GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: VEHICLE BODY ENGINEERING
(Code:3340201)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

As a supervisor or self employed, the diploma graduate is supposed to fabricate and repair various vehicle bodies. The knowledge and skills of vehicle body technology is required to manage vehicle body fabrication and repair. In the automotive field auto body repair is experiencing a faster growth than any other service area. Collision repair plus the normal up-keep of the automobile body requires increasing numbers of well trained auto body technicians.This course is designed to provide students the required level of knowledge and skills of vehicle body technology.

2. LIST OF COMPETENCIES

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

- **Supervise vehical body manufacturing and repair work.**

3. COURSE OUTCOMES (CO's).

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Classify vehicle body according to body shape
ii. Use various hand & power tools require for vehicle body repair & alignment
iii. Describe repair procedure of vehicle body damages
iv. Describe body insulation and other vehicle body services such as glass and door service etc.
v. Identify and describe various materials used in construction of vehicle body parts/components
vi. Describe various painting and repainting methods
vii. Identify different paint defects, its causes and corrections

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit;; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	**Major Learning Outcomes** (in cognitive domain)	Topics and Sub-topics
Unit – I Development and construction of vehicle body	1a.Differentiate chassis, frame & body 1b. Describe classification according to body shape (car & bus) 1c. Explain fundamental body structure	1.1 Introduction to chassis, frame and body 1.2 Methods of construction 1.3 Basic body construction & its classification 1.4 Integral body construction 1.5 Design feature of integral body-frame(safety body cell & crumple zone) 1.6 General information-body repairs 1.7 Driver seat & drivers visibility 1.8 Space & safety in vehicle
Unit – II Body repair tools and shop equipments	2a. Describe various hand & power tools require for vehicle body repair & alignment 2b.Explain safety Measures	2.1 Basic hand tools 2.2 Power tools 2.3 Body shop equipments 2.4 Frame & underbody repair tools & equipments 2.5 Electronic straightening & measurement system 2.6 Safety Measures
Unit– III Minor Body Repairs	3a.Describe repair procedure of minor vehicle body damages 3b. Describe Corrosion protection	3.1 repair with washer welder 3.2 repair with hammer and dolly 3.3 panel filling with plastic body and filler-forming with solder 3.4 Panel shrinking (drawing operation) 3.5 Repairing of rusted body panels
Unit– IV Major Body Repairs	4a.Describe repair procedure of major vehicle body damages.	4.1 Diagnosis of damage. 4.2 Front end Collision 4.3 Rear end Collision 4.4 Side swipe collission 4.5 Roll-over damage 4.6 Fibre glass repairs & replacement 4.7 Body aligning. 4.8 Panel replacement.
Unit– V Miscellaneous Body services	5a.Describe glass and door service 5b. Describe body insulation and other vehicle body service	5.1 Interior trim and upholstry 5.2 Glass and door service 5.3 Body insulation and sealing 5.4 Exterior trim
Unit-VI Body Materials	6a. Describe various materials used in vehicle body components	6.1Characteristics of Sheet Metal 6.2 Types of Glass 6.3 Types of Resins

Unit	**Major Learning Outcomes** (in cognitive domain)	Topics and Sub-topics
		6.4 Plastic parts 6.5 Composite materials GRP (glass reinforced plastic) , FRP (fiber reinforced plastic),
Unit-VII Painting & Refinishing	7a. Describe various painting methods 7b. Describe Paints & painting Equipment & tools 7c. Describe Repainting process 7d. Describe Paint Defects, causes & corrections	7.1 Paint types & characteristics 7.2 Painting methods &techniques a. Spraying b. Immersion 7.3 Painting equipments 7.4 Painting procedure with surface preparation 7.5 Refinishing facilities 7.6 Refinishing equipments and tools 7.7 Different types of paint defects occurring during painting & immedietly after drying, their causes & remedies

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration –42 Hours)			
			R Level	U Level	A Level	Total
1.	Development And Construction of Vehicle Body	03	03	04	-	07
2.	Body Repair Tools And Shop Equipments	03	03	04	-	07
3.	Minor Body Repairs	08	03	05	04	12
4.	Major Body Repairs	10	03	08	05	16
5.	Miscellaneous Body services	08	03	07	04	14
6.	Body Materials	04	03	04	-	07
7.	Painting & Refinishing	06		03	04	07
	Total	42	18	35	17	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table**.**

7. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme

S. No.	Unit No.	Practical/Exercises (Any Seven) (Outcomes in Psychomotor Domain)	Apprx. Hr Required
1	I	Observe & prepair report of various bodies repairing work	04
2	II	Demostrate use of different tools required for body repairing work	04
3	II	Demostrate safety measures in body building shop	04
4	III	Demostrate works carried out for minor repairing	04
5	IV	Observe and record work carries out for major repairing	04
6	IV	Demostrate various joining process	04
7	V	Demostrate upholstery works.	04
8	VI	Demostrate glasses and door fitting and repairing process	04
9	VII	Demostrate the use of various paints and coating used for vehicles	04
10	VII	Demostrate finishing process	04
		Total	28

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

a. Visit to automobile body repair shops, and observe and record processes.

b. Seminars using power point presentations to get understanding of different types of body structure, types of materials, major and minor body reparing procedure etc.,

c. internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects……etc. These could be individual or group-based.

9. INSTRUCTIONAL STRATEGIES

a. Lecture cum discussion using animation and videos.

b. Visit of authorized workshop for body repairing works.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr.No.	Author	Title of Books	Publication
1	Anil Chhikaara	Automobile Engineering body Repair Technique Vol 4	Satya Pracation ,New Delhi
2	Anil Chhikaara	Automobile Engineering paint Technique Vol 5	Satya Pracation ,New Delhi
3	Gilcs J Pawlowski	Vehicle body engineering	Century Publications ISBN
4	Automotive Refinishing	Harry T. Chudy	Prentice Hall, Inc., London
5	John Fanton	Vehicle body layout and analysis	Mechanical Engineering Publications (1980) ISBN:- 0852984456
6	Alexander Tait, Andre,G. Deroche. Necholas.N. Hilde brand	The Principles of Auto body repairing and Repainting	Prentice Hall, Inc., London
7	Haynes	The Haynes Automotive Body Repair & Painting Manual	Delmar Cengage Learning; 1 edition ISBN:- 1850104794

B. List of Major Equipment/ Instrument

Different hammer, Dolly blocks, Body pullers, power lock stand, air spray gun etc..

C. List of Software/Learning Websites

i. https://www.youtube.com/watch?v=gcKx2ZqhlcU
ii. https://www.youtube.com/watch?v=ORFa_iPtAeY
iii. https://www.youtube.com/watch?v=I3OIxtpWX7Y
iv. https://www.youtube.com/watch?v=t4TdwcPbEiE
v. https://www.youtube.com/watch?v=u0IJjKh-dWE
vi. https://www.youtube.com/watch?v=LtwX8rrcEUQ
vii. https://www.youtube.com/watch?v=SnDCcnzQapo&list=PL91B84909AEC3F3E4
viii. https://www.youtube.com/watch?v=A3Cw58U0I4Q&list=PL91B84909AEC3F3E4
ix. https://www.youtube.com/watch?v=qUehclZVeIs

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. M. J. Pathak,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof. D.J.Gohel,** Lecturer, Automobile Dept., C.U. Shah Polytechnic, Surendranagar
- **Prof. A.C. Suthar** Lecturer, Automobile Engineering Department, M.L.Institute of Diploma Studies, Bhandu

- **Prof. Sulay Patel**, I/C H.O.D., Automobile Engineering Department,L.J. Polytechnic, Ahemdabad.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K.K.Jain,** Professor, Department of Mechanical Engineering
- **Dr. C. K. Chugh,** Professor Department of Mechanical Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: VEHICLE KINEMATICS & DYNAMICS
(Code: 3340202)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

This subject is concerned with the movements of vehicle on a road surface. The movements of interest are acceleration, braking, ride and turning. Dynamic behavior is determined by the forces imposed on the vehicles from the tires, gravity and aerodynamics. Dynamics is the branch of Theory of Machine which deals with the forces and their effects acting on the components of machine so first chapter is related to introduction to theory of machine. The rest course is designed to provide understanding about effects of various unbalanced forces, its effects on the various components of vehicle and method to balance that unbalanced forces for getting smooth operation and long life of the vehicle. This course also aims to build higher level cognitive skill of future technicians for analyzing vehicle performance against various resistances acting on it during operation, vibrations and its effects with respect to ergonomics of the vehicle. The knowledge of this subject is essential to design aerodynamics shapes of car body, to calculate equivalent weight and maximum acceleration, desired power to propel the vehicle.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency

- **Use knowledge of Kinematics and Dynamics in manufacturing and maintenance of automobile systems for vehicle operation and performance.**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Explain basic terminology related theory of machine and vehicle dynamics with their appropriate examples
ii. Solve numerical problems of Rotating mass or Reciprocating mass balancing in the same or different planes applying graphical and/or analytical method.
iii. Identify causes of vibration and factors affecting human comfort in a vehicle
iv. Derive and apply equation of true rolling condition for solving numerical

v. Determine various performance parameters for given operating conditions and braking of vehicle
vi. Explain various types of suspension system used in vehicles
vii. Describe various factors affecting tyre life and which are responsible for vehicle performance

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	2	0	6	70	30	00	00	100

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit;; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit– I Introduction to Theory of Machine and Vehicle Dynamics	1a. Explain the division of theory of machine 1b. Differentiate Mechanism, Structure and Machine 1c. Classify different types of kinematic pair with their examples 1d. Describe inversions of mechanism with neat sketch 1e. Describe various forces and moments acting on a vehicle.	1.1 Introduction to theory of machine 1.2 Basic terminology related to theory of machines like kinematic link, kinematic pair, kinematic chain, mechanism, structure, machine, degree of freedom for plane mechanism. 1.3 Different types of basic mechanisms used in Automobile System like - Four bar Mechanism. - Single and Double Slider Crank Mechanisms. - Cam and Follower Mechanism with their types 1.4 Introduction to vehicle dynamics - Drag, Lift, Side force, rolling moment, pitching moment, yawing moment, - Dynamic load on axle

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – II Balancing	2a. Define Static and dynamic Balancing, Primary and Secondary Balancing 2b. Derive an expression for determining value of balancing mass at given radius for given unbalanced Rotating or Reciprocating Masses in the same or different planes 2c. Explain Effects of unbalance primary force in reciprocating engines 2d. Solve numerical of Rotating mass or Reciprocating mass balancing in the same or different planes applying graphical and/or analytical method	2.1 Need of Balancing, Static and Dynamic Balancing 2.2 Balancing of rotating mass. 2.3 Balancing of single rotating mass. 2.4 Balancing of several rotating masses. 2.5 Primary and secondary unbalanced forces of reciprocating masses. 2.6 Partial balancing of unbalanced primary force in reciprocating engines. 2.7 Variation of tractive force, Swaying couple and Hammer blow with respect to locomotive engine. 2.10 Balancing of primary forces of multi cylinder in-line engine. 2.11 Balancing of secondary forces of multicylinder in-line engine.
Unit – III Vehicle Vibrations & Ergonomics	3a. Define various terminologies related to Vibrations 3b. Explain causes of vibration 3c. Explain the concept of ergonomic with reference to vehicle	3.1 Definitions of Terminologies related to Vibrations 3.2 Sources of vibration in a vehicle, isolation 3.3 Vibration isolation in a vehicle 3.3 Vehicle Vibration and human comfort 3.4 Factors affecting human comfort in a vehicle
Unit– IV Steering Mechanism	4a. Differentiate types of Steering Mechanisms 4b. Derive and Apply equation of true rolling condition for solving numerical 4c.Derive an equation for Turning circle radius	4.1 Ackerman steering Mechanism 4.2 Condition for true rolling 4.3 Turning circle radius
Unit–V Vehicle Performance	5a. Explain effects of various resistances on vehicle performance. 5b. Derive relations between various terms responsible for vehicle performance 5c. Determine various performance parameters for given operating conditions and braking of vehicle	5.1 Various resistances to vehicle. 5.2 Power for propulsion 5.3 Traction and tractive effort 5.4 Relation between engine speed and vehicle speed 5.5 Acceleration, drawbar pull and grade ability 5.6 Distribution of weight in three wheeled and four wheeled vehicle 5.7 Stability of vehicle on slope 5.8 Calculation of maximum acceleration, maximum tractive effort and relation for different drives 5.9 Factors affecting braking efficiency. 5.10 Calculation of stopping distance.(when

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		brakes are applied to front wheel, rear wheels and four wheels) 5.11 Braking of vehicle on curved path
Unit VI Suspension and Tyres	6a. Explain the function of suspension with respect to force generation 6b. Explain various types of suspension system 6c. Describe various terminologies related to tyre which is responsible for vehicle performance	6.1 Function of suspension system(Ride control, height control, roll control, dive and squat control, road holding) 6.2 Types of front and rear suspension (Solid axles (Hotchkiss, Four Link, DeDion), Independent suspensions (SLA Front Suspension, Macpherson Strut, Trailing-Arm Rear Suspension, Semi-Trailing Arm, Swing Axle, Multi link rear suspension) 6.3 Roll axis and effect of side forces. 6.4 Tyre construction, size and load rating, various terminologies related to tyre, concept of mechanism of force generation in tyre.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – …..Hours)			
			R Level	U Level	A Level	Total
1.	Introduction to theory of machine and vehicle dynamics.	10	04	07	03	14
2.	Balancing.	14	00	07	07	14
3.	Vehicle vibration & Ergonomics.	05	03	04	00	07
4.	Steering mechanism.	05	00	03	04	07
5.	Vehicle.Performance	14	00	11	07	18
6.	Suspension and tyre.	08	07	03	00	10
	Total	**56**	**14**	**35**	**21**	**70**

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED LIST OF TUTORIAL

S. No.	Unit No.	Tutorial/Exercises	Approx. Hrs. Required
1	I	Exercise on theory of machine	02
2	II	Exercise on balancing of rotating mass.	04
3	II	Exercise on balancing of reciprocating mass.	04
4	III	Exercise on vibration and ergonomics	04
5	IV	Exercise on steering mechanism.	04
6	VI	Exercise on suspension system and tyre	04
7	V	Exercise on vehicle performance.	06
		Total	28

8.SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Seminars using power point presentations including video/animation to get better understanding of various components of mechanisms, pairs, joints, inversions etc and their working.

ii. Group discussion on various parameters to be considered for aerodynamic design, vehicle performance etc., mini-projects to develop model of various mechanisms for specific task, internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc. These could be individual or group-based.

iii. Case studies from real life problems of balancing, vibration etc.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

i. Presentation through video/animation to explain working of various mechanisms and their inversions.
ii. Power point presentation showing wheel balancing, balancing of reciprocating masses, various types of vibrations, its effect and remedies to reduce it, vehicle performance testing etc.
iii. Chart and models showing models of various mechanisms and their inversions.
iv. Assignments to solve problems related to balancing, steering mechanism, vehicle performance etc.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Thomas D. Gallespie	Fundamentals of vehicle dynamics	SAE.
2	Oleg Vinogradov	Fundamentals of kinematics and dynamics of machine and machanisms.	CRC Press

S.No.	Author	Title of Books	Publication
3	N.K. Giri	Automobile Mechanics	Khanna Publishers, Delhi
4	R.S. Khurmi	Theory of Machines	Eurasia Publishing house (P) Ltd. New Delhi
5	R.S. Khurmi; J.K. Gupta	Theory of Machines	S. Chand and Compny., New Delhi
6	S.S. Rattan	Theory of Machines	Tata Mc Graw-Hill Pub., New Delhi
7	V. P. singh	Theory of Machines in SI Units	Dhanpat Rai and Co (P) Ltd. New Delhi
8	J. Shigley	Theory of Machines and Mechanisms	McGraw Hill International. New Delhi
9	J. R. Ellis	Vehicle dynamics	Business Books, 1969
10	W. steeds	Mechanics of road vehicle	Iliffe, 1960

B. List of Major Equipment/ Instrument

i. Charts for various mechanisms and their inversions.
ii. Models for various mechanisms and their inversions.
iii. Rotating mass balancing equipment.
iv. Universal Vibration Apparatus.

C. List of Software/Learning Websites

i.http://www.youtube.com/watch?v=GBnk0iRxEqY (Ackerman Steering Mechanism)

ii.http://www.youtube.com/watch?v=YzGM8Uc2HB0 (Davis Steering Mechanism)

iii.http://www.youtube.com/watch?v=hvpFcSPtDV0 (Balancing)

iv.http://www.youtube.com/watch?v=y60dTiuJv24 (Balancing)

v.http://www.youtube.com/watch?v=OfTpw4L9y4Y

vi.http://www.bandgmachine.com/news-media/videos/video-balancing/

vii.http://www.youtube.com/watch?v=XAgRNI6tY58

viii. http://www.youtube.com/watch?v=lLqF7A3SAXE (Vibration of a Steering Wheel)

ix.http://www.youtube.com/watch?v=qhF3I5ylIHM (Wheel Alignment)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. M. J. Pathak, H.O.,** Automobile Engineering Department., Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof. M. N. Vibhakar, Lecturer,** Automobile Engineering Department. Dr.S&SS Gandhi Polytechnic, Surat
- **Prof. S.V. Trivedi**, H.O.D., Automobile Engineering Department, Parul Institute of Technology, Vadodara.
- **Prof. A. C. Suthar** Lecturer, Automobile Engineering Department, M. L. Institute of Diploma Studies, Bhandu

Coordinator and Faculty Members from NITTTR,Bhopal

- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering
- **Dr. K. K. Jain,** Professor, Department of Mechanical Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: MODERN VEHICLE TECHNOLOGY

(Code: 3340203)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

Since last few decades, car designers have turned to high technology in order to meet ever more stringent emission control, ergonomics, safety regulations and the demands of customers for better cars at global level. Multi-modal transportation become increasingly common and intelligent vehicles will cater to diverse consumer needs for information, environmental responsibility and safety. Vehicle electronics contribute significantly to improve environmental performance of motor vehicles and are, therefore, an important enabler of "green" vehicle technology. Electronics offer improved control to a variety of vehicle systems, allowing for more efficient operation of engines and other power trains, heating and cooling systems etc., resulting in less fuel or other power consumed and thus, lower harmful emissions. Today's complex hybrid power trains could not be operated and managed without an array of electronics, including sensors, controllers and actuators. Furthermore, replacement of mechanical components with electronic components tends to be lighter, again leading to less demand for fuel and power options. This course aims to provide understanding of importance of multidisciplinary knowledge in application by appreciation about role of sensor, actuator and electronics components for modernization of automobile.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Improve efficiency, security, safety & performance of automobile using electronics and technology.**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe construction, functions and applications of various sensors and actuators used in modern vehicle
ii. Explain modern Ignition systems of S.I. and C.I. Engines
iii. Explain latest advancement in Engine technology
iv. Identify and describe various advanced peripheral system used in automobile
v. Demonstrate various safety features and equipment used in modern vehicle
vi. Identify various modern features for better functioning of vehicle.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	0	2	6	70	30	20	30	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit;; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I Applications of Transducers, Sensors & Actuators.	1a.Differentiate working principle of Mechanical and Electrical measuring systems. 1b.Explain various equipments working on the principle of electrical energy for measurement of various quantities. 1c. List various sensors and actuators applicable in automobile vehicle with neat sketch. 1d.Describe construction, functions and applications of various sensors and actuators with neat sketch.	1.1 Concept of general measurement system & difference between Mechanical and electrical/ electronic instruments; 1.2 Measurement of Temperature: Working of Thermocouple and Thermister; 1.3 Measurement of Speed: Contact less electrical tachometer, Inductive, Capacitive type tachometer, Stroboscope; 1.4 Measurement of Force: Strain gauge load cell; 1.5 Electrical method for moisture measurement; 1.6 Electromechanical Type Transducer – Potentiometric resistance type, Inductive, Capacitive, Piezometric; Photoelectric. 1.7 Basic requirement of Sensors, Functions, Applications and Circuitry arrangement of various Sensors such as Mass Air flow rate sensor, Exhaust gas Oxygen concentration, Throttle plate angular position, Crankshaft angular position, Coolant temperature, Intake air temperature, Manifold absolute pressure (MAP), Vehicle speed Sensor. Transmission gear selector position, Methanol sensor, Rain Sensor & Rain sensing wiper. 1.8 Working Principal and Functions of various Actuators such as Solenoid Actuators, Motorized Actuators, and Stepper motors.
Unit– II Advance Ignition system	2a.Differentiate working principle of electrical and electronics ignition system. 2b. Explain modern Ignition systems in S.I. and C.I. Engines with neat sketch.	2.1 Electrical & electronics ignition system. 2.2 Modern Spark Ignition system (e.g. D.T.S.I , T.D.S.I., Multi electrode etc. System) 2.3 Insulated coils. 2.4 Concept of Non-battery Energy Storage: Ultra capacitors and Flywheels.

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit– III Advancement in Engine and related components.	3a. Explain need of advancement in Engine technology. 3b. Explain alternative power sources. 3c. Describe Blue Motion Technology for Green Vehicle Technology.	3.1 Introduction & types of hybrid vehicle. 3.2 Hybrid drives systems. 3.3 Compressed air car. 3.4 Solar Cars. 3.5 Hydrogen operated Engine. 3.6 Basic concepts of Blue Motion Technologies like DSG, TSI, TDI, GDI variable valve timing system.
Unit– IV Modernization in Peripheral systems.	4a. Explain importance of application of peripheral systems in automobiles. 4b. Explain advanced peripheral system in automobile with neat sketch.	4.1 Security Systems. Remote keyless entry, Anti-theft system, Alarm system. 4.2 Entertainment and peripheral systems. Integrated communications, Proximity sensors 4.3 Global positioning satellites(GPS)
Unit– V Advance Safety Equipments.	5a.Explain an importance of safety with respect to automobile vehicle. 5b. Describe various safety features and equipments used in automobile.	5.1 Seat Belts, Seat Belts pre-tensioners, Smart seatbelt reminder. 5.2 Concepts of Crash test, Crash sensors. 5.3 Air bags Introduction of air bags, Duel stage air bags, Side Airbags. 5.4 Tire pressure monitoring system 5.5 Pedestrian Protection & Night vision with pedestrian detection.
Unit– VI Modern Features in Automobile.	6a. Explain requirement of modern features in automobiles. 6b. List various modern features for better functioning of vehicle.	6.1 Power Sliding doors. 6.2 Electronic stability / Skid-control system, Traction control system. 6.3 Telescopic steering wheel / adjustable pedals. 6.4 Rear mounted Radar & Cameras. 6.5 Electromagnetic suspension and levitation. 6.6 Automatic Lift Axle. 6.7 Regenerative Braking Systems. 6.8 Continuous Variable Transmission. 6.9 Intelligent Parking Assist System, Self Parking

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Applications of Transducers / Sensors & Actuators.	15	07	07	07	21
2.	Advance Ignition system	5	03	03	01	7
3.	Advancement in Engine and related components.	10	06	06	02	14
4.	Modernization in Peripheral systems.	7	03	03	01	7
5.	Advance Safety Equipments.	7	03	03	01	7

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
6.	Modern Features in Automobile.	12	06	06	02	14
	Total	**56**	**28**	**28**	**14**	**70**

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table**.**

7. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme

S. No.	Unit No.	**Practical/Exercises** (Course Outcomes in Psychomotor Domain**)** (Any Seven)	Approx Hours Required
1	I	Measure shaft speeds by using Speed measurement device.	4
2	I	Use strain gauge as sensing element for different types of sensors.	4
3	I	Identification and demonstration of different sensors and actuators.	4
4	I	Study and demonstrate use of various sensors and actuators for multi cylinder modern vehicle.	4
5	III	Study of Hybrid motor vehicle.	4
6	V	Demonstration of Peripheral system.	4
7	V	Identify and demonstrate various safety systems used in vehicle	4
8	VI	Study of various modern features used in vehicle. Also prepare write up regarding benefits of these features.	4

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Seminar by students on various modern technologies in automobile like automatic dipper system, night vision with pedestrian detection, GPS, DTSI, TDI, TSI, TFSI, CVT etc.

ii. Preparation of display boards or charts for various electronic components like LED, sensors, actuators etc.

iii. Assembly/ disassembly/ connections of various electronic components with automobile actuating mechanisms for understanding principle of operation and control.

iv. Individual or group-based projects to prepare working model of various modern mechanisms such as solar car, hybrid car, regenerative brakes, automatic dipper system, CVT etc.

v. Teacher guided self learning activities to prepare report as an assignment from industrial survey/internet/library/or group discussion on any of the modern automobile technology.

9. SPECIAL INSTRUCTIONAL STRETAGIES (If any)

i. Arrange visit to garages of advance/high hand four wheeler manufacturers and demonstrate functioning of advance technologies/systems used in the vehicles.

ii. Show video/animation films on functioning of advance/modern systems being used in vehicles.

iii. Assignment on comparison of popular brands of vehicles on the basis of advanced/modern systems being used for different purposes in these vehicles (Students may be asked to do market survey or visit the websites of the manufacturers to collect data)

10. SUGGESTED LEARNING RESOURCES

A. List of Books

Sr. No.	Author	Title of Books	Publication
1	Tom Denton	Automobile Electrical and electronic systems	Arnold ISBN-0750662190
2	Theraja BL	Fundamentals of Electrical and Electronics Engineering	NIrja Construction & Development Co Ltd.
3	P L Kohli	Automotive Electrical Equipments	Tata Mc-Graw Hill
4	A K Sawney	Electrical and Electronics measuring Instruments	Dhanpat Rai and sons.
5	John turner	Automotive Sensors	Momentum press, LLC NEW YORK ISBN- 9781606500095 ISBN- 1606500090
6	Barbara J. Peters, George A. Peters	Automotive Vehicle Safety	SAE International and Taylor & Francis ISBN - 978-0-7680-1096-1
7	J. Marek, H.-P. Trah, Y.Suzuki, I. Yokomor	Sensors for Automotive Technology	ISBN – 3527295534 Wiley-vch , weinheim
8	Jeff Daniels	Modern Car Technology	Haynes Publishing

B. List of Major Equipment/ Instrument

a. Charts for various electronic components like sensors, diodes, LEDs etc.

b. Display board of various electronic components like sensors, diodes, LEDs etc.

c. Working model of various automotive mechanisms operated through modern technology.

C. List of Software/Learning Websites

Links for Literature:

1 http://en.wikipedia.org/wiki/Mass_flow_sensor mass flow rate sensor
2 http://en.wikipedia.org/wiki/Oxygen_sensor exhaust gas o2 sensor
3 http://en.wikipedia.org/wiki/Crankshaft_position_sensor crank shaft position
4 http://en.wikipedia.org/wiki/Engine_coolant_temperature_sensor coolant temp sensor
5 http://en.wikipedia.org/wiki/MAP_sensor MAP sensor
6 http://en.wikipedia.org/wiki/Wheel_speed_sensor vehicle speed sensor
7 http://en.wikipedia.org/wiki/Rain_Sensor rain sensor
8 http://en.wikipedia.org/wiki/Ignition_system diff between electrical and electronics
9 http://en.wikipedia.org/wiki/Wasted_spark modern ignition system
10 http://en.wikipedia.org/wiki/Hybrid_Synergy_Drive hybrid drive system
11 http://en.wikipedia.org/wiki/Compressed_air_car compressed air engine
12 http://en.wikipedia.org/wiki/Air_engine compressed air engine
13 http://en.wikipedia.org/wiki/Solar_car
14 http://en.wikipedia.org/wiki/Direct-Shift_Gearbox
15 http://en.wikipedia.org/wiki/Dual-clutch_transmission
16 http://en.wikipedia.org/wiki/Turbocharged_Direct_Injection
17 http://en.wikipedia.org/wiki/Gasoline_direct_injection
18 http://auto.howstuffworks.com/question122.htm/printable
19 http://wot.motortrend.com/toyota-confirms-400-hp-awd-hybrid-r-concepts-yaris-roots 396083.html
20 http://en.m.wikipedia.org/wiki/On-board_diagnostics
21 http://www.powershow.com/view/bc1fe-Mzg4N/Energy_Storage_Systems_For_Advanced_Power_Applications_powerpoint_ppt_presentation
22http://www.sae.org/servlets/product?PROD_TYP=PAPER&PARENT_BPA_CD=GV&TECH_CD=SI
23 http://en.wikipedia.org/wiki/Intelligent_Parking_Assist_System

Links for Video

i. http://www.youtube.com/watch?v=g5d-749l3Kw (Video on Solar Car Assembly)
ii. http://www.youtube.com/watch?v=40dOyZIVlPw (Video on How to make Solar Car)
iii. http://www.youtube.com/watch?v=W2R-0DQ8gi8 (Video on Solar Toy Car - Hindi)
iv. http://www.youtube.com/watch?v=tyo21ghGD5M (Video on Audi V6 TDI Technology)
v. http://www.youtube.com/watch?v=kJ5opH5qgj0 (TSI engine with Active Cylinder Management Technology)
vi. http://www.youtube.com/watch?v=20qqavckWdw&list=TL6h-rxUo5sjdowaUfxVw83XSMro9OIvkR (Video for VW TSI twincharger)
vii. http://www.youtube.com/watch?v=wmHxiY2J8Ok (Ford Ecoboost Animation)
viii. http://www.youtube.com/watch?v=H-fij4bnmDw (Video on TFSI Engine in Action)
ix. http://www.youtube.com/watch?v=BlCUhzxsxQo&list=PL57B331239D8F5F0D
x. http://www.youtube.com/watch?v=iRh6SxwTc2g&list=PL57B331239D8F5F0D (Video of Hyundai new engine 1.6 GDi)
xi. http://www.youtube.com/watch?v=uotknd6hlxk (What is GPS?)
xii. http://www.youtube.com/watch?v=v_6yeGcpoyE (GPS Constellation)
xiii. http://www.youtube.com/watch?v=Z3Pm3HHUyzk and http://www.youtube.com/watch?v=PLjld-edVj8 (How GPS works)
xiv. http://www.youtube.com/watch?v=RUWz6FQfXN0 (Global Mini Tracking Device GSM GPRS GPS-for Mini Project)
xv. http://www.youtube.com/watch?v=xITyQsirIvA (Pedestrian Detection in Darkness)
xvi. http://www.youtube.com/watch?v=XEGdrLjTyjs (Wireless Pedestrian Detection Technology)

xvii. http://www.youtube.com/watch?v=mj0EwLHualM (Pedestrian detection and tracking using stereo vision techniques)
xviii. http://www.youtube.com/watch?v=NrpW1e8IFeA (Simulation of a Signalized Pedestrian Crossing)
xix. http://www.youtube.com/watch?v=DojthARCO6k (Bosch Night Vision - Night Vision plus)
xx. http://www.youtube.com/watch?v=9IodzwsdGKM (Working principle of Hybrid Synergy Drive (HSD))
xxi. www.youtube.com/watch?v=zgt1DBYR9GE (Electromagnetic suspension and levitation in automobiles)
xxii. http://www.youtube.com/watch?v=y8jRAwIzPTM (Bosch Regenerative Braking)
xxiii. http://www.youtube.com/watch?v=jffePCHt11A (How the CVT Transmission Works)
xxiv. http://www.youtube.com/watch?v=c47caRqbbnE (Continuously Variable Transaxle Operation)
xxv. http://www.youtube.com/watch?v=8an3Bt4MXJg (Video for Nissan Quest - Sliding Doors)
xxvi. http://www.youtube.com/watch?v=wNLfwOQ6mPw&list=TLuawUd0DfNwvjBcdEQWGeNqIaJ2JFA4UH (Toyota Prius Intelligent Parking Assist demonstration)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. D. A. Dave,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof. S. V. Trivedi**, H.O.D., Automobile Engineering Department, Parul Institute of Technology, Po. Limda, Ta. Waghodia, Di. Vadodara.
- **Prof. A. C. Suthar** Lecturer, Automobile Engineering Department, M. L. Institute of Diploma Studies, Bhandu
- **Prof. Sulay Patel**, I/C H.O.D., Automobile Engineering Department, L. J. Polytechnic, Ahemdabad.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering.
- **Dr. K. K. Jain,** Professor, Department of Mechanical Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: AUTOMOBILE INDUSTRIAL MANAGEMENT
(Code: 3340204)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th semester

1. RATIONALE

In our country, automobile industry has grown many folds. The market is flooded with many manufacturers of various kinds of automobiles, who are continuously upgrading and innovating their products, thus automobiles is big business opportunity. Automobile business may be small, medium and large scale but for their efficient and effective management, understanding of some management concepts is necessary. In addition to this it is must to know government rules for safe driving, ownership and fitness of vehicle, etc. The diploma engineer whether in employment or in business, should therefore have awareness of various kinds of business, auto business management, and different rules & acts. This course helps diploma engineers to equip with this information.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency

- **Plan, organize, and manage various aspects of automobile operations and business for profitability and growth**.

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe merit and demerit of different forms of business organizations.
ii. Identify and describe sources of business finances
iii. Apply CPM and PERT techniques as network planning tools
iv. Use various inventory control techniques for better material management
v. Explain various steps involved in preventive maintenance
vi. Describe motor vehicle rules and driving regulations
vii. Explain the procedure for issuing a driving license and registration of vehicle
viii. Explain various steps involved in vehicle selling technique.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	100
3	0	0	3	70	30	00	00	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit;; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I Elements of forms of Business Management	1.a Describe forms of business organizations 1.b Describe self employment & entrepreneurship	1.1 Nature of business organization. 1.2 Merits & demerits of the sole trading, partnership, Joint stock company, Co-operative & State enterprise, etc. 1.3 Self employment & Entrepreneurship
Unit – II Elements of Business Finance	2.a Describe sources of business finances	2.1 Sources of raising business finance such as shares, debentures bonds, commercial banks, Public deposits and co-op. credit bank, etc. 2.2. Specialized Agencies of finance such as IDBI, IFC, ICICI, NIDC, LITI, LIC, GSPE, GIDC, GSIC, etc. and their function.
Unit– III Net Work Analysis	3.a Describe planning tools: CPM and PERT 3.b Determine the critical path on a network	3.1 Meaning of CPM and PERT. 3.2 Meaning of activity and event 3.3 Rules of constructing a network using dummy and real activities. 3.4 Calculation of net work.
Unit– IV Material Management	4.a Explain the different purchasing systems 4.b Classify the stores 4.c Carryout the codification of different items 4.d Explain various inventory control techniques. 4.e Prepare ABC analysis chart	4.1 Functions of material management. 4.2 System of purchasing. 4.3 Types of forms used in purchasing. 4.4 Stores management: Functions of store keeping, Types of stores, Materials to be stored, Types of records maintained in the stores, Classification and codification of stores. 4.5 Inventory control: Importance, and its techniques.
Unit– V Preventive Maintenance	5.a Explain importance of preventive maintenance 5.b Explain various steps involved in preventive maintenance	5.1 Preventive maintenance: Meaning, Philosophy, functions, designing a preventive maintenance schedule, Economical aspects, dos & don'ts. 5.2 Factors to be taken into account while making preventive maintenance schedule.

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit– VI Motor Vehicle Rules & Regulation	6. a State terms related to motor vehicle act 6.b Describe the control of traffic 6.c State registration marks and mandatory signs & other traffic signs	6.1 Key terms of motor vehicle act FAW, RAW, UW, RLW, LMV, HMV public carrier, private carrier, etc. 6.2 Control of traffic, important clauses. 6.3 Registration marks & mandatory signs & other traffic signs. 6.4 Provisions of motor vehicle act on driving regulations.
Unit-VII Licensing	7.a Describe necessity of obtaining the driving license 7.b Explain the procedure for issuing a driving license 7.c Explain duties of driver and conductor of motor vehicle	7.1Necessity and eligibilities for obtaining the driving license 7.2 Form contents, validity and currency of driving license 7.3 Renewal, revocation, endorsement and power of disqualifying the holder for driving license 7.4 Conducts and duties of driver of motor vehicle 7.5 Necessities and granting of conductor's license 7.6 Duties and conducts of conductor rule
Unit-VIII Registration of motor vehicle	8.a Explain the procedure for registration of vehicle 8.b Explain the information about refusal of registration of vehicle, cancellation of registration, transfer of ownership of the vehicle.	8.1 Registration of Motor Vehicle 8.2 The exhibition of registration 8.3 Information about the refusal of registration of vehicle 8.4 Procedure for registration of vehicles removed to another state 8.5 The Provision for transfer of ownership of the vehicle. 8.6 The Provision for alteration in vehicle. 8.7 The suspension of registration. 8.8 The cancellation of registration of vehicle. 8.9 The necessity of certificate of fitness of transport vehicle.
Unit– IX Vehicle Sales & Sales Promotion	9.aDescribe salient features of agreement between dealer and manufacture. 9.b Explain various steps involved in vehicle selling technique. 9.c Describe management of self employment type organizations.	9.1 Salient features of manufacture dealer agreement. 9.2 Various steps involved in vehicle selling techniques. 9.3 Professional approach of selling vehicle. 9.4 Management of self employment: Prospecting of customers, and customer care.

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Elements of forms of Business Management.	02	04	-	-	04
2.	Elements of Business Finance.	02	03	-	-	03
3.	Net Work Analysis.	05	03	02	02	07
4.	Material Management.	09	06	04	04	14
5.	Preventive Maintenance.	04	05	02	-	07
6.	Motor Vehicle Rules & Regulations	06	05	02	-	07
7.	Licensing	05	06	04		10
8.	Registration of motor vehicle	05	06	05		11
9.	Vehicle Sales & Sales Promotion	04	03	04	-	07
	Total	42	41	23	06	70

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

7. SUGGESTED LIST OF PRACTICAL/EXERCISES

Not Applicable

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Seminar by Students on a given topic
ii. Write brief report of various types of maintain records in stores
iii. Fill up various types of forms/formats
iv. Write assignments (classroom, library, home)
v. To prepare report as an assignment from industrial survey/internet/library/or group discussion on any of the automobile sales promotion.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Lecture cum discussion by using standard forms/formats
ii. Field visit to R.T.O.
iii. Case study on ABC analysis chart, CPM & PERT, Inventory models etc.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books

S. No.	Name of the book	Author	Publication
1	Material Management	Ammer	Taraporevala
2	Industrial Maintenance	H. P. Garg	S.chand
3	Modern Maintenance Management	E. J. Miller	
4	Material Management	N. K. Nair	Vikas Publication House pvt.ltd

S. No.	Name of the book	Author	Publication
5	Industrial Engineering and Management	O.P.Khanna	Dhanpat Rai
6	Motor vehicles Act, 1989		
7	The Gujarat Motor vehicles Rules, 1989		
8	The Central Motor vehicle Rules,1989		
9	CPM and PERT (Principles & applications)	L. S. Srinath	Ease-West Press Pvt. Ltd New Delhi
10	Industrial Organisation & Engg. Economics	S. C. Sharma	Khanna

(B) List of websites

i. www.b-u.ac.in/sde_book/bcom_bs.pdf
ii. home.snc.edu/eliotelfner/333/stones/page3.html
iii. www.morth.nic.in
iv. www.sarathi.nic.in
v. www.vahan.nic.in
vi. www.b-u.ac.in/sde_book/bcom_bs.pdf
vii. home.snc.edu/eliotelfner/333/stones/page3.html
viii. www.morth.nic.in
ix. www.sarathi.nic.in
x. www.vahan.nic.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. D. A. Dave,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof. D. J. Gohel,** Lecturer, Automobile engineering Department C.U.Shah Polytechnic, Surendranagar
- **Prof. S. V. Trivedi**, H.O.D., Automobile Engineering Department, Parul Institute of Technology, Vadodara.
- **Prof. A. C. Suthar** Lecturer, Automobile Engineering Department, M. L. Institute of Diploma Studies, Bhandu

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering
- **Dr. K. K. Jain,** Professor Department of Mechanical Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: AUTOMOBILE TRADE PRACTICE
(Code: 3340205)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

Automobile maintenance is also a good business proposition in modern economy. This business is both technically satisfying and financially lucrative. Some entrepreneur who have started this business as a small garage now have garages as big as small industry employing 40 to 50 workers and supervisors. Some diploma engineers would like to be entrepreneur and may start this business after passing out, or some may work as supervisors in big garages. This course tries to prepare students for such roles. In planning this course, it was decided to link theory with practice with a particular emphasis on the various aspects of service and maintenance work. The content of this course is purely practical base and designed in such a way that student be acquainted with practices and knowledge required to start workshop at least at small scale. It will be also helpful to students who aim to work in authorized work-shop.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Plan, operate and maintain auto garage activities**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Prepare modern garage layout by following preliminary safety rules
ii. Select appropriate hand tool or power tool for required application.
iii. Use appropriate testing and servicing tools or instruments for given situation

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	50
0	0	2	2	00	00	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit;; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I Introduction to automobile garage	1a. sketch general layout of modern garage 1b. Follow preliminary safety rules in garage	1.1 Garage layout 1.2 Importance of various sections in garage 1.3 Types of job done in various sections 1.4 General safety rules while working in garage
Unit – II Tools	2a. Describe various hand & power tools 2b. Select appropriate hand tool or power tool for required application	2.1 Application of various hand & power tools used in garage 2.2 Application of special purpose tools used in garage
Unit– III Measuring & testing instruments	3a. Explain various measuring & testing instruments 3b. Select appropriate measuring & testing instrument for required application	3.1 Use of various measuring & testing instruments like Vernier callipers, Dial gauge, micrometer, thickness gauge, wire gauge, pressure gauge etc. 3.2. Various engine testing equipment 3.3 Various transmission system testing equipment 3.4 A.C System & electrical system testing equipment
Unit– IV Servicing & Maintenance	4a. Describe about service operation 4b. Describe different service equipment used	4.1Role of service advisor & service executive. 4.2 Prepare a job card -Over view of car inspection -exterior inspection -interior inspection -inspecting engine components -inspecting trunk -inspecting bottom 4.3 Service equipments 4.4. Servicing of vehicle

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (Theory)

Not Applicable

7. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme

Sr. No.	Unit No.	PRACTICAL/EXERCISES (Outcomes in Psychomotor Domain) (Any Seven)	Approx. Hrs. Required
1	I	Prepare a layout of a modern Garage for given vehicle	04
2	I	Demonstrate use of safety equipments and procedures in garage	04
3	II	Demonstrate use and care of hand tools	04
4	II	Demonstrate features and use of instruments, power tools, special purpose tools	04
5	III	Demonstrate features and use of various types of measuring instruments	04
6	III	Demonstrate features and use of various types of testing instruments and equipment	04
7	IV	Carryout maintenance of bearing and bushes	04
8	IV	Demonstrate features and use of servicing equipment	04
9	IV	Perform role of service advisor, service executive, job card preparation and customer care	04
10	IV	Demonstrate Procedure for Servicing of two wheeler/four wheeler	04
		Total Hrs	28

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Prepare Charts of various hand & Power tool, measuring instruments.
ii. Visit the garage.
iii. Prepare the layout of modern garage.
iv. Take measurements of precision parts, like- crankshaft, cam shaft, piston, bore of cylinder block, etc. in workshops.

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Chart/films showing various modern garage lay out and different operation taking place there.
ii. Demonstration of various tools to repair/ for maintenance of vehicle.
iii. Disassembly and assembly of various parts of automobile for maintenance.
iv. Visit the automobile garage.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Kirpal singh	Automobile engg. vol-1	Standard Publishers Distributors
2	William Crouse	Automobile Mechanics	TATA Mc-Graw Hill Publication
3	H. M. Sheti	Automotive Technology	Mc-Graw Hill Publication
4	Anil Chhikara	Automobile Engg Vol-2	Satya Prakasan
5	J. A. Dolan	Motor Vehicle Technology	Heinemann educational books
6	Staton Abbey	Automobile workshop	Pitman

S.No.	Author	Title of Books	Publication
		practice	

B. List of Major Equipment/ Instrument

i. Various hand & power tools for maintenance.

ii. Various testing & measuring equipments.

iii. Engine & other system parts for disassembly and assembly.

iv. Personal safety equipments.

C. List of Software/Learning Websites

i. www.youtube.com

ii. www.howstuffworks.com

iii. www.ehow.com

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. M. J. Pathak,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof. M. N. Vibhakar,** Lecturer, Automobile Engineering Department, Dr. S&SS Gandhi Polytechnic, Surat.
- **Prof. D. J. Gohel,** Lecturer, Automobile engineering Department. C. U. Shah Polytechnic, Surendranagar
- **Prof. Sulay Patel**, I/C H.O.D., Automobile Engineering Department, L. J. Polytechnic, Ahemdabad.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering
- **Dr. K. K. Jain,** Professor, Department of Mechanical Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: AUTOMOBILE MANUFACTURING TECHNOLOGY
(Code: 3340206)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

As a diploma engineer, they are supposed to manage operations of manufacturing in industries. Thus, they should have operational knowledge and skills of various kinds of manufacturing equipment and processes. This course provides operational knowledge and skills of various manufacturing processes. It also provides general knowledge regarding various machine tools and machining operations carried out on them. This course also creates awareness about modern manufacturing technologies and tools used in industry. The course also tries to develop safety consciousness in students so that they may work safely in machine shop.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Supervise simple manufacturing processes required for manufacturing and repairs of systems / components of automobiles.**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe various manufacturing processes and its application
ii. Describe principles of metal working processes and its application
iii. Identify defects and its causes in metal working processes
iv. Explain Casting process, defects & remedial measures
v. Describe different metal joining processes and its application
vi. Identify welding defects, its causes and remedial measures
vii. Explain working principle of conventional and non-conventional Machine Tool and operations carried out on each Machine tool

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
Unit – I Introduction To Manufacturing Processes	1.a Describe various manufacturing processes & its application.	1.1 Nature, role and scope of manufacturing process. 1.2 Classification of manufacturing processes. 1.3 Introduction and application of each process. 1.4 Types of production.
Unit– II Metal Working Processes	2.a Describe principles & its application of metal working processes 2.b Explain Defects and its remedies in metal working processes	2.1 Hot and cold working processes 2.2 Working principles and application of: Rolling, Drawing, Spinning, Forging, Bending, Embossing, Extrusion, Piercing, Squeezing 2.3 Common Defects observed in cold and hot working processes 2.4 Remedial measures
Unit– III Metal Casting	3.a Explain various casting process 3.b Explain Casting defects & Remedial measures	3.1 Introduction to casting 3.2 Working principles of different methods of casting 3.3 Casting defects. 3.4 Remedial measures
Unit– IV Metal Joining	4.a Describe different metal joining processes 4.b Identify appropriate metal joining process for the given job	(a) Introduction and classification of Metal Joining methods (b) Working principles, application, and limitation of Gas Welding, Arc Welding & Resistance Welding (c) Defects in Welding (d) Remedial Measures (e) Working principles & application of Brazing and Soldering (f) Safety precautions.
Unit– V Basic Machine Tools	5.a Explain Working principle of each Machine Tool &	5.1 Introduction to Basic Machine Tools 5.2 Working principle of each Machine Tool & List out and explain each operations carried

Unit	Major Learning Outcomes (in Cognitive Domain)	Topics and Sub-topics
	operations carried out on each Machine tool 5.b Describe Factors affecting the selection of suitable Machine tool	out on each Machine tool like, Shaping, Planing, Milling, Drilling, Lathe, Boring, Grinding etc… 5.3 Factors affecting the selection of suitable Machine tool 5.4 Different surface finish operations 5.5 Working principle and different operations carried out on press
Unit– VI Modern Manufacturing Tools & Techniques.	6.a Justify need and role of automation in automobile manufacturing industries 6.b Explain basic concept of CIM, NC, CNC, DNC, FMS, GT and CM 6.c Explain automated material handling tools	6.1 Need and Role of Automation in manufacturing of automobile industry 6.2 Basic concepts of NC, CNC, DNC and brief introduction of their components 6.3 Basic concepts of Computer Integrated Manufacturing, CIM wheel, Benefits of CIM 6.4 Basic concepts of Flexible Manufacturing System, Flexible Assembly Systems, Benefits of FMS 6.5 Basic concepts of Group Technology (GT) and Cellular Manufacturing (CM), Benefits of GT and CM 6.6 Application of Automated Material handling tools like AGVs, AR/RS, and Robots

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Introduction To Manufacturing Processes	04	3	4	0	07
2.	Metal Working Processes	10	4	3	4	11
3.	Metal Casting	08	0	7	3	10
4.	Metal Joining	08	0	7	3	10
5.	Basic Machine Tools	16	7	7	7	21
6.	Modern Manufacturing Tools & Techniques.	10	4	7	0	11
	Total	**56**	**18**	**35**	**17**	**70**

Legends: R = Remember, U = Understand, A= Apply and above Level (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table**.**

7. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme

S. No.	Unit No.	**PRACTICAL/EXERCISES** (Outcomes in Psychomotor Domain) (Any Seven)	Hrs
1	II	Demonstrate forging process	04
2	III	Demonstrate casting procedure	04
3	IV	Prepare a job using gas cutting and gas welding	04
4	IV	Prepare a job using arc welding	04
5	IV	Demonstrate brazing and soldering and operation	04
6	V	Demonstrate various machining operation carried out on centre lathe as per the given drawing (Straight Turning, Taper Turning, Grooving, Knurling, Thread cutting)	04
7	V	Demonstrate basic operations on Shaper and Milling Machine	04
8	V	Demonstrate surface finishing operations (Grinding, Honning, Lapping)	04
9	VI	Demonstrate working of CNC Lathe and/or CNC Milling machine.	04

8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Seminar by Students on manufacturing processes like forging, casting, welding process etc.
ii. Prepare Display Board such as gas cutting kit, welding kit etc.
iii. Prepare job to explore various welding techniques applicable in automobile industries.
iv. Prepare job to explore various operations using various machine tools and measuring equipments.
v. Internet Base Assignment, Teacher guided self learning activity etc.(These could be Individual or group base.)

9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

i. Lectures cum discussion using Charts (such as forging process, welding, operation carried on lathe machine, milling machine, shaping machine.) and Cut Section/Model (such as mold, riser, runner, flask), Display board (such as casting steps, lathe).

ii. Use of power point presentation, animation, or videos showing operations on various machine tools.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	R. K. Jain & S.C.Gupta	Production Technology	Khanna Publ.
2	O.P.Khanna	Production Technology	Dhanpat Rai and Sons
3	Hazra Choudhary	Workshop Technology Vol-I, Vol-II	Media promotors and publishers pvt. Limited,
4	Raghuwanshi	Workshop Technology Vol-I, Vol-II	Dhanpat Rai and Sons
5	M. L. Begman	Manufacturing processes	Willey International edition, USA
6	R.S. Khurmi And J.K. Gupta	A Textbook Of Workshop Technology : Manufacturing Processes	S. Chand Limited
7	P.N. Rao	Manufacturing Technology : Foundry, Forming & Welding	TATA Mc-Graw Hill
8	Mikell P. Groover	Automation, Production Systems, and Computer-integrated Manufacturing	Prentice Hall
9	P. N. Rao, N. K. Tewari, T. K. Kundra,	Computer Aided Manufacturing	TATA Mc-Graw Hill
10	P. N. Rao	Cad/Cam: Prin & Appl 3E	Tata McGraw-Hill Education

B. List of Major Equipment/ Instrument

i. Lathe Machine
ii. Milling Machine
iii. Grinding Machine
iv. Boring Machine
v. Shaping Machine
vi. Casting Equipments.

C. List of Software/Learning Websites

i. http://www.youtube.com/watch?v=2lewK1TiQ_c
ii. http://www.youtube.com/watch?v=Kmb5tivQ_bY
iii. http://www.youtube.com/watch?v=h-c4_Ukqgx4
iv. http://www.youtube.com/watch?v=OOyAaWT6WQU
v. http://www-old.me.gatech.edu/jonathan.colton/me4210/casting.pdf
vi. http://me.emu.edu.tr/majid/MENG364/2_casting.pdf

vii. http://www.youtube.com/watch?v=CoNw_faThgQ (What Is Welding)
viii. http://www.youtube.com/watch?v=66-RK0DPXfU (Introduction to Resistance Welding)
ix. http://www.youtube.com/watch?v=U99asuDT97I (Milling: Chapter 1)
x. http://www.youtube.com/watch?v=RIbdYmmhPDI (Milling: Chapter 2)
xi. http://www.youtube.com/watch?v=BBqzca2gmNI (Machine Shop Training - Introduction Lathe Types & Terminology)
xii. http://eng.sut.ac.th/metal/images/stories/pdf/02_Forging.pdf
xiii. http://www.powershow.com/view/1dfd98NjgyZ/Chapter_13_Flexible_Manufacturing_Systems_powerpoint_ppt_presentation (Flexible Manufacturing System)
xiv. http://www.youtube.com/watch?v=JBN7IAwNLqQ (Video for FMS Part-I)
xv. http://www.youtube.com/watch?v=Jldf6Po8xWo (Video for FMS Part-II)

http://www.powershow.com/view/1451a5MDlmY/Chapter_12_Group_Technology_and_Cellular_Manufacturing_Systems_powerpoint_ppt_presentation (Group Technology and Cellular Manufacturing)

xvi. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDAQFjAA&url=http%3A%2F%2Fharshparmar.files.wordpress.com%2F2013%2F04%2Fautomated-guided-vehicles.ppt&ei=kkZMUvrCLc6HrgfUz4GIAw&usg=AFQjCNFBlD0ST8JFiEGmZThfFC2G5ye29Q (AGV)

xvii. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDYQFjAB&url=http%3A%2F%2Fwww.et.byu.edu%2F~ered%2FME486%2FJenniferAGV.ppt&ei=kkZMUvrCLc6HrgfUz4GIAw&usg=AFQjCNFEEjrn80-Z-1Hgk8vpUeeNUhAxVg (AGV)

xviii. https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0CDAQFjAB&url=http%3A%2F%2Fwww.deu.edu.tr%2Fuserweb%2Farslan.ornek%2Fdosyalar%2F67044-Ch11.ppt&ei=7klMUtahL8qArgefhoDACA&usg=AFQjCNHW7sUWf3jeGBbQZcpvE8UoqfYiIg (AS/RS)

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. D. A. Dave,** H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof (Mrs.) M. N. Vibhakar,** Lecturer, Automobile Engineering Department, Dr. S&SS Gandhi Polytechnic, Surat.
- **Prof. S.V. Trivedi**, H.O.D., Automobile Engineering Department, Parul Institute Technology, Vadodara.
- **Prof. D. J. Gohel,** Lecturer, Automobile engineering Department. C.U.Shah Polytechnic,Surendranagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K. K. Jain,** Professor, Department of Mechanical Engineering.
- **Dr. C. K. Chugh,** Professor, Department of Mechanical Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: HUMAN RESOURCE MANAGEMENT FOR AUTO INDUSTRY
(Code: 3340207)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering	4th Semester

1. RATIONALE

Human resources are very crucial for effective achievement of changing goals of the organization. They have tremendous level of untapped potential which can be utilised by professional supervisor using human resource management abilities. In changing environment the role of the supervisor and people becomes crucial to success. Working conditions may create stress and conflict which could be managed effectively using various tools and techniques related to training, guidance, counselling, mentoring and coaching. In the present era of globalisation, human resource is considered as a dynamic asset which in turn contributes for achieving the excellence and delighting the customers.

This course aims at developing intra-personal, inter-personal and social competencies in the polytechnic students so as to enable them to perform their future role of supervisor effectively.

2. COMPETENCIES (Programme Outcomes according to NBA Terminology)

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competencies.

- **Manage people effectively fostering values, positive attitude and interpersonal relations to achieve personal and organizational goals**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	100
2	0	0	2	70	30	0	0	

Legends: L -Lecture; **T** -Tutorial/Teacher Guided Student Activity; **P** -Practical; **C** -Credit; **ESE**-End Semester Examination; **PA** -Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit I Introduction	1a Appreciate importance of human resource	1.1 Need and scope of human resource management in industrial environment. 1.2 Impact of human factors on productivity and industrial harmony. 1.3 Importance of providing need based training to the man power. 1.4 Qualities of a good supervisor.
Unit II Human needs, relations and values	2a. Identify human motivations.	2.1 Importance of human resources in Indian philosophy. 2.2 X and Y theory. 2.3 Maslow's hierarchy, its importance in managing human resources.
	2b. Appreciate values and ethics for relationships.	2.4 Need of human relations and human values in the industry, inter department and intra department. 2.5 Good relations with the suppliers and clients. 2.6 Desirable human values and their importance including ethics and morale values.
Unit III Behavioural dynamics	3.a Analyse self for interpersonal behaviour.	3.1 Need for interpersonal competence. 3.2 Determinants of interpersonal behaviour. 3.3 Concept of interpersonal orientation and attractions and its importance in human behaviour.
	3.b Develop team spirit and positive attitude.	3.4 Concept of group dynamics. 3.5 Dynamics of group formation. 3.6 Types of groups. 3.7 Role of teams in an organization. 3.8 Desirable characteristics of a team member. 3.9 Concept & importance of positive attitude and openness of mind. 3.10 Do's and don'ts for developing positive

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
		attitude. 3.11 Importance of mental health.
Unit IV Leadership Development	4a. Use leadership qualities. 4b. Develop subordinates by motivations & training. 4c. Develop decision making ability.	4.1 Various definitions of leadership. 4.2 Situational approach to leadership. 4.3 Quality of a good leader. 4.4 Power influence and compliance. 4.5 Influence of Leadership. 4.6 Techniques to deal people effectively. - case studies. 4.7 Importance of resource management (human, machine, material, method, money, time (moment), information (message)). 4.8 Need, importance & types of oragnisational training. 4.9 Need and importance of motivations. 4.10 Changing role of supervisor as facilitator& motivator. 4.11 Need, importance and use of guidance, mentoring, coaching and counselling. 4.12 Importance of problem solving and decision making in context of productivity, quality, cost consciousness, human relations and goal achievement. 4.13 Factors affecting decision making. 4.14 Types and process of decision making. 4.15 Make the decisions for given case/situation. - case studies.

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit V Change and stress management.	5a. Identify need for change and barriers to change. 5b. Suggest strategies for any change. 5c. Resolve conflicts.	5.1 Need for change. 5.2 Barriers to change. 5.3 Strategies and tools to manage change.(Effective implementation and management of change). - case studies. 5.4 Trade unions and their objectives. 5.5 Constructive role of trade unions in goal setting, achievement and change management. 5.6 Causes of conflicts and techniques to resolve conflicts - case studies.
	5d. Analyse stress situation 5e. Manage stress.	5.7 Concept and Causes of stress. 5.8 Stress measuring techniques. 5.9 Need for relieving stress. 5.10 Techniques to manage the stress- case studies. 5.11 Self-management techniques

5. SUGGESTED SPECIFICATIONTABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction	02	02	03	00	05
II	Human needs, relations and values	04	05	05	00	10
III	Behavioural dynamics	08	06	07	07	20
IV	Leadership Development	08	05	05	10	20
V	Change and stress management	06	02	08	05	15
Total		**28**	**20**	**28**	**22**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. LIST OF EXERCISES/PRACTICALS

- Not Applicable

7. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Name the students with whom you have very good relations. Also list the reasons for that.

ii. Name the students with whom you have very bad relations. Also list the reasons for that.

iii. List the factors/situations which motivate you.

iv. Identify the situations which cause stress to you. Also state reasons for that.

v. Visit institute's canteen, workshop and administration departments and identify the ways how people manage stress during peak hours.

vi. Visit nearby hotels, hospitals, malls, workshops, industries and draw the organisational structure followed in these organisations. Also prepare a list of documents that are commonly used by them for effective and smooth working of these organisations.

vii. Visit nearby hotels, hospitals, malls, workshops, industries and prepare a report on how they are dealing with day to day grievances and customer complaints.

viii. Visit different organisations and prepare a report on various unions exist in these.

ix. Each student should search the web and prepare biography of one leader from any field and try to identify the leadership traits he/she possesses.

x. Participate in team building exercises

xi. Prepare a plan to develop yourself for achieving excellence

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

S. No.	Unit	Strategies	Purpose
1	I	Live examples/movies on productivity and harmony.	Importance of productivity and harmony can be understood.
2	II	a: Group discussion for Maslow's hierarchy. b: Case study/ case movie which appreciate importance of values and ethics.	To identify human motivations and to appreciate values and ethics for relationships.
3	III	a: Presentation on self characteristics. b: Tasks assignments to deal in team. c: Case study/movie. d: Group discussion.	To analyse self for interpersonal behaviour and develop the ability to work in team. Also to develop self confidence and openness of the thoughts.
4	IV	a: Case study-leadership. b: Role play-leadership. c: Group discussion-case for decision making.	To make students aware of the techniques to deal different types of people effectively. Also to develop the ability to identify the factors

S. No.	Unit	Strategies	Purpose
		d: Group discussion for the case which require solution.	affecting decision making.
5	V	a: Case study/Movie. b: Group discussion.	To know the causes of conflicts and to find out the resolution techniques of conflicts. Also to know the techniques to manage the stress.

9. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Books	Author	Publication
1	Managing people at work.	Ahuja, Jain & Chhabra.	Dhanpatrai and Sons.
2	Human Resource	Biswajeet Pattanayak	PHI Learning, New Delhi
3	Human Resource	K. Aswathappa	Tata McGraw Hill
4	Seven Habits of successful	Stephen R. Covey	Free Press
5	Competency Framework for HRM	B.L. Gupta	Concept Publishing, New Delhi, First Edition 2011
6	Behavioural processes in organisation.	Pareek, Udai and Rao T.V.	Oxford and TBH Publishing Co., New Delhi, 1981.
7	Human Resource Management	V. S. P. Rao	
8	Human Resource	D.R.Patel, Y.R.Joshi	Atul Prakashan.

B) List of Software/Learning Websites:

i. www.cipd.co.uk/NR/rdonlyres/29D9D26D.../9781843982654_sc.pdf
ii. www.slideshare.net/kumaravinash23/chapter-12-2634971
iii. www.tutor2u.net/business/people/motivation_theory_mcgregor.asp
iv. www.mindtools.com
v. kalyan-city.blogspot.com/.../maslow-hierarchy-of-needs-theory-of.html
vi. www.enotes.com › Health
vii. www.youtube.com/watch?v=RwZ4-GTSNUI
viii. www.entrepreneur.com/article/204248
ix. ceocommunity.ning.com/forum/attachment/download?id...
x. www.facultyfocus.com/...leadership/improve-your-decision-making-skill...
xi. www.nap.edu/catalog.php?record_id=13188
xii. nearyou.gwu.edu/hrdl-hr/hrd-ld-hr_brochure.pdf
xiii. www.hrinz.org.nz/Site/Resources/...Base/.../Change_Management_.aspx
xiv. http://www.youtube.com/watch?v=OD6-dBymmjk
xv. http://www.youtube.com/watch?v=SJR-MRVd1okhttp://www.youtube.com/watch?v=pbxpg6D4Hk8

10. COURSE CURRICULUM DEVELOPMENT

COMMITTEE Faculty Members from Polytechnics

- **Prof. Shah Bhaskar K**. Lecturer in Mechanical Engineering, Butler Polytechnic, Vadodara.
- **Prof. A.M. Talsaniya**, Lecturer in Mechanical Engineering, Sir Bhavsinhji polytechnic institute, Bhavnagar.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. B.L.Gupta**, Professor and Head, Department of Management.
- **Prof. Sharad Pradhan**, Associate Professor and Head Department of Mechanical Engineering.