
	Results &							
	Analysis	Angliantian of IC and inco						
	* *	Application of IC engines						
	Remarks							
	Faculty Signature with Date							
M								

Experiment 10 : Four stroke single cylinder petrol engine.

- Exp	eriment No.:	10	Marks	50	Date	31/10/2019	Date
					Planned		Conducted

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1	Title									
			Four stroke single cylinder petrol engine.							
2	Course		To Draw the performance characteristics							
-	Aim	oucomes								
	2 1111		To determine the performance characteristics of a four stro	oke single cylinder						
			-	stigle cyllider						
			petrol engine.							
4	Materia		A four stroke natual engine coupled to electrice	1 dynamamatan						
	Equipn	ient	A four stroke petrol engine coupled to electrica	i dynamometer,						
	Require	ed	Measurement control panel and Electrical Loading.							
5	-	, Formula,								
	-	le, Concept								
6	Proced									
			1) Check all electrical connections; ensure fuel level in the							
	Algorit	~ `.	2) Tighten all fuel lines and open 3 -way cock, make fuel to	flow into the engine						
	Pseudo	Code	directly.							
			3) Put the carburetor knob to RUN position and with the he	elp of rope start the						
			engine							
			4) Wait till the engine stabilizes for a rated speed.							
			5) Close valve of 3 -way cock, allow the fuel to flow	w into the engine						
			through burette.	in most and trighted						
			0							
			6) Note down the time for 10 cc of fuel consumption.							
			7) Now switch on the electrical loading for first resistance.							
			8) Note down reading of all above and repeat experiment for	or different load by						
			switching all switches one by one.							
7	Block,	Circuit,								
	Model	Diagram,	And a second sec							
	Reactio	-								
	Equation	on,								
	Expect	ed Graph	ALL ALL							
		-								
			1 a a							
8	Observ	ation								
	Table,	Look-up	OBSERVATIONS :							
	Table,	-								
			Calorific value of petrol (CV) 41.0	00 KJ/Kg						
				Kg / Liter						
			Efficiency of Generator (ri_g) 0.72	0						
				$5 \mathrm{mm} = 0.01525 \mathrm{m}$						
			0.05							
				Kg/m^3						
				m / sec^2						
			Water density (p_w) 1000	$M Kg/m^3$						
	17MEI 5	0	Dago # 25 / 26 Convright @2017. a							

MATT	TUTE OF	SKIT	Teaching Proce	SS			Rev No.: 1.0		
Doc Code:		SKIT.Ph5b1.F0				Date: 10-09-2019			
INS * BANG	GALORE *	Title:	Course Plan				Page: 26 / 26		
1 1 1		S. All rights reserved.	1	COURSE PLAN – CA	Y 2019-20	BE-5-ME-SKIT-	Ph5b1-F02-V2.2		
	Sample								
C	Calculat	tions	BRAKE POWER (BP) in KW						
				BP = (V X I)	KW				
			(1000 X ri _g)						
			TOTAL FUEL CONSUMPTION (Mf) in Kg/hr Mf= $(10 \text{ cc } \times 3600 \text{ X o})$						
			(t X 1000)						
			AIR FUEL	RATIO					
				$A/F = M_a$	/ Mf				
			Where Mass	flow rate of air (N	/Ia) in Kg / hr Ai	rea of $=$	A.X Cd X 3600 X		
			orifice (AO =	$= (7 \text{cdo}^2 / 4) \text{ m}^2$					
				n mts $(H_a) = Hw$	Xpw				
				<u> </u>	Pa				
			SPECIFIC	FUEL CON	SUMPTION	(SFC) in			
			SILCIFIC		FC = (Mf / BP)	. ,			
			BRAKE				in 0/		
			DKAKE	THERMAL		CY (nbth)	in %		
				$ib_th = \underline{BP X}$					
			** 71 1	Heat sup	-				
	Where, heat supplied = Mf X Cv X 3600								
						0			
				L EFFICIENC		0			
]	firnech = <u>BP 2</u> IP	<u>x 100</u> %				
				Ir					
				Where $IP = BP +$	FP				
						ve i.e. a graph l	between TFC v/s BP		
			~			8F			
10 0	Franhs	Outputs			D				
10 0	Jiapiis,	Outputs	1.	TFC v/s B	Р				
				2	SFC v/s I	מכ			
				2.	SFC V/8 1	5P			
			3. ibth v/s BP						
			C. 1041 1/0 D1						
11 R	Results	&							
	Analysi								
-			Application of	IC engines					
	Remark			<u> </u>					
		Signature							
	vith Da								
LI			1						