SCHEME OF EXAMINATION

And

SYLLABUS

For

Bachelors in Vocation (B. Voc.)

in

AUTOMOBILE

Offered by

Community College of Skill Development

J. C. Bose University of Science & Technology, YMCA, Faridabad (Haryana)

2024 - 25

ABOUT THE COMMUNITY COLLEGE OF SKILL DEVELOPMENT

The Community College model is a flexible, open education system that is based on lifelong learning needs and is accessible to a large number of individuals in the community. Community College of Skill Development was started in 2013. It primarily focuses on imparting skill-based education on the models of National Occupational Standards (NOS). It provides Entrepreneurship Orientation to the students. Community College of Skill Development has been running B.Voc. in Automobiles since 2018 with a mission to impart quality education along with extensive hands-on training on the equipment/systems in automobile laboratories and industries. The presence of highly skilled and qualified trainers helps the students to enhance their professional and skill levels.

ABOUT THE PROGRAM

The B. Voc. Degree in Automobile runs with a mission to impart knowledge, technical skills & hands-on training in automobiles, focusing on four wheelers & two wheelers, both petrol & diesel, and Electrical Vehicles. This program is an outcome of recent industrial demand. This B.Voc program in Automobile has emphasis on practical hands-on learning with adequate theoretical knowledge which makes students more employable and outshine in this field. This program is designed to introduce the students to the operation of today's complex vehicles by giving them a comprehensive understanding from basic to advanced, of various automotive systems like transmission, brakes, steering, suspension, electrical & electronics, and engine performance, etc. Students under this program will acquire the necessary skills to diagnose and repair mechanical and computer controlled electronic systems on the latest models of automobiles. Vocational training programs have been created with the aim of imparting industry-specific skills in students. These programs are crafted in such a way that the students acquire skills, which will lead them to employment in the respective sector.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Automobile Engineering to expand their knowledge horizon beyond books and make them industry ready.

PEO-2: To enable students to service, design and maintain automotive equipment which are useful for the industries.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and efficiently.

PROGRAMME OUTCOMES (POs)

After completion of the program, the student will:

1. Be trained to NSQF level 5.5 in at least one job/profile in the field of automotive skills.
2. Be trained for multiple skill sets under the domain of automotive skills like Body repair, refinish painting technology, wheel care, engine emission system, automotive electrical circuit designing, vehicle dynamics etc.
3. Be able to supervise the various automotive workshop floors for mechanical shop, wheel care, body & paint repair.

4. Be trained & equipped with knowledge and understanding to start his/her own enterprise in automotive sales and services.
5. Able to develop skills in management of customer issues, analysis and evaluation of mechanical, electrical and electronics faults.
6. Plan and set up his/her enterprise/agency for repair and overhaul of engines and power trains, repair of suspension and steering system, wheel maintenance or spare parts business of any automotive OEM.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

To apply practical skills, vocational training and knowledge of automobile servicing fundamentals to industries. The student will be ready and skilled to take-up a career or to pursue higher studies with high regard to ethical values and social responsibilities.

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credit	Marks Weightage		Course Type
				Internal	External	
ENG-151-V	ENGLISH LITERACY	3-0-0	3	25	75	BSC
MTV-151-V	MATHEMATICS	3-0-0	3	25	75	BSC
AMV-101-V	QUALITY CONTROL AND SAFETY	3-1-0	3	25	75	PCC
AMV-103-V	ENGINEERING SCIENCE	3-0-0	3	25	75	PCC
AMV-105-V	BASICS OF AUTOMOBILE TECHNOLOGY	3-1-0	3	25	75	PCC
AMV-109-V	ENGINEERING GRAPHICS AND DRAWING	0-0-4	2	60	40	PCC
AMV-107-V	AUTOMOBILE WORKSHOP - I	0-0-06	3	30	70	SDP
Total		**15-2-10**	**20**	**155**	**445**	

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
AEC-151-V	BEHAVIORAL SKILLS	3-0-0	3	25	75	BSC
WDD-109-V	TYPOGRAPHY AND COMPUTER APPLICATION	3-1-0	3	25	75	BSC
AMV-102-V	APPLIED SCIENCE	3-0-0	3	25	75	PCC
AMV-104-V	INTERNAL COMBUSTION ENGINE	3-1-0	3	25	75	PCC
AMV-106-V	AUTOMOBILE WORKSHOP - II	0-0-10	5	30	70	SDP
VAC-151-V to 153-V	MANDATORY AUDIT COURSE	3-0-0	3	25	75	MAC
Total		**15-2-10**	**20**	**215**	**485**	

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
VAC-154-V	EMPLOYABILITY SKILLS	3-0-0	3	25	75	BSC
AMV-201-V	METROLOGY	3-1-0	3	25	75	SDP
AMV-203-V	CAD/CAM	3-1-0	3	25	75	BSC
AMV-205-V	MOTOR VEHICLE TECHNOLOGY	3-1-0	3	25	75	PCC
AMV-207-V	AUTOMOBILE ELECTRICAL EQUIPMENT	3-1-0	3	25	75	PCC
AMV-209-V	AUTOMOBILE WORKSHOP - III	0-0-6	3	30	70	SDP
AMV-211-V	CAD LAB	0-0-2	2	30	70	SDP
Total		**15-4-8**	**20**	**185**	**515**	

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
AMV-202-V	ELECTRICAL AND HYBRID VEHICLES	3-1-0	3	25	75	PCC
AMV-204-V	INDUSTRIAL MANAGEMENT	3-0-0	3	25	75	PCC
AMV-208-V	AUTOMOBILE WORKSHOP - IV	0-0-10	5	30	70	SDP
AMV-206-V	PROJECT	0-0-6	3	25	75	SDP
OEC-101-V to 104-V	OPEN ELECTIVE COURSE	3-1-0	3	25	75	OEC
AMV-210-V, 212-V, 214-V	PROGRAM ELECTIVE COURSE	3-0-0	3	25	75	PEC
Total		**12-2-16**	**20**	**155**	**445**	

FIFTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU-501	On Job Training (OJT)/ Internship	20	350	150	OJT
	Total	**20**	**350**	**150**	

SIXTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU-601	On Job Training (OJT)/ Internship	20	350	150	OJT
	Total	**20**	**350**	**150**	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
VAC-151-V	Human Value and Professional Ethics
VAC-152-V	Balanced Diet and Nutrition
VAC-153-V	Environmental Science

LIST OF OPEN ELECTIVE COURSES

Course Code	Course Name
OEC-101-V	ENTREPRENEURSHIP
OEC-102-V	TRENDS IN TECHNOLOGY
OEC-103-V	WASTE MANAGEMENT
OEC-104-V	INDUSTRY 4.0

LIST OF PROGRAM ELECTIVE COURSES

Course Code	Course Name
AMV-210-V	ALTERNATIVE FUELS & EMISSION CONTROL
AMV-212-V	VEHICLE BODY ENGINEERING
AMV-214-V	AUTOTRONICS

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credit	Marks Weightage		Course Type
				Internal	External	
ENG-151-V	ENGLISH LITERACY	3-0-0	3	25	75	BSC
MTV-151-V	MATHEMATICS	3-0-0	3	25	75	BSC
AMV-101-V	QUALITY CONTROL AND SAFETY	3-0-0	3	25	75	PCC
AMV-103-V	ENGINEERING SCIENCE	3-0-0	3	25	75	PCC
AMV-105-V	BASICS OF AUTOMOBILE TECHNOLOGY	3-1-0	3	25	75	PCC
AMV-109-V	ENGINEERING GRAPHIC AND DRAWING	0-0-4	2	60	40	PCC
AMV-107-V	AUTOMOBILE WORKSHOP - I	0-0-06	3	30	70	SDP
Total		**15-0-10**	**20**	**155**	**445**	

SUBJECT NAME: ENGLISH LITERACY
PAPER CODE: ENG-151-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course is to acquire knowledge on the Basic English grammar starting from speeches to synaptic category going forward with tenses and its types. To comprehend voices, narration and sentence making.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To accurately identify and use different parts of speech in sentences.
CO2: To effectively use prepositions, conjunctions, and interjections in their writing and storytelling.
CO3: To construct sentences correctly using present, past, and future tenses.
CO4: To form various types of sentences and identify active and passive voice as well as direct and indirect narration.

Unit-I PARTS OF SPEECH
Noun, Pronoun, Verb, Adverb, Adjective, Vocabulary building.

Unit-II LITERACY SKILLS
Preposition, Conjunction, Interjection, Story Telling.

Unit-III FRAGMENT OF TENSES
Present tense, Past Tense, Future Tense, Oral Drilling of simple commands and statements, Developing LSR (Listening, Speaking, Reading) skills.

Unit-IV SENTENCE FORMATION
Active and Passive voice, Direct and Indirect Narration, Simple Sentences, Compound Sentences, Complex Sentences, Compound-Complex Sentences, Use of phonetics to aid in identifying speech sounds.

Practical Exercises:
The learners are required to

1. Identify and label the parts of speech in a given paragraph.
2. Write a short story using at least five different prepositions, conjunctions, and interjections.
3. Convert a set of given sentences into present, past, and future tenses.
4. Transform given sentences from active to passive voice, and from direct to indirect speech.

Suggested Readings:

1. Wren and Martin. High School English Grammar and Composition. New Delhi: RRP.
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: MATHEMATICS
PAPER CODE: MTV-151-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course is to Familiarize the prospective graduates with the basics of mathematics, provide knowledge on the application of trigonometry, integration and differentiation and to understand the use of matrices, trigonometry, integration and differentiation to solve formulated mathematical problems

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To analyse and solve problems related to percentages, interest calculations, and statistical measures, and interpret their results in real-world contexts. To visualise and conceptualized the engineering problems.

CO2: to apply trigonometric identities and functions to solve mathematical problems and real-life applications involving angles and triangles. Use differentiation to evaluate the slop of function.

CO3: To evaluate the properties of matrices and determinants and apply these concepts to solve systems of linear equations.

CO4: To understand and apply the principles of differentiation and integration to solve calculus problems.

Unit-I QUANTITATIVE APTITUDE
Percentage, HCF & LCM, Simple interest and Compound interest, Profit & loss, Time, speed & distance, A.P & G.P series, Mean, Median, Mode, Standard deviation.

Unit-II TRIGONOMETRY
Introduction to trigonometric functions: Radian and degree measure, right triangle trigonometry, trigonometric functions of any angle, applications using right triangles; Graphs of sine and cosine functions, transformation of graphs of the sine and cosine functions, Trigonometric Identities, Quadrant Rule, Sum and difference identities for cosine, sine, and tangent, Double-angle identities, half-angle identities, Verifying trigonometric identities, Ratios of Complementary Angles.

Unit-III MATRICES AND DETERMINANTS
Definition and Properties of Determinants, Definition and Types of Matrices, Transpose of a Matrix, Symmetric, Skew Symmetric Matrices, Orthogonal matrices, Hermitian and Skew Hermitian, Minors and Cofactors, Adjoint and Inverse of a Matrix, Cramer's Rule, Solution of Simultaneous Linear Equations by Inverse Matrix Method.

Unit-IV DIFFERENTIATION AND INTEGRATION
Introduction to Derivatives, Product Rule, Quotient Rule, Chain Rule, Derivatives of Algebraic Function, Derivative of trigonometric functions, Derivative of inverse trigonometric functions, evaluation of simple differentials. Concepts of integration, integration of trigonometric functions, exponential and logarithmic functions, integration by parts, evaluation of simple integrals.

Practical Exercises:
The learners are required to

1. Solve a set of real-life financial problems involving calculations of simple and compound interest, profit and loss, and time-speed-distance scenarios.
2. Verify and prove given trigonometric identities and solve practical problems involving right triangles using trigonometric ratios.
3. Solve a system of linear equations using the inverse matrix method and Cramer's Rule, and

explain the steps involved.

4. Differentiate and integrate given functions, applying product, quotient, and chain rules for differentiation, and integration by parts and substitution methods for integration.

Suggested Readings:

1. G.B. Thomas and R.L. Finney, “Calculus and Analytic geometry”, Pearson.
2. N.P. Bali and Manish Goyal, “A textbook of Engineering Mathematics", Laxmi Publications.

Notes: 1. Only the latest editions of the above books are recommended.

SUBJECT NAME: QUALITY CONTROL AND SAFETY
PAPER CODE: AMV-101-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course to know the importance of safety, health and environment and importance of 5's in the workplace. This course is designed to know the different types of hazards workers face when working in industry and different types of accidents that can arise due to these hazards.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To understand the importance of safety, health, and environmental practices in the workplace. Analyse the problems related to statistical quality control.
CO2: To analyze different types of accidents, their causes, and approaches to prevent them. Evaluate the importance of acceptance sampling.
CO3: To apply the principles of 5S (Sort, Set in order, Shine, Standardize, Sustain) to organize and maintain a safe and efficient workplace.
CO4: To evaluate manufacturing output for correct specifications and implement quality control measures.

UNIT-I IMPORTANCE OF SAFETY, HEALTH AND ENVIRONMENT
Safety, Health and Environment, cleaning of work area, tools, equipment and materials, Importance of safety, objectives of safety management, personal protective equipment like safety gloves, safety glasses, safety shoes and safety helmet, contents of the first aid kit, instructions of equipment manual.

UNIT-II ACCIDENTS AND SAFETY IN HAZARDOUS AREA
Classification of accidents, causes of accidents, accident investigations/reporting, approaches to prevent accidents, Firefighting, Hazards and risks, difference between hazard and risk, Hazard in industrial zones, physical, chemical, environmental, biological, ergonomics and psycho- social hazards, Introduction to OSHMS, OHSAS 18001 and OSHA.

UNIT-III 5S IN SAFETY
The basic principles of 5 S in manufacturing and workplace – Cleaning, sorting etc. sorting of materials, tools and equipment's and spare parts, standards, procedures and policies related to 5S, importance of waste disposal, segregation of waste into Hazardous and Non-Hazardous waste, disposal the waste as per SOP, labelling procedures, storage procedures.

UNIT-IV INSPECTION AND QUALITY CONTROL
How to measure the correct specifications of the output in the terms of thickness, hardness, durability, tightness, finesse etc. relevant manufacturing standards and procedures followed in the company in detail, different types of defects which may arise due to improper manufacturing, Concept of quality control. elements of quality control, quality control groups, objectives of quality control. Statistical quality control, objectives of S.Q.C. Inspection by variables & attributes. Frequency distribution, mean, median & mode, standard deviation, X-R charts, P-Charts, C-Charts and acceptance sampling. (i) I.S.O. 9000 (ii) KAIZEN (iii) Six Sigma (iv) 5S.

Practical Exercises:
The learners are required to

1. Demonstrate the proper cleaning procedures for work areas, tools, equipment, and materials, and identify and use personal protective equipment.
2. Conduct a hazard assessment in a simulated industrial zone, identifying physical, chemical, environmental, biological, and ergonomic hazards, and propose preventive

measures.

3. Implement the 5S methodology in a designated area of the workplace, including cleaning, sorting, standardizing, and sustaining practices, and present the results.
4. Analyze manufacturing defects and implement appropriate quality control techniques such as statistical process control charts (X-R, P, C-Charts), ISO 9000 standards, and Six Sigma principles to improve product quality.

Suggested Readings:

1. Industrial Safety and Health Management by C Ray Asfahl, Pearson publications.
2. Industrial Safety (Safety Management) by D S S Ganguly & C S Changeriya.

Note: 1. Only the latest edition of the above books is recommended.

SUBJECT NAME: ENGINEERING SCIENCE
PAPER CODE: AMV-103-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The main objective of studying this course is to understand the different system of units and their measurement. In this course students will know the different types of laws of motion, basics of thermodynamics, fuels and their classification and pollutants and its types.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To understand the need for measurement, different systems of units, and the concept of accuracy and precision in measurements.

CO2: To analyze and apply Newton's laws of motion to solve problems related to equilibrium, friction, and circular motion. Apply the different methodologies for analysis of water and techniques involved in waste water treatment.

CO3: To synthesize knowledge of atomic structure, chemical bonding, and properties of elements and compounds.

CO4: To evaluate the characteristics of different types of fuels, the sources and effects of pollution, and methods for pollution control.

UNIT-I UNITS AND MEASUREMENTS
Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures. Dimensions of physical quantities, dimensional analysis and its applications.

UNIT-II LAWS OF MOTION
Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication. Dynamics of uniform circular motion: Centripetal force, examples of circular motion.

UNIT-III BASIC CHEMISTRY
Introduction, atomic structure, periodic classification of element, chemical bonding, acid base and salts, carbon and its compound, metal non-metal and man-made substances.

UNIT-IV FUEL, POLLUTION & ITS CONTROL
Definition, characteristics, classification into solid, liquid and gaseous fuel, Petroleum and brief idea of refining into various factions and their characteristics and uses, Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.
Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, NO_x, HC, Sox and particulates, effects of pollutants on man and environment – photochemical smog and acid rain. Water Pollution: Classification of pollutants, their sources, wastewater treatment – domestic and industrial. Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control. Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

PRACTICAL EXERCISES:
1. Measure the diameter of a wire using a screw gauge and calculate percentage error.

2. Verify Newton's second law by applying different weights on a trolley and recording acceleration.
3. Estimate the calorific value of a fuel sample using a simple water calorimeter.

Suggested Readings:

1. Thermodynamics by P K Nag
2. Environmental pollution and control engineering: C. S. Rao
3. Basic Science by S. Chand.

Note: 1. Only the latest edition of the above books is recommended.

SUBJECT NAME: BASICS OF AUTOMOBILE TECHNOLOGY
PAPER CODE: AMV-105-V

Total credits: 3

L	T	P
3	1	0

Theory: 75
Sessional: 25

Course Objectives:
The course should enable the students to know the basics of automobiles, to understand about the suspension and steering system and wheels and tires.

Course Outcomes:
After the successful completion of the course, students will be able to:

CO1: To understand the basics of automobiles, their classification, parts, and performance metrics.
CO2: To able to analyze the functions, requirements, and components of chassis and suspension systems.
CO3: To able to evaluate the necessity, functions, and effectiveness of transmission and braking systems in automobiles. Demonstrate the knowledge of different types of braking systems.
CO4: To synthesize knowledge of steering systems and front axles to understand their purpose, construction, and types.

UNIT-I INTRODUCTION
Introduction to an Automobile, Brief history of an Automobile, Classification of Automobiles, Parts of an Automobile, Performance of an Automobile.

UNIT-II CHASSIS AND SUSPENSION
Introduction to Chassis, Classification of Chassis, Frame, Vehicle Dimensions, Introduction to Suspension System Functions/Objects of a Suspension System, Requirements of a Suspension System, Elements of a Suspension System, Springs, Dampers (or Shock Absorbers), Suspension Systems, Wheels and Tires

UNIT-III TRANSMISSION AND BRAKING SYSTEM
Introduction to Transmission System, Clutch Gearbox (Transmission), Propeller Shaft Universal Joints, Final Drive and Differential, Rear Axles. Introduction to Braking System, Necessity of a Braking System, Functions of Brakes, Requirements of a Good Braking System, Classification of Brakes, Mechanical Brakes, Hydraulic Brakes, Power Brakes, Brake Effectiveness, Anti-locking Braking System.

UNIT-IV STEERING AND FRONT AXLE
Purpose of a Steering System, Functions of a Steering System, Requirements of a Good Steering System, General arrangement of a Steering System, Steering Gears, Steering Ratio, Reversibility, Steering Geometry, Wheel Alignment, Steering Mechanism, Understeering and Oversteering, Steering Linkages, Steering Wheel and Column, Steering Arm, Drag link, Steering Stops, Adjustment of Steering Geometry, Introduction to Front Axle, Construction of Front Axle, Types of Front Axles

Practical Exercises:
The learners are required to

1. Identify and label the major parts of an automobile, and analyze the performance characteristics of different types of vehicles.
2. Design and sketch a chassis frame layout for a given vehicle type, and propose a suspension system setup considering vehicle dimensions and performance requirements.
3. Disassemble and inspect components of a manual transmission system, and perform brake performance tests to assess effectiveness and identify potential issues.

4. Demonstrate proper wheel alignment procedures using alignment equipment, and disassemble and reassemble steering linkage components to understand their functions and adjustments.

Suggested Readings:

1. Automobile Engineering, R.K. Rajput, Laxmi Publications.
2. Automobile Engineering by Dr. Kripal Singh.

Note: 1. Only the latest editions of the above books are recommended.

SUBJECT NAME: AUTOMOBILE WORKSHOP-I
PAPER CODE: AMV-107-V

Total credits: 5

L	T	P
0	0	10

Theory: 70
Sessional: 30

Course Objectives:
To introduce automobile basics, to understand repairing of suspension and steering systems, to study the repairing of automobile wheels and tyres and to perform vehicle overhauling.

Course Outcomes:
After the successful completion of the course, students will be able to:

CO1: To comprehend the specifications provided by auto component manufacturers related to various mechanical aggregates of vehicles. Evaluate the main causes of engine part malfunctioning.

CO2: Students will able to apply their understanding to repair and overhaul electrical wire harnesses, lighting, ignition, and electronic systems in vehicles.

(A) Carry Out Service and Major Repairs in Mechanical Aggregates and Overhauling of a Vehicle.

1. To understand the various precautions to be taken to avoid damage to the vehicle and its components while working on diagnosis or troubleshooting the vehicle for any faults.
2. To Understand the auto component manufacturer specifications related to the diesel engines, petrol engines, electrical vehicles, gear box, transmission systems, propeller shaft etc.
3. To Service, repair and overhaul of the steering system.
4. To Service, repair and overhaul of suspension system.
5. To Service, repair and overhaul of wheels.
6. To Service, repair and overhaul of cooling system and radiator
7. To Service, repair and overhaul of emission and exhaust system.
8. To Service, repair and overhaul of gearbox, drive-train assembly and transmission systems (manual, automatic etc.)
9. To Service, repair and overhaul of brake system, pneumatic brakes, hydraulic brakes.
10. To Service, repair and overhaul of clutch assembly.
11. To Service, repair and overhaul of single plate and multi plate clutches.
12. To Service, repair and overhaul of hydraulic and pneumatic systems and various lubrication systems.
13. To Service, repair and overhaul of emission and exhaust system.

Suggested Readings:

1. Vehicle Maintenance and Garage Practice by Doshi J.A

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: ENGINEERING GRAPHICS AND DRAWING
PAPER CODE: AMV-109-V

Total credits: 2

L T P
0 0 2

Theory: 40
Sessional: 60

Course Objectives:
The objective of studying this course is to develop the graphic skill for communication of concept, idea and design of engineering products and to expose them to existing national standard related to technical drawing.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To understand the principles and types of projection, including orthographic projection and first/third angle projection, and be able to project points and lines accurately.

CO2: To analyze and project simple solids such as prisms, pyramids, cylinders, and cones onto different planes using rotation and auxiliary plane methods.

CO3: To synthesize knowledge to develop the lateral surfaces of simple solids and solids with cut-outs and holes, including prisms, pyramids, cylinders, and cones.

CO4: To evaluate the principles and techniques of isometric projection, including isometric scale, and be able to create isometric projections of simple and truncated solids.

UNIT-I PROJECTION
Projection: Type of projection, orthographic projection, first and third angle projection.
Projection of points and lines: Line inclined to one plane, inclined to both the plane, true length and true inclination.

UNIT-II PROJECTION OF SOLIDS
Projection of simple solid like prisms, pyramids, cylinder, cone and truncated solid when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT-III DEVELOPMENT OF SURFACE
Development of lateral surface of simple and the section solid-prisms, pyramid cylinder and cones. Development of lateral surface of solid with cut-outs and holes.

UNIT-IV ISOMETRIC AND PERSPECTIVE PROJECTION
Principal of isometric projection – isometric scale – isometric projection of simple solid and truncated solid – prism, pyramid, cylinder, cones.

Practical Exercises:
The learners are required to

1. Practice projecting points and lines onto different planes using orthographic projection techniques, and create drawings showing true length and true inclination of lines.
2. Use rotation and auxiliary plane methods to project simple solids onto different planes, and create detailed drawings showing the projections of each solid.
3. Practice developing the lateral surfaces of simple solids and solids with cut-outs and holes, and create unfolded patterns to represent the flat layout of each surface.
4. Analyze and create isometric projections of simple and truncated solids using isometric scale, and compare the differences between isometric and perspective projections.

Suggested Readings:

1. Bhatt N.D.; Engineering Drawing, Charotar.
2. Gill P.S.; Engineering Drawing, Kataria.

Note: 1. Only the latest editions of the above books are recommended

SYLLABUS & SCHEME OF EXAMINATION

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
AEC-151-V	BEHAVIORAL SKILLS	3-0-0	3		75	BSC
WDD-109-V	TYPOGRAPHY AND COMPUTER APPLICATION	3-0-0	3	25	75	BSC
AMV-102-V	APPLIED SCIENCE	3-0-0	3	25	75	PCC
AMV-104-V	INTERNAL COMBUSTION ENGINE	3-1-0	3	25	75	PCC
AMV-106-V	AUTOMOBILE WORKSHOP - II	0-0-10	5	30	70	SDP
VAC-151-V to 153-V	MANDATORY AUDIT COURSE	3-0-0	3	25	75	MAC
Total		**15-0-8**	**20**	**215**	**485**	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
VAC-151-V	HUMAN VALUE AND PROFESSIONAL ETHICS
VAC-152-V	BALANCED DIET AND NUTRITION
VAC-153-V	ENVIRONMENTAL SCIENCE

SUBJECT NAME: BEHAVIORAL SKILL
PAPER CODE: AEC-151-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objective of studying this course is to discuss behavioral skill and their forms and how it is going to help the students. To acquire practical knowledge of writing skills, along with group discussion and interview skills.

Course Outcomes:

After the successful completion of the course, students will be able:

CO1: To understand the meaning, importance, functions, types, and barriers of communication.

CO2: To synthesize knowledge to effectively write different types of letters, reports, mails, and resumes.

CO3: To evaluate the significance of soft skills and demonstrate proficiency in group discussions, translation, and paraphrasing.

CO4: To apply their literacy skills by demonstrating effective speaking, listening, reading, and telephonic communication abilities.

Unit-I Communication Skills

Meaning of Communication, Importance, Function, Types, Communication barriers and majors to overcome them.

Unit-II Writing Skills

Letter writing: Formal letter, application letter, covering letter and business letter. Report writing: Academic report, Business report, technical report, News report. Mail writing and resume.

Unit-III Soft Skills

Definition and significance of soft skills, Group Discussions, basic knowledge of translator and Paraphrasing.

Unit-IV Speaking and Reading Skills

Importance of Literacy skills (Reading, Writing, Listening, Speaking), telephonic communication skills, Levels of reading skills, process of skimming and scanning.

Practical Exercises:

The learners are required to

1. Write formal letters, application letters, and business letters addressing hypothetical scenarios, and draft resumes and reports based on given prompts or case studies.
2. Participate in group discussions on various topics, practice translation exercises, and paraphrase given texts to convey the same meaning in different words.
3. Engage in telephonic role-plays to practice effective communication, demonstrate different levels of reading skills by analyzing and summarizing texts, and practice skimming and scanning techniques to extract information quickly from written material.

Suggested Readings:

1. Mishra. B, Sharma. S Communication Skills for Engineers and Scientists. PHI Learning Pvt. Ltd.
2. Chaturvedi P. D, Chaturvedi M. Business Communication: Concepts, Cases and Applications. Pearson Education India.

Note: 1. Only the latest editions of the above books are recommended.

SUBJECT NAME: TYPOGRAPHY AND COMPUTER APPLICATION
PAPER CODE: WDD-109-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course is to understand and learn about the basics of windows, to understand the important MS office programs and to be able to create documents for printing and sharing.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To apply their knowledge of basic computer components and Windows interface to navigate, manage files, and customize settings effectively.
CO2: To synthesize their understanding of word processing tools and features to create, format, and manage documents efficiently using MS Word.
CO3: To evaluate and utilize various features and functions of MS Excel to analyze, manipulate, and present complex data effectively.
CO4: To evaluate and utilize presentation software (e.g., MS PowerPoint) and database management software (e.g., MS Access) to create, manipulate, and present data and information effectively.

Unit-I COMMUNICATION SKILLS
Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screensaver and appearance using windows accessories.

Unit-II WRITING SKILLS
Introduction to word processing interface, Toolbars, Menus, Creating & Editing Document, Formatting Document, Finding and replacing text, Format painter, Header and footer, Drop cap, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Previewing and printing document, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

Unit-III SOFT SKILLS
Introduction to MS-Excel, Cell, cell address, Creating & Editing Worksheet, Formatting and Essential Operations, Moving and copying data in excel, Header and footer, Formulas and Functions, Charts, Cell referencing, Page setup, Macros, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation, Database Management using Excel-Sorting, Filtering, Validation, What if analysis with Goal Seek, Conditional formatting, Collaborating with Other Users, Analysing and Presenting Complex data.

Unit-IV SPEAKING AND READING SKILLS
Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect., Introduction to MS Access: creating database creating and manipulating tables, forms, queries, reports, modules, importing and exporting of data.

Practical Exercises:
The learners are required to

1. Demonstrate proficiency in using Windows by completing tasks such as organizing files and folders, customizing display properties, and managing hardware and software through the Control Panel.

2. Create a comprehensive document using MS Word, incorporating advanced features such as mail merge, macros, tables, and templates, and demonstrate proficiency in editing, formatting, and printing.
3. Analyze and manipulate data using MS Excel, including creating and formatting worksheets, applying formulas and functions, generating charts, and performing advanced tasks such as pivot tables, database management, and what-if analysis.
4. Create and deliver a multimedia presentation using MS PowerPoint, incorporating slides, organizational charts, charts from Excel, Word Art, animations, sounds, and other multimedia elements. Also, create and manipulate a database using MS Access, including creating tables, forms, queries, reports, and modules, and importing/exporting data.

Suggested Readings:

1. V. Rajaraman, Computer Fundamentals.
2. Ashok Arora, Fundamentals of Computer Systems.

Note: 1. Only the latest editions of the above books are recommended.

SUBJECT NAME: APPLIED SCIENCE
PAPER CODE: AMV-102-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objectives of this course to learn concepts of Units, Laws of vectors, parallel forces, moment of force, couple, to Learn the fundamentals of properties and behavior of the materials, understand different types of communication systems and to know the fundamentals of advanced communication systems.

Course Outcomes:

After the successful completion of the course, students will be able:

CO1: To understand the significance of mechanics, statics, and dynamics, and be able to analyze force systems using vector representation and resolution techniques.

CO2: To analyze stress, strain, and material properties of solids, and apply Hooke's law and Young's modulus in solving engineering problems.

CO3: To evaluate the mechanisms of heat transfer (conduction, convection, radiation) and electromagnetic waves, and understand their applications.

CO4: To understand the fundamental concepts of thermodynamics, including system, surrounding, boundary, types of processes, and laws of thermodynamics.

Unit-I Basics of mechanics and force system

Significance and relevance of Mechanics, Statics, Dynamics. Space, time, mass, particles, flexible body and rigid body. Scalar and vector quantity, Units of measurement (SI units) - Fundamental units and derived units. Force – unit, representation as a vector and by Bow's notation, characteristics and effects of a force, Principle of transmissibility of force, Force system and its classification. Resolution of a force - Orthogonal components of a force, moment of a force, Varignon's Theorem. Composition of forces – Resultant, analytical method for determination of resultant for concurrent, non-concurrent and parallel coplanar force systems – Law of triangle, parallelogram and polygon of forces.

Unit-II Properties of solids

Definitions of deforming force, elasticity and plasticity, examples for elasticity and plasticity, definition of stress and its types with examples and its S.I unit, definition of strain and its types with examples, elastic limit, Hooke's law, stress - strain graph with explanation. Modulus of elasticity and its types, derivation of an expression for Young's modulus of a material. Definition of Compressibility and factor of safety. Simple problems on stress, strain and Young's modulus. Properties of liquids: Definition of thrust and pressure with S.I units. Definition of surface tension and its S.I unit, Viscosity.

Unit-III Transmission of heat and Electromagnetic waves

Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, coefficient of thermal conductivity (K) and its S.I unit. Applications of conduction, convection and radiation.

Electromagnetic wave: Definition, generation of electromagnetic waves and their properties. Electromagnetic spectrum: Definition, classification and its applications. Lasers: Principle and listing the types of Lasers, properties of Laser, applications. Nano-Technology: Definition of Nano-Technology, advantages and dis-advantages of Nanotechnology.

Unit-IV Thermodynamics

Introduction of thermodynamics, system, surrounding and boundary, types of system, properties of system, state, equilibrium and process, types of thermodynamic processes, laws of thermodynamics- Zeroth, First, second and third law.

Practical Exercises:

1. Analyze and solve problems involving forces and force systems, including determining resultant forces using analytical and graphical methods, and applying Varignon's Theorem to find moments of forces.
2. Perform experiments to measure stress and strain in materials, construct stress-strain graphs, and calculate Young's modulus for different materials using experimental data.
3. Conduct experiments to demonstrate heat transfer mechanisms and measure thermal conductivity, and investigate properties and applications of electromagnetic waves using various devices.

Suggested Readings:

1. D.S. Bedi, Engineering Mechanics, Khanna Publications, New Delhi (2008)
2. Khurmi, R.S., Applied Mechanics, S. Chand & Co. New Delhi.
3. Bansal R K, A textbook of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.

Note: 1. Only the latest editions of the above books are recommended

SUBJECT NAME: INTERNAL COMBUSTION ENGINES
PAPER CODE: AMV-104-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
This course is designed to help students to understand the concepts of internal combustion engines, its combustion and various testing & performance parameters.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To understand the basic principles, components, classifications, and working cycles of internal combustion engines, along with the differences between 4-stroke and 2-stroke engines and SI and CI engines.

CO2: To evaluate the combustion phenomenon in SI engines, understand the factors affecting ignition timing and performance parameters, and analyze various types of combustion chambers.

CO3: To understand the combustion phenomenon in CI engines, including ignition lag, diesel knock, combustion chamber design, and cold starting procedures.

CO4: To synthesize knowledge to conduct testing and evaluate the performance of IC engines, including measuring performance parameters, analyzing engine performance curves, and comparing petrol and diesel engines.

UNIT-I INTRODUCTION TO IC ENGINE
Basic idea of IC Engines, different parts and terms connected with IC Engines, Classification of IC Engines, applications of IC Engines, engine cycle energy balance, working cycles, indicator diagram, 4 stroke cycle engine, 2 stroke cycle engine, comparison of 4 stroke and 2 stroke engines, comparison of SI and CI engine.
Intake for Two Stroke Cycle Engines, Scavenging Process, Scavenging Parameters, Scavenging Systems, Crankcase Scavenging, Scavenging Pumps and Blowers.

UNIT-II COMBUSTION IN SI ENGINE
Introduction to combustion in SI Engine. Combustion Phenomenon, Effect of Engine Variables on Ignition Lag, Spark Advance and Factors Affecting Ignition Timing, Pre-ignition, Detonation, Performance Number, Highest Useful Compression Ratio (HUCR), Combustion Chamber Design-S.I. Engines, Some Types of Combustion Chambers.

UNIT-III COMBUSTION IN CI ENGINE
Introduction to Combustion in C.I. Engines. Combustion Phenomenon in C.I. Engines Fundamentals of the Combustion Process in Diesel Engines. Delay Period (or Ignition Lag) in C.I. Engines. Diesel Knock. C.I. Engine Combustion Chambers. Cold Starting of C.I. Engines.

UNIT-IV TESTING AND PERFORMANCE OF IC ENGINE
Testing and Performance of I.C. Engines, Introduction to Testing and Performance of I.C. Engines Performance Parameters, Basic Measurements, Engine Performance Curves, Comparison of Petrol and Diesel Engines-Fuel Consumption, Load Outputs and Exhaust Composition, Governing of I.C. Engines, Noise Abatement.

Practical Exercises:

1. Disassemble and assemble a small internal combustion engine, identify and label its components, and compare the working cycles of 4-stroke and 2-stroke engines using indicator diagrams.
2. Conduct experiments to observe and analyze the effect of engine variables on ignition lag and spark advance, and compare the performance of different types of combustion chambers through engine testing.

3. Conduct experiments to measure ignition lag and diesel knock in CI engines, analyze different combustion chamber designs, and simulate cold starting procedures to understand their impact on engine performance.
4. Design and conduct performance tests on IC engines, collect data on fuel consumption, load outputs, and exhaust composition, and analyze engine performance curves to optimize engine operation and implement noise abatement measures.

Suggested Readings:

1. Automobile Engineering, R.K. Rajput, Laxmi Publications.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House
3. Automobile Engineering by Dr. Kripal Singh.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: AUTOMOBILE WORKSHOP – II
PAPER CODE: AMV-106-V

Total credits: 3

L T P
0 0 6

Theory: 70
Sessional: 30

Course Objectives:

After completing this course, students will be able perform repairing of suspension and steering systems, to understand functioning of automobile's wheels and tyres, to perform vehicle overhauling.

Course Outcomes:

After the successful completion of the course, students will be able to:

CO1: Apply knowledge of two-stroke and four-stroke diesel engines to perform overhauling and repair operations, demonstrating understanding and application of engine components and functions.

CO2: Apply knowledge of two-stroke and four-stroke petrol engines to perform overhauling and repair operations, demonstrating understanding and application of engine components and functions.

CO3: Demonstrate proficiency in tuning a multi-cylinder petrol engine, adjusting critical parameters such as dwell, rpm, ignition timing, and component clearances.

CO4: Analyze and calculate the mechanical efficiency of a multi-cylinder engine using Morse Test, demonstrating evaluation and problem-solving skills in engine performance.

(A) Carry Out Service and Major Repairs in Mechanical Aggregates and Overhauling of a Vehicle.

1. To understand the working of two stroke and four stroke diesel engines, perform overhauling and repair operations.
2. To understand the working of two stroke and four stroke petrol engines, perform overhauling and repair operations.
3. Find the mechanical efficiency of a multi-cylinder engine by Morse Test.
4. Tune a multi-cylinder petrol engine and set dwell, rpm, ignition timing, CB point gap, spark plug gap, and tappet clearance.
5. Dismantle and assemble the given electrical fuel pump. Check it for proper working. 8. Set the cut-out and regulator of a vehicle.
6. Dismantle, study, and re-assemble multi-cylinder F.I. pump.
7. Test a multi-cylinder F.I. pump on the calibrating machine and check it for proper phasing. Set the injection timing on the engine.
8. Test a diesel fuel injector and set injection pressure. Grind needle and seat.
9. Study and sketch rotary F.I. pump.
10. Study of working of electric vehicles.
11.

Suggested Readings:

2. Vehicle Maintenance and Garage Practice by Doshi J.A

Note: 1. Only the latest editions of the above books are recommended

SUBJECT NAME: HUMAN VALUE AND PROFESSIONAL ETHICS
PAPER CODE: VAC-151-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course is to understand the value system, honesty and integrity, harmony and universal declaration of human rights.

Course Outcomes:
After the successful completion of the course, students will be able:

CO1: To understand the purpose and significance of value education in contemporary society and recognize the importance of balancing outer and inner aspects of life.
CO2: To evaluate key values such as truth, honesty, empathy, and teamwork, and recognize their importance in personal and professional life.
CO3: To synthesize knowledge to understand and promote harmony in family, society, and nature, and recognize the interconnectedness of human beings and the environment.
CO4: To evaluate the interdependence of living and non-living beings, understand human rights issues, and identify strategies to address social evils and promote national integration and peace.

UNIT-I INTRODUCTION
Value education-its purpose and significance in the present world, Value system, the role of culture and civilization, Holistic living, Balancing the outer and inner - Body, Mind and Intellectual level- Duties and responsibilities**.**

UNIT-II SALIENT VALUES FOR LIFE
Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity, and inclusiveness, Self-esteem and self- confidence, punctuality - Time, task and resource management, Problem solving and decision-making skills- Interpersonal and Intra personal relationship, Team work, Positive and creative thinking.

UNIT-III UNDERSTANDING HARMONY
Harmony in Family and Society: How to owe responsibilities in family, Understanding Values in Human- Human relations, Role of Trust and Respect, Samman (Respect) for all, Akhand Samaj (A United Society)
Harmony in Nature: Understanding the Harmony in Nature, making sure your contribution is in harmony with nature, Interconnectedness and mutual fulfilment.

UNIT-IV ENVIRONMENT AND ECOLOGICAL BALANCE
Interdependence of all beings - living and non-living, The binding of man and nature - Environment conservation and enrichment.
Human Rights and social evils: Universal Declaration of Human Rights National Integration - Peace and non-violence - Dr. APJ Kalam's ten points for enlightened citizenship - Social Values and Welfare of the citizen - The role of media in value building - Human Rights violations - Social Evils: Corruption, Cybercrime, Terrorism, Alcoholism, Drug addiction, Dowry, Domestic violence, Untouchability, female infanticide, atrocities against women and how to tackle them.

Practical Exercises:
The learners are required to

1. Engage in reflective exercises to identify personal values, explore cultural influences on values, and develop strategies for holistic living through activities promoting physical, mental, and intellectual well-being.
2. Analyze real-life scenarios to understand the application of values like commitment, forgiveness, and problem-solving, and participate in group discussions and role-plays to explore different perspectives.

3. Collaborate with family members and community members to organize events promoting trust, respect, and inclusiveness, and engage in environmental conservation activities such as tree planting and waste management.

Suggested Readings:

1. R. R. Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.
3. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: BALANCED DIET AND NUTRITION
PAPER CODE: VAC-152-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objective of studying this course is to understand and apply the concepts of balanced diet and nutritional value, students will be able to identify and apply food principles to food and nutrition systems.

Course Outcomes:

After the successful completion of the course, students will be able to:

CO1: Understand the fundamental concepts of food nutrition, including macronutrients and micronutrients, and plan a balanced diet.

CO2: Demonstrate knowledge of different food groups and their nutritive values, including cereals, pulses, milk, vegetables, fruits, fatty oils, and sugars.

CO3: Analyze the concepts of energy metabolism, calorie requirements, and factors influencing energy expenditure.

CO4: Understand yogic concepts of diet and nutrition, including concepts of mitahara, satvik, rajsik, and tamasik diet, and their role in healthy living.

UNIT-I CONCEPTS AND COMPONENTS OF FOOD NUTRITION

Meaning of nutrition, Basic definition regarding nutritional requirements, Nutritional need of human; Concept of food, Acceptance of food, Function of food, Components of food and their classification; Macronutrients – Carbohydrate, Fat, Protein (source, function and effect on the body); Micronutrients – Vitamins, Mineral, Water, roughage (source, function and effect on body); Planning Balanced Diet.

UNIT-II FOOD GROUP

Cereals and Millet – Selection, Preparation and Nutritive value; Pulses, Nuts and Oilseeds- Selection, Preparation and Nutritive value; Milk and Milk production - Selection, Preparation and Nutritive value; Vegetable and Fruits - Selection, Preparation and Nutritive value; Fatty oil and Sugar, Jaggery - Selection, Preparation and Nutritive value.

UNIT-III FOOD AND DIGESTION

Energy – Key concepts, Definition and Components of energy requirements.; Energy – Imbalance concepts of metabolism, anabolism and catabolism; Calorie requirement – BMR, SDA; Physical activity – carbohydrates, lipids and protein metabolism; Factors affecting energy- requirement and expenses; Factors affecting BMR; Factors influencing energy expenditure in physical activity; Methods and requirements for estimating energy expenditure.

UNIT-IV YOGIC CONCEPTS OF DIET ANDNUTRITION

General introduction to diet concepts, concepts of mitahara, Definition and classification, yogic diet according to traditional yoga texts; Concepts of diet according to Gheranda Samhita and Hath Pradeepika; Satvik, Rajsik and Tamasik diet as describe in Bhagwadgeeta; Pathya and Apathya food according to the texts of Yoga; Role of yogic diet in healthy living; Diet according to nature of the body – Vata, Pitta and Kapha.

Practical Exercises:

The learners are required to

1. Analyze the nutritional content of various foods, create a balanced diet plan considering different food groups and their nutritive values.
2. Calculate basal metabolic rate (BMR) and estimate energy expenditure for various physical activities, considering factors like age, gender, weight, and activity level.

3. Implement yogic dietary principles in daily life, including choosing foods according to one's body type (Vata, Pitta, Kapha) and following guidelines from traditional yoga texts, such as Gheranda Samhita and Bhagavad Gita.

Suggested Readings:

1. Bakhru, H. K., 1991, A Complete Handbook of Nature Cure.
2. Kumar Neeraj, Nagendra, 2014, Mera Aahar Mera Swasthya.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: ENVIRONMENTAL SCIENCE
PAPER CODE: VAC-153-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objective of studying this course is to provide the students a detailed knowledge on the threats and challenges to the environment due to developmental activities, to identify the natural resources and suitable methods for their conservation and sustainable development, to focus on the importance of ecosystem and biodiversity for maintaining ecological balance, and to learn about various attributes of pollution management and waste management practices.

Course Outcomes:

After the successful completion of the course, students will be able to:

CO1: Understand the multidisciplinary nature of environmental studies and recognize the importance of public awareness in addressing environmental issues.

CO2: Analyze the utilization and exploitation of natural resources, including forests, water, minerals, food, energy, and land, and identify sustainable practices for their conservation.

CO3: Comprehend the concepts of ecosystems, biodiversity, and their conservation, and evaluate the significance of biodiversity at global, national, and local levels.

CO4: Analyze social issues related to the environment and evaluate sustainable development strategies, environmental ethics, and the role of legislation in environmental protection.

UNIT-I THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance. Need for public awareness.

UNIT-II NATURAL RESOURCES RENEWABLE AND NON-RENEWABLE RESOURCES

Natural resources and associated problems, Forest resources: Use and overexploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non- renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-III ECOSYSTEMS, BIODIVERSITY AND ITS CONSERVATION

Concept of an ecosystem Structure and Concept of an ecosystem, Structure and function of an ecosystem. Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, and estuaries).

Biodiversity and Its Conservation: Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss,

poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-site and ex-situ conservation of biodiversity.

UNIT-IV SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable Development urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation. Consumerism and waste products, Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act, Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation, public awareness.

Practical Exercises:

The learners are required to

1. Conduct awareness campaigns or workshops in local communities to educate people about environmental problems and the need for conservation.
2. Conduct field visits to areas affected by deforestation, water scarcity, or land degradation, and propose sustainable solutions to mitigate these issues.
3. Conduct biodiversity surveys in different ecosystems (forest, grassland, aquatic), assess their biodiversity indices, and propose conservation strategies for endangered species and habitats.
4. Organize debates or seminars on topics such as climate change, waste management, or environmental legislation, and encourage students to propose innovative solutions and ethical considerations.

Suggested Readings:

1. "Perspectives in Environmental Studies" by A. Kaushik and C. P. Kaushik, New age international publishers.
2. "Environmental Studies by Benny Joseph", Tata McGraw Hill Co, New Delhi
3. "Environmental Science Towards a sustainable future" by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. "Environmental Engineering and science" by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.
5. "Fundamentals of Ecology" by Odum, E.P., Barrick, M. and Barret, G.W. Thomson Brooks/Cole Publisher, California, 2005.

Note:

1. Only the latest editions of the above books are recommended

SYLLABUS & SCHEME OF EXAMINATION

THIRD SEMESTER

SUBJECT CODE	SUBJECT NAME	L-T-P	CREDITS	MARKS WEIGHTAGE		COURSE TYPE
				INTERNAL	EXTERNAL	
VAC-154-V	EMPLOYABILITY SKILLS	3-0-0	3	25	75	BSC
AMV-201-V	METROLOGY	3-0-0	3	25	75	SDP
AMV-203-V	CAD/CAM	3-0-0	3	25	75	BSC
AMV-205-V	MOTOR VEHICLE TECHNOLOGY	3-0-0	3	25	75	PCC
AMV-207-V	AUTOMOBILE ELECTRICAL EQUIPMENT	3-0-0	3	25	75	PCC
AMV-209-V	AUTOMOBILE WORKSHOP - III	0-0-6	3	30	70	SDP
AMV-211-V	CAD LAB	0-0-4	2	30	70	SDP
TOTAL		**15-0-10**	**20**	**185**	**515**	

SUBJECT NAME: EMPLOYABILITY SKILLS
PAPER CODE: VAC-154-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objective of studying this course is to encourage the all-round development of students by focusing on behavioral skills and to make the students aware of the importance, the role and the content of behavioral skills through instructions, knowledge acquisition, demonstration and practice.

Course Outcomes:

At the end of the course, the student shall be able to:

CO1: Apply employability skills, including teamwork, leadership, and interview techniques, to enhance professional competence.

CO2: Demonstrate effective presentation skills and personality development techniques to communicate confidently and persuasively.

CO3: Apply effective communication strategies to interact with stakeholders, including customers, industry partners, and colleagues.

CO4: Develop proficiency in written communication through various formats such as letters, reports, and resumes.

UNIT-I EMPLOYABILITY SKILLS

Soft skills– Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Teamwork Skills, Leadership Skills, Interview –Types.

UNIT-II PERSONALITY DEVELOPMENT AND PRESENTATION SKILLS

Types of Personality, Gesture, posture, facial expression, body Language, Personality development programs and techniques, Group Discussion, Presentations Types and making effective presentations.

UNIT-III COMMUNICATING WITH STAKEHOLDERS

Communication with customers, dealing with angry customers, call flow, Opening and closing a call, Communication with industry partners/suppliers/dealers/agents, Feedback: Giving and receiving a Feedback.

UNIT-IV WRITING SKILLS

letter Writing, business letter, application letter, covering letter, formal mail, report writing, academic report, business report, technical project report, job application and resume writing.

Practical Exercises:

The learners are required to

1. Role-play scenarios simulating team projects or leadership situations, followed by peer feedback and reflection sessions to improve interpersonal skills.
2. Conduct mock presentations on various topics, focusing on non-verbal communication cues such as gestures and posture, followed by constructive feedback sessions to refine presentation styles.

Suggested Readings:

1. Wren and Martin. High School English Grammar and Composition. New Delhi,RRP.
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge.
3. Malhotra, Prerna and Halder, Deb. Communication Skills: Theory and Practice.

Note: 1. Only the latest editions of the above books are recommended

SUBJECT NAME: METROLOGY
PAPER CODE: AMV-201-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The aim of studying this course for students is to know the basic concepts in various methods of engineering measurement and application, and to understand the importance of measurement and inspection in manufacturing industries. Expose the students to various modern meteorological instruments and the procedure used to operate these instruments.

Course Outcomes:

At the end of the course, the student shall be able to:

CO1: Apply principles of measurement and metrology to select appropriate instruments, analyze measurement errors, and ensure accuracy in industrial processes.

CO2: Demonstrate proficiency in linear and angular measurements using precision instruments and comparators, ensuring compliance with engineering standards.

CO3: Perform measurements of physical properties such as temperature, force, pressure, and surface finish, employing appropriate instruments and techniques.

CO4: Apply geometric dimensioning and tolerancing (GD&T) principles to interpret engineering drawings and measure components' geometric features accurately.

UNIT-I INTRODUCTION TO MEASUREMENT

Aim, Definition, Types, need of inspection, terminology Methods of measurements, units measurements, Selection of instruments, Concept of error (systematic and random), sources of er measurement standards, calibration, statistical concepts of metrology.

UNIT-II LINEAR AND ANGULAR MEASUREMENTS

Linear instruments, Surface plates (size, accuracy and material), slip gauges, length bars-calibratio slip gauges, dial indicator, micrometre, bevel protector, spirit level, sine bar, angle gaug Comparators, their types, relative merits and limitations, Miscellaneous measurements, Taper & rad measurements.

UNIT-III LIMITS FITS AND TOLERANCES

Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges, computer aided tolerancing.

UNIT-IV MEASUREMENT OF SURFACE FINISH

Measurement of GD&T parameters: measurement of straightness, flatness, squareness, parallelism, roundness, cylindricity, non-contact profiling system

Measurement of surface finish: introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, methods, precautions, surface microscopy, surface finish software.

Practical Exercises:

The learners are required to

1. Conduct hands-on sessions using various measurement instruments such as micrometers, dial indicators, and comparators to measure dimensions of precision components, followed by error analysis and calibration procedures.
2. Practice using instruments like micrometers, bevel protractors, and angle gauges to measure linear and angular dimensions accurately, followed by exercises on interpreting measurement results and determining component tolerances.

3. Interpret engineering drawings with GD&T symbols, then use coordinate measuring machines (CMMs) or profile projectors to measure geometric features like straightness, flatness, and roundness, followed by analysis of measurement data and reporting.

Suggested Readings:

1. Thomas, “Engineering Metrology”, Butthinson & Co., 1984.
2. Graham T. Smith, “Industrial Metrology”, Springer-Verlag London Ltd.
3. Mahajan. M., “A text-Book of Metrology”, Dhanpat Rai & Co. (P) Ltd.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: MOTOR VEHICLE TECHNOLOGY
PAPER CODE: AMV-205-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The aim of studying this course is to introduce the automobile fuel supply system, to understand the suspension and steering system, and study about Automobile Pollution.

Course Outcomes:
At the end of the course, the student shall be able to:

- CO1: Analyze and evaluate the fuel supply systems in spark ignition (SI) engines, identifying factors influencing carburetion and understanding the theory of carburetors.
- CO2: Examine fuel injection systems for compression ignition (CI) engines, including fuel pumps, injectors, and troubleshooting techniques, to ensure optimal engine performance.
- CO3: Evaluate engine friction and lubrication systems, understanding their impact on engine efficiency and longevity.
- CO4: Assess air pollution and emissions control methods in internal combustion engines, recognizing the environmental and health implications of exhaust emissions.

UNIT-I FUEL SUPPLY SYSTEM IN S.I ENGINE
Introduction to Carburetion and Induction System, Factors Influencing Carburetion, Mixture Requirements, Distribution, Transient Mixture Requirements, A Simple or Elementary carburetor, Complete Carburetor, Carburetors, Petrol Injection, Theory of Simple carburetor.

UNIT-II FUEL SUPPLY SYSTEM IN C.I ENGINE
Introduction to Fuel Injection Systems for C.I. Engines, Functional Requirements of an Injection System, Functions of a Fuel Injection System, Fuel Injection Systems, Fuel Pump and Fuel Injector, Types of Nozzles and Fuel Spray Patterns, Engine Starting Systems, Fuel Injection Computation in C.I. Engines, troubleshooting of a Fuel System, Troubleshooting of carburetor Comparative Diesel Engine Fuel, System Data Some Indian Automobiles.

UNIT-III ENGINE FRICTION AND LUBRICATION SYSTEM
Total Engine Friction Effect of Engine Parameters on Engine Friction Determination of Engine Friction Lubrication Systems Crankcase Ventilation Lubrication System of Some Indian Vehicles.

UNIT-IV AIR POLLUTION AND EMISSIONS CONTROL METHODS
Emissions from SI and CI engines, Effects of Toxic Gas Components on Human Health, Generation of Toxic Exhaust Gas Components, Correlation Between Toxic Components of Exhaust.

Vehicle Emissions Control Methods, Evaporative Emission (EVAP) Control System, Positive Crankcase Ventilation (PCV) System (or Blow-by Gas Control), Controlling Combustion to Improve Emissions Treatment of Exhaust Gasses, Secondary Air Injection System, Three Way Catalytic Converter (TWC), Exhaust Gas Analyzer, Smoke Meter, Exhaust Emission, Standards for Pollution, Control Fuel Quality Standards, Fuel Additives.

Practical Exercises:
The learners are required to

1. Disassemble and inspect a carburetor from a small gasoline engine, identify its components, and understand their functions. Demonstrate the adjustment of fuel-air mixture ratios for different operating conditions.

2. Perform maintenance tasks on a diesel fuel injection system, including cleaning fuel filters, checking injector nozzles, and adjusting fuel pump timing. Use diagnostic tools to identify and rectify common fuel system issues.
3. Measure engine friction using a dynamometer and analyze the effect of engine parameters on frictional losses. Demonstrate the disassembly and assembly of engine lubrication components, such as oil pumps and filters, and inspect for wear and damage.

Suggested Readings:

1. Automobile Engineering, R.K. Rajput, Laxmi Publications.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House
3. Automobile Engineering by Dr. Kripal Singh

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: AUTOMOBILE ELECTRICAL ELECTRONICS
PAPER CODE: AMV-207-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The course should enable the students to understand the basics of batteries, used for electrical components of automobiles, electrical components of automobiles, and the electrical wiring and lighting.

Course Outcomes:

At the end of the course, the student shall be able to:

CO1: Analyze the principles, construction, and characteristics of various types of batteries used in automotive applications, including lead-acid, nickel-cadmium, and lithium-ion batteries.

CO2: Evaluate the components and functioning of automotive electrical systems, including starter motors, generators, alternators, and ignition systems.

CO3: Assess the operation and control strategies of electronic ignition systems, including capacitive discharge ignition (CDI) and distributor-less ignition systems (DIS).

CO4: Examine automotive wiring, lighting systems, and dashboard instruments, understanding their construction, operation, and wiring circuits.

UNIT-I TYPES OF BATTERIES

Principle and construction of Lead Acid Battery, Nickel – Cadmium Battery, Nickel Metal, Hybrid Battery, Sodium Sulphur Battery and Aluminum Air Battery, Characteristics of Battery, Battery, Capacity and Efficiency, Various Tests on Battery, Battery–Charging Techniques, Maintenance of batteries.

UNIT-II ELECTRICAL COMPONENTS AND IGNITION SYSTEMS

Electrical Components: Requirements of Starter Motor, Starter Motor types, construction and characteristics, Starter drive mechanisms, Starter Switches and Solenoids, Charging system components, Generators and Alternators, types, construction and Characteristics. Voltage and Current Regulation, cut –out relays and regulators, Charging circuits for D.C. Generator, A.C. Single Phase and Three – Phase Alternators.

Ignition System: Battery Coil and Magneto–Ignition System, Circuit details and Components of Battery Coil and Magneto–Ignition System, Centrifugal and Vacuum Advance Mechanisms, Spark Plugs, Constructional details and Types.

UNIT-III ELECTRICAL AND ELECTRONIC IGNITION SYSTEMS

Electronically–Assisted and Full Electronic Ignition System, non–Contact–type Ignition Triggering devices, Capacitive Discharge Ignition Distributor–less Ignition System, Digital Ignition System, Control Strategy of Electronic Ignition System.

UNIT-IV WIRING, LIGHTING AND OTHER INSTRUMENTS AND SENSORS

Automotive Wiring, Insulated and Earth Return System, Positive and Negative Earth Systems, Headlamp and Indicator Lamp Details, Anti–Dazzling and Dipper Details, Electrical and Electronic Fuel Lift Pumps, Theory and Constructional Details of Dash Board Instruments and their Sensors like Speedometer, Odometer, Fuel Level Indicator Oil Pressure and Coolant Temperature Indicators, Horns and Wiper Mechanisms, Automotive Wiring Circuits.

Practical Exercises:

The learners are required to

1. Disassemble and inspect starter motors and charging system components, identifying key parts and their functions. Test ignition system components such as coils, distributors, and spark plugs, and diagnose common ignition system faults.

2. Create wiring diagrams for automotive lighting systems and instruments, including headlamps, indicators, and dashboard gauges. Install and test various lighting components and instruments, ensuring proper functionality and wiring connections.

Suggested Readings:

1. Young, A.P. and Griffith, S.L., Automobile Electrical Equipment, ELBS and New Press.
2. Kohli.P.L. Automotive Electrical Equipment, Tata McGraw-Hill co ltd, New Delhi,2004
3. Automotive Electricals and Electronics, A. K

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: CAD / CAM
PAPER CODE: AMV-203-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The aim of studying this course is to study about Introduction CIM and CAD & Analysis. Computer aided Manufacturing CAM and Part Programming NC part programming.

Course Outcomes:

At the end of the course, the student shall be able to:

CO1: Evaluate the concepts and benefits of Computer Integrated Manufacturing (CIM) and Computer-Aided Design (CAD), analyzing their evolution and integrated functionalities.

CO2: nalyze the functions and benefits of Computer-Aided Manufacturing (CAM), understanding part families, coding structures, and Computer-Aided Process Planning (CAPP) systems.

CO3: Assess the components and working principles of CNC machines, including turning centers and machining centers, and understand the principles of part programming for CNC machining.

CO4: Demonstrate the heat treatment processes of hardening, tempering, annealing, normalizing, and case hardening on metal samples and analyze the resulting microstructures and properties.

UNIT-I INTRODUCTION CIM AND CAD & ANALYSIS

CIM: Introduction of CIM– concept of CIM - evolution of CIM – CIM wheel –Benefits – integrated CAD/CAM. CAD: Introduction– CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD systems, CAD software packages, 2D & 3D transformations, Geometric modelling: Techniques: Wire frame modelling – surface modelling – solid modelling.

UNIT-II COMPUTER AIDED MANUFACTURING CAM

Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optimize system, MICLASS system and CODE System - process planning – CAPP – Types of CAPP: Variant type, Generative type – advantages of CAPP – production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)

UNIT-III CNC MACHINE AND ITS PART PROGRAMMING

CNC Machines: Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.

Part Programming NC part programming – methods – manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation.

UNIT-IV FMS, INTEGRATED MATERIAL HANDLING AND ROBOT

Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems

– benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types, benefits – Automatic Storage and Retrieval Systems (ASRS).

ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.

Practical Exercises:

The learners are required to

1. Design a simple mechanical component using CAD software, demonstrating proficiency in 2D and 3D transformations and geometric modeling techniques.
2. Develop a part program for a CNC machine, considering motion control types, coordinate systems, tooling, and NC dimensioning, utilizing both manual and conversational programming methods.
3. Design a layout for a flexible manufacturing cell, incorporating AGVs for material handling and programming a robot for specific tasks such as material transfer or assembly.

Suggested Readings:

1. Ibrahim Zeid CAD/CAM - Theory and practice Tata McGraw Hill Publishers.
2. Salomon, D. Transformations and projections in computer graphics Springer.
3. Rao, P.N., CAD / CAM Principles and Applications, McGraw Hill Publishers, New Delhi.
4. M.P. Groover, Automation, production systems and Computer-integrated Manufacturing, Eastern Economy Edition.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: AUTOMOBILE WORKSHOP – III
PAPER CODE: AMV-209-V

Total credits: 3

L	T	P
0	0	6

Theory: 70
Sessional: 30

Course Objectives:
The main objective of this course is to familiarize the students with different type of mechanical and optical measurement tool. The knowledge of this tool help student in quality inspection and dimension measurement.

Course Outcomes:
After the successful completion of the course, students will be able to:

CO1: Apply basic measurement techniques using micrometers and vernier calipers to accurately measure dimensions of various objects.
CO2: Analyze the measurement of angles using sine center, sine bar, or bevel protractor, understanding the principles of angular measurement.
CO3: Evaluate alignment measurements using an autocollimator or roller set, identifying and correcting deviations from the desired alignment.
CO4: Apply two-wire or three-wire methods to measure screw thread parameters accurately, understanding the principles of thread measurement.

METROLOGY LAB

1. Measurements using Micrometer, vernier caliper.
2. Measurement of angle using Sine Centre / Sine bar / bevel protractor.
3. Measurement of alignment using Autocollimator / Roller set
4. Measurement of cutting tool forces using a) Lathe tool Dynamometer b) Drill tool Dynamometer.
5. Measurement of Screw threads Parameters using two wire or Three-wire meth
6. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
7. Measurement of gear tooth profile using gear tooth vernier /Gear tooth micrometer
8. Calibration of Micrometer using slip gauges
9. Measurement using Optical Flat.

AUTOMOBILE LAB

1. To Service, repair and overhaul of brake system.
2. To Service, repair and overhaul of pneumatic brakes.
3. To Service, repair and overhaul of hydraulic brakes.
4. To Service, repair and overhaul of clutch assembly.
5. To Service, repair and overhaul of single plate and multi plate clutches.
6. To Service, repair and overhaul of hydraulic and pneumatic system and various lubrication systems.

Suggested Readings:

1. The Metrology handbook by jay L. Bucher, ASQ, Quality Measurement Division.
2. Handbook of optical metrology by Toru Yoshizawa, CRC Press publication.

Note:

1. 1. Only the latest editions of the above books are recommended

SUBJECT NAME: CAD LAB
PAPER CODE: AMV-211-V

Total credits: 2

L	T	P
0	0	4

Theory: 60
Sessional: 40

Course Objectives:
The main objective of this course is to familiarize the students with AUTO-CAD software so students can learn the draw sketch in more efficient manner and also do drafting of give part.

Course Outcomes:
After the successful completion of the course, students will be able to:

CO1: Understand the fundamental concepts and principles of Computer-Aided Design (CAD) software.
CO2: Apply commands and tools within CAD software to create and modify drawings effectively.
CO3: Demonstrate proficiency in viewing drawings, manipulating coordinates, and navigating within CAD software.

CAD LAB

1. Introduction to CAD.
2. Selecting commands & working with drawing.
3. Viewing drawing and working with coordinates.
4. Creating simple entities by using draw commands.
5. Modifying entities.
6. Getting drawing information.
7. Working with text and practice.
8. Dimensioning drawing and practice.
9. 2D Drawing practice.
10. Layers
11. Isometric views
12. Working with blocks

Suggested Readings:

1. A handbook on AutoCAD tool practice by Azar Wahab, SSR Krishna.

Note:

1. 1. Only the latest editions of the above books are recommended

SYLLABUS & SCHEME OF EXAMINATION

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
AMV-202-V	ELECTRICAL AND HYBRID VEHICLES	3-0-0	3	25	75	PCC
AMV-204-V	INDUSTRIAL MANAGEMENT	3-0-0	3	25	75	PCC
AMV-208-V	AUTOMOBILE WORKSHOP - IV	0-0-10	5	30	70	SDP
AMV-206-V	PROJECT	0-0-6	3	25	75	SDP
OEC-101-V to 104-V	OPEN ELECTIVE COURSE	3-0-0	3	25	75	OEC
AMV-210-V, 212-V, 214-V	PROGRAM ELECTIVE COURSE	3-0-0	3	25	75	PEC
Total		**12-0-16**	**20**	**155**	**445**	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
VAC-151-V	HUMAN VALUE AND PROFESSIONAL ETHICS
VAC-152-V	BALANCED DIET AND NUTRITION
VAC-153-V	ENVIRONMENTAL SCIENCE
VAC-154-V	SHRIMAD BHAGAVAD GEETA

LIST OF OPEN ELECTIVE COURSE

Course Code	Course Name
OEC-101-V	ENTREPRENEURSHIP
OEC-102-V	TRENDS IN TECHNOLOGY
OEC-103-V	WASTE MANAGEMENT
OEC-104-V	INDUSTRY 4.0

SUBJECT NAME: ELECTRIC AND HYBRID VEHICLES
PAPER CODE: AMV-202-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The course should enable the students to understand general aspects of Electric and Hybrid Vehicles (EHV), including architectures, modelling, sizing, and sub system design and hybrid vehicle control, to Understand about vehicle dynamics, Design the required energy storage devices, and understanding of hybrid electric vehicles.

Course Outcomes:
At the end of the course, the student shall be able to:

- CO1: Understand the significance and impact of electric and hybrid electric vehicles on society and the environment.
- CO2: Analyze the power flow and functioning of electric and hybrid electric drive trains.
- CO3: Evaluate the components of electric drive systems and their requirements.
- CO4: Assess energy storage systems and their management in electric and hybrid electric vehicles.

UNIT-I INTRODUCTION
Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, current status of EVs, EVs companies and models.

UNIT-II ELECTRIC AND HYBRID ELECTRIC DRIVE TRAINS
Types of EVs, Battery Electric Vehicle (BEV), Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), Fuel Cell Electric Vehicles (FCEVs), Series hybrid, Parallel hybrid Combined hybrid.

UNIT-III POWER FLOW AND ELECTRIC DRIVE COMPONENTS
Power Flow: Power flow control in electric and hybrid electric drive train topologies, Interconnections of various EV components and their functioning, Regenerative braking systems. Electric Drive Components: Introduction to electric drive components used in electric and hybrid vehicles, Electric motor requirements, Direct Current (DC) motors (Brushed and Brushless), Power converters, Drive controllers.

UNIT-IV ENERGY STORAGE SYSTEMS
Battery management systems (BMS), Charging infrastructure and technologies, Supercapacitors and other energy storage alternatives.

Practical Exercises:
The learners are required to

1. Research and present a comparative analysis of the social and environmental benefits of electric and hybrid electric vehicles compared to conventional vehicles.
2. Study and compare the design and operating principles of Battery Electric Vehicles (BEVs), Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Fuel Cell Electric Vehicles (FCEVs).
3. Design and implement a battery management system (BMS) for a simulated electric vehicle battery pack, and evaluate its performance in terms of charging, discharging, and safety management.

Suggested Readings:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House
2. Automotive Fuel Technology-Electric, Hybrid and Fuel-Cell Vehicles: Jack Erjavec& Jeff Arias.

3. Electric and Hybrid Vehicles: Design Fundamentals: Iqbal Husain
4. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design: Mehrdadehsani, Yimingao, AliEmadi.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: INDUSTRIAL MANAGEMENT
PAPER CODE: AMV-204-V

Total credits: 3

L	T	P
3	0	0

Theory: 75
Sessional: 25

Course Objectives:
The main objective of this course is to understand how to manage the material in industry, different costs associated with the production and labour, industrial and tax laws.

Course Outcomes:
At the end of the course, the student shall be able to:

- CO1: Understand the principles of industrial management and the sources of capital for industrial ventures.
- CO2: Differentiate between private sector and public sector enterprises, and comprehend the organizational structures and functions within industries.
- CO3: Grasp the concepts of wages, incentives, and material management in industry, along with elements of cost and indirect expenses.
- CO4: Familiarize with the evolution of labour and industrial laws, and understand the roles of technicians and supervisors in industry.

UNIT-I INTRODUCTION
Growth of industry, the management of men, materials and machines, the art of management, Sources of capital- industrial individual enterprise, private partnership and private Ltd. Co., Joint Stock Co. shares, debentures, financial agencies and their role in promoting industries. Break even analysis.

UNIT-II PRIVATE SECTOR AND PUBLIC SECTOR
Public sector enterprise, merits and demerits of public sector industry and private sector industry, Line, staff and functional organizations, reasons for the choice of various types of organization, functions of different departments, viz. stores, purchase and sales departments relationship between individual departments.

UNIT-III WAGES & INCENTIVES AND MATERIAL MANAGEMENT
Definition of wages, real wage and nominal wage, systems of wage payment, incentives, financial and non - financial incentives, Essentials of a good wage plan, essentials of a good incentive scheme. Introduction to elements of cost & indirect expenses, Material cost, labour cost, fixed and variable overheads, components of cost, selling price, Factory expenses, administrative expenses, selling & distribution expenses, depreciation, obsolescence, interest on capital, Idleness, Repair and maintenance.
Material Management: Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards

UNIT-IV LABOUR, INDUSTRIAL & TAX LAWS
Evolution of industrial law, factory act, workmen compensation act, payment of wages act, employee's state insurance act, Industrial dispute act. Role of technician in industry: Position of technician in various engineering departments, Role of a supervisor in industry, Foremanship, duties and qualities of a good foreman.

Practical Exercises:
The learners are required to

1. Analyze case studies of different industrial ventures to identify the sources of capital utilized and evaluate their effectiveness in achieving business objectives.
2. Conduct a comparative study of a private sector and a public sector enterprise, examining their organizational structures, decision-making processes, and operational efficiencies.

3. Design a wage plan and incentive scheme for a hypothetical industrial scenario, considering factors such as productivity, employee motivation, and cost-effectiveness.
4. Role-play scenarios based on industrial laws and regulations, allowing students to understand their practical implications in resolving workplace disputes and ensuring compliance.

Suggested Readings:

1. Industrial Management, S.C. Sharma, Khanna Publishing House.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: AUTOMOBILE WORKSHOP-IV	
PAPER CODE: AMV-208-V	
	Total credits: 5
L T P	Theory: 70
0 0 10	Sessional: 30

Course Objectives:

The aim of this course is to cover diesel engine, petrol engine and Electric vehicle Engineering, maintenance and repair.

Course Outcomes:

After the successful completion of the course, students will be able to:

- CO1: Classify and differentiate between various types of electric vehicles based on their propulsion systems and understand their respective advantages and limitations.
- CO2: Explain the working principles of different types of batteries utilized in electric vehicles and analyze their suitability for specific applications.
- CO3: Interpret auto component manufacturer specifications related to vehicle components and systems, including major aggregates like engines, gearboxes, and transmission systems.
- CO4: Apply diagnostic techniques to inspect mechanical, electrical, and electronic systems in electric vehicles and identify potential repair or adjustment requirements.

AUTOMOBILE WORKSHOP

1. To understand the different types of Electric Vehicle (BEV, FCEV, EREV, PHEV, HEV).
2. To understand the working of different types of batteries like Lead-acid batteries, Nickel-cadmium batteries, Sodium-sulphide batteries, Molten salt batteries.
3. To understand the working principle of the battery management system.
4. To understand the working of the battery charging system, repair and maintenance.
5. To Conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement.
6. Check the condition of the given battery as regards: (i) cell voltage (ii) specific gravity (iii) ampere-hour capacity (iv) Level of electrolyte. Use a battery capacity tester. Clean the battery and charge it. Prepare a maintenance schedule.
7. Dismantle study, assemble and check for proper working the following: (a) Electric horn (b) Wiper motor (c) Starter motor (d) dynamo (e) alternator.
8. Test the following on the electrical test bench: (a) Dynamo (b) Starter motor (c) Alternator. Also study the working of a growler.
9. Dismantle, inspect and assemble the magneto of a 2-wheeler. Set the ignition timing using dial gauge.
10. Study and sketch the Electrical Wiring System of a Car.
11. Repair and overhaul of electronic control unit
12. To Repair and overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.
13. To Repair and overhaul safety systems.
14. Repair and overhaul of hydraulic and pneumatic systems.

Suggested Readings:

1. Automobile maintenance, service and repair by Mohd. Saad Saleem and Saimah Khan.

Note: Only the latest editions of the above books are recommended

SUBJECT NAME: PROJECT	
PAPER CODE: AMV-206-V	
	Total credits: 3
L T P	Theory: 60
0 0 3	Sessional: 40

Course Objectives:

The aim of this course is to apply the subject knowledge to make a project related to your field.

PROJECT

The student individually works on a specific topic approved by a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programmer. The topic may be experimental or analytical. At the end of the semester, a detailed report on the work done should be submitted which contains a clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

SUBJECT NAME: ENTREPRENEURSHIP
PAPER CODE: OEC-101-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:

The objective of studying this course is that the students acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities, to develop the ability of analyzing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial activities.

Course Outcomes:

At the end of the course, the student shall be able to:

- CO1: Analyze the essential characteristics of successful entrepreneurs and differentiate between various types of entrepreneurs based on their traits and motivations.
- CO2: Apply leadership skills and emotional intelligence in entrepreneurial contexts to foster team collaboration and problem-solving.
- CO3: Assess the societal impact of entrepreneurship and analyze the ethical responsibilities of entrepreneurs towards society.
- CO4: Understand the regulatory and legal framework governing entrepreneurship, including intellectual property rights and government support mechanisms for start-ups.

UNIT-I ENTREPRENEURSHIP AND ENTREPRENEUR

Entrepreneurship: Concept and process, Entrepreneur vs manager, Essential Characteristics of a good Entrepreneur, Types of entrepreneurs, Types of Entrepreneurial firms, Need and Importance of Entrepreneurship, Entrepreneurial Mindset.

UNIT-II KEY SKILLS FOR SUCCESSFUL ENTREPRENEURSHIP

Leadership: leadership styles, Lead by example, Team Spirit, Emotional Intelligence, Problem Solving by Critical Thinking: Applying critical thinking, Reason Model of Critical Thinking. Problem solving by Creative thinking, Importance and benefits of Creative thinking,

UNIT-III SERVING THE SOCIETY

Roles of Entrepreneurs in society, Selfless Entrepreneurship, Factors affecting entrepreneurial business, Business Networking and its advantages, entrepreneurial work ethics, Success Story of Mumbai Dabbawalla and Steve Jobs (Discuss more Success failure stories of famous entrepreneurs)

UNIT-IV REGULATORY AND LEGAL ISSUES IN ENTREPRENEURSHIP

Introduction to start-up's, Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC. Business Loans for start-ups and MSMEs by Indian Government, Legal Issues: Intellectual Property Rights, patents, trademarks, copyrights, trade secrets.

Practical Exercises:

The learners are required to

1. Conduct personality assessments and case studies to identify and evaluate the key characteristics of successful entrepreneurs, followed by a group discussion on the importance of these traits in entrepreneurial ventures.
2. Conduct a group debate or seminar on the role of entrepreneurs in addressing social issues and promoting sustainable development, using case studies of successful entrepreneurs who have made significant contributions to society.
3. Engage in role-playing exercises to simulate real-life entrepreneurial scenarios, where students take turns practicing different leadership styles and emotional intelligence techniques to address team challenges and conflicts effectively.

Suggested Readings:

1. Khanka S.S., “Entrepreneurship Development” S. Chand
2. C.V. Bakshi, Entrepreneurship Development, Excel Publications.
3. Drucker, Peter. "Innovation and Entrepreneurship" Heinemann, London.
4. Arora M., Natarajan K. and Gordan E., Entrepreneurship Development, 1st ed; Himalaya Publishing House Pvt Ltd, 2009.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: TRENDS IN TECHNOLOGY
PAPER CODE: OEC-103-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course is to make aware of the changes in technologies, applications and Systems around us.

Course Outcomes:
At the end of the course, the student shall be able to:

- CO1: Evaluate the different types of e-commerce models and their respective advantages and disadvantages.
- CO2: Demonstrate proficiency in using basic internet tools such as email, search engines, and social networking sites.
- CO3: Analyze the security measures and electronic payment systems employed in e-banking transactions.
- CO4: Evaluate the implementation challenges and strategies associated with e-governance, e-agriculture, and e-learning initiatives.

UNIT-I E-COMMERCE
Introduction: E-commerce as Business need-commerce, Types, Advantages, Disadvantages, e-Commerce Architecture; Internet Payment Systems, Characteristics, 4C Payment Methods, SET Protocol for Credit Card Payment, E-Cash, E-Check, Overview of Smart Card.

UNIT-II E-MAIL & INTERNET
Introduction, E-mail Account & Its Functions, Search Engine, Surfing Webpages, Basics of Social Networking Site.

UNIT-III E-BANKING TRANSACTIONS
Inter Banking, Intra Banking, Electronic Payments, (Payment – Gateway Example), Securities in E-banking (SSL, Digital Signatures – Examples), Services Provided: ATM, Smart Card ECS (Electronic Clearing System), e.g., Telephone, Electricity Bills.

UNIT-IV E – GOVERNANCE, E – AGRICULTURE, E-LEARNING
E –Governance Models: (G2B, G2C, C2G, G2G), Challenges to E – Governance, Strategies and tactics for implementation of E – Governance, Types of Agriculture information (Soil, Water, Seeds, Market rate) & Technique dissemination, Future trade marketing, Corp Management, Query redressal System, (Information Kiosk, IVR, etc.), Case Study.
Models WBT, CBT, Virtual Campus, LMS & LCMS, Video Conferencing, Chatting Bulletin, Building Online Community, Asynchronous / Synchronous Learning, Case Study.

Practical Exercises:
The learners are required to

1. Conduct a comparative analysis of various e-commerce platforms (e.g., B2B, B2C, C2C) using case studies of successful and unsuccessful e-commerce ventures, and present findings in a group discussion.
2. Assign tasks requiring students to create and manage email accounts, perform web searches to gather information on specific topics, and engage in discussions on social networking platforms to explore the functionalities and potential risks associated with online communication.
3. Simulate online banking transactions using different electronic payment methods (e.g., credit card, e-check) and explore the security protocols (e.g., SSL, digital signatures) involved in securing online transactions, followed by a discussion on the importance of trust and security in e-commerce.

Suggested Readings:

1. Internet (Use of Search Engines Google & yahoo etc.).
2. E–Commerce: C. V. S. Murty.
3. Fire Wall and Internet Security: William Cheswick, Stevens, Aviel, Rubin.
4. The Essential Guide to Knowledge management: Amrit Tiwana.
5. The GIS Book: George B. Karte.
6. Management Information System: Laudon & Laudon

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: WASTE MANAGEMENT
PAPER CODE: OEC-104-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The objective of this course is to introduce about Sources of solid and hazardous wastes, to study about Waste exchange and storage and collection of municipal solid wastes

Course Outcomes:
At the end of the course, the student shall be able to:

- CO1: Evaluate the regulatory framework and its application in solid and hazardous waste management.
- CO2: Analyze the composition and characteristics of solid wastes to develop effective waste management strategies.
- CO3: Evaluate waste collection, storage, and transportation systems for efficiency and effectiveness.
- CO4: Assess waste processing technologies and disposal options for sustainable waste management.

UNIT-I SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK
Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes, plastics and fly ash – Financing waste management.

UNIT-II WASTE CHARACTERIZATION AND SOURCE REDUCTION
Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW.

UNIT-III STORAGE, COLLECTION AND TRANSPORT OF WASTES
Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT-IV WASTE PROCESSING TECHNOLOGIES AND WASTE DISPOSAL
Objectives of waste processing – material separation and processing technologies – biological & chemical conversion technologies – methods and controls of Composting - thermal conversion technologies, energy recovery – incineration – solidification & stabilization of hazardous wastes-treatment of biomedical wastes.
Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation.

Practical Exercises:
The learners are required to

1. Analyze and interpret Indian legislation related to waste management, identify key provisions and requirements, and develop a compliance checklist for waste management practices.

2. Conduct a waste characterization study, collect samples of municipal solid waste (MSW), perform physical and chemical analyses, and interpret the results to understand waste composition and properties.
3. Assess different waste collection methods in a local community, conduct a field study to observe waste handling practices, and propose improvements for optimizing waste collection and transportation processes.

Suggested Readings:

1. George Techobanoglous et al, ‖Integrated Solid Waste Management‖, McGraw - Hill, 2014.
2. Manual on Municipal Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
3. Tchobanoglous Theisen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: INDUSTRY 4.0
PAPER CODE: OEC-102-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
To introduce Industry 4.0, Internet of Things (IoT) and related topics. This subject will introduce students about technological and business challenges and opportunities as well as ethical concerns related to IoT.

Course Outcomes:
At the end of the course, the student shall be able to:

CO1: Evaluate the principles and challenges of Industry 4.0 implementation.
CO2: Assess the impact of Industry 4.0 technologies on organizational productivity and value addition.
CO3: Explain the characteristics and functional blocks of the Internet of Things (IoT).
CO4: Discuss the foundations, scope, and applications of Artificial Intelligence (AI) in Industry 4.0.

UNIT-I INTRODUCTION OF INDUSTRY 4.0
Industry 4.0 definition, Benefits of Industry 4.0, Industrial Revolutions and Future View, The digital transformation of industry and the fourth industrial revolution, Principles of "Smart Factory", Industry 4.0 strategy and implementation, Industry 4.0 challenges and risks.

UNIT-II INDUSTRY 4.0 TECHNOLOGIES
Articulate how key IoT technologies can improve organizational productivity and add value, Human-machine interaction, Advanced robotics and 3-D printing, Lean Manufacturing Touch interfaces, virtual reality and augmented-reality systems, Cloud Computing.

UNIT-III INTRODUCTION TO IOT
Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT.

UNIT-IV IOT, M2M AND INTRODUCTION OF ARTIFICIAL INTELLIGENCE
Machine to Machine, Difference between IoT and M2M, Software define Network.
Introduction of Artificial intelligence: Foundations, scope, problems, and approaches of AI, Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents.

Practical Exercises:
The learners are required to

1. Analyze case studies of companies implementing Industry 4.0 strategies, identify key challenges faced during implementation, and propose solutions to address these challenges.
2. Design a conceptual IoT system architecture, including physical and logical designs, and identify the functional blocks required for data acquisition, processing, communication, and control in an IoT environment.

Suggested Readings:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

Note: Only the latest editions of the above books are recommended

SUBJECT NAME: ALTERNATIVE FUEL & EMISSION CONTROL
PAPER CODE: AMV-210-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The main objective of course is to familiarize about the auto body, body structure, body material and safety standards.

Course Outcomes:
At the end of the course, the student shall be able to:

- **CO1:** Evaluate the need for alternative fuels and their comparative properties to conventional fuels.
- **CO2:** Analyze emission measurement techniques and control strategies for both spark ignition (SI) and compression ignition (CI) engines.
- **CO3:** Evaluate the health effects of emissions from automobiles and the importance of emission norms.

UNIT-I CONVENTIONAL FUELS AND NEED FOR ALTERNATIVE FUELS
Conventional Fuels and Need for alternative fuels: Estimate of petroleum reserve and availability - comparative properties of fuels- diesel and gasoline, quality rating of SI and CI engine fuels, fuel additives for SI and CI engines, need for alternative fuels, applications, types etc.

UNIT-II ALTERNATIVE FUELS
Alternative Fuels: Gaseous Fuels and Bio-fuel: Introduction to CNG, LPG, ethanol, vegetable oils, bio-diesel, biogas, Hydrogen and HCNG. Study of availability, manufacture, properties, storage, handling and dispensing, safety aspects, engine/vehicle modifications required and effects of design parameters performance and durability Synthetic Fuels Introduction to Syngas, DME, P-Series, GTL, BTL, study of production, advantages, disadvantages, need, types, properties, storage and handling, dispensing and safety, discussion on air and water vehicles.

UNIT-III EMISSION MEASUREMENT AND EMISSION CONTROL (S.I & CI ENGINE)
Emission Measurement and Control (CI Engine): Chemical delay, intermediate compound formation, pollutant formation on incomplete combustion, effect of design and operating variables on pollutant formation,
Emission Control (C.I Engine): Controlling of emissions, emissions and drivability, exhaust gas recirculation, exhaust after treatment – doc, dpf, scr and lnt. Measurement and test procedure (ndir analyzers, fid, chemiluminescence nox analyzer, oxygen analyzer, smoke measurement, constant volume sampling, particulate emission measurement, orsat apparatus.)
Emission Control (SI Engine): Emission formation in S.I. engines - Hydrocarbons, carbon monoxide, oxides of nitrogen, poly-nuclear aromatic hydrocarbon, effects of design and operating variables on emission formation in spark ignition engines, controlling of pollutant formation in engines exhaust after treatment, charcoal canister control for evaporative emission control, emissions and drivability, positive crankcase ventilation system for ubhc emission reduction.

UNIT-IV HEALTH EFFECTS OF EMISSIONS FROM AUTOMOBILES
Health effects of Emissions from Automobiles: Emission effects on health and environment. Emission inventory, ambient air quality monitoring, Emission Norms: As per Bharat Standard up to BS – IV.

Practical Exercises:
The learners are required to

1. Analyze the properties and availability of alternative fuels such as CNG, LPG, biofuels, and synthetic fuels, and compare them with conventional fuels like diesel and gasoline based on their suitability for different applications.
2. Conduct emission measurements using various analyzers (NDIR, FID, Chemiluminescence, etc.) on SI and CI engines under different operating conditions, and propose emission control strategies such as exhaust gas recirculation, after-treatment systems, and positive crankcase ventilation.
3. Conduct a literature review on the health effects of automobile emissions on humans and the environment, compile an emission inventory for a specific region, and discuss the significance of adhering to emission norms such as Bharat Standard up to BS-IV for mitigating adverse health effects.

Suggested Readings:

1. Alternative fuel and their utilization strategies in internal combustion engine by Akhilesh Pratap Singh, Springer.

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: VEHICLE BODY ENGINEERING
PAPER CODE: AMV-212-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The main objective of this course is to get knowledge of different types of fuels used in automobiles and to emission control.

Course Outcomes:
At the end of the course, the student shall be able to:

CO1: Evaluate different types of automotive body structures and their suitability for various vehicle applications.
CO2: Assess the properties and characteristics of materials used in automotive body construction.
CO3: Demonstrate understanding of safety standards and regulations related to automotive body design.
CO4: Analyze the design features and functions of automotive bodies in terms of visibility, passenger comfort, and luggage requirements.

UNIT-I AUTO BODY
Introduction, main features and functions of body, body requirements, Types: saloon, convertibles, limousine, estate car, racing and sports car. Visibility: regulations, driver's visibility, tests for visibility, frame construction- tubular, interlaced, channel section, ladder type, car frame, truck frame.

UNIT-II BODY STRUCTURES
frameless construction, integral construction, semi- unitary or endo- skeleton, unitary with sub frame, car body paneling, special purpose bodies, passenger and luggage requirements, all metal bodies, coach-built bodies, auto floors, cowl assembly, front end assembly, roof assembly doors and door fittings.

UNIT-III BODY MATERIALS
requirement of body material, type- specification, Timber- plywood fiberboard, Steel, Mild steel – angle, channel, strips, Aluminum alloy- sheets, strips, channel etc., Rivets/ screws, glass- colored glass, toughened glass, fiber reinforced

UNIT-IV SAFETY STANDARDS
Safety standards regarding- anchorage, instruments/ control, windshield, glass, wipers, doors, windows, roofs, head rests, safety belts, air bags.

Practical Exercises:
The learners are required to

1. Analyze the structural design and construction of different vehicle bodies, including frameless construction, integral construction, and unitary with sub-frame, and compare their advantages and disadvantages.
2. Conduct material testing and analysis of commonly used automotive body materials such as steel, aluminum alloy, timber, and glass, to understand their mechanical properties, durability, and suitability for different body components.
3. Conduct a visibility test on different vehicle models, assess passenger comfort and luggage space, and propose design improvements to enhance visibility and optimize interior space utilization.

Suggested Readings:

1. Sydney F. Page, “Body Engineering”, 3rd Ed. Chapman & Hill Ltd., London. [T2] P.L. Kohli, “Automotive Chassis and Body”, McGraw Hill Publication Co.
2. J Fairbrother, “Fundamentals of Vehicle Body work”, Hutchinson, London

Note:

1. Only the latest editions of the above books are recommended

SUBJECT NAME: AUTOTRONICS
PAPER CODE: AMV-214-V

Total credits: 3

L T P
3 0 0

Theory: 75
Sessional: 25

Course Objectives:
The objective of studying this course to get the knowledge of electronics, automotive sensors and actuators.

Course Outcomes:
At the end of the course, the student shall be able to:

CO1: Analyze the current trends and advancements in automotive electronic systems.
CO2: Evaluate the types and functionalities of automotive sensors and actuators.
CO3: Demonstrate understanding of automotive electronic systems and their components.
CO4: Apply data acquisition techniques for automotive applications.

UNIT-I FUNDAMENTALS OF AUTOMOTIVE ELECTRONIC SYSTEM
Fundamentals of Automotive Electronic System: Current Trends in Automotive Electronic Engine Management System, Electro-magnetic Interference Suppression, Electromagnetic Compatibility, Electronic Dashboard Instruments, onboard Diagnostic system, security and warning systems.

UNIT-II AUTOMOTIVE SENSORS & ACTUATORS
Automotive Sensors & Actuators Types of sensors, actuators, Crankshaft position, camshaft position, manifold absolute pressure, Airflow rate sensor, Throttle position sensor, Inlet air temperature sensor, oxygen sensor, vehicle speed sensor, Wheel speed sensor, sensors for feedback control, engine control actuators, Solenoid actuators, motorized actuators.

UNIT-III AUTOMOTIVE ELECTRONIC SYSTEMS
Automotive Electronic Systems Electronic Ignition systems, electronic injection systems, Anti-Lock brake system circuit, Traction control, electronic control of automobile transmission, Active suspension, EPS.

UNIT-IV APPLICATIONS DATA ACQUISITIONS
Applications Data Acquisitions- Temperature Control – Stepper Motor Control-Automotive Applications Engine Control, Suspension System Control, Driver Information Systems), Development of A High Speed, High Precision Learning Control System for the Engine Control. Programmable Logic Controls, Relay Logic, Control, Motion Control.

Practical Exercises:
The learners are required to

1. Explore various electronic engine management systems used in modern vehicles, including their components, functionalities, and integration with other vehicle systems.
2. Conduct hands-on experiments with different automotive sensors and actuators, such as crankshaft position sensors, throttle position sensors, and motorized actuators, to understand their operation and applications.
3. Disassemble and analyze electronic ignition systems, electronic injection systems, and other electronic control systems in vehicles to understand their circuitry, components, and functionality.

Suggested Readings:

1. Ramesh Goankar S., “Microprocessor Architecture Programming and Applications”, Willey Eastern Ltd.
2. William B. Riddens, “Understanding Automotive Electronics”, 5thEdition, Butter Worth Heinemann.

Note:

1. Only the latest editions of the above books are recommended

FIFTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU 501	On Job Training (OJT)/ Internship evaluation including report and presentation	20	350	150	OJT
	Total	**20**	**350**	**150**	

Students will go into industries for **On Job Training**. Students will be evaluated based **upon On Job Training (OJT)/Internship** including report and presentation.

SIXTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU 601	On Job Training (OJT)/ Internship evaluation including report and presentation	20	350	150	OJT
	Total	**20**	**350**	**150**	

Students will go into industries for **On Job Training**. Students will be evaluated based **upon On Job Training (OJT)/Internship** including report and presentation.

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