

**CIRCULAR NO.SU/B.Sc./CBC&GS /67/2023**

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies, Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted the **following syllabi of Bachelor of Science with Practical Pattern of Question Paper under the scheme of Choice Based Credit & Grading System** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Biotechnology (Degree)	IIIrd & IVth semester
2.	B.Sc. Automobile Technology (Degree)	IIIrd & IVth semester
3.	B.Sc. Workshop Technology (Degree)	IIIrd & IVth semester
4.	B.Sc. Refrigeration and Air Conditioning (Degree)	IIIrd & IVth semester
5.	B.Sc. Physics (Optional)	IIIrd & IVth semester
6.	B.Sc. Chemistry (Optional)	IIIrd & IVth semester
7.	B.Sc. Analytical Chemistry (Optional)	IIIrd & IVth semester
8.	B.Sc. Statistics (Optional)	IIIrd & IVth semester

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.

REF.NO.SU/2023/670-77
Date:- 03.06.2023.

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*Deputy Registrar,
Academic Section*

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] **The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.**
- 2] The Section Officer,[B.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
- 6] The Public Relation Officer, Dr.BAMU,A'bad.
- 7] The Record Keeper, Dr.BAMU,A'bad.

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India



Undergraduate Bachelor Degree Program
in Science & Technology
Automobile Technology

Course Structure and Curriculum
(Outcome Based Curriculum)
Choice Based Credit System

(Effective from Academic Year 2023-24)

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad – 431004 (MS) India

Dr. Prashant Ambekar

Dr. Prashant Ambekar

[Signature]

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science & Technology

Course Structure and Scheme of Examination

B.Sc. Automobile Technology Undergraduate Degree Program

Semester III

	Course Code	Course Title	Teaching Time / Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
(DSC-1C) Core Courses	AT-311	Automotive Engine I	2 hours	2	50	10	40	20
	AT-312	Advance Automotive Engine I	2 hours	2	50	10	40	20
	AT-321	Lab Course Based on AT-311	3 hours	1.5	50	10	40	20
	AT-322	Lab Course Based on AT-312	3 hours	1.5	50	10	40	20
(DSC-2C) Core Courses	AT-313	Transmission System I	2 hours	2	50	10	40	20
	AT-314	Automobile Tools I	2 hours	2	50	10	40	20
	AT-323	Lab Course Based on AT-313	3 hours	1.5	50	10	40	20
	AT-324	Lab Course Based on AT-314	3 hours	1.5	50	10	40	20
(DSC-3C) Core Courses	AT-315	Machine Drawing I	2 hours	2	50	10	40	20
	AT-316	Mechanical Measurement I	2 hours	2	50	10	40	20
	AT-325	Lab Course Based on AT-315	3 hours	1.5	50	10	40	20
	AT-326	Lab Course Based on AT-316	3 hours	1.5	50	10	40	20
Skill Enhancement Course (SEC I)	AT-317	Any one Skill to be chosen out of two SEC (A) : Aptitude and Reasoning I SEC (B) : Mathematics I	2 Hours	2	50	10	40	20
Ability Enhancement Compulsory Courses (AECC-3)	AT-331	Communication Skills in English III	3 hours	3	50	10	40	20
	AT-332	Marathi/Hindi A student can opt any one of these subject (SL-3)	3 hours	3	50	10	40	20
Additional Credits		Computer Ability	2 Hours	2*	50	10	40	20
			38 Hours	29	750	150	600	
Total Credits for Semester III : 29(Theory : 20 ; Practical : 9)								


Dr. Prashant Ambekar


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Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science & Technology

Course Structure and Scheme of Examination

B.Sc. Automobile Technology Undergraduate Degree Program

Semester IV

	Course Code	Course Title	Teaching Time / Week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
(DSC-1D) Core Courses	AT-411	Automotive Engine II	2 hours	2	50	10	40	20
	AT-412	Advance Automotive Engine II	2 hours	2	50	10	40	20
	AT-421	Lab Course Based on AT-411	3 hours	1.5	50	10	40	20
	AT-422	Lab Course Based on AT-412	3 hours	1.5	50	10	40	20
(DSC-2D) Core Courses	AT-413	Transmission System II	2 hours	2	50	10	40	20
	AT-414	Automobile Tools II	2 hours	2	50	10	40	20
	AT-423	Lab Course Based on AT-413	3 hours	1.5	50	10	40	20
	AT-424	Lab Course Based on AT-414	3 hours	1.5	50	10	40	20
(DSC-33) Core Courses	AT-415	Machine Drawing II	2 hours	2	50	10	40	20
	AT-416	Mechanical Measurement II	2 hours	2	50	10	40	20
	AT-425	Lab Course Based on AT-415	3 hours	1.5	50	10	40	20
	AT-426	Lab Course Based on AT-416	3 hours	1.5	50	10	40	20
Skill Enhancement Course (SEC II)	AT-417	Any one Skill to be chosen out of two SEC (A) : Aptitude and Reasoning II SEC (B) : Mathematics II	2 Hours	2	50	10	40	20
Ability Enhancement Compulsory Courses (AECC-4)	AT-431	Communication Skills in English IV	3 hours	3	50	10	40	20
	AT-432	Marathi/Hindi A student can opt any one of these subject (SL-4)	3 hours	3	50	10	40	20
Additional Credits		Computer Ability Environmental studies	2 Hours	2*	50	10	40	20
			38 Hours	29	750	150	600	

Total Credits for Semester IV : 29(Theory : 20 ; Practical : 9)


Dr. Prashant Ambekar


Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

AT-311: Automotive Engine I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives:

- The student will be made to learn
- The anatomy of the automobile in general
- The location and importance of each part
- The functioning of the engine and its accessories

Unit:-I: Introduction to Engine: 06

- Description of internal and external combustion engines
- Classification of IC engines
- Principle and working of 2 and 4-stroke diesel and petrol engine
- Differentiate between 2-stroke and 4 stroke C.I. engine and S.I Engine
- Technical terms used in engine
- Engine specification.

Unit:-II: I.C. Engine Construction: Structural Components; Components of an Engine: 06

- Cylinder Block, Cylinder Head, Gaskets
- Cylinder Liner (Or Sleeve), Crankcase
- Oil Pan, Manifolds Exhaust System
- Engine Mounting
- Bearings, Main Bearings
- Fasteners
- Vibration Damper

Unit:-III: Engine Construction: Mechanism Forming Components: 06

- Introduction, Piston, Piston Rings, Gudgeon (Or Piston) Pin
- Connecting Rod, Crankshaft, Camshaft
- Valve Operating Mechanisms, Valves Rocker Shaft Assembly And Rocker Arms,
- Important Dimensions And Clearances In Valve Operating Mechanism
- Belt and Pulleys
- Flywheel and Ring Gear.

Unit:-IV: Carburetion:- 09

- Introduction, Definition of Carburetion, Factors Affecting Carburetion, types of carburetor

- Air-Fuel Mixtures
- Mixture Requirements at Different Loads and Speeds
- Air-Fuel Mixture Requirements
- Idling Range, Cruising Range, Power Range,
- Principle of Carburetion The Simple Carburetor
- Total Calculation of the Air-Fuel Ratio, Air-Fuel Ratio Neglecting Compressibility of Air, Air-Fuel Ratio Provided by a Simple Carburetor
- Size of the Carburetor, Essential Parts of a Carburetor,
- The Fuel Strainer, The Float Chamber, The Main Metering and Idling System,
- The Choke and the Throttle, Compensating Devices, Air-bleed jet, Compensating Jet, Emulsion Tube Back Suction Control Mechanism, Auxiliary Valve, Auxiliary Port.

Reference Text Books

- 1) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 2) Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications
- 3) Internal Combustion Engines by V Ganesan, Mc Graw Hill Education

Course Outcomes:The student will be able to

- Identify the different parts of the automobile
- Explain the working of various parts like engine
- Develop a strong base for understanding future developments in the automobile industry

AT-312: Advance Automotive Engine I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives: The student will be made to learn

- ❖ The anatomy of the automobile in general
- ❖ The location and importance of each part
- ❖ The functioning of the engine and its accessories

Unit:-I: Mechanical Injection systems: 06

- Introduction, Functional Requirement of an Injection System, Classification of Injection System
- Fuel Feed Pump, Injection Pump
- Injection Pump Governor
- Fuel Injector
- Nozzle
- Injection in SI Engine

Unit:-II: Electronic Injection Systems: 08

- Introduction, Types of Injection System
- Electronic Fuel Injection System
- Multi-Point Fuel Injection (MPFI) System
- Electronic Control System
- Injection Timing
- Electronic Diesel Injection System (CRDI)

Unit:-III : Conventional Fuels: 06

- Introduction, Solid Fuel, Gaseous Fuel, Liquid Fuel
- Chemical Structure of Petroleum
- Paraffin Series, Olefin Series, Naphthene Series, Aromatic Series
- Petroleum Refining Process
- Important Qualities of Engine Fuels, SI Engine Fuels, CI Engine Fuels
- Rating of Fuels, Rating of SI Engine Fuels, Rating of CI Engine Fuels

Unit:-IV: Alternate Fuels:-06

- Introduction
- Possible Alternatives, Solid Fuels, Liquid Fuels, Alcohol, Methanol, Ethanol
- Alcohol for SI Engines, Reformulated Gasoline for SI Engine

- Water-Gasoline Mixture for SI Engines, Alcohol for CI Engines
- Surface-Ignition Alcohol CI Engine, Spark-Assisted Diesel
- Vegetable Oil, Biodiesel, Production, Properties
- Environmental Effects
- Gaseous Fuels, Hydrogen, Hydrogen Engines, Natural Gas
- Advantages & Disadvantages of Natural Gas
- Compressed Natural Gas (CNG)
- Liquefied Petroleum Gas (LPG), Advantages and Disadvantages of CNG & LPG

Reference Text Books

- Internal Combustion Engines by V Ganesan, Mc Graw Hill Education
- Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications
- Automobile Engineering Volume 2 by K.M.Gupta, Umesh Publications

Course Outcomes: The student will be able to

- Identify the different parts of the automobile
- Explain the working of various parts like engine
- Develop a strong base for understanding future developments in the automobile industry

AT-321: Lab Course Based on AT-311 (Automotive Engine I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study construction and working 2 and 4-stroke petrol engine
- To study construction and working 2 and 4-stroke diesel engine
- To study Engine specification in details
- To study construction and working of Components of an Engine in details (Cylinder Block, Cylinder Head, Gaskets)
- To study construction and working of Engine Mountings
- To study construction and working of Connecting Rod, Crankshaft, Camshaft
- To study construction and working of Valve Operating Mechanism
- To study construction and working of Simple Carburetor
- To study construction and working of Multiple Venturi Carburetor:

AT-322: Lab Course Based on AT-312 (Advance Automotive Engine I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study the construction and working of Fuel Injector
- To study the construction and working of Electronic Fuel Injection System
- To study the construction and working of Multi-Point Fuel Injection (MPFI) System
- To study the construction and working of Electronic Diesel Injection System (CRDI)
- To study Important Qualities of SI & CI Engine Fuels
- To study characteristics of Compressed Natural Gas (CNG) as a alternate fuel
- To study characteristics Liquefied Petroleum Gas (LPG) as a alternate fuel

AT-313: Transmission System I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives: The student will be made to learn

- ❖ The anatomy of the automobile in general
- ❖ The location and importance of each part
- ❖ The functioning of the gear box, clutch, final drive, Wheel.

Unit:-I : Clutch

- Introduction, Function, Necessity
- Types Of Clutches And Their Working Principles
- Wet And Dry Clutches, Components Of Clutch System
- Parts Of Clutch
- Operating Mechanism Of Clutch (Hydraulic, Mechanical, Vacuum Assisted , Air Pressure Assisted)
- Fluid Flywheel, Torque Converter

Unit:-II: Transmissions

- Principles Of Gears, Function And Need Of Gear Box
- Gear Ratio
- Types Of Gear, Spur , Bevel , Helical, Etc.
- Types Of Gear Box, Sliding, Constant, Synchromesh.
- Gear Selecting Mechanism
- Parts Of Gear Box, Gear Box Foundation, Over Drive
- Semi And Fully Automatic Transmission
- Epicyclic Gears, Free Wheel.

Unit:-III: Final Drive and Differential

- Use Of Propeller Shaft, Material And Construction
- Use And Types Of U Joints
- Slip Joint, Universal Coupling
- Hotch Kich And Torque Tube Drive, Types of drive (front, rear and four wheel)
- Function of final drive types of final drives, types of rear axle
- Function, principle, necessity, construction of differential.

Unit- IV: Wheel and Tyre

- Construction And Types Of Wheel Such As Wire Wheel, Disk Wheel, Spoke Wheel.

- Tyre- Construction Of Tyre, Types Of Tyre, Trade Pattern
- Tyre Specification, Tyre Inflation
- Factor Affecting Tyre Performance, Tyre Rotations
- Tyre Remolding and Retarding Process.

Reference Text Books

- 1) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 2) Automobile Engineering Volume 2 and Volume 1 by K.M.Gupta, Umesh Publications

Course Outcomes:

The student will be able to

- ❖ Identify the different parts of the automobile
- ❖ Explain the working of various parts like transmission, clutch,
- ❖ Develop a strong base for understanding future developments in the automobile industry

AT-314: Automobile Tools I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives:

The student will be made to learn

- ❖ The anatomy of the automobile tools in general
- ❖ The use and importance of each tools
- ❖ The functioning of the various tools and testing machine.

Unit:-I: General Tools 08

- ❖ Spanners, Adjustable Spanners,
- ❖ Different Types Like Open-Ended, Ring, Box,
- ❖ Various Types Of Screw Drivers,
- ❖ Different Types Of Pliers, Cutting Pliers, Circlip Pliers,
- ❖ Combination Pliers,
- ❖ Different Types Of Wrench,
- ❖ Different Types Of Hammer, E.G. Mallet, Brass, Plastic Copper Etc.
- ❖ Allen Key
- ❖ Different Types Of Files,
- ❖ Chisel, Punches, Vice Etc.

Unit:-II: Special Tools 09

- ❖ Box Spanner Set, Feeler Gauge, Thread Gauge
- ❖ Vernier Caliper, Micrometer, Depth Gauge
- ❖ Piston Ring Compressor And Expander, Valve Spring Compressor Tester
- ❖ Clutch Center Guide, Spark Plug Spanner
- ❖ Stud Extractor, Tap Extractor
- ❖ Valve Spring Lifter's
- ❖ Different Types Of Pullers, Types Of Plugs, Sliding Hammer, Magneto Pullers, Toeing equipments

Unit:-III: Different types of Gauges & meters – 09

- ❖ Vacuum Gauge, Compression Gauge, Injection Pressure Gauge, Oil Pressure Gauge
- ❖ Temperature Gauge, Air Pressure Gauge
- ❖ Multimeter, Tachometer, Dwell Tester
- ❖ Timing Light
- ❖ Dial Gauge

Reference Text Books

- 1) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 2) Automobile Engineering Volume 2 by K.M.Gupta, Umesh Publications
- 3) Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications

Course Outcomes: The student will be able to

- ❖ Identify the different tools of the automobile
- ❖ Explain the use of various tools and testing machine
- ❖ Describe how the various tools operate.
- ❖ Describe how the various testing machine operate.

AT-323: Lab Course Based on AT-313 (Transmission System I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study construction and working single and multiplate clutch
- To study construction and working Cone Clutch
- To study construction and working Centrifugal Clutch
- To study construction and working Hydraulic Clutch
- To study construction and working Sliding mesh gear box
- To study construction and working Constant mesh gear box
- To study construction and working Synchromesh gear box
- To study construction and working Universal Joints
- To study construction and working different types Wheel
- To study Construction Of Tyre

AT-324: Lab Course Based on AT-314 (Automobile Tools I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study Various Types Of Screw Drivers
- To study Different Types Of Pliers
- To study Different Types Of Wrench & Hammers
- ❖ To study Vernier Caliper, Micrometer, Depth Gauge
- ❖ To study construction and working Stud Extractor, Tap Extractor
- ❖ To study construction and working Toeing equipments
- To study construction and working Tachometer
- To study construction and working Dwell Tester

AT-315: Machine Drawing I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objective

1. The student will acquire knowledge of threads, fastening arrangements, different styles of attachment for shaft.
2. To understand and apply national and international standards while drawing machine component.

Unit I: Screw Threads

- Introduction, Definitions (various Parts of Screw threads),
- Forms of screw threads,
- Triangular or V Threads and Square Threads (With Types)
- Conventional representation of thread (All Methods)
- Multiple Starts threads
- Right and Left hand Threads

Unit II: Screw Fastenings

- Introduction,
- Types of Nuts: Hexagonal & Square Nut, Types of nuts of special purpose
- Bolts & Forms of Bolts (All Types)
- Set Screw, Washer
- Locking Arrangement of Nuts
- Foundation Bolts
- Conventional representation of Nuts and Bolts

Unit III: Key, Cotter and Pin Joints

- Introduction,
- Keys Joint, Taper keys and its types, Parallel or feather keys, Spline shaft, Woodruff Key, Cone Key
- Cotter and Cotter joints (All Types)
- Pin Joint or Knuckle joints

Unit IV: Shaft Couplings

- Introduction
- Fast and Rigid Coupling
- Box or muff Coupling, Half lap Coupling, Split muff Coupling
- Flanged, Protected flanged & Solid flanged Coupling

- Flexible Coupling
- Universal Coupling
- Oldham Coupling

Learning Outcomes

1. Students will get good interpretation of machine components
2. Students will understand standardization of drawings.
3. Student will understand the Indian and International standard components.
4. Student will able create drawings to industrial standard.
5. Learn what tolerance and fits and assembly

AT-316: Mechanical Measurement I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objectives

1. The main objective of this course is to make students familiar with the mechanical measuring systems, and the standard measurement methods.
2. It further aims to make them to understand the basic measurement systems in the real time engineering applications.

Unit I: Measurements and Measurement Systems

- Introduction, Significance of Measurements
- Methods of Measurement: Direct Methods, Indirect Methods, Primary, Secondary and Tertiary Measurements
- Primary Measurements, Secondary Measurements, Tertiary Measurements
- Mechanical, Electrical and Electronic Instruments
- Classification of Instruments : Absolute Instruments, Secondary Instruments
- Functions & Applications of Instruments and Measurement Systems
- Elements of a Generalized Measurement System

Unit II Static Characteristics of Instruments and Measurement Systems

- Static Characteristics, True Value, Static Error, Static Correction, Scale Range and Scale Span, Error Calibration Curve, Scale Readability, Repeatability and Reproducibility, Drift
- Signal to Noise Ratio (S/N), Noise, Accuracy and Precision, Range of Doubt, Discrepancy
- Static Sensitivity, Linearity, Hysteresis, Threshold, Dead Time , Dead Zone

Unit III Errors in Measurements

- Errors in Measurements, Limiting Errors (Guarantee Errors), Relative (Fractional) Limiting Error
- Combination of Quantities with Limiting Errors, Known Errors
- Types of Errors: Gross Errors, Systematic Errors, Instrumental Errors, Environmental Errors, Observational Errors, Random (Residual) Errors

Unit IV Pressure Measurements

- Introduction, Types of Pressure Measurement
- Manometers, Types of Manometers
- Bourdon Tube, Bellows, Diaphragms

- Electromechanical Pressure Transducers, Potentiometric Transducers, Strain Gauges, Inductive Transducers
- Linear Variable Differential Transducers LVDT, Capacitive Transducers, Piezoelectric Transducers
- Photoelectric Transducers, McLeod Gauge, Knudsen Gauge, Thermal Conductivity Gauges
- Thermocouple Gauge Pirani Gauge

Learning Outcomes

1. Selecting suitable mechanical measuring instruments for basic and special requirement in the industries.
2. Analyzing the characteristics of measuring instruments.
3. Designing the fits and tolerances to improve the existing performance.
4. Determine error and analyzing uncertainty in the measurements.
5. Work in quality control and quality assurances divisions in industries.

AT-325: Lab Course Based on AT-315 (Machine Drawing I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- Draw Triangular or V Threads
- Draw and Square Threads
- Draw and Hexagonal Nuts
- Draw and Square Nuts
- Draw Foundation Bolts
- Draw Cotter and Cotter joints (All Types)
- Draw Pin Joint or Knuckle joints
- Draw any three types of coupling

AT-326: Lab Course Based on AT-316 (Mechanical Measurement I)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To Study Elements of a Generalized Measurement System
- To Study Static & Dynamic Characteristics of instrument
- To study types of errors using measurement instrument
- Calibration of LVDT
- To study bourdon tube pressure gauge
- Calibration of Pressure Gauge
- To study Thermal Conductivity Gauges
- To study Manometers

Skill Enhancement Course (SEC I) SEC A

AT-317: Aptitude and Reasoning I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objectives

1. This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

Unit -I: Quantitative Ability (Basic Mathematics)

- Number Systems
- LCM and HCF
- Decimal Fractions
- Simplification
- Square Roots and Cube Roots
- Average

Unit -II: Arithmetic Ability I

- Problems on Ages
- Surds & Indices
- Percentages
- Problems on Numbers
- Permutation and Combinations
- Probability

Unit -III: Logical Reasoning

- Analogy
- Blood Relation
- Directional Sense
- Number and Letter Series
- Coding – Decoding
- Calendars
- Clocks
- Venn Diagrams
- Seating Arrangement

Learning Outcomes

1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability
5. Compete in various competitive exams

Skill Enhancement Course (SEC I) SEC B

AT-317: Mathematics I

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Unit – I Algebra I

- Logarithm: Concept and laws of logarithm
Determinant and matrices
- Value of determinant of order 3×3
- Solutions of simultaneous equations in three unknowns by Cramer's rule.

Unit– II Trigonometry

- Trigonometric ratios of Compound, allied, multiple and sub-multiple angles (without proofs)
- Factorization and de-factorization formulae(without proofs)
- Inverse trigonometric ratios and related problem.
- Principle values and relation between trigonometric and inverse trigonometric ratio.

Unit– III Coordinate Geometry

- Straight line and slope of straight line a. Angle between two lines. b. Condition of parallel and perpendicular lines
- Various forms of straight lines.
a. Slope point form, two point form. b. Two points intercept form. c. General form. d. Perpendicular distance from a point on the line. e. Perpendicular distance between two parallel lines.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

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Faculty of Science & Technology

Course Structure and Scheme of Examination

B.Sc. Automobile Technology Undergraduate Degree Program

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Ability	AT-431	Communication Skills in English IV	3 hours	3	50	10	40	20
Enhancement Compulsory Courses (AECC-4)	AT-432	Marathi/Hindi A student can opt any one of these subject (SL-4)	3 hours	3	50	10	40	20
Additional Credits		Computer Ability	2 Hours	2*	50	10	40	20
			38 Hours	29	750	150	600	

Total Credits for Semester IV : 29(Theory : 20 ; Practical : 9)

AT-411: Automotive Engine II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives:

The student will be made to learn

- ❖ The anatomy of the automobile in general
- ❖ The location and importance of each part
- ❖ The functioning of the engine and its accessories

Unit:-I: Ignition: 06

- Introduction
- Energy Requirements for Ignition, The Spark Energy and Duration
- Ignition System, Requirements of an Ignition System, Battery Ignition System
- Battery, Ignition Switch, Ballast Resistor, Ignition Coil, Contact Breaker
- Capacitor, Distributor, Spark Plug
- Operation of a Battery Ignition System, Limitations
- Dwell Angle
- Advantage of a 12 V Ignition System, Magneto Ignition System

Unit:-II: Lubrication System: 06

- Function of Lubrication, Mechanism of Lubrication
- Elastohydrodynamic Lubrication
- Journal Bearing Lubrication, Stable Lubrication
- Lubrication of Engine Components
- Piston, Crankshaft Bearings, Crankpin Bearings orator, Wristpin Bearing
- Lubrication System, Mist Lubrication System, Wet Sump Lubrication System, Dry Sump Lubrication System

Unit:-III: Cooling System: 06

- Need for Cooling System, Characteristics of an Efficient Cooling System
- Types of Cooling Systems, Liquid Cooled Systems, Direct or Non-return System
- Thermosyphon System, Forced Circulation Cooling System, Evaporative Cooling System
- Pressure Cooling System, Air-Cooled System
- Cooling Fins

- Comparison of Liquid and Air-Cooling Systems
- Advantages of Liquid-Cooling System, Limitations
- Advantages of Air-Cooling System, Limitations

Unit:-IV: Fuel Supply Systems For Petrol And Diesel Engines 08

- Introduction, Types Of Fuel Supply Systems
- Fuel Supply In Petrol Engines, Fuel Pump, Fuel Tank, Fuel Filters
- Fuel Piping And Hoses
- Air Cleaners: Need And Functions
- Fuel Pumps
- Electrical Automatic Choke
- Electronic Petrol Injection System, Supercharging
- Fuel Supply (Injection) System In Diesel Engines, Fuel Feed Pump, Fuel Injection Pump, Rotary Distributor Pump
- Fuel Injector, Auxiliary Starting Devices, Piezoelectric Fuel Injection System, Governors

Reference Text Books

- 1) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 2) Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications
- 3) Internal Combustion Engines by V Ganesan, Mc Graw Hill Education

Course Outcomes:

The student will be able to

- ❖ Identify the different parts of the automobile
- ❖ Explain the working of various parts like engine
- ❖ Develop a strong base for understanding future developments in the automobile industry

AT-412: Advance Automotive Engine II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives:

The student will be made to learn

- ❖ The anatomy of the automobile in general
- ❖ The location and importance of each part
- ❖ The functioning of the engine and its accessories

Unit:-I: Modern Ignition Systems: 06

- Introduction
- Transistorized Coil Ignition (TCI) System
- Capacitive Discharge Ignition (CDI) System
- Firing Order
- Ignition Timing and Engine Parameters, Engine Speed, Mixture Strength, Part Load Operation
- Spark Advance Mechanism, Centrifugal Advance Mechanism, Vacuum Advance Mechanism, Ignition Timing and Exhaust Emissions

Unit:-II: Advance Lubrication System: 06

- Introduction
- Crankcase Ventilation
- Properties of Lubricants, Viscosity, Flash and Fire Points, Cloud and Pour Points out to, Oiliness or Film Strength, Corrosiveness, Detergency, Stability, Foaming
- SAE Rating of Lubricants, Single-grade, Multi-grade
- Additives for Lubricants, Anti-oxidants and Anticorrosive Agents
- Detergent-Dispersant, Extreme Pressure Additives, Pour Point Depressors
- Viscosity Index Improvers
- Oiliness and Film Strength Agents, Antifoam Agents

Unit:-III: Performance Parameters and Characteristic: 08

- Introduction
- Engine Power, Indicated Mean Effective Pressure (PIM) fox, Indicated Power (IP), Brake Power (BP)
- Brake Mean Effective Pressure (BMEP), Engine Efficiencies, Air-Standard Efficiency

- Indicated and Brake Thermal Efficiencies
- Mechanical Efficiency, Relative Efficiency, Volumetric Efficiency
- Scavenging Efficiency, Charge Efficiency, Combustion Efficiency, Engine Performance Characteristics
- Variables Affecting Performance Characteristics
- Combustion Rate and Spark Timing, Air-Fuel Ratio
- Compression Ratio, Engine Speed, Mass of Inducted Charge
- Heat Losses, Methods of Improving Engine Performance

Reference Text Books

- 1) Internal Combustion Engines by V Ganesan, Mc Graw Hill Education
- 2) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 3) Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications
- 4) Automobile Engineering Volume 2 by K.M.Gupta, Umesh Publications

Course Outcomes: The student will be able to

- Identify the different parts of the automobile
- Explain the working of various parts like engine
- Develop a strong base for understanding future developments in the automobile industry

AT-421: Lab Course Based on AT-411 (Automotive Engine II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study construction and working Battery Ignition System
- To study construction and working of Magneto Ignition System
- To study construction and working of Mist Lubrication System
- To study construction and working of Wet Sump Lubrication System
- To study construction and working of Dry Sump Lubrication System
- To study construction and working of Thermosyphon System,
- To study construction and working of Forced Circulation Cooling System,
- To study construction and working of Air-Cooled System

AT-422: Lab Course Based on AT-412 (Advance Automotive Engine II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study the construction and working of Transistorized Coil Ignition (TCI) System
- To study the construction and working of Capacitive Discharge Ignition (CDI) System
- Practical on Spark Advance Mechanism
- Practical on Ignition Timing and Exhaust Emissions
- To study Single-grade, Multi-grade Lubricants and its effect on engine performance
- To study the different performance parameter on engine on engine test rig.
- Practical on Methods of Improving Engine Performance

AT-413: Transmission System II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives: The student will be made to learn

- ❖ The anatomy of the automobile in general
- ❖ The location and importance of each part
- ❖ The functioning of the Suspension brakes, steering, axles and wheels
- ❖ Suspension, frame, springs and other connections

Unit:-I: Suspension System –(9)

- Function, Principle, Necessity And Requirements Of Good Suspension
- Types Of Spring, Construction And Working Of Spring
- Types Of Spring Such As Coil Spring, Leaf Spring, Torsion Bar Etc.
- Types Of Suspension System Rigid And Independent System
- Independent Front And Rear System
- Combined Coil And Leaf Spring Suspension
- Stabilizer Bar, Swing Arm, Mcpherson Etc.
- Lubrication Of Suspension
- Rubber Bushing, Anti Roll Bar
- Design Aspect Of Suspension System
- Air Suspension System.

Unit:-II: Shock absorber – (3)

- Function, Necessity Construction Of Shock Absorber
- Types Of Shock Absorber Such As Telescopic, Hydraulic, Gas Filled, Column And Struts,

Unit:-III: Brake System –(7)

- Introduction, Principle, Necessity
- Construction, And Types Of Brake System
- Disk And Drum Brake
- Mechanical, Hydraulic, Air, Electric, Vacuum And Air Assisted Hydraulic Brake.
- Parts Of Various Brake System
- Parking Brake
- Design Aspect of Brake System, Factor Affecting Brake Efficiency.

Unit:-IV: Steering System–(7)

- Introduction, Function
- Types Of Axle, Live And Dead Axle, Stub Axle
- Types Of Steering System
- Different Types Of Steering Gear Box
- Steering Geometry
- Wheel Alignment
- Electronic Power Steering, Hydraulic Power Steering
- Under Steer And Over Steer
- Turning Circle Radius, Ackerman Principle.

Reference Text Books

- 5) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 6) Automobile Engineering Volume 2 and Volume 1 by K.M.Gupta, Umesh Publications

Course Outcomes: The student will be able to

- ❖ Identify the different parts of the automobile
 - ❖ Explain the working of various parts like brakes, steering, Suspension.
 - ❖ Describe how the steering and the suspension systems operate.
 - ❖ Develop a strong base for understanding future developments in the automobile industry
-

AT-414: Automobile Tools II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Course Objectives:

The student will be made to learn

- ❖ The anatomy of the automobile tools in general
- ❖ The use and importance of each tools
- ❖ The functioning of the various tools and testing machine.

Unit:-I: Automotive Equipments –

(13)

- Growler Machine, Engine Analyzer For Diesel & Petrol, Exhaust Gas Analyzer For Diesel & Petrol
- Hydrometer, Voltmeter, Ammeter, Battery High Rate Discharge Tester, Grease Gun, Hot Patch Clamp, Injector Tester
- Chain Pulley Block Arbor Press
- Engine Lifter, Hydraulic Jack, Alternator Tester
- Coil And Condenser Testing Machine
- Spark Plug Testing And Cleaning Machine, Blow Lamp, Paraffin Gun
- Pneumatic Nut And Bolt Tightener, Suzuki Scan Tools
- Accidental Repairs Pneumatic Equipments

Unit:-II: Special Purpose Machines I–

(13)

- F.I.P. Testing And Calibration Machine
- Wheel Alignment Gauge, Wheel Balancing Machine
- Portable Drilling Machine, (Hand & Power)
- Battery Charger
- Crank Shaft Grinding Machine
- Block Boring Machine
- Cylinder Head Refacer
- Valve Refacing Machine

Unit:-III: Special Purpose Machines II –

(13)

- valve seat cutter
- connecting rod aligner
- Engine test rig
- head light alignment set up

- car washing machine
- Riveting Machine
- Hydraulic press
- Teflon coating machinery
- Body glazing and buffing machinery.

Reference Text Books

- 4) Automobile Engineering by C.P. Nakra, Dhanpat Rai Publishing Company
- 5) Automobile Engineering Volume 2 by K.M.Gupta, Umesh Publications
- 6) Automobile Engineering Volume 1 by K.M.Gupta, Umesh Publications

Course Outcomes: The student will be able to

- ❖ Identify the different tools of the automobile
- ❖ Explain the use of various tools and testing machine
- ❖ Describe how the various tools operate.
- ❖ Describe how the various testing machine operate.

AT-423: Lab Course Based on AT-413 (Transmission System II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To study construction and working of Leaf Spring
- To study construction and working of Independent Suspension system
- To study Lubrication Of Suspension system
- To study construction and working of Telescopic shock absorber
- To study construction and working of Hydraulic shock absorber
- To study construction and working of Disk And Drum Brake
- To study construction and working of Mechanical brake system
- To study construction and working of Mechanical brake system
- To study construction and working of pneumatic brake system

AT-424: Lab Course Based on AT-414 (Automobile Tools II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- Practical on Engine Analyzer For Diesel & Petrol
- Practical on Exhaust Gas Analyzer For Diesel & Petrol
- Practical on Hydraulic Jack
- Practical on F.I.P. Testing And Calibration Machine
- Practical on Wheel Alignment Gauge, Wheel Balancing Machine
- Practical on Engine test rig
- Practical on Hydraulic press
- Practical on different car washing machine

AT-415: Machine Drawing II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objective

1. The student will acquire knowledge of fastening arrangements such as welding, riveting.
2. The student also is enabled to prepare the assembly of various machine or engine components and miscellaneous machine components.

Unit I: Pulley

- Introduction, Types of Pulleys : C.I. Belt Pulley, Fast and loose Pulley,
- Stepped Pulley
- Split Pulley, Rope Pulley,
- V-Belt Pulley & Details of V-Groove

Unit II: Spur Gearing

- Introduction, Definitions (various Parts of Spur Gear),
- Pitch Definitions, Relationship between pitches
- Tooth Proportions
- Involute Spur Gears
- Construction of base circle and Approximate Construction of Teeth Profile
- Rack and Pinion

Unit III: Riveted and Welded Joints

- Introduction of Riveting,
- Caulking and fullering
- Forms and Proportions of Rivet heads
- Failure of Riveted Joints
- Types of Riveted Joints : Lap & butt Joint
- Introduction of Welding,
- Types of Welded & Welds Joints
- Representation of Welded Joints

Unit IV: Assembly Drawing

- Introduction & Types of Assembly Drawing
- Accepted norms to be observed for Assembly Drawing

- Sequence of preparing the assembly drawing
- Problems : Tool Post Assembly, Crane hook Assembly, Stuffing box Assembly, Eccentric Drawing

Learning Outcomes

1. Students will get good interpretation of machine components
2. Students will understand standardization of drawings.
3. Student will able create drawings to industrial standard.
4. Learn what tolerance and fits and assembly

AT-416: Mechanical Measurement II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objectives

1. The main objective of this course is to make students familiar with the mechanical measuring systems, and the standard measurement methods.
2. It further aims to make them to understand the basic measurement systems in the real time engineering applications.

Unit I: Metrology

- Introduction, Dimensional Measurements
- Length Standards, Line and End Standards, Line Standard Instruments : Vernier Caliper, Micrometer
- Gauge Blocks, Use of Gauge Blocks
- Dial Gauges, Comparators, Types of Comparators
- Measurement of Angle, Angle Comparators

Unit II: Strain Gauges and Measurement Of Strain

- Introduction, Ballast Circuit, Wheatstone Bridges, Gauge Sensitivity
- Strain Gauges Connected in Series
- Stress Strain Relationships
- Rosettes

Unit III: Force and Torque Measurements

- Force, Basic Methods of Measurement of Force
- Multiple Lever Systems, Pendulum Scale, Accelerometers
- Hydraulic and Pneumatic Load Cells
- Measurement of Torque, Measurement of Torque of Rotating Shafts, Torque Measuring methods using Strain Sensors

Unit IV Temperature Measurements

- Introduction, Classification of Temperature Measuring Devices
- Liquid in Glass Thermometers, Pressure Gauge Thermometers
- Bimetallic Thermometers
- Electrical Resistance Thermometers
- Semi-conductor Thermometers, Thermister
- Thermocouples

Learning Outcomes

1. Selecting suitable mechanical measuring instruments for basic and special requirement in the industries.
2. Analyzing the characteristics of measuring instruments.
3. Designing the fits and tolerances to improve the existing performance.
4. Determine error and analyzing uncertainty in the measurements.
5. Work in quality control and quality assurances divisions in industries.

AT-425: Lab Course Based on AT-415 (Machine Drawing II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- Draw Fast and loose Pulley, Stepped Pulley
- Draw Construction of base circle and Approximate Construction of Teeth Profile
- Draw Forms and Proportions of Rivet heads
- Draw Welded & Welds Joints
- Draw any Tool Post assembly
- Draw Crane hook Assembly

AT-426: Lab Course Based on AT-416 (Mechanical Measurement II)

Total Credits : 1.5	Teaching Time / Week : (3 /Week)
Marks: 50 (10 CA + 40 UA)	

Lab Practical

- To determine the length, height and diameter of the given work piece using vernier caliper, vernier height gauge
- To determine the length, height and diameter of the given work piece using micrometer.
- To study Wheatstone Bridges using strain gauge
- Calibration of Thermocouple
- Calibration of Load Cell
- To study Hydraulic and Pneumatic Load Cells
- To Study Electrical Resistance Thermometers
- Determination of modulus of elasticity of a mild steel specimen using strain gauges.

Skill Enhancement Course (SEC II) SEC A

AT-417: Aptitude and Reasoning II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Learning Objectives

1. This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

Unit -I: Arithmetic Ability II

- Logarithm
- Profit and Loss
- Simple and Compound Interest
- Time, Speed and Distance
- Time & Work
- Ratio and Proportion
- Area
- Mixtures and Allegation

Unit II : Arithmetic Ability III

- Pipes and Cistern
- Boats and Stream
- Volume and Surface Areas
- True Discounts
- Bankers Discounts
- Heights and Distance
- Old Man Out and Serise

Unit -III: Data Interpretation

- Tabulation
- Bar graphs
- Pie Charts
- Line Graphs

Learning Outcomes

1. Understand the basic concepts of quantitative ability

2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability
5. Compete in various competitive exams



Dr. Prashant Ambad

Skill Enhancement Course (SEC II) SEC B

AT-417: Mathematics II

Total Credits : 2	Teaching Time / Week : (2 /Week)
Marks: 50 (10 CA + 40 UA)	

Unit – I Algebra II

Matrices, algebra of matrices, transpose adjoint and inverse of matrices. Solution of simultaneous equations by matrix inversion method.

- Types of partial fraction based on nature of factors and related problems.

Unit-II Mensuration

- Area of regular closed figures, Area of triangle, square, Area of triangle, square, and circle.
- Volume of cuboids, cone, cylinders and sphere.

Unit –III Statistics

- Range, coefficient of range of discrete and grouped data.
- Mean deviation and standard deviation from mean of grouped and ungrouped data, weighted means
- Variance and coefficient of variance.
- Comparison of two sets of observation.