

C-18 - Curriculum

Diploma in Automobile Engineering



**State Board of Technical Education & Training
Telangana, Hyderabad**

IV Semester

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)			
			L	T	P			Mid Sem 1	Mid Sem 2	I.E	Max marks	Min marks	Total Marks	Min marks for passing including CIE
1	18A-401C	Advanced Engineering Mathematics	3	1	0	60	3	20	20	20	40	14	100	35
2	18A-402C	Automobile Body and Chassis Engineering	3	1	0	60	3	20	20	20	40	14	100	35
3	18A-403C	Strength of Materials and Fluid Mechanics	3	1	0	60	3	20	20	20	40	14	100	35
4	18A-404C	Automobile servicing and Maintenance	3	1	0	60	3	20	20	20	40	14	100	35
5	18A-405C	Automobile Electrical Systems	3	1	0	60	3	20	20	20	40	14	100	35
6	18A-406P	Automobile Chassis and Body Engg. Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
7	18A-407P	Automobile servicing and Maintenance Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18A-408P	Strength of Materials and Fluid Mechanics Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18A-409P	Automobile Electrical Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18A-410F	Advanced Communications and Life Skills Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	Skill Up gradation		0	0	7	105	2.5	0	0	Rubrics				
TOTAL			20	5	17	630	25	200	200	200	400	170	1000	425
Activities: The student performance is to be assessed through Rubrics														

ADVANCED ENGINEERING MATHEMATICS

Course Title	: Advanced Engineering Mathematics	Course Code	: 18A-401F
Semester	: IV	Course Group	: Foundation
Teaching Scheme in periods (L : T :P)	: 45 : 15 : 0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 60 Marks	SEE	: 40 Marks

Pre requisites

This course requires the knowledge of Engg. Mathematics at Diploma first year level and Applied Engg. Mathematics at Diploma 3rd Semester level.

Course Outcomes :

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations
CO 3	Express $f(x)$ as a Fourier series in the given interval
CO 4	Express $f(x)$ as a Fourier Half-Range Cosine series and Sine series
CO 5	Find Laplace transforms of simple functions
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
1	Homogeneous Linear Differential equations with constant coefficients	05	Q4	Q1	Q9(a)	Q13(a)
2	Non-Homogeneous Linear Differential equations with constant coefficients	15				
3	Fourier series	10		Q2	Q10(a)	Q14(a)
4	Fourier Half-range series	05				
5	Laplace Transforms	10	Q3	Q5,Q6 Q7,Q8	Q9(b), Q11(a), Q11(b) Q10(b), Q12(a), Q12(b)	Q13(b), Q15(a), Q15(b) Q14(b), Q16(a), Q16(b)
6	Inverse Laplace transforms	15				

Total	60	8	8	8
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Course Contents:

Unit – I

Duration: 05 Periods (L:3.0 – T:2.0)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 15 Periods (L:12.0 – T:3.0)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form $f(D)y = X$, where X is in the form k (a constant), e^{ax} , $\sin ax$, $\cos ax$, x^n , ($n = 1, 2, 3$) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 10 Periods (L: 8.0 – T: 2.0)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c + 2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function. Even, Odd functions and Fourier series over the Interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit – IV

Duration: 05 Periods (L: 3.0 – T: 2.0)

Fourier Half-range series

Representation of a function as Fourier Half-range Sine series and Cosine series over the interval $(0, \pi)$

Unit – V

Duration: 10Periods (L: 7.0 – T:3.0)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem, multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 15 Periods (L: 12.0 – T: 3.0)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s – Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S.Grewal .
2. Laplace Transforms - Murray R. Spiegel .
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books: www.mathebook.net

Suggested Learning Outcomes

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

- 1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.
- 1.2 Solve the higher order homogeneous Linear differential equations with constant coefficients.

Unit-II

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

- 2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.
- 2.2 Solve n^{th} order differential equation of the type $f(D)y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form $k, e^{ax}, \sin ax, \cos ax, x^n$.
- 2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

- 3.1 Define the orthogonality of functions in an interval.
- 3.2 Define Fourier series of a function on the interval $(C, C+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.
- 3.3 Write sufficient conditions for the existence of Fourier series for a function.
- 3.4 Write Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$.
- 3.5 Write Fourier series for even and odd functions in the interval $(-\pi, \pi)$
- 3.6 Solve simple problems on even and odd functions in the interval. $(0, 2\pi)$ and $(-\pi, \pi)$

Unit- I

4.0 Understand the Half – Range Fourier series expansion of functions

- 4.1 Write Half – Range Cosine series of a function in the range $(0, \pi)$.
- 4.2 Write Half – Range Sine series of a function in the range $(0, \pi)$.
- 4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

- 5.1 Write the definition of Laplace Transform and Laplace transform of standard functions.
- 5.2 Explain the sufficient conditions of existence of Laplace Transform.
- 5.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem, Change of Scale property.
- 5.4 Solve simple problems using the above properties.
- 5.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u)du$ in terms of Laplace transform of $f(t)$
- 5.6 Solve simple problems using the above formulae.
- 5.7 Define unit step function and write the Laplace Transform of unit step function.
- 5.8 Write Second shifting theorem.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

- 6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.
- 6.2 Solve simple problems on Inverse Laplace Transforms.
- 6.2 Write Shifting theorems and Change of scale property of inverse Laplace Transform.
- 6.3 Solve simple problems on 6.2
- 6.4 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t), \frac{f(t)}{t}, f^n(t), \int_0^t f(u)du$
- 6.5 Solve simple problems on 6.4
- 6.6 Define convolution of two functions and state convolution theorem.
- 6.7 Solve simple problems on Convolution theorem.
- 6.8 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home Assignments.

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2	2	1			1			3	1,2,3,4,7,10
CO2	3	2	2	1			1			3	1,2,3,4,7,10
CO3	3	2	2	1			1			3	1,2,3,4,7,10
CO4	3	2	2	1			1			3	1,2,3,4,7,10
CO5	3	2	2	1			1			3	1,2,3,4,7,10
CO6	3	2	2	1			1			3	1,2,3,4,7,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page, 1page and 2 pages respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
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01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI					
Total Questions	8		8	8	

Code: 18A-401F

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS
MID SEM –I, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS**

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions
- 2 Each question carries **ONE** mark

04 X 01 = 04

1. Write the General solution of $(aD^2+bD+c)y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{3x}$
4. Find the P.I of $(D^2 - 16)y = \sin 4x$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a) Solve: $(D^2 + 3D - 54)y = 0$

Or

5 b) Solve : $(D^2 + 16)y = 0$

6 a) Solve : $(D^2 + 4D + 4)y = e^{2x}$

Or

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART C

Instructions:

1. Answer **ALL** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Solve : $(D^3 - 2D^2 - 4D + 8)y = 0$

Or

7 b) Solve : $(D^3 - D^2 - D + 1)y = 0$

8 a) Solve : $(D^2 + 36)y = \sin^2 x$

Or

8 b). Solve : $(D^2 + 3D + 2)y = x^2$

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Code: 18A-401F

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

BOARD DIPLOMA EXAMINATIONS

MID SEM -II, MODEL PAPER, IV SEMESTER

ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function $f(x)$ in the interval $(0, 2\pi)$
3. Write Half-range sine series of $f(x)$ in the interval $(0, \pi)$
4. Find a_0 for $f(x) = e^x$ in $0 < x < \pi$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a). If $f(x) = x^2$ in $(0, 2\pi)$, then find the value of a_n in Fourier series of $f(x)$

Or

5 b) If $f(x) = |x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of $f(x)$

6 a). Find the value of a_n in half-range Cosine series for the function $f(x) = e^x$ in $(0, \pi)$

Or

6 b). Obtain the Fourier Half – Range Sine series for $f(x) = (\pi - x)$ in the interval $(0, \pi)$

PART C

Instructions:

1. Answer any **TWO** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a). Obtain the Fourier series for $f(x) = x$ in the interval $0 < x < 2\pi$

Or

7 b). Find the Fourier series for $f(x) = (x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots + \frac{\pi^2}{12}$$

8 a) Express $f(x) = \pi x - x^2$ as a half-range Sine series in $(0, \pi)$

Or

8 b). Find the half –range cosine series for the function $f(x) = x^2$ in the interval $(0, \pi)$

18A-401F

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAM MODEL PAPER
IV SEMESTER EXAMINATION
ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function $f(x)$ in the interval $(c, c+2\pi)$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + \cos 3t)$
5. Find $L(t + 5 \cos ht)$
6. State the First Shifting theorem of Laplace Transforms.

7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

- Instructions: 1. Answer any **FOUR** questions 04 X 03 = 12
2. Each question carries **THREE** marks

9. a) Solve: $(D^2 + D + 1)y = 4e^{3x}$

Or

9 b) Find $L(t \cos 3t)$

10 a) Find Half Range Sine Series of $f(x) = x$ in $(0, \pi)$

Or

10 b) Find $L^{-1}\left(\frac{s+1}{s^2+6s-7}\right)$

11 a) If $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$, find $L\{f(3t)\}$

Or

11 b) Find $\int_0^\infty t \cdot e^{-2t} \sin 3t dt$ using Laplace Transform Technique

12 a) Show that $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right) = \frac{1-\cos at}{a^2}$

12 b) Find $L^{-1}\left(\frac{s}{(s+2)^2+4}\right)$

PART C

- Instructions: 1. Answer any **FOUR** questions 04 X 05 = 20
2. Each question carries **FIVE** marks

13. a) Solve : $(D^2 + D - 2)y = x + \sin x$

Or

13 b) Find $L[te^t \sin 3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

Or

14 b) Find $L^{-1}\left(\frac{s}{(s+1)^2(s^2+1)}\right)$

15 a) Find $L\left(\frac{\sin 3t \cdot \cos t}{t}\right)$

Or

15 b) Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

16 a) Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$ using Convolution theorem .

Or

16 b). Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by
Laplace Transform method.

Automobile Body and Chassis Engineering

Course Title :	Automobile Body and Chassis Engineering	Course Code:	18A-402C
Semester:	IV	Course Group:	Core
Teaching Scheme in Hrs (L:T:P):	42.6:17.4:0	Credits:	3
Methodology:	Lecture + Assignments	Total Contact periods:	60Periods
CIE:	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE:

S. No	Unit No.	Questions for SEE				Periods	
		R		U	A		
1	Body Constructional Details	4	1		9(a)	13(a)	10
2	Body Production Methods and Aerodynamics						10
3	Basics of Automobile Air conditioning		2		10(a)	14(a)	10
4	Steering System						10
5	Braking System		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	Suspension System			7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)	10
Total Questions		8		8	8	60	

Pre requisites:

This course requires the basic knowledge of Automobile power train.

Course Outcomes:

At the end of course student should be able to:

CO1 :	Comprehend on the contemporary issues in the field of vehicle body construction and brief the important aspects of Interior design.
CO2 :	Summarize various vehicle production methods and aerodynamic aspects.
CO3 :	Give overview of the automobile air-conditioning systems.
CO4 :	Summarize the working of Steering system of an automobile.
CO5:	Explain the need and functions of each component in a braking system.
CO6:	Outline the requirements and functions of components in suspension system of automobile.

Course Content:

1. Body Constructional Details

Duration: periods 10 (L:8 T:2)

Major dimensions of a heavy passenger vehicle - Factors to be considered for interior design – Comfort, Utility, Seating arrangement – Trimming- Interior trimming, Exterior trimming - Dust proofing – Body insulation.

Doors, Types of doors, Door locks, Windows, Types of windows, Window Regulating Mechanism – Operation of Power windows – Central door locking mechanism– Seat – Types of seats- Seat adjusting mechanism - Seat belt - Structural members and materials used - Methods of joining them – Description and Constructional details of Roof, Bonnet, Luggage boot, Grills.

2. Production methods and aerodynamics

Duration: periods 10 (L:8 T:2)

Vehicle body drafting – Use of computers in body drafting - Manufacture of plastic body panels - Sheet metal stamping – Body painting – Paint materials and purpose of each material - Different methods of painting – Construction and working of Spray painting gun – Painting Procedure for New vehicle body and Repainting a vehicle body – Spray painting – Description of Painting booth and purpose - Body Finishing methods.

Aerodynamic drag – Lift – Pitching – Yawing, Rolling moments and Sideway forces – Wake – Streamlining of vehicle body.

3. Basics of Automobile Air Conditioning

Duration: periods 10 (L:8 T:2)

Definition of refrigeration – Unit of refrigeration – Co-efficient of performance –Comfort Air conditioning – Classification of refrigerants- Refrigerants used in automobiles.

Psychometric Properties – Humidity – Relative humidity – Humidity ratio – DBT – WBT – Sensible heat – Latent heat - Fans - Supply ducts – Grills for outlets – Return ducts – Air filters and Dust collectors – Heating Coils – Cooling coils – Necessity of automobile air-conditioning – Location of air conditioning components in a car – Function of components- Compressor –Condenser -Receiver drier - Expansion valve – Evaporator –Compressor clutch - Expansion tube and Expansion valve type automobile air conditioning systems.

4. Steering system

Duration: periods 10 (L: 8 T: 2)

Requirements of the vehicle steering – Steering layout for Rigid axle and Independent systems- Types of steering gears – Construction and working of Rack and Pinion type, Recirculating ball type and Worm and Sector type - Need of power steering – Types of Power steering systems – Hydraulic power steering –Reversible and irreversible steering, Over steering and Under steering - Steering gear ratio -Turning radius - Ackermann's & Davis steering gear mechanism - Steering geometry - Caster, Camber, King pin inclination-Steering axis inclination – Toe- in and Toe-out - Wheel wobble and Shimmy – Wheel balancing - Wheel alignment.

5. Braking system

Duration: periods 10 (L: 8 T: 2)

Functions of brakes – Working principle of braking system - Requirements of automobile brakes - Stopping time – Stopping distance – Braking efficiency- Simple numerical problems – Types of braking systems- Primary and Secondary brakes- Parking brakes – Mechanical and Hydraulic brakes – Layout of hydraulic braking system – Construction and working of Single

and Tandem master cylinders- Wheel cylinder - Brake bleeding - Constructional details of Internal expanding shoe brakes and disc brakes – Advantages and limitations of disc brakes over shoe brakes- Advantages and limitations of hydraulic brakes over Mechanical brakes – Power brakes- Working of Air brakes - Construction and working of Brake valve - Power assisted brakes – Vacuum servo assisted brakes – Anti skid or Anti lock braking system – List out types of brakes used in various vehicles.

6. Suspension System

Duration: periods 10 (L: 8 T: 2)

Objectives of the suspension system – Requirements of a good suspension system – Suspension Nomenclature - Types of suspension systems – Conventional, Independent and Semi-independent suspension systems – Working principles of independent suspension system - Single arm parallel, Single arm perpendicular, Double arm parallel and Double arm perpendicular systems - Types of springs used in suspension system – Torsion bar – Need of shock absorber – Working of Telescopic shock absorber - Stabilizer bar – Working of Air suspension system.

Recommended Reference Books:

1. Automobile Engineering	Vol. I & II	by	Dr. Kirpal Singh
2. The motor vehicle		by	Newton steeds. &Garret
3. Automobile engineering		by	G.B.S.Narang
4. Automobile engineering		by	Sethi.
5. Automobile chassis		by	P.M.Heldt.
6. Body engineering		by	S.F.Page.
7. Vehicle body Engineering		by	Powlaksi
8. Refrigeration and air conditioning		by	Domukundwar
9. Automotive Mechanics		by	William H Cruise

Suggested learning outcomes:

Student will be able to:

- 1.0 Draw the sketch of a heavy passenger vehicle as per the dimensions.
- 1.1 Describe the construction of various types of seats.
- 1.2 Identify the materials for members used in body construction
- 1.3 Explain the constructional details of roof, bonnet, luggage boot, grills etc.,
- 1.4 Understand the major dimensions of vehicles.
- 1.5 Explain with a neat sketch about the interior design of the vehicle towards the comfort, utility, seating arrangements interior fitting, trimming, dust proofing.
- 2.0 Explain the understand the concept of body drafting
- 2.1 Explain the production methods of plastic bodies panels, sheet metal fabrication
- 2.2 Explain the body finishing method
- 2.3 Explain briefly body painting.
- 2.4 Understand the Aerodynamic considerations in Body profiling
- 2.5 Explain aerodynamic drag
- 2.6 Explain lift, pitching, yawing and rolling moments
- 3.0 Understand Automobile Air conditioning
- 3.1 Define Refrigeration and Air conditioning

- 3.2 Express unit of refrigeration in terms of ton of refrigeration
- 3.3 Define coefficient of performance
- 3.4 Identify commonly used refrigerants
- 3.5 Explain Air conditioning as applicable to human comfort
- 3.6 Define various Psychometric Properties
- 3.7 Explain the sensible heat and latent heat
- 3.8 Explain the functions various equipment such as fans, supply ducts, outlets, Return ducts, filters and dust collectors
- 3.9 Explain the necessity of Automobile Air-conditioning
- 3.10 Locate the different components of Air conditioner in a car
- 3.11 Working and construction of components
- 3.12 Explain Expansion valve type automobile Air conditioning system
- 3.13 Explain Expansion tube type Air conditioning system
- 3.14 Explain construction and working of compressor clutch

- 4.0 Explain the requirements of steering gear mechanisms
- 4.1 Explain the types of Steering gear mechanisms
- 4.2 Identify the components of various steering gears.
- 4.3 Explain working of power steering.
- 4.4 Explain steering geometry.

- 5.0 Explain the functions and necessity of a brake
- 5.1 Identify the types of braking system.
- 5.2 Explain working of various components of hydraulic braking system.
- 5.3 List and explain different types of braking systems used in various vehicles.

- 6.0 Explain the necessity of suspension system
- 6.1 State the requirements of a good suspension system.
- 6.2 Identify and explain the types of suspension systems.
- 6.3 Distinguish the types of springs.

Suggested Student Activities:

1. Student visits Library to refer to Automobile Manuals to find the various steering systems used in automobiles.
2. Student inspects the available equipment in the Laboratory to identify the different chassis components and vehicle body components.
3. Students to browse the online latest developments related to the course.
4. Student should observe the different types vehicles in respect of bodies and present a seminar or publish a paper.
5. Student should visit the service station and identify the different types steering mechanisms and present a paper.
6. Quiz
7. Group discussion
8. Surprise test

Suggested E-Learning references:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO
CO1	Comprehend on the contemporary issues in the field of vehicle body construction and brief the important aspects of Interior design.	R/A	1,2,10
CO2	Summarize various vehicle production methods and aerodynamic aspects.	R/U/A	1,2,10
CO3	Give overview of the automobile air-conditioning systems.	R	1,2,10
CO4	Summarize the working of Steering system of an automobile.	R/U	1,2
CO5	Explain the need and functions of each component in a braking system.	R/U/A	1,2
CO6	Outline the requirements and functions of components in suspension system of automobile.	R/U	1,2,6,10

OVER VIEW OF STUDENT EVALUATION**Mid Semester Examination-1****Max Marks: 20**

S. No	Unit	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2**Max. Marks: 20**

S. No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

(Model Question Paper)

Mid Sem -I

Subject Name: **Automobile Body and Chassis Engineering**

Subject Code: **18A-402C**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** Mark

4 x1 = 4 Marks

1. Name any two interior trim parts in a car?
2. Write any two major dimensions of a vehicle?
3. List the methods used for vehicle body painting?
4. Define ‘Yawing moment’?

PART – B

Answer the following. Each question carries **THREE** marks

2x3= 6 Marks

5. a). State the importance of seat belt in a car.

OR

- b). Explain the term luggage boot.

6. a) Explain the term Lift.

OR

- b) Write the importance of body drafting.

PART – C

Answer the following. Each question carries **FIVE** marks

2x5 = 10 Marks

7. a). Explain about window regulating mechanism.

OR

- b). Explain about seat adjusting mechanism.

8. a). Explain about manufacturing of plastic body panels.

OR

- b). Explain about stream lining of body in aerodynamics.

(Model Question Paper)

Mid Sem -II

Subject Name : **Automobile Body and Chassis Engineering**

Subject Code: **18A-402C**

Time: 1 Hour

Total Marks: 20 M

PART – A

Answer **ALL** questions and each question carries **ONE** mark.

4x1 = 4 Marks

1. Define the term ‘refrigeration’
2. List any two types of refrigerants used in automobiles.
3. Define the term King pin inclination.
4. State reversible steering.

PART – B

Answer the following. Each question carries **Three** marks

2x3 = 6 Marks

5. a). Define the terms (a) DBT (b) WBT

OR

b). Define the terms (a) Sensible Heat (b) Relative Humidity

6. a) Define Caster and Camber .

OR

b) Draw a neat sketch of Re-circulating ball type steering gear box .

PART – C

Answer the following. Each question carries **five** marks

2x5 = 10 Marks

7. a). Explain the working principle of compressor clutch with neat sketch ?

OR

b). Explain the construction of receiver drier with a neat sketch.

8. a). Explain the working of Rack and Pinion steering gear box with neat sketch

OR

b). Explain Ackermann's steering gear mechanism with a neat sketch.

(Model Question Paper)

SEMESTER END EXAM

Subject Name: **Automobile Body and Chassis Engineering**

Subject Code: **18A-402C**

Time: 2 Hour

Total Marks: 40M

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed ¼ page.

8x1 = 8Marks

1. List any two materials used for Body structural members.
2. Define the term 'Unit of refrigeration'
3. List any two types of braking systems
4. List any two steering angles.
5. Write the function of brake.
6. Define 'Stopping Time'
7. List two types of springs used in automobiles.
8. Write any two objectives of suspension system.

PART – B

Answer the following. Each question carries **Three** marks
and answer should not exceed 1 page.

4x3=12 Marks

9. a). Explain about dust proofing

OR

b) Draw layout of Hydraulic braking system.

10. a) Define the terms (a) Toe-in and (b) Toe-out

OR

b) Write a short note on Torsion bar.

11. a) What are the requirements of Braking system.

OR

b) List any six advantages of Hydraulic Brakes.

12. a) State the importance of Coil spring.

OR

b) Write three requirements of good suspension system.

PART – C

Answer the following. Each question carries **five** marks
and answer should not exceed TWO pages.

4x5 = 20 Marks

13. a) Draw the major Dimensions of a Bus

OR

b). Explain the working of Vacuum Brakes with help of block diagram.

14. a). Explain with a block diagram the working of Expansion Valve type automobile air conditioning system.

OR

b). Explain the working of Air suspension system with the help of a block diagram.

15. a). Explain the constructional caliper type disc brake system with the help of a block diagram.

OR

b). Explain the Brake bleeding operation.

16. a). Explain the necessity of 'Stabilizer bar' in vehicle.

OR

b) . Explain the construction and working of Mc-Pherson Strut type suspension system

Strength of Materials and Fluid Mechanics

Course Title :	Strength of Materials and Fluid Mechanics	Course Code:	18A 403C
Semester:	IV	Course Group:	Core
Teaching Scheme in Hrs(L:T:P):	42.6:17.4:0	Credits:	3
Methodology:	Lecture + Assignments	Total Contact Periods:	60 Periods
CIE:	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE:

S. No	Unit No.	Questions for SEE				Periods	
		R		U	A		
1	Simple stresses and strains	4	1		9(a)	13(a)	10
2	Properties of Fluids						10
3	Geometric properties of Sections		2		10(a)	14(a)	10
4	Flow of Fluids						10
5	Shear Force and Bending Moment		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	10
6	Hydraulics and Hydraulic Machinery				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total		8		8		8	60

Pre requisites:

This course requires the basic knowledge of geometry at Secondary school level

Course outcomes:

At the end of course student should be able to

CO1 :	Calculate the stress and strain acting on the given material under different axial load conditions and to understand the elastic behavior of metals.
CO2 :	Understand the concepts of fluid pressure and other properties.
CO3 :	Assess the geometrical properties like C.G and M.I of symmetrical and non symmetrical laminas.
CO4 :	Comprehend the basic types of fluid flows and energy possessed in a fluid flow.
CO5 :	Draw the shear force and bending moment diagrams for the simple load system on Cantilever, Simply supported and Over hanging beams.
CO6:	Detail about the governing functions of hydraulic operated machines.

COURSE CONTENT:

UNIT-1: Simple stresses and strains

Periods 10 (L: 7.0 –T: 3.0)

Introduction–Load- Force - Difference between load and force- Types of loads - Mechanical properties: Strength, Stiffness, Elasticity, Plasticity, Ductility, Malleability, Toughness, Hardness, Brittleness, Creep and Fatigue - Stress, Strain - Various types of Stresses and Strains: Tensile, Compressive, Shear, Bending – Hooke’s law-Modulus of elasticity- Stress v/s Strain diagram- Problems on total elongation, Stress induced, Strain in bars of varying cross sections- Ultimate stress - Factor of Safety- Design or Allowable stress -Young’s modulus,- Rigidity Modulus - Bulk Modulus - Poisons’ ratio - Relation among three elastic constants- Problems related to three elastic constants-Thermal stresses and strains-Related problems.

UNIT-2: Properties of fluids

Periods 10 (L: 7.0 – T: 3.0)

Definition of fluid – Types of fluids: Compressible and In-compressible fluids – Properties of fluids: Density, Specific weight, Specific gravity, Viscosity, Capillarity, Surface Tension and Pressure - Pascal’s law – Intensity of pressure – Gauge and absolute pressure – Measurement of pressure by – Piezometer, U- tube and Differential manometers – Problems on pressure measurement - Working of bourdon’s tube pressure gauge.

UNIT-3: Geometrical properties of sections

Periods 10 (L: 6.0 – T: 4.0)

Centre of gravity of regular laminas: Square, Rectangle, Triangle and Circle – Centroid - Neutral axis-Inertia -Types of Moment of Inertias: Mass moment of Inertia, Area moment of Inertia and Polar Moment of Inertia – Application of these Moment of Inertias and formulae – Definition of area Moment of Inertia or 2nd Moment of Inertia - Radius of gyration - Section modulus of Square, Rectangle, Triangle and Circle - Parallel and perpendicular axis theorems - Calculation of moment of inertia of L, I and T- sections.

UNIT-4: Flow of Fluids

Periods 10(L: 6.0– T: 4.0)

Types of fluid flows: Steady and Unsteady, Uniform and Non-uniform, Laminar and Turbulent flows - Concept of Reynolds number –Continuity Equation –Assumptions made for Bernoulli’s theorem – Statement of Bernoulli’s theorem, Equation and its Practical applications – Problems on Bernoulli’s equation – Flow of fluid through pipes and orifice – Hydraulic coefficients - Loss of head in pipes due to friction: Darcy’s and Chezy’s formula (without proof) – Hydraulic gradient – Total energy line – Power transmitted through pipes, efficiency and condition for maximum power transmission (without derivation)- Simple problems.

UNIT-5: Shear Force and Bending Moment

Periods 10(L: 6.0– T: 4.0)

Definition of Beam, Types of beams: Cantilever, Simply supported, Overhanging beam, Fixed beam and Continuous beams - Cantilever, Simply supported and Overhanging beams subjected to Point load and U.D.L - S.F. and B.M. calculations and diagrams for these beams – Assumptions made for bending equation and Derivation of Bending Equation.

UNIT-6: Hydraulics and Hydraulic Machinery

Periods 10 (L: 6.8 – T: 3.2)

Basic components of hydraulic control circuit, Symbols used: Reservoir, Filter, Pump or Power source, Control elements and Actuator - Function of each basic component – Types of Filters: Edge, Surface and Depth filters- Arrangement of Filters - Types of oil pumps and their constructional details: Gear Pumps, Vane Pump - Hydraulic control valves: Direction, Pressure and flow control valves Constructional details and working principle of Hydraulic Press, Jack, Ram, Crane and Press.

REFERENCE BOOKS:

Strength of Materials	-by	R.S.Khurmi
Solid Mechanics	-by	Pakirappa
Strength of Materials	-by	Ramamrutham
Hydraulics	- by	R.S. Khurmi
Hydraulics &Hydraulics Machines Vol- I&II	- by	Jagadish Lal
Hydraulics	- by	Reya and Rao
Fluid Power Pneumatics	-by	ALAN H. JOHN
Fluid Power & Pneumatics	-by	AUDEL

Suggested learning outcomes:

- 1.0 Simple stresses and strains
 - 1.1 Differentiate between load, force
 - 1.2 Meaning of point load and distributed load
 - 1.3 Difference between stress and strain
 - 1.4 Principal constituents of stress-strain diagram of mild steel.
 - 1.5 Meaning of various elastic constants
 - 1.6 Simple problems on thermal stresses and strains.
- 2.0 Properties of fluids
 - 2.1 Define fluid, differentiate between the fluid flows.
 - 2.2 Define various properties of fluids.
 - 2.3 State Pascal law and its applications
 - 2.4 Explain the atmospheric pressure, absolute pressure and pressure head of fluid
 - 2.5 Explain the working principle of pressure Gauges.
 - 2.6 Problems on manometers.
- 3.0 Geometrical properties of sections
 - 3.1 Define centroid, centre of gravity, Moment of inertia, and radius of gyration.
 - 3.2 State the necessity of finding the centroid and centre of gravity for various engineering applications.
 - 3.3 Calculate positions of centroid for simple plane laminas.
 - 3.4 Explain the method of determining the centroid by 'Method of moments'.
 - 3.5 Define moment of inertia, radius of gyration.
 - 3.6 State the necessity of finding moment of inertia for various engineering applications.
 - 3.7 Determine M.I of standard sections L, I and T by applying parallel axes and perpendicular axes theorems.

4.0 Types of Fluid flows

- 4.1 Explain the fluid flow of steady, unsteady, uniform, non-uniform, laminar and turbulent flows.
- 4.2 Write the Equation of continuity of flow
- 4.3 Write the total energy equation of fluid in motion. Bernoulli's theorem (proof not necessary) and its practical applications in venturimeter. Simple problems.
- 4.4 Explain the phenomenon of flow through orifices under constant heads. Know the coefficient of velocity, coefficient of contraction and coefficient of discharge and the relation among the three coefficients – simple problems.
- 4.5 State the laws of fluid friction, Reynolds number, change of stream lined flow into Turbulent flow and critical velocity.
- 4.6 Illustrate various losses in a fluid flow. Loss of friction – Darcy's and Chezy's expressions (Without proof) - Simple problems.

5.0 S.F. and B.M. diagrams

- 5.1 Types of beams
 - 5.2 Define different types of loads: Point load, Uniformly distributed load etc.,
 - 5.3 Define and explain the terms (a) Shear force and (b) Bending moment.
 - 5.4 Determine shear force and bending moments on cantilever, simply supported beam and overhanging beam for simple cases of loading (Point load, uniformly distributed load).
 - 5.5 Describe the procedures for sketching the shear force diagrams (SFD) and Bending Moment diagrams (BMD).
 - 5.6 Define Point of contra flexure.
 - 5.7 Definition of Bending
 - 5.8 Derivation of Bending equation and assumptions.
- #### 6.0 Hydraulics and Hydraulic Machinery
- 6.1 List the parts of Hydraulic circuit
 - 6.2 Explain the function of each part of the Hydraulic circuit.
 - 6.3 List the types of pumps like gear pump, vane pump, rotary pump, centrifugal pump.
 - 6.4 Explain the constructional details of gear pump (external and internal gear type), vane pump.
 - 6.5 List the different types of actuators
 - 6.6 Write the basic symbols used in hydraulic circuit.
 - 6.7 Explain the Constructional details and working principle of
 - Hydraulic press
 - Hydraulic jack
 - Hydraulic lift
 - Hydraulic crane

Suggested Student Activities:

- ✓ Draw Stress/Strain diagrams for different types of materials and analyze the performance of these metals.
- ✓ Demonstrate the measurement of pressure head using Pitot tube.
- ✓ Sketch the bending and deflection diagrams under single point load on a cantilever, simply supported beam and overhanging beam.
- ✓ Visit any hydraulic power plant and submit a study report.
- ✓ Verify Bernoulli's using a Pitot tube in a pipe flow and submit a report.
- ✓ Debate on the applications of Strength of materials in the respective field of engineering.
- ✓ Seminar on any other type of hydraulic machine you know

Suggested E-Learning Resources:

- ✓ Simple Stresses and Strains:
<https://www.toppr.com/guides/physics/mechanical-properties-of-solids/stress-and-strain/>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/1>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/2>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/3>
- ✓ Geometrical Properties of sections
<https://nptel.ac.in/courses/112103108/15>
- ✓ Flow of Fluids
<https://nptel.ac.in/courses/112105171/1#>
<https://nptel.ac.in/courses/112105171/2#>
<https://nptel.ac.in/courses/112105171/3#>
- ✓ Shear Force and Bending Moment Diagrams
<https://nptel.ac.in/courses/105106172/53>

to

- <https://nptel.ac.in/courses/105106172/77>
- ✓ Hydraulic Machinery
<https://www.youtube.com/watch?v=kEqPV4YUSfg>
- ✓ Hydraulic Press
<https://www.youtube.com/watch?v=AtQ1oh09Uyo>
- ✓ Hydraulic Ram
<https://www.youtube.com/watch?v=GsglThL38Mc>
- ✓ Hydraulic Jack
<https://www.youtube.com/watch?v=iXXt2oGXvmo>
- ✓ www.nptel.ac.in
- ✓ www.wikipedia.org

Course Outcome		Cognitive Level	Linked PO'S	Periods
CO1	Calculate the stress and strain acting on the given material under different axial load conditions and to understand the elastic behavior of metals.	R/U/A	1,3,4,5,8	10
CO2	Understand the concepts of fluid pressure and other properties.	R/U/A	1,3,5,10	10
CO3	Assess the geometrical properties like C.G and M.I of symmetrical and non symmetrical laminas.	R/U/A	1,2,3,10	10
CO4	Comprehend the basic types of fluid flows and energy possessed in a fluid flow.	R/U/A	1,2,3,6	10

CO5	Draw the shear force and bending moment diagrams for the given simple load system on Cantilever, Simply supported and Over hanging beams.	R/U/A	1,2,8,9	10
CO6	Detail about the governing functions of hydraulic operated machines.	R/U/A	1,3,4,5	10
TOTAL				60

CO/PO Mapping Matrix:

OVER VIEW OF STUDENT EVALUATION

Mid Semester Examination-1

Max. Marks: 20

S. No	Unit	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2

Max. Marks: 20

S. No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Internal Assessment**Max. Marks: 20**

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions
Assignment	Any one Unit	5	Different group assignments of Higher order Questions that develop problem solving skills and critical thinking should be given
Seminar		5	Any topic approved by the faculty

IV SEMESTER: MID 1**COURSE CODE:18A 403C****COURSE TITLE: STRENGTH OF MATERIALS AND FLUID MECHANICS****(Time:1hour****Max marks:20)****Instructions:**

1. Answer FOUR questions from Part A. Each question carries ONE mark.
2. Answer any TWO questions from Part B. Each question carries THREE marks.
3. Answer any TWO questions from Part C. Each question carries FIVE marks.

PART-A**4 X 1= 4**

1. Define the term “stress”.
2. State Newton’s law of viscosity.
3. Define the term poisson’s ratio.
4. Define the term surface tension.

PART-B**2 X 3 = 6**

5(a) A bar of 16mm diameter is subjected to a pull of 27 k N. The measured extension over gauge length of 80 mm is 0.12 mm. Find the modulus of elasticity.

(or)

5(b) A steel rod of 25 mm diameter and 6000mm length is subjected to an axial pull of 40 k N .Find the in tension of stress induced.

6(a) Write a short notes on (a) surface tension (b) capillarity

(or)

6(b) Write a short notes on manometers.

PART-C

2 X 5 = 10

7(a) A bar of 18 mm diameter is subjected to a pull of 40 k N. The measured extension over gauge length of 800 mm is 0.15 mm and the change in diameter is 0.007mm. Find the poisson's ratio and modulus of elasticity.

(or)

7(b) A steel rod 4m long and 20 mm diameter is subjected to an axial tensile load of 45 k N. Find the change in (a) length (b) diameter and (c) volume Take, $E = 200 \text{ k N/mm}^2$, $1/m = 0.3$

8(a) Find the kinematic viscosity of oil whose specific gravity is 0.96 and viscosity is 0.00109 N s/m^2 .

(or)

8(b) Explain the constructional details of U-tube manometer.

IV SEMESTER MID 2

COURSE CODE: 18A 403C

COURSE TITLE: STRENGTH OF MATERIALS AND FLUID MECHANICS

(Time : 1 hour)

Max marks:20)

Instructions:

1. Answer FOUR questions from Part A. Each question carries ONE mark.
2. Answer any TWO questions from Part B. Each question carries THREE marks
3. Answer any TWO questions from Part C. Each question carries FIVE marks.

PART-A

4 X 1= 4

1. Define the term "centre of gravity".
2. State Bernoulli's theorem.
3. Define the term moment of inertia.
4. Write an expression of Darcy's equation

PART-B

2 X 3 = 6

5(a) Find the M.I. of a rectangle of width 50 mm and depth 80 mm about its centroidal axes.

(or)

5(b) Find the M.I. of a rectangle of 80 mm wide and depth 120 mm about its base.

6(a) List the limitations of Bernoulli's Theorem.

(or)

6(b) Write a short notes on venturimeter.

PART-C

2 X 5 = 10

7(a) A bar of T section has a flange 50 mm wide and 10 mm thick. The web is 80 mm deep and 10 mm thick. Find the M.I. of the section about a line parallel to its flange and about a line passing through the centroids of flange and web.

(or)

7(b) Find the moment of inertia about centroidal axes of a channel 200mm X 100 mm with flange thickness 5 mm and web thickness 10 mm.

8(a) A horizontal venturimeter has a main diameter of 300 mm and a throat diameter of 200 mm. If discharge of 10000 litres of water per minute when the difference of pressure heads between the inlet and the throat is 1.5 m of water. Find the coefficient of meter.

(or)

8(b). The head of water over the centre of an orifice of diameter 30 mm is 2 m. The actual discharge through the orifice is 3 l/s. Find the coefficient of discharge.

IV SEMESTER: SEMESTER END EXAMINATION
COURSE CODE: 18A 403C
COURSE TITLE: STRENGTH OF MATERIALS AND FLUID MECHANICS

Time: 2Hours

Max.Marks:40

PART-A

Answer all the questions.

Each question carries one mark

1. Define the term 'Elasticity'? 8 x 1 = 8 Marks
2. State the Pascal's law?
3. What is 'Point of contra flexure'?
4. State the equation of continuity of flow?
5. Define the term 'Beam'?
6. What is Bending moment?
7. Define the term 'Hydraulics'?
8. List any four components of hydraulic control circuit?

PART-B

Answer any FOUR questions.

Each question carries Three marks

4 X 3 = 12

9(a) The specific gravity of water at 20°C is 0.998 and it's Dynamic viscosity is 0.001008 Pa-S .Find it's kinematic viscosity.

(Or)

9(b) List various types of beams

10(a) Find the M.I of a triangle whose base is 180mm and height is 120 mm about its base.

(Or)

10(b) List the functions of control valve

11(a) List the assumptions made in bending equation.

(Or)

11(b) Write an expression of bending equation and relate the terms.

12(a) List any three advantages and disadvantages of hydraulic control system.

(Or)

12(b) What are the industrial applications of actuators.

PART-C

Answer any FOUR questions.

Each question carries five marks.

4 X 5 = 20

13(a) A piece of steel 200 mm long and 20 mm X 20 mm cross section is subjected to a tensile force of 40k N in the direction of its length. Calculate the change in its volume.

Take, $E = 2 \times 10^5 \text{ N/mm}^2$, $1/m = 0.3$

(Or)

13(b) A cantilever 2 m long carries point loads of 6N, 5N, 2N and 3N at a free end at 1.5 m, 0.9 m and 0.4 m from fixed end. Sketch the SFD and BMD showing SF and BM values.

14(a) Explain the constructional details of Bourdon's tube pressure gauge with a neat sketch?

(Or)

14(b) Explain the construction of External gear pump and label the parts?

15(a) A cantilever of 2m long carries point loads of 6N, 5N, 2N and 3N at free end, 1.5m, 0.9m and 0.4m from fixed end. Sketch the SFD and BMD showing the values?

(Or)

15(b) A Simply supported beam of 10m length at its end, carries a load of 2kN/m over the left half of the span and a point load of 3kN at the mid span. Find the maximum bending moment and draw SF and BM diagrams?

16(a) Sketch, Describe the construction and Explain the working of a Gear Pump?

(Or)

16(b) With the aid of a diagram explain the constructional details and working of Hydraulic Press?

Automobile Servicing and Maintenance

Course Title :	Automobile Servicing and Maintenance	Course Code	18A-404C
Semester:	IV	Course Group	:Core
Teaching Scheme in Periods (L:T:P)	40:20:0	Credits	: 3
Methodology:	Lecture + Practical	Contact Periods:	: 45 Periods
CIE	60 Marks	SEE	: 40 Marks

Course Content and Blue Print of Marks for SEE

S.No	Unit No.	Questions for SEE					Periods
		R		U	A		
1	Service station & Equipment	4	1		9(a)	13(a)	08
2	Maintenance of motor vehicles & servicing of two wheelers						12
3	Servicing & Maintenance of four wheelers		2		10(a)	14(a)	10
4	Automobile Reconditioning Equipment						12
5	Hierarchy of Operations in Service Station		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	08
6	Automobile Pollution and control				7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions		8		8	8	60	

Pre requisites:

This course requires the basic knowledge of Basic Automobile Engineering and Automobile Power Train at second and third semester levels.

Course Outcomes

CO1 :	Identify the various tools and equipment required in a service station
CO2 :	Identify the general troubles and remedies of two wheeler
CO3 :	Describe the working of various automobile reconditioning equipment.
CO4 :	Determine the sources of pollution; identify the common troubles and remedies for four wheelers.
CO5 :	Demonstrate/ submit presentation on assigned topics related to the course

Course Content:

Unit 1: Automobile Service Station & Equipment.

Duration: Periods: 6 (L: 5 T: 1)

Garage, Service Station, Specialist repair Shop -Tools and equipment for a garage and service station – Factors to be considered while locating service station - Layout of a typical garage and service station - Car Washing Equipment - Vehicle Hoist - Air Compressor - Lubrication equipment: A grease gun,

High pressure lubrication - Fire safety- Fire extinguishers and types A, B and C.

Unit 2: Types of Maintenance & Servicing of 2- Wheelers **Duration: Periods 12 (L:8 ,T:4)**

Types of maintenance –Periodic maintenance–Preventive maintenance – Breakdown maintenance– Operation maintenance – Servicing and its necessity – Degreasing plant- Decarbonizing methods.–overhauling- necessity. Periodic checkup (Maintenance schedule) and the trouble shooting of motorcycle and scooter (Without clutch and gear shift).

Unit 3: Servicing & Maintenance of four wheelers **Duration: Periods 10 (L: 6 T: 4)**

Servicing- Maintenance- Periodic checkup and Trouble shooting (Diagnosis and fault rectification) of following systems of four wheelers:

- (a) **Engine systems**: Engine Overhaul- Engine tune-up Procedure - Trouble shooting of different types of Fuel systems - Lubrication system- Cooling system- Ignition system
- (b) **Transmission system**: Clutch: Clutch overhaul, Trouble shooting – Gearbox: Gear box overhaul, Trouble shooting – Differential: Differential overhaul, Trouble shooting
- (c) **Braking system**: Servicing of brake shoe assembly- Overhauling of Master cylinder, Wheel cylinder- Brake bleeding- Adjustment of brakes- Trouble shooting
- (d) **Suspension system**: Repair, Lubrication and maintenance of leaf spring
- (e) **Steering system**: Servicing of steering system and trouble shooting

Unit 4: Automobile re-conditioning Equipment **Duration: Periods 14 (L: 10 T: 4)**

Degreasing plant – Procedure of degreasing – De-carbonizing methods –Description and working of re-conditioning equipment: Cylinder re-boring machine, Honing machine, Line boring machine, Valve seat cutting and grinding machine, Valve re-facing machine, Valve lapping equipment, Crank shaft grinding machine, Brake drum lathe machine, Brake shoe riveting machine. Fuel injection pump Test Bench-Phasing and Calibration of F.I.P -Servicing and Testing of Fuel injector - Trouble shooting of fuel injection system.

Unit 5: Hierarchy of Operations in Service Station **Duration: Periods 8 (L: 4.8 T: 3.2)**

Roles and Responsibilities of service department staff: Service manager, Assistant service manager, Floor supervisor, Body shop supervisor, P.D.I supervisor, Service advisor, Technician, Spare parts in charge -Customer relationship executive. Procedure of P.D.I – Job card opening- Job card closing after repairs-Warranty claiming- Procedure of accident vehicle repairs involving Insurance claims.

Unit 6: Automobile Pollution and control **Duration: periods 10 (L: 6 T: 4)**

Various sources from vehicles, effects of pollutants on human and environment.SI Engine emissions – CO_x, NO_x, HC- Control measures: Exhaust Gas Recirculation, Catalytic Converter, Evaporative Loss Control Device, Positive Crankcase Ventilation etc., C.I Engine Emissions: Particulate emissions, Smoke control measures: Particulate trap. Vehicle emission norms – B.S (Bharat) and Euro, Exhaust gas Analyzer / Smoke meter.

Suggested Reference Books:

- | | |
|--------------------------------|--------------------------|
| 1. Automobile Engineering | by G.B.S.Narang |
| 2. Automobile Engineering | by Harbanth singh Rayath |
| 3. Manual on Depot maintenance | by T.S.R.T.C manuals. |
| 4. Transmission overhaul | by Station Abbey |
| 5. The modern motor Engineer | by Arten Judge |
| 6. Practical Auto Engineering | by Odamis |

Suggested Learning Outcomes

Student will be able to

- 1.0 Describe the Details of garage-service station and servicing equipment
- 1.1 List the various tools and equipments used in service station.
- 1.2 Draw and explain layout of service station
- 1.3 Differentiate between garage, service station and specialist service station
- 1.4 Explain the working of various servicing equipment.
- 1.5 List and state uses of various fire extinguishers.

- 2.0 Explain the necessity and general procedure of servicing and maintenance of motor vehicle.
- 2.1 List the types of maintenance.
- 2.2 Explain the various types of maintenance.
- 2.3 State servicing and its necessity
- 2.4 Explain the periodic checkup and the troubleshooting of moped and motorcycle.

- 3.0 Explain Engine tune up procedure.
- 3.1 Able to find fault and rectification of various systems of four wheeler.

- 4.0 List the various automobile reconditioning equipment.
- 4.1 State working of various automobile reconditioning equipment.
- 4.2 Describe the components of Fuel injection pump Test Bench.
- 4.3 Explain the procedure of Phasing and Calibration of F.I.P.

- 5.0 Mention the various Automobile Service department staff
- 5.1 State the role and responsibility of service department staff
- 5.2 Explain the procedure of PDI
- 5.3 Explain the procedure of job card opening and closing
- 5.4 Explain the procedure of warranty claims and insurance claims.

- 6.0 Identify sources of pollutants from vehicles
- 6.1 Recite the ill effects of pollutants
- 6.2 List the S.I and C.I Engine pollutants like CO_x, HC and NO_x
- 6.3 Mention the control measures of automotive pollution

Suggested Student Activities:

- 1. Student visits Library to refer to Manual of Automobile to find their maintenance schedules.
- 2. Student inspects the available reconditioning equipment in the Laboratory to identify the components.
- 3. Student inspects the available tools and equipments in the Laboratory and familiarize.
- 4. Quiz
- 5. Group discussion
- 6. Surprise test

Suggested E-Learning references:

- www.learnengineering.org
- www.sae.org
- www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO
CO1	Identify the various various tools and equipment required in a service station	R/A	1,2,10
CO2	Identify the general troubles and remedies of two wheeler	R/U/A	1,2,10
CO3	Describe the working of various automobile reconditioning equipment.	R	1
CO4	Determine the sources of pollution; identify the common troubles and remedies for four wheelers.	R/U/A	1,2,5,10
CO5	Demonstrate/ submit presentation on assigned topics related to the course	U/A	1,2,10

OVER VIEW OF STUDENT EVALUATION**Mid Semester Examination-1****Max. Marks: 20**

S.No	Unit	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2**Max. Marks: 20**

S. No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

(Model Question Paper)

Mid Sem -I

Subject Name: **Automobile Servicing and Maintenance**

Subject Code: **18A-404C**

Time: 1 Hour

Total Marks: 20 Marks

PART – A

Answer **ALL** questions

4x1 = 4Marks

Each question carries **One** mark and answer should not exceed ¼ page.

1. List any two factors to be considered for locating Service station?
2. What is overhauling?
3. List any two tools used in service station?
4. Define the term “maintenance”?

PART – B

Answer the following.

2x3 = 6Marks

Each question carries **Three** marks and answer should not exceed 1 page.

5. a). Draw a neat sketch of grease gun and label the parts?
OR
b).List any six difference between garage and service stations?
6. a) Draw a neat sketch of degreasing plant and label the parts ?
OR
b) Write a short notes on decarbonizing ?

PART – C

Answer the following.

2x5 = 10 Marks

Each question carries **Five** marks and answer should not exceed 2 pages.

7. a).Draw a layout of service station and explain?
OR
b) list the construction and working principle of car washing machine with a neat sketch?
8. a). Write the trouble shooting of motor cycle?
OR
b). write the maintenance schedule of motor cycle?

(Model Question Paper)

Mid Sem -II

Subject Name: **Automobile Servicing and Maintenance**

Subject Code: **18A-404C**

Time: 1 Hour

Total Marks: 20 Marks

PART – A

Answer **ALL** questions and each question carries **ONE** mark.
and answer should not exceed ¼ page.

Marks: 4 X 1M = 4M

1. List any two checkups of four wheelers in daily maintenance?
2. List any two regular checkups of four wheelers in periodic maintenance?
3. What is valve re-facing?
4. List the methods of decarbonizing

PART – B

Answer the following.

Each question carries **Three** marks and answer should not exceed one page. 2x3= 6 Marks

5. a). Write a short notes on engine time up procedure?

OR

b). Write a short notes on “brake bleeding”?

6. a) Write a short notes an “cylinder reboring?

OR

b) Write a short notes on valve seat cutting?.

PART – C

Answer the following.

Each question carries five marks and answer should not exceed two pages. 2x5 = 10 Marks

7. a). Explain the maintenance procedure of leaf spring?

OR

b). Write any three defects, cause and their remedies of a clutch?

8. a). Explain the working principle of brake drum lathe with a neat sketch

OR

b). Explain the working principle of Crankshaft grinding machine with a neat sketch?

(Model Question Paper)

SEMESTER END EXAM

Subject Name: **Automobile Servicing and Maintenance**

Subject Code: **18A-404C**

Time: 2 Hour

Total Marks: 40M

PART – A

Answer **ALL** questions.

8x1 = 8

Marks

Each question carries **ONE** mark and answer should not exceed ¼ page.

1. Define “Garage”?
2. List any two engine reconditioning equipment
3. Write the full form of P.D.I?
4. Write the full form of E.G.R?
5. Write any two duties of floor supervisor?
6. Write any two duties of body shop supervisor?
7. List any two emission of S.I engine?
8. Write two ill effects of automobile pollutants?

PART – B

Answer the following.

4x3 = 12

Marks

Each question carries **THREE** marks and answer should not exceed ONE page.

9. a) Define the term “fire extinguisher”?
OR
b) Write the duties of assistant service manager?
10. a) Explain the procedure of “degreasing”?
OR
b) Write the necessity of catalytic convertor in automobile ?
11. a) What is the rule of service advisor in service station?
OR
b) What are the rules and responsibilities of technician in a service station ?
12. a) List various BS (Bharat) emission norms?
OR
b) Write a short note on “particulate emission”?

PART – C

Answer the following.

4x5 = 20 Marks

Each question carries **FIVE** marks and answer should not exceed two pages.

13. a) Explain any two types of fire extinguishers with neat sketch?

OR

b) Explain the detailed procedure of opening job card?

14. a) What are the various defects, causes and their remedies of a lubrication system of a four wheels?

OR

b) Explain the EGR system with a neat sketch?

15. a) Explain about the warranty claiming procedure in a service station?

OR

b) Explain about the job card closing after repair in service station?

16. a) Explain the catalytic convertor with a neat sketch?

OR

b) Explain about positive crankcase ventilation with a neat sketch?

Automobile Electrical Systems

Course Title :	Automobile Electrical Systems	Course Code	18A-405C
Semester	IV	Course Group	CORE
Teaching Scheme in Hrs(L:T:P)	35:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours	50Hrs/60Pds
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE

S.No	Unit No.	Questions for SEE				Periods	
		R		U	A		
1	Fundamentals of Electrical Engineering	4	1		9(a)	13(a)	12
2	Batteries						10
3	Electrical and Hybrid Vehicles		2		10(a)	14(a)	08
4	Lighting and Accessories						06
5	Starting and Charging systems		3	5, 6	9(b)	13(b)	14
					11(a)	15(a)	
					11(b)	15(b)	
6	Ignition System			7,8	10(b)	14(b)	08
					12(a)	16(a)	
					12(b)	16(b)	
Total Questions		8		8	8	60	

Pre requisites:

This course requires the basic knowledge of Physics and chemistry at Secondary school level

Course outcomes:

At the end of course student should be able to

CO1 :	Summarize the fundamentals of electrical engineering.
CO2 :	Comprehend the working, care and maintenance of automobile batteries.
CO3 :	Explain the function of each component in Electrical and Hybrid vehicles
CO4 :	Interpret the components of lighting and accessories of an automobile.
CO5 :	Elaborate the working of starting and charging systems used in a vehicle.
CO6:	Illustrate the working of automobile Ignition system

COURSE CONTENT:

UNIT-1: Fundamentals of Electrical Engineering

Duration: Periods 12(L:10 – T:2)

Electrical Units of Current, Voltage, Resistance, Power, Energy- Concept of Potential difference – Ohm's Law – Series and parallel circuits – Determination of total resistance of a given series circuit,

parallel circuit, Series and Parallel circuits - Kirchhoff's Laws, Simple and elementary problems on Kirchhoff's laws - Magnetism and Electromagnetism - Electromagnetic Induction - Definitions of Inductance, Impedance, Capacitance – Self induction – Mutual induction-Basic principle of flux production due to electric current- Maxwell's cork screw rule - Fleming's Right hand and Left hand rules - Lenz's law.

UNIT-2: Batteries

Duration: Periods 10 (L:7 – T: 3)

Types of batteries – Primary and secondary cells –Different types of batteries - Constructional features of a lead acid battery – Constructional details of Li-ion battery - Chemical reaction during charging and discharging in a lead acid battery– Capacity of a battery - Ampere-hour efficiency- Watt-hour efficiency –Charging of Lead acid and Li-ion batteries – Different methods used including trickle charging - Battery tests – Voltage test, Specific gravity test, High discharge test, Cadmium cells test - Care and maintenance of Lead acid battery and Li-ion battery- Introduction to Fuel cell.

UNIT-3: Electrical and Hybrid Vehicles

Duration: Periods 08 (L: 7 – T: 1)

Need of Non polluting or Zero Emission Vehicles – Introduction to Electric drive Vehicles - Layout of a typical Electric Vehicle - Types of Electric vehicles based on the types of drive motors used- AC Motors and DC Motors and their types – Electronic control of these motors - Hybrid Vehicles and Types of hybrid drives.

UNIT-4: Lighting and Accessories

Duration: Periods 06 (L: 5 – T: 1)

Need of Automobile Illumination - Head lamps – Construction of sealed beam lamps – Halogen screen wiper circuit - Traffic Indicators –Block diagram of modern automobile computer based instrumentation system- Instrument panel – electronic engine Speed measurement - Fuel quantity measuring system - Oil pressure gauge – coolant temperature measuring system - Automatic wiper - Automatic Head lamp –Electronic vehicle speed measurement- Trip information- Navigation systems.

UNIT-5: Starting and Charging Systems

Duration: Periods 14 (L: 10 – T: 4)

Need of a D.C machine in an automobile - Constructional details of D.C Machine – Conversion of D.C Motor into Generator and Vice-versa – Characteristics of a D.C series motor –Need for self starter - Conditions of self starter during starting of an engine - Need for series motor as self starter – Constructional details of self starter and solenoid switch - Starter Drive mechanisms – Bendix, Folio thru, Lucas etc. - Over running clutch drive.

Working Principle of an Alternator - Construction details of an Alternator -Limitations of D.C. Generator and Advantages of using alternator–Rectification of AC to DC – Half –wave rectifier and Full-wave rectifier – Basic Principles of charging – Need of voltage regulation and working of an electronic voltage regulator.

UNIT-6: Ignition system

Duration: Periods 8 (L: 5 – T: 3)

Requirements of ignition system - Types of ignition system- Coil ignition and magneto ignition systems - Constructional details and working principle of coil ignition systems with circuit diagrams – Function of each component and their constructional details - Ignition Timing – Advancing and Retarding of ignition timing- Automatic advance mechanisms - Specifications of a spark plug – Types

of spark plugs-Working of Electronic ignition and Transistorized (CDI) ignition systems-Advantages over conventional ignition system.

Suggested Reference Books:

- | | | |
|--|----|---------------------------------|
| 1. Automotive Electrical systems equipment | by | N.R. Khatawate - (S.Chand& Co.) |
| 2. Basic Electrical Engineering. | by | M.L. Gupta |
| 3. Electrical Technology | by | Theraja |
| 4. Electrical Equipment of Automobiles | by | Parker Smith |
| 5. Automobile Electrical Equipment | by | P.L. Kohli |
| 6. Basic Automobile Electricity | by | C.P. Nakra |
| 7. Automobile Electrical Engineering | by | Arora & Dass |
| 8. Automobile Engineering | by | K.K. Ramalingam |
| 9. Microcontroller & application (8051) | by | Mazdi&Mazdi |
| 10. Digital Electronics | by | Morris Mano |
| 11. Instrumentation | by | A.K.Sawhaney |
| 12. Automotive Mechanics | by | S.Srinivasan |
| 13. Automotive Electrical and Electronic systems | by | Tom Denton |

Suggested E Learning References:

1. Fundamentals of Electrical Engineering
https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijk2Eub-UHs_y
2. Ohm's Law etc.,
https://www.youtube.com/watch?v=bT1Ko-1_1nY
3. Types of batteries
<https://www.youtube.com/watch?v=EfgDShcgKvM>
4. Li Ion Battery
https://www.youtube.com/watch?v=5X2YYNQWm_k
<https://www.youtube.com/watch?v=Jiyrw1zUQlA>
<https://www.youtube.com/watch?v=kqR7MihP5k4>
<https://www.youtube.com/watch?v=4ONdsVs6yS0>
5. Charging and Starting Circuits of a vehicle
<https://www.youtube.com/watch?v=EthVlixON4o>
https://www.youtube.com/watch?v=k7LYOC_AXI4
6. Working of charging system
<https://www.youtube.com/watch?v=VOGu2Fft7WQ>
7. Modern vehicle charging system
<https://www.youtube.com/watch?v=oxUbXtsY7cA>
8. How does an Ignition system of a car work
<https://www.youtube.com/watch?v=W94iksaQwUo>
9. Magneto Ignition system
https://www.youtube.com/watch?v=z4xkPyQn_ZU
10. Spark Plug
<https://www.youtube.com/watch?v=742Ml4oD3s4>

SUGGESTED STUDENT ACTIVITIES:

1. Quiz on the fundamentals of electrical engineering.
2. Visit a substation and submit a report.
3. Give a seminar on the working of any one component of Automobile Electrical Systems.
4. Submit a report on the electrical systems data of an automobile.
5. Visit a service center near to you and submit a report on your observations on the servicing of a specific automobile electrical system.
6. Write a Slip test (Objective type)
7. The faculty is advised to conduct an identification parade of auto electrical components and conduct a viva-voice examination.
8. Study a specific model of electric vehicle and submit a report.
9. Procure the components of a lead acid battery and share your knowledge with your classmates.
10. Prepare a wiring circuit of a functionary system of a four wheeler as a micro project.

SUGGESTED LEARNING OUTCOMES:**On completion of the course of instruction the student shall be able to**

- 1.0 Comprehend the basic Electrical units of current, voltage, power, energy and Electro Magnetic induction
- 1.1 State and explain Ohm's Law
- 1.2 Differentiate between series and parallel electrical circuits
- 1.3 Compute the resistance of a conductor for a given length, area and resistivity.
- 1.4 State the Faraday's laws of electromagnetic induction.
- 1.5 State Fleming's Right hand rule
- 1.6 State Lenz's law
- 1.7 Distinguish between self and mutual inductance.
- 1.8 Calculate inductance of a given coil.
- 1.9 State the Energy stored in a magnetic field (only formula)
- 1.10 Describe the Lifting power of a magnet (no derivation)
- 2.0 Explain the need of a battery in an automobile
- 2.1 Classify the batteries
- 2.2 List different types of batteries used in automobile
- 2.3 Explain the Constructional features of a lead acid battery
- 2.4 Narrate the Constructional details of a Li-ion battery
- 2.5 Write the Chemical reaction during charging and discharging in a lead acid battery
- 2.6 Write the specifications of a battery based on Ampere-hour efficiency and Watt-hour efficiency.
- 2.7 Explain the procedure for Charging of Lead acid and Li-ion batteries, including trickle charging.

- 2.8 Narrate the Battery tests – Voltage test, Specific gravity test, High discharge test, Cadmium cells test Care and maintenance of Lead acid battery and Li-ion battery.
- 2.9 Explain the working of a Fuel cell.

- 3.0 Narrate the Need of Non polluting or Zero Emission Vehicles
- 3.1 Give the Introduction to Electric drive Vehicles
- 3.2 Draw the Layout of a typical Electric Vehicle
- 3.3 List of classify the types of Electric vehicles based on the types of drive motors used
- 3.4 Enumerate the types of drive motors used for Electric vehicles
- 3.5 Explain the procedure for Electronic control of the drive motors
- 3.6 Write the need of Hybrid Vehicles and Types of hybrid drives.

- 4.0 Comprehend the Automobile Electrical wiring systems, Lighting and Accessories
- 4.1 Explain the constructional details of sealed beam head light.
- 4.2 Describe the adjustment of head lights.
- 4.3 Draw neat sketch of wind screen wiper and explain in brief
- 4.4 Explain in brief the working of horn
- 4.5 Explain the working principles horn, wind screen wiper, Traffic indicator, flash type directional signals, fuel and oil and water gauge circuits.

- 5.0 Explain the need of a D.C Motor and Generator in an automobile.
- 5.1 Explain the Constructional details of D.C Machine.
- 5.2 Comprehend the procedure for Conversion of D.C Motor into Generator and Vice-versa
- 5.3 Explain the Characteristics of a D.C series motor
- 5.4 Explain need for self starter in an automobile.
- 5.5 Recite the Conditions required for self starter during starting of an engine
- 5.6 Explain why a series motor is used as self starter
- 5.7 Describe the Constructional details of self starter and solenoid switch
- 5.8 Explain the working of Starter Drive mechanisms Bendix, Folio through, Lucas etc.,
- 5.9 Comprehend the working of over running clutch drive.
- 5.10 Explain the Working Principle and constructional details of an Alternator

- 5.11 Recite the Limitations of D.C. Generator and Advantages of using alternator
- 5.12 Identify the Need Rectification of AC to DC
- 5.13 Explain the working of Half –wave rectifier and Full-wave rectifier
- 5.14 Narrate Basic Principles of charging using block or line diagram
- 5.15 Explain the Need of voltage regulation and working of an electronic voltage regulator.

- 6.0 List the Requirements of ignition system
- 6.1 Write Types of ignition system
- 6.2 Constructional details and working principle of coil ignition systems with circuit Diagram.
- 6.3 Know the Function of each component and their constructional details of a coil ignition System.
- 6.4 Identify the importance of Ignition Timing: Advancing and Retarding of ignition timing-Automatic advance mechanisms
- 6.5 Specify a spark plug
- 6.6 List Types of spark plugs
- 6.7 Explain the Working of Electronic ignition and Transistorized (CDI) ignition systems
- 6.8 List the Advantages over conventional ignition system.

CO and PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching periods
CO1	Summarize the fundamentals of Electrical Engineering	R/U	1,2	14
CO2	Comprehend the working, care and maintenance of an automobile battery.	R/U/A	1,2	08
CO3	Explain the function of each component in charging system of a vehicle	R/U/A	1,2	12
CO4	Illustrate the working of automobile Ignition system	R/U/A	1,2	08
CO5	Elaborate the working of starting system used in a vehicle.	R/U/A	1,2	10
CO6	Interpret the components of lighting and accessories of an automobile.	R/U/A	1,2	08

OVER VIEW OF STUDENT EVALUATION

Mid Semester Examination-1

Max. Marks: 20

S.No	Unit	R	U	A	Remarks
1	Unit-I	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Mid Semester Examination-2

Max. Marks: 20

S.No	Unit	R	U	A	Remarks
1	Unit-III	1, 2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3, 4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

Internal Assessment

Max. Marks: 20

Type of test	Unit	Marks allotted	Remarks
Slip Test 1	1 and 2	5	2 Essay Questions out of 3 Questions
Slip Test 2	3 and 4	5	2 Essay Questions out of 3 Questions
Assignment	Any one Unit	5	Different group assignments of Higher order Questions that develop problem solving skills and critical thinking should be given
Seminar		5	Any topic approved by the faculty

MID SEM –I
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING

Time: 1hr

Max Marks: 20

PART-A

Short answers questions

Answer All Questions. Each question carries ONE mark

4 x1 = 4 Marks

1. Define a) Voltage b) Resistance?
2. State ohm's law?
3. What is the necessity of Battery in an Automobile?
4. List the types of Batteries?

PART-B

Essay type questions

Answer any TWO Questions by choosing either (a) or (b) from each question.

Each question carries THREE marks

2 x 3 = 6 Marks

5. (a) State the Faraday's laws of electromagnetic Induction?
5. (b) State Fleming's Right hand rule?

6. (a) State the ampere hour and watt-hour efficiency of the battery?
6. (b) List and explain different methods of charging of battery?

PART-C

Application type questions

Answer any TWO Questions by choosing either (a) or (b) from each question.

Each question carries THREE marks

2 x 3 = 6 Marks

7. (a) Describe the working of PNP Transistor?
7. (b) State the use of Transistor as an amplifier?
8. (a) Explain any one method of testing of a lead acid battery for fully charged and discharged condition?
8. (b) Explain the care and maintenance of an automobile battery ?

MID SEM –II
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING

Time: 1hr

Max Marks: 20

PART-A

Short answers questions

Answer All Questions. Each question carries ONE marks

4 x 1 = 4 Marks

1. What is the need of non polluting vehicles?
2. List types of electric vehicles?
3. What is the purpose of headlights?
4. What is navigation system?

PART-B

Essay type questions

Answer any TWO Questions choosing either (a) or (b) from each question.

Each question carries FIVE Marks

2 x 3 = 6 Marks

5. (a) Draw layout of electric vehicle?
5. (b) Explain the need of hybrid vehicle?
6. (a) Explain construction of sealed beam headlight?
6. (b) Explain electronic engine speed measurement?

PART-C

Application type questions

Answer any TWO Questions choosing either (a) or (b) from each question.

Each question carries FIVE Marks

2 x 10 = 20 Marks

7. (a) Explain any one type of electric vehicle?
7. (b) Explain hybrid vehicle?
8. (a) Explain oil pressure measurement?
8. (b) Explain electronic vehicle speed measurement?

**SEMESTER END EXAMINATION
MODEL QUESTION PAPER
C-18, DIPLOMA IN AUTOMOBILE ENGINEERING**

Time: 2hrs

Max Marks: 40

PART-A

Answer all Questions. Each question carries One mark

8 x 1 = 8 Marks

1. Define power?
2. What is the need of non polluting vehicles?
3. State the need of a D.C machine in an automobile?
4. What is the function of condenser in ignition system?
5. State the need for series motor as self starter?
6. Mention the advantages of using alternator?
7. State the specifications of a spark plug?
8. List the types of spark plugs?

PART-B

Answer any FOUR questions choosing either (a) or (b) from each question.

4 x 3 = 12 Marks

9. (a) Explain about care and maintenance of Lead acid battery?
9. (b) Explain the need for self starter?
10. (a) Explain about fuel quantity measuring system?
10. (b) Mention the requirements of ignition system?
11. (a) Explain any one type of starter drive mechanism?
11. (b) Explain the need of voltage regulation?
12. (a) Explain ignition timing?
12. (b) Mention the advantages of electronic ignition system?

PART-C

Answer any FOUR questions choosing either (a) or (b) from each question.

4 x 5 = 20 Marks

13. (a) Explain the constructional features of a lead acid battery?
13. (b) Explain the Constructional details of self-starter
14. (a) Explain any one type of electric vehicle?
14. (b) Explain working principle of coil ignition systems with circuit diagram?
15. (a) Explain working Principle of an Alternator ?
15. (b) Explain constructional details of D.C Machine?
16. (a) Explain Working of Electronic ignition?
16. (b) Explain constructional details of ignition coil ?

Automobile Chassis and Body Engineering lab

Course Title :	Automobile Chassis and Body Engineering lab	Course Code:	18A-406P
Semester:	IV	Course Group:	Core
Teaching Scheme in Periods (L:T:P):	7.5:7.5:30	Credits:	1.5
Methodology:	Lecture + Assignments	Total Contact periods:	45 Periods
Continuous Internal Evaluation (CIE):	20+20+20 = 60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE:

Unit No	Experiment title	Periods	Criteria for SEE			Marks weightage	% of Weightage
			Handling	Manipulation	Precision		
1.	Automobile steering system	3	10	10	20	40	100
2.	Braking system	3	10	10	20	40	100
3.	Independent suspension system	3	10	10	20	40	100
4.	Air suspension system	3	15	15	10	40	100
5.	Rigid axle suspension system	3	15	15	10	40	100
6.	Anti skid braking system	3	15	15	10	40	100
7.	Body denting practice	3	10	10	20	40	100
8.	Body panel riveting.	3	10	10	20	40	100
9.	Manual & Power window mechanism.	3	10	10	20	40	100
10.	Door locking system	3	10	10	20	40	100
11.	Wheel Balancing	3	10	10	20	40	100
12.	Computerised wheel aligner	3	10	10	20	40	100
13.	Painting of automobiles	6	10	10	20	40	100
14.	Tests	3 Periods					
	Total	45 Periods					

Prerequisites:

This course requires the basic knowledge of Basic Automobile Engineering Laboratory

Course Outcomes:

At the end of the course the student should be able to:

CO1 :	Perform sequential dismantling and assembling of steering, braking, and suspension and study the parts.
CO2 :	Understand sequential procedure of denting practice of a car body.
CO3 :	Comprehend the painting operation of a car body.
CO4 :	Perform the procedures for wheel alignment and wheel balancing.

Course Contents:**LIST OF EXPERIMENTS**

1. Dismantle the given steering system of an automobile and study the working of the system.
2. Study the Braking system of the given automobile and report the type and its working.
3. Identify the given Independent suspension system of an automobile and report the type of suspension system and its working.
4. Study the given Air suspension system in automobile and report on its working.
5. Identify the given Rigid axle suspension system of the automobile and report on its working and lubrication.
6. Study the working of anti skid braking system of the given automobile and submit a report on its constructional details and working.
7. Identify the special tools used for body dent removal and practice removal of dent on a vehicle body.
8. Practice riveting of vehicle body panels and study the tools and equipment used.
9. Study the Manual and Power window regulating mechanisms of given vehicles and submit your observations on construction and working.
10. Comprehend the door locking system used in the given automobile and submit your report.
11. Dismantle the wheels from the vehicle and balance all the wheels of the vehicle.
12. Conduct wheel alignment for the given automobile on the given computerised wheel aligner.
13. Study the given spray painting gun and report on its construction and working.
14. Practice spray painting process and report on the techniques required for proper painting.

The key competencies to be achieved by the student:

S.No	Title of the Experiment	Key competencies expected	Competencies expected
1	Automobile steering systems	(a) Identify the tools and gauges required (b) dismantling and assembling (c) Servicing and adjustments.	(a) Understand the construction and working (b) Understand the steering systems used in different types of vehicles (c) Understand the grades of oils used in automobile steering systems.
2	Braking systems of automobiles	(a) Identify the tools and gauges required (b) dismantling and assembling (c) Servicing and adjustments (d) Brake bleeding.	(a) Understand the construction and working (b) Understand the braking systems used in different types of vehicles (c) Understand the grades of oils used in automobile brake systems.
3	Independent suspension systems of automobiles	(a) Identify the tools and gauges required (b) Dismantling and assembling (c) Servicing and adjustments	(a) Understand the construction and working (b) Understand the independent Suspension systems used in different types of vehicles.
4	Air suspension system in automobile	(a) Identify the tools and gauges required. (b) Dismantling and assembling. (c) Servicing and adjustments.	(a) Understand the construction and working (b) Understand the air suspension systems used in different types of vehicles.
5	Rigid axle suspension system of automobiles	(a) Identify the tools and gauges required (b) Dismantling and assembling (c) Servicing and adjustments.	(a) Understand the construction and working (b) Understand the rigid axle suspension systems used in different types of vehicles.
6	Anti skid braking system	(a) Identify the tools and gauges required (b) Dismantling and assembling (c) Servicing and adjustments.	(a) Understand the construction and working.
7	Body denting practice	(a) Identify the tool required for body denting repairs (b) Able to repair body repairs.	(a) Able to inspect the body defects
8	Body components riveting and welding.	(a) Identify the tool required For body riveting. (b) Able to riveting the body panels.	(a) Able to inspect the body riveted joints.
9	Manual & power window mechanism and door locks.	(a) Identify the tools and gauges required (b) Dismantling and assembling (c) Servicing and adjustments.	(a) Understand the construction and working.
10	Computerised wheel	(a) Identify the equipments,	(a) Understand the various

	aligner and wheel balancer	tools and gauges required (b) Able to carry out the wheel balancing and wheel alignment methods on the vehicle with the help of equipment.	parameters used in wheel alignment and balance (b) Able to understand the effects of miss alignment and Imbalance of wheel.
11	Paint booth and painting of automobiles.	(a) Identify the equipments, tools and different paints required (b) Able to carry out the painting work in the paint booth. (c) Able to carry out the complete body painting work including spray painting work.	(a) Understand the advantage of paint booth (b) Understand the uses of different kinds of paints and painting materials.

Suggested Student Activities:

- Visit service station/browse on internet and Collect the information about type of steering systems, brakes, suspension of four wheelers.
- Case study of different car bodies.
- Student inspects the available equipment in the Laboratory to identify the chassis components.
- Visit nearby workshop / service station to familiarize the denting of different parts of vehicle bodies and painting procedure.
- Student should watch video lessons related to the latest trends in the course.
- Student should participate in Quiz
- Student should participate in Group discussion
- Surprise test

Suggested E-Learning references:

- www.learnengineering.org
- www.sae.org
- www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO
CO1	Perform sequential dismantling and assembling of steering, braking, and suspension and study the parts.	U/A	1,2,3,8,10
CO2	Understand sequential procedure of denting practice of a car body.	R/U	1,2,3,8,10
CO3	Comprehend the painting operation of a car body.	U	1,2,3,8
CO4	Perform the procedures for wheel alignment and wheel balancing.	U/A	1,2,3,8

(Model Question Paper)
Mid Sem –I, II and Semester End Examination
Subject Name: **Automobile Chassis and Body Engineering Laboratory**
Subject Code: **18A-406P**

Time: 3 Hour

Total Marks: 20 / 20 /40 M

Instructions:

- I. *The examiner is instructed to test the performance of the candidate by adopting lottery system for allocation of the experiment in the list of experiments performed in the laboratory.*
- II. *Answer any One of the following*
- III. *All questions carry equal marks*

1. Dismantle the given steering system of an automobile and study the working of the system.
2. Study the Braking system of the given automobile and report the type and its working.
3. Identify the given Independent suspension system of an automobile and report the type of suspension system and its working.
4. Study the given Air suspension system in automobile and report on its working.
5. Identify the given Rigid axle suspension system of the automobile and report on its working and lubrication.
6. Study the working of anti skid braking system of the given automobile and submit a report on its constructional details and working.
7. Identify the special tools used for body dent removal and practice removal of dent on a vehicle body.
8. Practice riveting of vehicle body panels and study the tools and equipment used.
9. Study the Manual and Power window regulating mechanisms of given vehicles and submit your observations on construction and working.
10. Comprehend the door locking system used in the given automobile and submit your report.
11. Dismantle the wheels from the vehicle and balance all the wheels of the vehicle.
12. Conduct wheel alignment for the given automobile on the given computerised wheel aligner.
13. Study the given spray painting gun and report on its construction and working.
14. Practice spray painting process and report on the techniques required for proper painting.

Automobile Servicing and Maintenance Laboratory

Course Title :	Automobile Servicing and Maintenance Laboratory	Course Code	18A-407P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods (L:T:P)	7.5:7.5:30	Credits	: 1.5
Methodology	Lecture + Assignments	Total Contact periods	: 45 periods
CIE	60 Marks	SEE	:40 Marks

Course Content and Blue Print of Marks for SEE:

Unit No	Unit name	Hours/ Periods	Questions for SEE			Marks Weightage	%Weightage
			Handling	Manipulation	Precision		
1.	Decarburization	3	10	10	20	40	100
2.	Cylinder Reboring	3	10	10	20	40	100
3.	Cylinder Honing.	3	10	10	20	40	100
4.	Valve seat cutting, grinding and refacing.	3	15	15	10	40	100
5.	Line boring	3	15	15	10	40	100
6.	Crank shaft grinding	3	15	15	10	40	100
7.	Brake drum turning	3	10	10	20	40	100
8.	Brake shoe riveting	3	10	10	20	40	100
9.	Fuel injection pump testing - phasing and calibration	3	10	10	20	40	100
10.	Review of Experiments	9 Periods					
11	Test I	3 Periods					
12	Test II	3 Periods					
13	Revision test	3 Periods					
Total		45 Periods					

Pre requisites:

This course requires the basic knowledge of Automobile Servicing and Maintenance Laboratory

Course Outcomes:

At the end of the course student should be able to:

CO1 :	Obtain awareness about inspection, reporting on the condition, servicing, repair, reconditioning of various engine components.
CO2 :	Understand the sequential operations in brake servicing, repair and reconditioning.
CO3 :	Perform Phasing and Calibration operations of FIP.

The competencies and key competencies to be achieved by the student

S. No.	Name Of The Experiment	Key Competencies	Competencies
1	Decarbonisation	Scrape Engine components with hand scraper	- State various decarbonising methods. - Identify suitable tools - Wet the components with kerosene / diesel - Scrape Engine components with hand scraper - Use hand scraper unidirectionally - Wipe the components with cotton cloth.
2	Cylinder Reboring	- Measure ovality and taper using dial bore gauge - Align the cylinder block with cylinder reboring machine. - Check roundness of cylinder	- Identify the tools required for dismantling Engine. - measure ovality and taper using dial bore gauge - Calculate depth of cut. - Align the cylinder block with cylinder reboring machine. - Select suitable speed , feed and depth of cut.
3	Cylinder Honing.	- Align the cylinder block with honing machine. - Obtain smooth and criss - cross hatch pattern.	- Identify the tools required. - Select the required hone. - Select suitable speed , feed and depth of cut - Align the cylinder block with honing machine. - Obtain smooth and criss- cross hatch pattern.
4	Valve seat cutting, grinding and refacing	- Check the condition of valve face and seat. - Align valve with grinding wheel. - Check concentricity for valve face and seat.	- State different grades of emery paste. - Check the condition of valve face and seat. - Apply lapping compound on valve seat and valve face. - Align valve with grinding wheel. - Check concentricity for valve face and seat.
5	Line – boring	- Align Main journal with line boring machine. - Check for correctness of bearing journals.	- Measure diameter of journal using micrometer. - Align Main journal with line boring machine. - Select suitable speed , feed and depth of cut - Check for correctness of bearing journals.
6	Crank shaft grinding	- Align crank pin with grinding wheel. - Check roundness of crank pin.	- Measure diameter of crank pin using micrometer - Calculate depth of cut. - Align crank pin with grinding wheel. - Select suitable speed , feed and depth of cut - Check correctness.

7	Brake drum turning	• Check ovality and taper. • Mount brake drum with suitable cones. • Check roundness of brake drum	• Identify tools required for removing brake drum. • Measure diameter of brake drum for ovality and taper • Calculate depth of cut. • Mount brake drum with suitable cones • Select suitable speed , feed and depth of cut.
8	Brake shoe riveting	• Align new brake liner on brake shoe • Fix brake liner to brake shoe using rivets • Check the thickness of liner.	• Identify the tools required for removing lining from brake shoe. • State the procedure of riveting. • Remove the old rivets • Align new brake liner on brake shoe • Fix brake liner to brake shoe using rivets.
9	Fuel injection pump testing - phasing and calibration.	• Mount F.I.P. on test bench. • Adjust controls of test bench. • Compare fuel output with manufacturer specifications. • Check fuel injection timing	• State various specialized tools required. • Identify controls of F.I.P. test bench. • Mount F.I.P. on test bench. • Adjust controls of test bench. • Compare fuel output with manufacturer specifications. • Check fuel injection timing.

Suggested E-Learning references:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		CL	Linked PO
CO1	Obtain awareness about inspection, reporting on the condition, servicing, repair, reconditioning of various engine components.	R/U/A	1,2,3,8,10
CO2	Understand the sequential operations in brake servicing, repair and reconditioning.	U/A	1,2,3,8,10
CO3	Perform Phasing and Calibration operations of FIP.	U/A	1,2,3,8

Suggested Student Activities:

- 1) Visit service station and collect the information about different engine reconditioning equipment and submit a report with diagram.
- 2) Visit service station and collect the information about the brakes and FIP reconditioning equipment and submit a report with diagram.
- 3) Student inspects the available equipment in the Laboratory to identify the components.
- 4) Student should watch video lessons related to the latest trends in the course.
- 5) Student should participate in Quiz
- 6) Student should participate in Group discussion
- 7) Surprise test

(Model Question Paper)

Mid Sem –I&II

Subject Name: **Automobile Servicing and Maintenance Laboratory**

Subject Code: **18A-407P**

Time: 3 Hour

Total Marks: 20 M

1. Perform decarburization operation on a given multi cylinder engine?
2. Dismantle a given multi cylinder engine, inspect cylinder ovality, taper with the help of bore dial gauge and perform and re-boring operation on all cylinder and assemble the engine?
3. Perform cylinder honing operation with honing tool to the specifications?
4. Perform valve seat cutting, grinding and refacing operations on a given cylinder head and engine valves?
5. Perform line boring operation for a given multi cylinder engine on line boring machine with the help of special tools?
6. Perform crank shaft grinding operation for a given multi cylinder crank shaft on a crank shaft grinding machine with the help of special tools?
7. Perform brake drum truing operation for a given brake drum on brake drum lathe with the help of special tools?
8. Perform brake shoe riveting operation for a given brake shoe on brake shoe riveting machine?
9. Perform phasing and calibration operations for a given FIP on FIP Test bench and note the readings?

(Model Question Paper)

SEMESTER END EXAMINATION

Subject Name: **Automobile Servicing and Maintenance Laboratory**

Subject Code: **18A-407P**

Time: 3 Hour

Total Marks: 40 M

1. Perform decarburization operation on a given multi cylinder engine?
2. Dismantle a given multi cylinder engine, inspect cylinder ovality, taper with the help of bore dial gauge and perform and re-boring operation on all cylinder and assemble the engine?
3. Perform cylinder honing operation with honing tool to the specifications?
4. Perform valve seat cutting, grinding and refacing operations on a given cylinder head and engine valves?
5. Perform line boring operation for a given multi cylinder engine on line boring machine with the help of special tools?
6. Perform crank shaft grinding operation for a given multi cylinder crank shaft on a crank shaft grinding machine with the help of special tools?
7. Perform brake drum truing operation for a given brake drum on brake drum lathe with the help of special tools?
8. Perform brake shoe riveting operation for a given brake shoe on brake shoe riveting machine?
9. Perform phasing and calibration operations for a given FIP on FIP Test bench and note the readings?

STRENGTH OF MATERIALS AND FLUID MECHANICS LAB

Course Title :	STRENGTH OF MATERIALS AND FLUID MECHANICS LAB	Course Code	18A 408P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Hours :	:45 Periods
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the basic knowledge of behavior of materials and material testing, performance parameters.

Course Content and Blue Print of Marks for SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE			Marks weightage	% of Weightage
			Handling	Manipulation	Precision		
1.	Tensile test	3	10	10	20	40	100
2.	Compression test	3	10	10	20	40	100
3.	Impact test	3	10	10	20	40	100
4.	Hardness test	3	10	10	20	40	100
5.	Torsion test on shafts	3	10	10	20	40	100
6.	Deflection test on a simply supported beam	3	10	10	20	40	100
7.	Verification of Bernoulli's Theorem	3	10	10	20	40	100
8.	Venturi meter	3	10	10	20	40	100
9.	Orifice meter	3	10	15	15	40	100
10.	Reciprocating Pump	3	10	15	15	40	100
11.	Mid Sem -I	3	10	15	15	40	100
12.	Mid Sem -II	3	10	15	15	40	100
13.	Revision of Experiments	9	-	-	-	-	-
Total		45	10	15	15	40	100

Course Outcomes:

Course Outcome	
CO 1	Familiar with the controls and working of UTM.
CO 2	Determine the ultimate strength of given M.S Bar.
CO 3	Determine the impact strength of the given material.
CO 4	Find out the hardness number of the given material.
CO 5	Conduct torsion test on solid shaft or hollow shaft and calculate the torsional stiffness of the given shaft.
CO 6	Analyze the deflection test by point loads on metals and non metals

CO 7	Calculate the energy possessed by a fluid using Bernoulli's Theorem.
CO 8	Calculate the velocity head of a given pipe using Venturi meter
CO 9	Calculate the discharge of a given pipe using Orifice meter
CO 10	Calculate the efficiency of Reciprocating Pump

Course Contents:

- 1) Describe Universal Testing Machine and study the controls of the machine.
- 2) Determine the ultimate crushing strength given Mild steel bar
- 3) Determine the impact strength or toughness of material by conducting an impact test.
- 4) Calculate the hardness number of the given material on Brinell hardness testing machine.
- 5) Calculate modulus of rigidity by conducting torsion test on solid shaft and hollow shaft
- 6) Analyze the deflection occurred while loading on the metals and wooden block
- 7) Determination of Total energy of a given pipe by Bernoulli's Theorem.
- 8) Determination of velocity head by using Venturi meter.
- 9) Determination of discharge of a given pipe by using Orifice meter.
- 10) Determination of overall efficiency of a reciprocating pump

Suggested Student Activities:

- i) Demonstrate the controls of Universal Testing Machine.
- ii) Study and submit a report on the behaviour of at least three engineering materials with tensile loads.
- iii) Give a seminar on the significance of impact strength for engineering materials in automobile engineering.
- iv) Submit a report on properties of engineering materials and their significance.
- v) Debate on the applications of this course in the respective field of engineering.
- vi) Submit your views on studying fluid mechanics by automobile engineering students.
- vii) Demonstrate the application of Bernoulli's theorem in automobile engineering.
- viii) Seminar on any other type of hydraulic machine you know.

Course Outcome		Linked PO	Teaching Hours
CO 1	Familiar with the controls and working of UTM.	1,2,3,4,5,9,10	04
CO 2	Determine the ultimate strength of given M.S Bar.	1,2,3,4,5,9,10	04
CO 3	Determine the impact strength of the given material.	1,2,3,4,5,9,10	05
CO 4	Find out the hardness number of the given material.	1,2,3,4,5,9,10	05
CO 5	Conduct torsion test on solid shaft or hollow shaft and calculate the Torsional stiffness of the given shaft.	1,2,3,4,5,9,10	05
CO 6	Analyze the deflection test by point loads on metals and non metals	1,2,3,4,5,9,10	04
CO 7	Calculate the energy possessed by a fluid using Bernoulli's Theorem.	1,2,3,4,5,10	05
CO 8	Calculate the velocity head of a given pipe using Venturi meter	1,2,3,4,5,10	05
CO 9	Calculate the discharge of a given pipe using Orifice meter	1,2,3,4,5,10	04
CO 10	Calculate the efficiency of Reciprocating Pump	1,2,3,4,5,10	04

State Board of Technical Education and Training, Telangana

DAE IV-Semester Practical Examination MID-1

Corse Code: 18A408P

Duration: 1hour

Course Name: STRENGTH OF MATERIALS LAB

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

(iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on Izod testing machine.
4. Determine the Brunel hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the Shear Force and Bending Moment Diagram and also Find the deflection of metal strip and wooden block.

State Board of Technical Education and Training, Telangana
DAE-IV Semester practical Examination MID-2

Course Code: 18A408P

Duration: 1 hour

Course Name: FLUID MECHANICS LAB

Max.Marks: 20

Instructions to the Candidate:

(i) Answer any One of the following Questions.

(ii) Record the results on a graph sheet if required, and conclude your observation of the experiment

(iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Determine the various energies in a given pipe by using Bernoulli's Theorem.
2. Determine the velocity head, Coefficient of discharge of a given Venturi meter.
3. Determine the Discharge in a given pipe of Orifice meter.
4. Calculate the efficiency of Reciprocating Pump.

State Board of Technical Education and Training, Telangana
END SEM EXAMINATION

Course Code: 18A408P

Course Name: STRENGTH OF MATERIALS AND FLUID MECHANICS LAB

Duration: 2 hours

Max.Marks: 40

Instructions to the Candidate:

(i) Answer any One of the following Questions.

(ii) Record the results on a graph sheet if required, and conclude your observation of the experiment

(iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brunel hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the Shear Force and Bending Moment Diagram and also find the deflection of metal strip and wooden block.
7. Determine the various energies in a given pipe by using Bernoulli's Theorem.
8. Determine the velocity head, Coefficient Of discharge of a given Venturi meter.
9. Determine the Discharge in a given pipe of Orifice meter.
10. Calculate the efficiency of Reciprocating Pump.

Automobile Electrical Laboratory

Course Title :	Automobile Electrical Laboratory	Course Code	18A409P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:7.5:30	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Hours :	:45Periods
CIE	60 Marks	SEE	40 Marks

Course Content and Blue Print of Marks for SEE:

Unit No	Unit name	Periods	Criteria and weightage for SEE			Max. Marks	%Weightage
			Handling	Manipulation	Precision		
1	Identification of different Wires, cables and harnesses used in Automobiles.	3	10	10	20	40	100
2	Identification of different connectors, removing and providing insulation for circuits.	3	10	10	20	40	100
3	Testing of Power cords for Continuity.	3	15	15	10	40	100
4	Identifying A.C. and D.C. Power supply.	3	15	15	10	40	100
5	Preparation of Simple switch Control Circuit	3	10	10	20	40	100
6	Measurement of Current, Voltage and Resistance.	3	10	10	20	40	100
7	Calculation of Resistance of the given cable.	3	10	10	20	40	100
8	Identification of different switches and relays	3	10	10	20	40	100
9	Soldering Practice.	3	10	10	20	40	100
10	Perform different tests on a given battery and reporting on the condition.	3	10	10	20	40	100
11	Identify various components of Automobile electrical system.	3	10	10	20	40	100
Test-1		3 Periods					
Test-2		3 Periods					
Revision of Experiments		6 Periods					
Total		45 Periods					

Pre requisites:

This course requires the basic knowledge of Electrical Engineering.

Course Outcomes

CO1 :	Remove and Provide insulation of cables.
CO2 :	Measure the voltage, current and resistance of the given circuit.
CO3 :	Prepare Simple switch Control of Circuits.
CO4 :	Identify the various automobile electrical components
CO5:	Calculate the resistance using Ohms Law
CO6:	Prepare and Solder the given wires

Course Contents:**1.0 Practice the Identification different materials in Electrical Laboratory**

- 1.1 Identify Conductors.
- 1.2 Identify Insulators.
- 1.3 Identify Magnetic materials.
- 1.4 Identify different types of Wires and Cable.
- 1.5 Identify Wiring Harness.

2.0 Identification of different connectors, removing and providing insulation for circuits.

- 2.1 Remove the insulation for a given circuit.
- 2.2 Provide new insulation for a given circuit

3.0 Testing of Power cords for Continuity.

- 3.1 Identify different wiring (including colours) Connection of main wiring harness of an automobile and test its continuity.

4.0. Practice Identification A.C and D.C Power supply

- 4.1 Identify A.C or D.C power supply for a given machine.

5.0 Prepare Simple switch Control Circuit

- 5.1. Prepare a Simple switch Control Circuit.

6.0 Measure Voltage, Current, Resistance

- 6.1. Practice to Measure Voltage by using Voltmeter.
- 6.1. Practice to Measure Current by using Ammeter.
- 6.1. Practice to Measure Voltage, Current and Resistance by using Multimeter.

7.0 Calculate the Resistance of a cable

- 7.1 Practice to measuring Current, Voltage and calculate resistance using Ohms Law.

8.0 Practice the Identification of different switches and relays

- 8.1 Identify different fuses in a fuse box of an automobile.
- 8.2 Identify various types of relays of automobile electrical circuits.
- 8.3 Identify and test various types of sensors in an automobile by using Multi meter.

9.0 Perform Soldering Practice

- 9.1 Practice soldering for a given wires/ components.

10.0 Identify and Perform different tests on battery

- 10.1 Identify battery in the given automobile
- 10.2 Inspect the condition of battery.
- 10.3 Perform Specific gravity test of battery.
- 10.4 Perform Voltage test on battery.
- 10.5 Report on the condition of the battery
- 10.6 Charge the battery if necessary

11.0 Identify various components of Auto electrical system

- 11.1 Identify various components of a starter motor.
- 11.2 Identify various components of a dynamo/alternator.
- 11.3 Identify various components of a wiper motor.
- 11.4 Identify various components of a combination switch.
- 11.5 Identify various components of an ignition system.
- 11.6 Identify various components and their connections of instrument panel.

Suggested Student Activities:

- i. Visit service station and Collect the information about type of electrical components used in four wheelers.
- ii. Case study of major electrical components in Automobile.
- iii. Student inspects the available electrical components used in the Laboratory.
- iv. Visit nearby workshop / service station to familiarize the specifications of Automobile electrical components.
- v. Quiz
- vi. Group discussion
- vii. Surprise test

Suggested E-Learning references:

- 1. www.learnengineering.org
- 2. www.sae.org
- 3. www.nptel.ac.in

CO PO Mapping Matrix:

Course Outcome		Linked PO	Teaching Hrs
CO1 :	Remove and Provide insulation of cables.	1,2,3,10	03
CO2 :	Measure the voltage, current and resistance of the given circuit.	1,2,3,10	03
CO3 :	Prepare Simple switch Control of Circuits.	1,2,3,10	03
CO4 :	Identify the various automobile electrical components	1,2,3,10	03
CO5:	Calculate the resistance using Ohms Law	1,2,3,10	03
CO6:	Prepare and Solder the given wires	1,2,3,10	03

(Model Question Paper)

Mid Sem –I&II

Subject Name: **Automobile Electrical Laboratory**

Subject Code: **18A-409P**

Time: 3 Hour

Total Marks: 20 M

Instructions:

- IV. *The examiner is instructed to test the performance of the candidate by adopting lottery system for allocation of the experiment in the list of experiments performed in the laboratory.*
- V. *Answer any One of the following*
- VI. *All questions carry equal marks*

- 1) Identification of different Wires, cables and harnesses used in Automobiles.
- 2) Identification of different connectors, removing and providing insulation for circuits.
- 3) Testing of Power cords for Continuity.
- 4) Identifying A.C. and D.C. Power supply.
- 5) Preparation of Simple switch Control Circuit
- 6) Measurement of Current, Voltage and Resistance.
- 7) Calculation of Resistance of the given cable.
- 8) Identification of different switches and relays
- 9) Soldering Practice.
- 10) Perform different tests on a given battery and reporting on the condition.
- 11) Identify various components of Automobile electrical system.

(Model Question Paper)

SEMESTER END EXAMINATION

Subject Name: **Automobile Electrical Laboratory**

Subject Code: **18A-409P**

Time: 3 Hour

Total Marks: 40 M

Instructions:

- I. *The examiner is instructed to test the performance of the candidate by adopting lottery system for allocation of the experiment in the list of experiments performed in the laboratory.*
- II. *Answer any One of the following*
- III. *All questions carry equal marks*

- 1) Identification of different Wires, cables and harnesses used in Automobiles.
- 2) Identification of different connectors, removing and providing insulation for circuits.
- 3) Testing of Power cords for Continuity.
- 4) Identifying A.C. and D.C. Power supply.
- 5) Preparation of Simple switch Control Circuit
- 6) Measurement of Current, Voltage and Resistance.
- 7) Calculation of Resistance of the given cable.
- 8) Identification of different switches and relays
- 9) Soldering Practice.
- 10) Perform different tests on a given battery and reporting on the condition.
- 11) Identify various components of Automobile electrical system.

Advanced Communication Skills and Life Skills

Course Title	Advanced Communication Skills and Life Skills	Course Code	18 Common 410 P
Semester	IV	Course Group	Foundation
Teaching Scheme in Periods- L:T:P	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours	45 Periods (3 Periods per Week)
CIE	60 Marks	SEE	40 Marks

Rationale:

This course is designed to impart writing skills and employability skills to the students of diploma which will help them in obtaining and maintaining the employment.

Prerequisites:

This course requires the basic knowledge of vocabulary, grammar and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Outcomes:

Modules	At the end of the course the students will have the ability to:
Presentation Skills	Prepare a presentation. Use presentation aids effectively. Develop public speaking skills. Learn to make PowerPoint Presentations effectively. Present a Paper using appropriate body language.
Writing Reports	Learn kinds of reports. Learn the format of a report. Organise ideas. Develop essential vocabulary useful to write scientific and technical reports.
Interview Skills	Learn the techniques to face an interview. Learn the etiquette to communicate with employers. Learn the dos and don'ts of an interview.

	Learn the frequently asked questions in interviews. Use appropriate body language. Learn to face interviews telephonically. Gain the confidence to face an interview by attending mock interview.
Group Discussion	Learn the dos and don'ts of a Group Discussion. Participate in a Group Discussion in a healthy manner. Use effective non-verbal communication. Use appropriate phrases and expressions useful in a group discussion.
Workplace Awareness	Learn workplace etiquette. Identify the knowledge, skills and attributes useful at workplace. Build strong workplace relationships. Learn professional ethics. Understand gender equality at the workplace Develop a sense of responsibility towards the society.
Writing Skills Useful at Workplace	Learn various writing formats useful at workplace. Develop an ability to apply technical information in documentation. Revise and edit written documents effectively. Develop corresponding skills - learn the kinds of business letters - the format of a business letter. Learn effective e-mail writing skills. Learn Business Memos. Learn Notes and Narratives. Learn Forms and Applications. Prepare templates for different purposes.

	Prepare an agenda of a meeting. Prepare the minutes of a meeting. Prepare Notices / Circulars for various purposes. Prepare Press release.
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CO-PO Matrix

	Course Outcome		Linked PO
CO 1	Making effective presentations	R/U/A	1, 2, 3,4, 5,6,7,8,9,10
CO 2	Writing scientific and technical reports	R/U/A	1,2,3,4, 5,6,7,8,9,10
CO 3	Learn to face oral and telephonic interviews	R/U/A	1,2,3,4, 7,9,
CO 4	Learn to face group discussion	R/U/A	1,2,3,7,8,9
CO 5	Learn to write various formats useful at workplace	R/U/A	1,2,3,5,7,8,9,10
CO6	Learn workplace etiquette and ethics	R/U/A	1,2,3,7,8,9,10

Course Contents:

I. Presentation Skills	Duration: 6 periods
II. Writing Reports	Duration: 9 periods
III. Interview Skills	Duration: 9 periods
IV. Group Discussion	Duration: 6 periods
V. Workplace Awareness	Duration: 6 periods
VI. Writing Skills Useful at Workplace	Duration: 9 periods

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Evaluation Pattern:

I. Continuous Internal Examination:	60 Marks
a. Mid Sem - I	20 marks
Syllabus:	
i. Presentation Skills	
ii. Writing Reports	
b. Mid – II:	20 Marks
Syllabus:	
i. Interview Skills	
ii. Group Discussion	
c. Internal assessment:	20 marks
i. Seminars:	10 marks
ii. Assignments:	5 marks
iii. Lab record submission:	5 marks
II. Semester End Examination :	40 Marks
a. Write an essay on a given topic or participate in an activity:	15 Marks
b. Interview or Group Discussion:	15 Marks
c. <i>Viva Voce</i>	10 marks

References:

- Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.
- Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.
- Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
- Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
- Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D
- Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

<http://www.dailywritingtips.com/>

<http://www.englishdaily626.com/c-errors.php>

<http://www.owlnet.rice.edu/~cainproj/>

<http://www.thehumorsource.com/>

<http://www.indiabix.com/group-discussion/topics-with-answers/>

<http://networketiquette.net/>

<https://public.wsu.edu/~brians/errors>

<http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/15>

BOARD DIPLOMA EXAMINATION (C-18)

FOURTH SEMESTER COMMON-410P

ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - I

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write the guidelines for preparing a PowerPoint presentation.
2. How do you prepare yourself for presenting a technical paper?
3. Mention a few presentation aids and how do you use them effectively?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. Write the format of a report and describe it.
5. Write a report on the accident you have seen recently.
6. Give the outline of a project report and describe it.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER COMMON-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - II

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. What are the dos and don'ts for a formal interview?
2. What at least ten frequently asked questions in a formal interview?
3. How do you prepare for a telephonic interview?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. What are the dos and don'ts of a group discussion?
5. Mention some phrases and expressions commonly used in a group discussion.
6. Write a short paragraph on the steps you take while participating in a group discussion.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER 18 COMMON-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
SEMESTER END EXAM

Time : 3 Hours

Total Marks: 40 Marks

Part – A

10 marks

Instruction: Pick any one question from the given lot.

1. Prepare the outline of a project report and describe it.
2. Write the guidelines for preparing the slides of a PowerPoint presentation.
3. Write the minutes of the meeting conducted at the Principal's chamber to conduct the annual day celebrations. Prepare the agenda of the annual day celebrations.
4. Describe the workplace etiquette.
5. Prepare a press note for the '*Job Mela*' which is going to be conducted at your institute.

Part – B

15 marks

6. Interview / Group Discussion

Part – C

15 marks

7. *Viva Voce*

Skill Up gradation

Course Title :	Skill Up gradation	Course Code:	SKD
Semester:	IV	Course Group:	Core
Teaching Scheme in Hrs:	15:90 (Instructions and Activity)	Credits:	2.5
Methodology:	Seminar+ G.D+ Activity	Total Contact Periods:	105 Periods
CIE:	By Rubrics (Pass or Fail)	SEE	Rubrics

Course Content and Blue Print of Marks for SEE:

The performance of the candidate is ascertained using rubrics in every skill development activity, No marks are awarded only the Pass or Fail is indicated in the final evaluation.

Pre requisites:

This course requires basic communication skills in English and general awareness of all the courses of the discipline.

Course Outcomes

At the end of course student should be able to:

CO1 :	Ability to apply basic and discipline specific knowledge to solve core and/or applied engineering problems.
CO2 :	Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
CO3 :	Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.
CO4:	Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
CO5:	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
CO6:	An ability to communicate effectively.
CO7:	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the context of technological changes.
CO8:	Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

SKILL UPGRADATION IN - ADVANCED ENGINEERING MATHEMATICS (18A-401F)

ACTIVITY ASSESSMENT Steps

- 1. Mathematical concepts**
- 2. Procedure**
- 3. Explanation**
- 4. Working with others**
- 5. Mathematical errors**

ACTIVITIES

1. List out the methods to find complimentary function and explain to solve a homogeneous Linear Differential equations.

2. List out the methods to find Particular integrals and explain the solution of Non-homogeneous Linear Differential equations.

3. Write short notes on expansion of simple functions as a Fourier series.

4. Prepare a presentation on Laplace Transforms of simple functions.

5. Prepare a presentation on Inverse Laplace Transforms of simple functions.

6. List out different applications of Laplace Transforms.

7. Solve the Differential equation by applying Laplace Transformations.

CO / PO - MAPPING OF ACTIVITIES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	1			1	3	2	3
CO2	3	2	2	1			1	3	2	3
CO3	3	2	2	1			1	3	2	3
CO4	3	2	2	1			1	3	2	3
CO5	3	2	2	1			1	3	2	3
CO6	3	2	2	1			1	3	2	3
CO7	3	2	2	1			1	3	2	3

Rubrics for Activity assessment

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Procedures	Typically, uses an efficient and effective procedure to solve the problem(s).	Typically, uses an effective procedure to solve the problem(s).	Sometimes uses an effective procedure to solve problems, but does not do it consistently.	Rarely uses an effective procedure to solve problems.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively	Student was an engaged partner but had trouble listening to others and/or working	Student cooperated with others, but needed prompting to stay on-task.	Student did not work effectively with others.

	throughout lesson.	cooperatively.		
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.

PASS SCORE: 2.5

STUDENT ASSESSMENT by RUBRICS

S.NO	PIN	CO1	CO2	CO3	CO4	CO5	CO6	CO7	AVERAGE

Suggested Student Activities in Automobile Chassis and Body Engineering(18A-402C):

1. Student visits Library to refer to Automobile Manuals to find the various steering systems used in automobiles.
2. Student inspects the available equipment in the Laboratory to identify the different chassis components and vehicle body components.
3. Students to browse the online latest developments related to the course.
4. Student should observe the different types vehicles in respect of bodies and present a seminar or publish a paper.
5. Student should visit the service station and identify the different types steering mechanisms and present a paper.
6. Quiz
7. Group discussion
8. Surprise test

Suggested E-Learning references in Automobile Chassis and Body Engineering:

1. www.learnengineering.org
2. www.sae.org
3. www.nptel.ac.in

Suggested Student Activities in Strength of Materials and Fluid Mechanics (18A-403C):

- 1) Draw Stress/Strain diagrams for different types of materials and analyze the behavior of these metals.
- 2) Demonstrate the measurement of pressure head using Pitot tube.
- 3) Sketch the bending and deflection diagrams under single point load on a cantilever, simply supported beam and overhanging beam.
- 4) Visit any hydraulic power plant and submit a study report.

- 5) Verify Bernoulli's using a Pitot tube in a pipe flow and submit a report.
- 6) Debate on the applications of Strength of materials in the respective field of engineering.
- 7) Seminar on any other type of hydraulic machine you know

Suggested E-Learning references in Strength of Materials and Fluid Mechanics:

- ✓ Simple Stresses and Strains:
<https://www.toppr.com/guides/physics/mechanical-properties-of-solids/stress-and-strain/>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/1>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/2>
- ✓ Fundamental Concepts of Fluid mechanics
<https://nptel.ac.in/courses/112105171/3>
- ✓ Geometrical Properties of sections
<https://nptel.ac.in/courses/112103108/15>
- ✓ Flow of Fluids
<https://nptel.ac.in/courses/112105171/1#>
<https://nptel.ac.in/courses/112105171/2#>
<https://nptel.ac.in/courses/112105171/3#>
- ✓ Shear Force and Bending Moment Diagrams
<https://nptel.ac.in/courses/105106172/53>
to
<https://nptel.ac.in/courses/105106172/77>
- ✓ Hydraulic Machinery
<https://www.youtube.com/watch?v=kEqPV4YUSfg>
- ✓ Hydraulic Press
<https://www.youtube.com/watch?v=AtQ1oh09Uyo>
- ✓ Hydraulic Ram
<https://www.youtube.com/watch?v=GsglThL38Mc>
- ✓ Hydraulic Jack
<https://www.youtube.com/watch?v=iXXt2oGXvmo>
- ✓ www.nptel.ac.in
- ✓ www.wikipedia.org

Suggested Student Activities in Automobile Servicing and Maintenance(18A-404C):

1. Student visits Library to refer to Manual of Automobile to find their maintenance schedules.
2. Student inspects the available reconditioning equipment in the Laboratory to identify the components.
3. Student inspects the available tools and equipments in the Laboratory and familiarize.
4. Quiz
5. Group discussion
6. Surprise test

Suggested E-Learning references in Automobile Servicing and Maintenance:

- www.learnengineering.org
- www.sae.org
- www.nptel.ac.in

Suggested Student Activities for Automobile Electrical Systems(18A-405C):

11. Quiz on the fundamentals of electrical engineering.
12. Visit a substation and submit a report.
13. Give a seminar on the working of any one component of Automobile Electrical Systems.
14. Submit a report on the electrical systems data of an automobile.
15. Visit a service center near to you and submit a report on your observations on the servicing of a specific automobile electrical system.
16. Write a Slip test (Objective type)
17. The faculty is advised to conduct an identification parade of auto electrical components and conduct a viva-voice examination.
18. Study a specific model of electric vehicle and submit a report.
19. Procure the components of a lead acid battery and share your knowledge with your classmates.
20. Prepare a wiring circuit of a functionary system of a four wheeler as a micro project.

Suggested E Learning References for Automobile Electrical systems:

11. Fundamentals of Electrical Engineering
https://www.youtube.com/watch?v=3TR_DS_7z2w&list=PLbRMhDVUMngfdEXVcdf_ijk2Eub-UHs_y
12. Ohm's Law etc.,
https://www.youtube.com/watch?v=bT1Ko-1_1nY
13. Types of batteries
<https://www.youtube.com/watch?v=EfgDShcgKvM>
14. Li Ion Battery
https://www.youtube.com/watch?v=5X2YYNQWm_k
<https://www.youtube.com/watch?v=Jiyw1zUQIA>
<https://www.youtube.com/watch?v=kqR7MihP5k4>
<https://www.youtube.com/watch?v=4ONdsVs6yS0>
15. Charging and Starting Circuits of a vehicle
<https://www.youtube.com/watch?v=EthVliXON4o>
https://www.youtube.com/watch?v=k7LYOC_AXI4
16. Working of charging system
<https://www.youtube.com/watch?v=VOGu2Fft7WQ>
17. Modern vehicle charging system
<https://www.youtube.com/watch?v=oxUbXtsY7cA>
18. How does an Ignition system of a car work
<https://www.youtube.com/watch?v=W94iksaQwUo>
19. Magneto Ignition system
https://www.youtube.com/watch?v=z4xkPyQn_ZU

20. Spark Plug

<https://www.youtube.com/watch?v=742Ml4oD3s4>

Suggested Student Activities in Automobile Chassis and Body Engineering Laboratory

(18A-406P):

- i. Visit service station/browse on internet and Collect the information about type of steering systems, brakes, suspension of four wheelers.
- ii. Case study of different car bodies.
- iii. Student inspects the available equipment in the Laboratory to identify the chassis components.
- iv. Visit nearby workshop / service station to familiarize the denting of different parts of vehicle bodies and painting procedure.
- v. Student should watch video lessons related to the latest trends in the course.
- vi. Student should participate in Quiz
- vii. Student should participate in Group discussion
- viii. Surprise test

Suggested Student Activities in Automobile Servicing and Maintenance Laboratory

(18A-407P):

- 1) Visit service station and collect the information about different engine reconditioning equipment and submit a report with diagram.
- 2) Visit service station and collect the information about the brakes and FIP reconditioning equipment and submit a report with diagram.
- 3) Student inspects the available equipment in the Laboratory to identify the components.
- 4) Student should watch video lessons related to the latest trends in the course.
- 5) Student should participate in Quiz
- 6) Student should participate in Group discussion
- 7) Surprise test

Suggested Student Activities in Strength of Materials and Fluid Mechanics Laboratory

(18A-408P):

- i) Demonstrate the controls of Universal Testing Machine.
- ii) Study and submit a report on the behaviour of at least three engineering materials with tensile loads.
- iii) Give a seminar on the significance of impact strength for engineering materials in automobile engineering.
- iv) Submit a report on properties of engineering materials and their significance.
- v) Debate on the applications of this course in the respective field of engineering.
- vi) Submit your views on studying fluid mechanics by automobile engineering students.
- vii) Demonstrate the application of Bernoulli's theorem in automobile engineering.
- viii) Seminar on any other type of hydraulic machine you know.

Suggested Student Activities in Automobile Electrical Systems Laboratory

(18A-409P):

- i. Visit service station and Collect the information about type of electrical components used in four wheelers.
- ii. Case study of major electrical components in Automobile.
- iii. Student inspects the available electrical components used in the Laboratory.
- iv. Visit nearby workshop / service station to familiarize the specifications of Automobile electrical components.
- v. Quiz
- vi. Group discussion
- vii. Surprise test

Suggested Student Activities in Advanced Communication and Life skills Laboratory

(18A-410P):

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Surprise Test
- Visiting workplaces
- Creating a model of workplace