

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
Sector-6, Mathura Road, Faridabad,
Haryana, India
2022-23

ABOUT THE PROGRAM

The B. Voc. Degree in Automotive Technology runs with a mission to impart knowledge, technical skills & hands-on training in automobiles, focusing on four wheelers & three wheelers, both petrol & diesel, and two wheelers. This program is an outcome of industry and student demand. Only Degree program in Automotive Technology with more than 80% Practical to make you more employable and outshine your career. 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 advance, 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 equipments 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 7 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	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-105 EL	English Literacy	3-0-0	3	25	75	BSC
BSC-107	Engineering Calculations	3-0-0	3	25	75	BSC
AM-101	Quality Control and Safety	3-0-0	3	25	75	PCC
AM-102	Engineering Science	3-0-0	3	25	75	PCC
AU-101	Basics of Automobile Technology	3-0-0	3	25	75	PCC
AU-102	Automobile Workshop - I	0-0-15	15	60	40	SDP
Total		15-0-15	30	185	415	

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-204BS	Behavioral Skills	3-0-0	3	25	75	BSC
BSC-205T	Typography and Computer Application	3-0-0	3	25	75	BSC
AM-201	Applied Science	3-0-0	3	25	75	PCC
AU-201	Internal Combustion Engine	3-0-0	3	25	75	PCC
AM-202	Engineering Graphics and Drawing	0-0-3	3	60	40	SDP
AU-202	Automobile Workshop - II	0-0-12	12	60	40	SDP
MAC-201 to 203	Mandatory Audit Course	3-0-0	3	25	75	MAC
Total		15-0-15	30	185	415	

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-302ES	Employability Skills	3-0-0	3	25	75	BSC
AM-301	Metrology	3-0-0	3	25	75	SDP
AM-302	CAD & CAM	3-0-0	3	25	75	BSC
AU-301	Motor Vehicle Technology	3-0-0	3	25	75	PCC
AU-302	Automobile Electrical Equipment	3-0-0	3	25	75	PCC
AU-303	Automobile Workshop - III	0-0-15	15	60	40	SDP
Total		15-0-15	30	185	415	

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
AU-401	Electrical And Hybrid Vehicles	3-0-0	3	25	75	PCC
AM-401	Industrial Management	3-0-0	3	25	75	PCC
AU-402	Automobile Workshop - IV	0-0-15	15	60	40	SDP
BSC-401P	Project	3-0-0	3	25	75	SDP
OEC-401 to 403	Open Elective Course	3-0-0	3	25	75	OEC
PEC-AU-401 to 403	Program Elective Course	3-0-0	3	25	75	PEC
Total		15-0-15	30	185	415	

FIFTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU-501	On Job Training (OJT)/ Internship	30	350	150	OJT
	Total	30	350	150	

SIXTH SEMESTER

Subject Code	Subject Name	Credits	Marks Weightage		Course Type
			Internal	External	
AU-601	On Job Training (OJT)/ Internship	30	350	150	OJT
	Total	30	350	150	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
MAC-201	Human Value and Professional Ethics
MAC-202	Balanced Diet and Nutrition
MAC-203	Environmental Science

LIST OF OPEN ELECTIVE COURSE

Course Code	Course Name
OEC-401	Entrepreneurship
OEC-402	Trends in Technology
OEC-403	Waste Management

LIST OF PROGRAM ELECTIVE COURSE

Course Code	Course Name
PEC-AU-401	Alternative Fuels & Emission Control
PEC-AU-402	Vehicle Body Engineering
PEC-AU-403	Autotronics

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-105 EL	English Literacy	3-0-0	3	25	75	BSC
BSC-107	Engineering Calculations	3-0-0	3	25	75	BSC
AM-101	Quality Control and Safety	3-0-0	3	25	75	PCC
AM-102	Engineering Science	3-0-0	3	25	75	PCC
AU-101	Basics of Automobile Technology	3-0-0	3	25	75	PCC
AU-102	Automobile Workshop - I	0-0-15	15	60	40	SDP
Total		15-0-15	30	185	415	

BSC-105: ENGLISH LITERACY

B. Voc. (Automobile) I Semester

No. of Credits:	3		
L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Pre- Requisite: Spoken English skills

Successive: Basics Communication Skills

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

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

- CO1 To learn about Parts of Speech.
- CO2 To learn about Syntactic Category.
- CO3 To know more about the Tenses.
- CO4 To acquire knowledge on Voices and Sentence Making.

Course Contents:

Unit 1: Parts of Speech

Noun, Pronoun, Verb, Adverb, Adjective.

Unit 2: Literacy Skills

Preposition, Conjunction, Interjection.

Unit 3: Fragment of Tenses

Present tense, Past Tense, Future Tense.

Unit 4: Sentence Formation

Active and Passive voice, Direct and Indirect Narration, Simple Sentences, Compound Sentences, Complex Sentences, Compound-Complex Sentences.

Text Books/ Reference Books:

1. Wren and Martin. High School English Grammar and Composition. New Delhi: RRP, 2007.
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge, 2017.

BSC-107: ENGINEERING CALCULATIONS

B. Voc. (Automobile) I Semester

No. of Credits:	3			Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Basic mathematics

Successive: Concepts of trigonometry, differentiation and integration.

Course Objectives: The objective of studying this course is to:

- ❖ Familiarize the prospective graduates with basics of mathematics.
- ❖ Provide knowledge on the application of trigonometry, integration and differentiation.
- ❖ Understand the use of matrices, trigonometry, integration and differentiation to solve formulated mathematical problems.

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

- CO1 Use trigonometry functions, ratios and their applications in real world scenario.
- CO2 Use trigonometric identities to solve mathematical problems.
- CO3 Understand and use matrices to solve mathematical problems.
- CO4 Deal with differential and integral problems.

Course Contents:

Unit 1: 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 2: 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 3: 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.

Unit 4: Complex Numbers

Definition of Complex Number, Operations on Complex Number (Add., Sub., Multiplication, Division), Conjugate Complex Number, Modulus and Amplitude of a Complex Number, Polar form of a Complex Number.

Text Books/ Reference Books:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", Pearson, 2002.
2. Advanced Engineering Mathematics by R.K. Jain.
3. A Basic course in Mathematics by Nabjyoti Dutta.
4. Skills in mathematics by Amit M Aggarwal.
5. Applied Mathematics for Polytechnics by H.K. Dass.
6. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint, 2010.

Note: It is recommended that some part of the syllabus is to be covered in online mode.

AM-101: QUALITY CONTROL AND SAFETY

B. Voc. (Automobile) I Semester

No. of Credits:	3			Sessional:	25 Marks
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives:

1. To understand the importance of safety, health and environment.
2. To classify different types of accidents.
3. To study different types of hazards and 5S at the workplace.

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

- CO1 Students will be aware about safety and health.
- CO2 Students will be aware of different types of accidents.
- CO3 Students will be able to differentiate different types of risks.
- CO4 Students will learn about 5S at the workplace.

Course Contents:

Unit 1: 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 2: Accidents

Classification of accidents, causes of accidents, accident investigations/reporting, approaches to prevent accidents, Fire fighting.

Unit 3: Safety in hazardous area

Hazards and risks, difference between hazard and risk, Hazard in industrial zones, physical, chemical, environmental, biological, ergonomics and psycho- social hazards, Introduction to OSHMS, OSHAS 18001 and OSHA.

Unit 4: 5S in safety

The basic principles of 5 S in manufacturing and workplace – Cleaning, sorting etc. sorting of materials, tools and equipments 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 5: Inspection

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.

Unit 6 Quality control

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.

Reference books:

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

AM-102: ENGINEERING SCIENCE

B. Voc. (Automobile) I Semester

No. of Credits:	3		
L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Course Objectives:

1. To learn about measurement devices.
2. To understand the law of motion and friction.
3. To study thermodynamics.
4. To learn about fuel and its classifications.

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

- CO1 To learn about units and dimensions.
- CO2 To improve understanding about motion and its laws.
- CO3 To acquire knowledge about thermodynamics.
- CO4 To be able to understand pollution and its control.

Course Contents:

Unit 1: 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 2: 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 3: Thermodynamics

Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; C_p , C_v - calorimetry; change of state - latent heat capacity. Thermal equilibrium and definition of temperature (zeroth law of

thermodynamics), heat, work and internal energy. First law of thermodynamics, isothermal and adiabatic processes. Second law of thermodynamics: reversible and irreversible processes, Heat engine and refrigerator.

Unit 4: Fuel and their Classification

Definition, characteristics, classification into solid, liquid and gaseous fuel, Petroleum and brief idea of refining into various fractions and their characteristics and uses, Calorific value of fuel, Gaseous fuels- preparation, properties, composition and use of producer gas, water and oil gas.

Unit 5: Pollution & its Control

Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, Nox, HC, Sox and particulates, effects of pollutants on man and environment – photochemical smog and acid rain. Water Pollution: Classification of pollutants, their sources, waste water 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.

Reference Books:

1. Thermodynamics by P K Nag
2. Environmental pollution and control engineering: C. S. Rao
3. Handbook of industrial metrology – John W. Greve, Frank W. Wilson, PHI – New Delhi.
4. Engineering Metrology – K.J. Hume, Macdonald and Co.(publisher) London

AU-101: BASICS OF AUTOMOBILE TECHNOLOGY

B. Voc. (Automobile) I Semester

No. of Credits:	3		
L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

The course should enable the students to:

1. To introduce automobile basics.
2. To understand the suspension and steering system.
3. To study automobile wheels and tyres.

Course Contents:

UNIT 1 INTRODUCTION

Introduction to an Automobile, Brief history of an Automobile, Classification of Automobiles, Parts of an Automobile, Performance of an Automobile

UNIT 2: 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 3: TRANSMISSION SYSTEM

Introduction to Transmission System, Clutch Gearbox (Transmission), Propeller Shaft Universal Joints, Final Drive and Differential, Rear Axles

UNIT 4: 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

UNIT 5: BRAKING SYSTEM

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.

Course Outcomes:

1. To learn various components of automobiles.
2. To acquire knowledge about steering and transmission systems.
3. To learn various components of Braking System,

Reference Books:

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

AU-102: AUTOMOBILE WORKSHOP-I

B. Voc. (Automobile) I Semester

No. of Credits:	3	Sessional:	40 Marks		
L	T	P	Total	Practical :	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To introduce automobile basics.
2. To understand repairing of suspension and steering systems.
3. To study the repairing of automobile wheels and tyres.
4. To perform the vehicle overhauling.

To understand the functioning of various components and aggregates of the vehicle

To be competent, the user/individual on the job must be able to:

1. To understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle, engines and fuel system (diesel, petrol, electrical, gas, hybrid etc.), cooling system, air supply systems, emission and exhaust system, ignition systems, clutch assembly, clutch operating system, gearbox (manual and automatic), drivelines and hubs, drive-train assembly and transmission systems (manual, automatic etc.), steering system, suspension system, brake system (including regenerative braking systems), tyres and wheels (including wheel alignment), radiator, batteries and power storage system.
2. To electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc. o electronic systems including active and passive safety, media and other systems
o various lubrication systems.
3. To understand the functioning of each system, component and aggregate (including both mechanical and electrical aggregates) of a vehicle.
4. To understand the tools used to assess and confirm technical faults that cannot be determined through a visual inspection.
5. To ensure any malfunctions observed in tools and equipment are reported to the concerned persons.
6. To understand the various values and tolerance limits of various components across the mechanical/ electrical aggregates.

B. Assessing service and repair requirements

To be competent, the user/individual on the job must be able to: available for assessing service and repair requirements of the vehicle including: diagnostic displays, visual inspections, test drives, vehicle/equipment manufacturer specifications, standard operating procedures for diagnosis, understand typical symptoms of common technical faults in a vehicle

C. Assist in the diagnosis of the root cause of the vehicle trouble

To be competent, the user/individual on the job must be able to:

1. To follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshoot problem in a vehicle
2. To review the job, card and understand customer complaints, follow standard operating procedures set out for diagnosing faults.
3. To follow instructions of seniors for specific tasks related to diagnosing faults in the various sub-assemblies and aggregates in a vehicle.
4. To use checklists and standard OEM operating procedures to understand if the fault is because of improper servicing, or low levels of oils, coolants, grease etc. or poor quality oil/air filters etc.
5. To ensure any malfunctions or repair requirements observed in vehicles (and beyond own scope of work) are reported to the concerned person.
6. 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.

D. Functioning of various components and component systems

To be competent, the user/individual on the job must be able to:

1. To understand the basic technology used in and functioning of various components and component systems of the vehicle including: o engines and fuel system (diesel, petrol, electrical, gas etc.)
2. To understand the tools used to assess deviations from specifications during routine servicing.

E. Carry out routine service and minor repairs of mechanical & electrical aggregates

To be competent, the user/individual on the job must be able to:

1. To calibrate, align and adjust settings, alignment and other routine service and maintenance of various parts and aggregates including:
 - o engine and aggregates
 - o other engine sub- assemblies like turbocharger, radiator etc.
 - o gear box and its aggregates
 - o propeller shafts and other transmission systems
 - o clutch and brake systems and sub-assemblies
 - o chassis
 - o electrical and electronic components
 - steering systems
 - o suspension system
 - o other components (including valves, ignition, fuel and emissions, transmission, lights, tyres, steering and body fittings)
2. To ensure that for routine maintenance and service, the correct spare parts and appropriate grade of lubricants, coolant, oils and grease required have been obtained to ensure all dismantled components (including mechanical and electrical aggregates) are cleaned and conditioned prior to reassembly. □
3. To understand the various precautions to be taken to avoid damage to the vehicle and its components while working on other aggregates.
4. To record all service and repairs carried out and ensure completeness of tasks assigned before releasing the vehicle for the next procedure.
5. To ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary

Course Outcomes:

1. To introduce the automobile and its classifications.
2. To improve understanding about different parts of automobiles and their functions.
3. To learn vehicle repairing.
4. To be able to rectify vehicle pollution and do its control.

SYLLABUS & SCHEME OF EXAMINATION

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-204BS	Behavioral Skills	3-0-0	3	25	75	BSC
BSC-205T	Typography and Computer Application	3-0-0	3	25	75	BSC
AM-201	Applied Science	3-0-0	3	25	75	PCC
AU-201	Internal Combustion Engine	3-0-0	3	25	75	PCC
AM-202	Engineering Graphics and Drawing	0-0-3	3	60	40	SDP
Total		15-0-15	30	185	415	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
MAC-201	Human Value And Professional Ethics
MAC-203	Balance Diet And Nutrition
MAC-202	Environmental Science

BSC-204BS: BEHAVIORAL SKILLS

B. Voc. (Electrical) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Communication Skills.

Successive: Basic reading and writing skills.

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

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

- CO1 Understand the basic concept of communication.
- CO2 To acquire better writing skills in formal communication.
- CO3 Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
- CO4 Fundamental knowledge about Speaking and reading skills.

Course Contents:

Unit 1: Communication Skills

Meaning of Communication , Importance , Function , Types , Communication barriers and its solutions.

Unit 2: 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 3: Soft Skills

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

and Paraphrasing.

Unit 4: Speaking and Reading Skills

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

Text Books/ Reference Books:

1. Mishra. B, Sharma. S (2011) Communication Skills for Engineers and Scientists. PHI Learning Pvt. Ltd.
2. Chaturvedi P. D, Chaturvedi M. (2011) Business Communication: Concepts, Cases and Applications. Pearson Education India.

BSC-205 FUNDAMENTAL OF COMPUTERS

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Successive: MS Office, MS Word, MS Excel, and MS PowerPoint.

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.
- ❖ To be able to create documents for printing and sharing.

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

- CO1 Learners will be able to claim proficiency in Word and PowerPoint.
- CO2 Learners will be able to independently create professional looking documents and presentations.
- CO3 Learners will be familiar with some advanced Word and PowerPoint functions.
- CO4 Learners will understand how to use Word and PowerPoint in a variety of professional, educational and personal situations.

Course Contents:

Unit 1: MS Windows

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 2: Documentation Using MS Word

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 3: Electronic SpreadSheet using MS Excel

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, Analyzing and Presenting Complex data.

Unit 4: Presentation using MS PowerPoint

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.

Text Books/ Reference Books:

1. V. Rajaraman, Computer Fundamentals.
2. Ashok Arora, Fundamentals of Computer System.
3. Russell A Stultz, Fundamentals of Computer System.

1. **Note:** It is recommended that some part of the syllabus is to be covered in online mode.

AM-202 APPLIED SCIENCE

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: Following are the objectives of this course:

1. To learn concepts of Units, Laws of vectors, parallel forces, moment of force, couple.
2. To Learn the fundamentals of properties and behavior of the materials
3. Understand different types of communication systems
4. To know the fundamentals of advanced communication systems.

Course Contents:

Unit – I Basics of mechanics and force system: Significance and relevance of Mechanics, Statics, Dynamics. Space, time, mass, particle, 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 co-planar 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: Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, co-efficient of thermal conductivity (K) and its S.I unit. Applications of conduction, convection and radiation.

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.

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

Course outcomes: After completing this course, student will be able to:

1. Identify the force systems for given conditions by applying the basics of mechanics.
2. Create knowledge of properties of matter applicable to engineering.
3. Analyze the different concepts of waves and vibration in the field of engineering
4. Analyze the recent trends in physics related to engineering.

Reference Books: -

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 text book of Engineering Mechanics, Laxmi Publications.
4. Ramamrutham, Engineering Mechanics, S. Chand & Co. New Delhi.

AU-201 INTERNAL COMBUSTION ENGINE

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Successive: Applied Thermodynamics, Heat and Mass Transfer, IC Engines, Refrigeration and Air Conditioning

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

Course Outcomes:

1. To learn the concepts of IC Engine.
2. To understand the concept of combustion in SI and CI engines.
3. To acquire knowledge about two stroke engines.
4. To check the performance parameters of IC engines.

Course Contents:

UNIT 1: INTRODUCTION TO IC ENGINE

Classification of IC Engines, applications of IC Engines, engine cycle energy balance, basic idea of IC Engines, different parts and terms connected with IC Engines, working cycles, indicator diagram, 4 stroke cycle engine, 2 stroke cycle engine, comparison of 4 stroke and 2 stroke engine, comparison of SI and CI engine.

UNIT 2 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 3 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 4 TWO STROKE ENGINE

General Aspects, Intake for Two Stroke Cycle Engines, Scavenging Process, Scavenging Parameters, Scavenging Systems, Crankcase Scavenging, Scavenging Pumps and Blowers.

UNIT 5 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

Reference Books:

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

AM-202 Engineering Graphics and Drawing Lab

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	60 Marks		
L	T	P	Total	Theory:	40 Marks
0	0	4	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objective: This course is designed to give knowledge of Engineering Graphics in Engineering and basic principles of Technical/Engineering Drawing.

Course Outcomes:

1. The student will become familiar with fundamentals of various science and technology subjects and thus acquire the capability to applying them
2. The graduates will become familiar with fundamentals of engineering design. Understanding the concept generation, design optimization and evaluation.
3. Students will be able to effectively design various engineering components and make process plans for the production.

Course Contents

1. Introduction to drawing, lines and lettering: 1.1. Definition and classification of drawing 1.2. Drawing instruments such as; drawing board, drawing sheets, drafter. 1.3. Types of pencils, sheets, eraser etc. 1.4. Different types of lines(Straight line, inclined line and curved lines) 1.5. Practice engineering style for letters and numbers as BIS: SP:46-2003

Hands on training: Prepare drawing sheet by using different types of lines Prepare Drawing Sheet Using Alphabets. Prepare a drawing sheet by Bisection of line, angle, arc.

2. Dimensioning and scale: 2.1. Importance of dimensioning 2.2. Types (i.e. chain, parallel and progressive etc.) and methods of placing dimensioning (i.e. aligned and unidirectional) 2.3. Principles of dimensioning and practice dimensioning technique as BIS: SP: 46-2003. 2.4. Free hand sketching of straight lines, circle, square, Polygons

Hands on training: To divide a line of length 120mm into 9 equal parts Divide a circle into 12 equal parts by using engineering compass Prepare drawing sheet by free hand sketching.

3. Introduction to Projection: 3.1. Introduction to first and third angle projection 3.2. Introduction to projection of point, line and plane 3.3. Sectioning of solids

Hands on training: Practice for projection of point Practice for projection of line Practice for projection plane Practice for sectioning of different solids.

4. Isometric and Orthographic projection: 4.1. Isometric drawing of simple geometric solids 4.2. Orthographic projection of simple geometric solids.

Hands on training: Prepare drawing sheet of orthographic projection Prepare drawing sheet of isometric projection. Orthographic drawings of Bolts and Nuts, Bolted Joints, Screw threads, Screwed Joints.

5. Geometric and dimensioning: Tolerance 5.1 Component Drawing and interpretation 5.2 Geometric dimension and Tolerance 5.3 Introduction to software used in drawing

Hands on training: Prepare drawing sheets by using GD&T in drawing .

Text Book

1. Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M. Panchal, Forty
2. Fourth Edition 2002, Charotar Publishing House.
3. Engineering Drawing: Laxmi Narayan and Vaishwanar, Charotar Publishing House.

AU-202 AUTOMOBILE WORKSHOP – II

B. Voc. (Automobile) II Semester

No. of Credits:	15	Sessional:	40 Marks		
L	T	P	Total	Practical:	60 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives

1. To introduce automobile basics.
2. To understand repairing of suspension and steering systems.
3. To study the repairing of automobile wheels and tyres.
4. To perform the vehicle overhauling.

Carry out diagnosis of vehicle for repair requirements.

1. To Follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshooting problems in a vehicle.
2. To conduct inspection of the engine and aggregates to diagnose the need for repairs or adjustment in various engine aggregates.
3. To Conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement
4. 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.

B. Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle.

1. To Understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gear box, transmission systems, propeller shaft etc.
2. To Service, repair and overhaul of the steering system.
3. To Service, repair and overhaul of suspension system.
4. To Service, repair and overhaul of tyres.
5. To Service, repair and overhaul of wheels.
6. To Service, repair and overhaul diesel Engines and its fuel system.

7. To Service, repair and overhaul petrol Engines and its fuel system.
8. To Service, repair and overhaul of cooling system and radiator
9. To Service, repair and overhaul of emission and exhaust system.
10. To Service, repair and overhaul of gearbox, drive-train assembly and transmission systems (manual, automatic etc.)
11. To Service, repair and overhaul of brake system.
12. To Service, repair and overhaul of pneumatic brakes.
13. To Service, repair and overhaul of hydraulic brakes.
14. To Service, repair and overhaul of clutch assembly.
15. To Service, repair and overhaul of single plate and multi plate clutches.
16. To Service, repair and overhaul of hydraulic and pneumatic system and various lubrication systems.

C. Carry out service and repairs of electrical and electronic faults in a vehicle.

1. Repair and overhaul of electronic control unit
2. To Repair and overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.
3. To Repair and overhaul safety systems.
4. Repair and overhaul of hydraulic and pneumatic systems.

Course Outcomes:

1. To learn about vehicles and its repair.
2. To improve understanding about different parts and their functions.
3. To perform vehicle wheel balancing.
4. To be able to rectify about vehicle pollution and do its control

MAC-201: HUMAN VALUE AND PROFESSIONAL ETHICS

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives: The objective of studying this course is to:

- ❖ Understand the value system.
- ❖ Understand Honesty and Integrity.
- ❖ Understand the Harmony.
- ❖ Understand universal declaration of human rights.

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

- CO1 Learn about value education system
- CO2 Improve understanding of values for life.
- CO3 Acquire knowledge about harmony in the society.
- CO4 Understand the human Right and Social Evils.

Course Contents:

Unit 1: 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 2: 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 3: 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)

Understanding the harmony in Society: Solution to our day-to-day problems, Prosperity and Compassion, the formula for establishing a fearless society, crafting a society that co-exists, Human Goals, Universal Human Order, From Family to the World.

Harmony in Nature: Understanding the Harmony in Nature, making sure your contribution is in harmony with nature, Interconnectedness and mutual fulfilment.

Unit 4: Environment and Ecological balance

Interdependence of all beings - living and non-living, The binding of man and nature - Environment conservation and enrichment.

Unit 5: Human Right and Social Evils

Human Rights: 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 totackle them.

Text Books/ Reference Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.
3. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.

Note: It is recommended that some part of the syllabus is to be covered in online mode.

MAC-202: BALANCED DIET AND NUTRITION

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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

- CO1 Understand the basic concepts of a balanced diet.
- CO2 Analyze the type of food and their nutritional value.
- CO3 Evaluate calorie (BMR).
- CO4 Learn the role of diet in healthy living.

Course Contents:

Unit 1: 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 2: 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 3: 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 4: Yogic concepts of Diet and Nutrition

General introduction to diet concepts, concepts of mitahara, Definition and classification, yogic diet according to traditional yoga texts; Concepts of diet according to GherandSamhita 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

Text Books/ Reference Books:

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

Note: It is recommended that some part of the syllabus is to be covered in online mode.

MAC-203: ENVIRONMENTAL SCIENCE

B. Voc. (Automobile) II Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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 importance of ecosystem and biodiversity for maintaining ecological balance.
- ❖ To learn about various attributes of pollution management and waste management practices.

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

- CO1 Get the information about ecosystem and also about its functions like Food chain, Ecological pyramids etc.
- CO2 Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of environment by the usage of these resources.
- CO3 Gain the knowledge about the ecosystem diversity, its values and also about the importance of the endemic species and different techniques involved in its conservation
- CO4 Gain the knowledge about the different types of pollutions and their control technologies, Waste water treatment, Bio medical waste management etc.

CO5 Get the complete information about EIA- Environmental Impact Assessment, Sustainable developmental activities, environmental policies and regulations, awareness among people about protection of wild life, forest and other natural resources.

Course Contents:

Unit 1: The Multidisciplinary Nature of Environmental Studies

Definition, scope and importance. Need for public awareness.

Unit 2: 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 3: Ecosystems

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).

Unit 4: 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 5: 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.

Text Books/ Reference Books:

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: It is recommended that some part of the syllabus is to be covered in online mode

SYLLABUS & SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-302	Soft Skills	3-0-0	3	25	75	BSC
BSC-303	Computer Lab	3-0-0	3	25	75	SDP
AM-301	CAD & CAM	3-0-0	3	25	75	BSC
AU-301	Motor Vehicle Technology	3-0-0	3	25	75	PCC
AU-302	Automobile Electrical & Electronics	3-0-0	3	25	75	PCC
AU-303	Automobile Workshop - III	0-0-15	15	60	40	SDP
Total		15-0-15	30	185	415	

BSC-302 SOFT SKILLS

B. Voc. (Automobile) III Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Communication skills, soft skills.

Successive: Professional and personal development.

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 Understand the importance of behavioral skills.
- CO2 Effectively communicate through verbal and nonverbal communication.
- CO3 Function effectively in multi di.
- CO4 To acquire knowledge on Voices and Sentence Making.

Course Contents:

Unit 1: Behavior skills

An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.

Unit 2: Body Language

Gesture, posture, facial expression, Group Discussion– Giving up ofPREP, REP Technique, Presentation Skills: How to make a PowerPoint presentation and Body language during presentation.

Unit 3: Teamwork and PDP

Teamwork Skills, Leadership Skills, Personality Development, Conflict Management, Decision-Making and Problem-Solving Skills.

Unit4: 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.

Text Books/ Reference Books:

1. Wren and Martin. High School English Grammar and Composition. New Delhi:RRP, 2007
2. Murphy, Raymond. Essential English Grammar. New Delhi: Cambridge, 2017.
3. Malhotra, Prerna and Halder, Deb. Communication Skills: Theory and Practice.

BSC-303: COMPUTER LAB

B. Voc. (Automobile) III Semester

No. of Credits:	3	Sessional:	60 Marks		
L	T	P	Total	Theory:	40 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Successive: Basic computer knowledge.

Course Objectives: The objective of this course is to understand the basic concept of Microsoft Excel, Word and PowerPoint and how these tools are helpful in creating editing, saving, printing, securing and protecting a document.

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

- CO1 Create a new document, open, save and print a document.
- CO2 To edit and format text, change the page layout, background and borders.
- CO3 To modify PowerPoint custom template presentation
- CO4 To create a word document with a customized template.

List of Experiments:

1. Create a document and apply different formatting options.
2. Design a Greeting card using Word Art for different festivals.
3. Create a biodata and use page borders and shading.
4. Create a document and insert header and footer, page title, etc.
5. To create a document, set the margins, orientation, size, column, watermark, page color and page borders.
6. Insert table into the document.

7. Prepare a marksheet of your class subjects.
8. Apply the creating, editing, saving, printing, securing and protecting operations to excel spreadsheets.
9. Prepare a bar chart and pie chart for analysis of five-year results of your institute.
10. Work on the following exercise on a workbook: Copy an existing sheet, Rename the old sheet, Insert a new sheet into an existing workbook and Delete the renamed sheet.
11. Prepare an attendance sheet of 10 students for any 6 subjects of your syllabus. Calculate their attendance, total percentage of attendance of each student and average of attendance.
12. Create a worksheet on students list of any 4 faculties and perform following database functions on it: Sort data by name, Filter data by class and Subtotal of number of students by class.
13. Apply themes and layout to powerpoint slides and insert pictures, graphics, shapes and tables.
14. In PowerPoint slides make use of adding transitions and animation.
15. Create an excel worksheet and perform computations using available data and mathematical functions chosen from menus.

AU-301 MOTOR VEHICLE TECHNOLOGY

B. Voc. (Automobile) III Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

1. To introduce the automobile fuel supply system.
2. To understand the suspension and steering system.
3. To study about Automobile Pollution.

Course Contents:

UNIT 1: FUEL SUPPLY SYSTEM IN S.I ENGINE

Introduction to Carburetion and Carburetors, 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 2: 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 3: 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 4: AIR POLLUTION FROM IC ENGINES

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.

UNIT 5: VEHICLE EMISSIONS CONTROL METHODS

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 Gases, 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

Course Outcomes:

1. To learn various components of automobiles.
2. To improve understanding about the power unit of automobiles.
3. To acquire knowledge about steering and suspension systems.
4. To be able to check wheel unbalanced.

Reference Books:

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

AU-302 AUTOMOBILE ELECTRICAL & ELECTRONICS

B. Voc. (Automobile) III Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

The course should enable the students to:

1. To understand the basics of batteries, used for electrical components of automobiles.
2. To understand electrical components of automobiles.
3. To know the electrical wiring and lighting.

Course Contents:

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

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.

UNIT III IGNITION SYSTEMS

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 IV 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 V 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.

Course Outcomes:

1. Students will be able to understand various Automobile Electrical Equipment.
2. Students will be able to understand ignition systems.
3. Students will learn about electronic ignition systems.
4. Students will understand about auto bile wiring, lighting and sensors.

Text books

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

AM-301 CAD & CAM

B. Voc. (Automobile) Semester 3rd

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course objectives:

1. To study about Introduction CIM and CAD & Analysis.
2. To study about Computer aided Manufacturing CAM.
3. To study about Part Programming NC part programming

UNIT 1: 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 modeling: Techniques: Wire frame modeling – surface modeling – solid modeling

UNIT 2: Computer aided Manufacturing CAM: Definition, functions, benefits. Group technology – Part families - Parts classification and coding - coding structure – Optiz 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 3: CNC Machine and Components:

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.

UNIT 4: 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 5: 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.

REFERENCE BOOKS:

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*,
5. Eastern Economy Edition.

AU-303 AUTOMOBILE WORKSHOP-III

B. Voc. (Automobile) III Semester

No. of Credits:	3	Sessional:	40 Marks		
L	T	P	Total	Practical:	60 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

1: INTRODUCTION TO AUTOCAD

Starting AutoCAD, AutoCAD Screen Components (Drawing Area Command Window Navigation bar Status bar), Invoking Commands in AutoCAD Keyboard(Ribbon Application Menu Tool Palettes Menu Bar Toolbar), Shortcut Menu, AutoCAD Dialog Boxes, Starting a New Drawing (Open a Drawing Start from Scratch Use a Template Use a Wizard, Saving Your Work, Save Drawing as Dialog box), Using the Drawing Recovery Manager to Recover Files, Closing a Drawing, Opening an Existing Drawing, Opening an Existing Drawing Using the Select File Dialog Box Opening an Existing Drawing Using the Startup Dialog Box Opening an Existing Drawing, Using the Drag and Drop Method, Quitting AutoCAD, Creating and Managing Workspaces Creating a New Workspace Modifying the Workspace Settings Autodesk Exchange.

2: GETTING STARTED WITH AUTOCAD

Dynamic input mode, Enable Pointer Input, Enable Dimension Input where possible Show command prompting and command input near the crosshairs, Drafting Tooltip Appearance, Drawing Lines in autocad, The Close Option, The UndoOption, Invoking tools Using Dynamic INPUT/Command Prompt Coordinate Systems, Absolute Coordinate System, Relative Coordinate System, Relative Polar Coordinates, Direct Distance Entry Erasing Objects, Cancelling and Undoing a Command Object Selection Methods, Window Selection Window Crossing Method Drawing a Circle, BASIC Display Commands Setting Units Type and Precision, Specifying the Format Specifying the Angle Format, setting the limits of a drawing.

3: STARTING WITH ADVANCED SKETCHING

Drawing Arcs, Drawing Rectangles, Drawing Ellipses, Drawing Regular Polygon, Drawing Polylines Placing Points, Drawing Infinite Lines Writing a Single Line Text

4: WORKING WITH DRAWING AIDS

Introduction, Understanding the Concept and use of LAYERS, Advantages of Using Layers, Working with Layers, Creating New Layers, Making a Layer Current, Controlling the

Display of Layers, Deleting Layers, Object Properties Changing the Colour, Changing the Line type, Changing the Line weight, Changing the Plot Style, Properties Palette, Quick Properties, Palette Drafting, Settings dialog box, Setting Grid, Setting Snap, Snap Type, Drawing Straight Lines using the Ortho Mode, Working with Object Snaps, Auto Snap, Endpoint Midpoint, Nearest Centre, Tangent Quadrant Intersection, Apparent Intersection Perpendicular, Node Insertion, Snap to None Parallel Extension From, Midpoint between 2 Points, Temporary Tracking Point, Combining Object Snap Modes, Running Object, Snap Mode, Overriding the Running Snap, Cycling through Snaps, Using Auto Tracking, Object Snap Tracking, Polar Tracking, Auto Track Settings, Function and Control Keys.

5: EDITING SKETCHED OBJECTS-I

Editing Sketches, Moving the Sketched Objects, Copying the Sketched Objects, Creating Multiple Copies, creating a Single Copy, Offsetting Sketched Objects, Rotating Sketched Objects, Scaling the Sketched Objects, Filletting the Sketches, Chamfering the Sketches,

Trimming the Sketched Objects, Extending the Sketched Objects, Stretching the Sketched Objects, Lengthening the Sketched Objects, Arraying the Sketched Objects, Rectangular Array Polar Array, Path Array, Mirroring the Sketched objects Text Mirroring.

6: EDITING SKETCHED OBJECTS-II

Introduction to Grips Types of Grips, Editing a Polyline by Using Grips Editing Grippled Objects ,Changing the Properties Using the PROPERTIES Pale Matching the Properties of Sketched Objects, Cycling Through Selection, Managing Contents Using the Design enter Autodesk Seek design content Link Displaying Drawing Properties, Basic Display Options Redrawing the Screen Regenerating Drawings, Zooming Drawings Real-time Zooming All Option, Centre Option Extents Option Dynamic Option Previous Option Window Option Scale Option Object Option Zoom In and Out, Panning Drawings Panning in Real time.

7: CREATING TEXT AND TABLES

Annotative Objects Annotation Scale, Assigning Annotative Property and Annotation Scales Customizing Annotation Scale, Multiple Annotation Scales, Assigning Multiple Annotation Scales Manually Assigning Multiple Annotation Scales Automatically, Controlling the Display of Annotative objects Creating Text, Writing Single Line Text Entering Special Characters Creating Multiline Text, Text Window Text Editor Tab, Editing Text, Editing Text Using the DDEDIT Command Editing Text Using the Properties Palette Modifying the Scale of the Text, Inserting Table in the Drawing Table style Area, Insert options Area Insertion behaviour Area, Column and row settings Area Set cell styles Area, Creating a New Table Style Starting table Area General Area, Cell styles Area, Setting a Table Style as Current Modifying a Table Style Modifying Tables, Substituting Fonts, Specifying an Alternate Default Font Creating Text Styles, Determining Text Height Creating Annotative text

8: BASIC DIMENSIONING, GEOMETRIC DIMENSIONING, AND TOLERANCING

Need for Dimensioning in AutoCAD Fundamental Dimensioning Terms, Dimension Line, Dimension Text Arrowheads Extension Lines Leader, Centre Mark and Centrelines Alternate Units, Tolerances Limits, Associative Dimensions Definition Points Annotative Dimensions, Selecting Dimensioning Commands Using the Ribbon and the Toolbar Using the Command

Line, Dimensioning a Number of Objects Together Creating Linear Dimensions, DIMLINEAR Command Options Creating Aligned Dimensions Creating Arc Length Dimensions Creating Rotated Dimensions Creating Baseline Dimensions Creating Continued Dimensions Creating Angular Dimensions, Dimensioning the Angle between Two Nonparallel Lines Dimensioning the Angle of an Arc, Angular Dimensioning of Circles, Angular Dimensioning based on Three Points Creating Diameter Dimensions, Creating Radius Dimensions Creating Jogged Linear Dimensions Creating Ordinate Dimensions, Maintaining Equal Spacing between Dimensions Creating Inspection Dimensions, Inspection Label Dimension Value, Working with True Associative Dimensions Inspection Rate, Removing the Dimension Associatively, Converting a Dimension into a True Associative Dimension Drawing Leaders, Multileader, Adding leaders to existing Multileader, Removing Leaders from Existing Multileader, Aligning Multileader, Distribute, Make leader segments Parallel Specify Spacing, Use current spacing, Geometric Dimensioning and Tolerance Geometric Characteristics and Symbols Adding, Geometric Tolerance, Feature Control Frame, Geometric Characteristics Symbol, Tolerance Value and Tolerance Zone Descriptor Material Condition Modifier, Datum, Complex Feature Control Frames Composite Position Tolerance Projected Tolerance Zone, Creating Annotative Dimensions, Tolerances, Leaders, and Multileader

9: EDITING DIMENSIONS

Editing Dimensions Using Editing Tools Editing Dimensions by Stretching, Editing Dimensions by Trimming and Extending Flipping Dimension Arrow, Modifying the Dimensions Editing the Dimension Text Updating Dimensions, Editing Dimensions with Grips, Editing Dimensions using the Properties Palette Properties Palette (Dimension), Properties Palette (Multileader), Model Space and Paper Space Dimensioning

10: DIMENSION STYLES, MULTILEADER STYLES, AND SYSTEM VARIABLES

Using Styles and Variables to Control Dimensions Creating and Restoring Dimension Styles, New Dimension Style dialog box Controlling the Dimension Text Format Fitting Dimension Text and Arrowheads Formatting Primary Dimension Units Formatting, Alternate Dimension Units Formatting the Tolerances, Creating and Restoring Multileader Styles Modify Multileader Style dialog box.

11: MODEL SPACE VIEWPORTS, PAPER SPACE VIEWPORTS, AND LAYOUTS

Model Space and Paper Space/Layouts Model Space Viewports (Tiled Viewports), Creating Tiled Viewports Making a Viewport Current Joining Two Adjacent Viewports, Paper space viewports (Floating Viewports) Creating Floating Viewports, Creating Rectangular Viewports Creating Polygonal Viewports, Converting an Existing Closed Object into a Viewport Temporary Model Space, Editing Viewports, Controlling the Display of Objects in Viewports Locking the Display of Objects in Viewports Controlling the Display of Hidden Lines in Viewports Clipping Existing Viewports, Maximizing Viewports Inserting Layouts, Inserting a Layout Using the Wizard Defining Page Settings, Controlling the Display of Annotative Objects in Viewports

12: PLOTTING DRAWINGS

Plotting Drawings in AutoCAD, Plotting Drawings Using the Plot Dialog Box Page Setup Area, Printer/plotter Area Paper Size Area Number of copies Area Plot area, Plot offset (origin set to printable area) Area Plot Scale Area, Plot style table (pen assignments) Area Shaded viewport options Area, Plot options Area Preview, Adding Plotters, The Plotter Manager Tool Using Plot Styles, Adding a Plot Style

13: HATCHING DRAWINGS

Hatching, Hatch Patterns Hatch Boundary, Hatching Drawings Using the Hatch Tool Panels in the Hatch Creation Tab, Boundaries Panel Pattern Panel Properties Panel Origin Panel Options Panel Match Properties, Setting the Parameters for Gradient Pattern Creating Annotative Hatch, Hatching the Drawing Using the Tool Palettes Drag and Drop Method, Select and Place Method, Hatching Around Text, Dimensions, and Attributes

14: WORKING WITH BLOCKS

The Concept of Blocks Advantages of Using Blocks Drawing Objects for Blocks, Converting Entities into a Block Inserting Blocks, Creating and Inserting Annotative Blocks Block Editor, Adding Blocks in Tool Palettes Drag and Drop Method, Modifying Existing Blocks in the Tool Palettes, Layers, Colours, Line types, and Line weights for Blocks Nesting of Blocks, Creating Drawing Files using the Write Block Dialog Box Exploding Blocks Using the XPLODE Command Renaming Blocks, Deleting Unused Blocks Editing Constraints to Block.

SYLLABUS & SCHEME OF EXAMINATION

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
AU-401	Electrical and Hybrid Vehicles	3-0-0	3	25	75	PCC
AM-401	Industrial Management	3-0-0	3	25	75	PCC
AU-402	Automobile Workshop-IV	0-0-15	15	60	40	SDP
BSC-401	Project	3-0-0	3	25	75	SDP
OEC-405to408	Open Elective Course	3-0-0	3	25	75	OEC
PEC-AU-401 to 403	Program Elective Course	3-0-0	3	25	75	PEC
	Total	30-0-15	30	115	375	

LIST OF OPEN ELECTIVE COURSE

COURSE CODE	COURSE NAME
OEC-401	Entrepreneurship
OEC-402	Trends in Technology
OEC-403	Waste Management
OEC-404	Industry 4.0

LIST OF PROGRAM ELECTIVE COURSE

COURSE CODE	COURSE NAME
PEC-AU-401	Alternative Fuels & Emission Control

PEC-AU-402	Vehicle Body Engineering
PEC-AU-403	Autotronics

AU-401 Electric and Hybrid Vehicles

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

The course should enable the students to:

1. General aspects of Electric and Hybrid Vehicles (EHV), including architectures, modeling, sizing, and sub system design and hybrid vehicle control.
2. Understand about vehicle dynamics,
3. Design the required energy storage devices,
4. Select the suitable electric propulsion systems and
5. Understanding of hybrid electric vehicles.

Course Contents:

Unit 1: INTRODUCTION

Introduction to electric and hybrid electric vehicles, History of hybrid and electric vehicles, Social and environmental importance of electric and hybrid electric vehicles, Electrical basics, Motor and generator basics

Unit 2: ELECTRIC AND HYBRID ELECTRIC DRIVE TRAINS

Types by drivetrain structure, Series hybrid, Parallel hybrid Combined hybrid; Types by degree of hybridization Strong, hybrid Medium hybrid, Mild hybrid / micro hybrid, Plug-in hybrid, Types by nature of the power source Electric-internal combustion engine, hybrid Fuel cell hybrid Human power and environmental power hybrids. Pneumatic hybrid Hydraulic hybrid

Unit 3: POWER FLOW

Power flow control in electric and hybrid electric drive train topologies.

Unit 4: 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 5 SUBSYSTEMS OF HYBRID AND ELECTRIC VEHICLES

Power Split devices for Hybrid Vehicles - Operation modes - Control Strategies for Hybrid Vehicle-Economy of hybrid Vehicles. Steering and Suspension system. Choice of Tires.

Course Outcomes The students able to understand

- i. Electric and hybrid vehicle operation and architectures
- ii. Design of hybrid and electric vehicles.
- iii. Energy requirement for vehicles.
- iv. Vehicle characteristics, operating modes, and performance parameters of the vehicle
- v. Different subsystems of hybrid and electric vehicles

Text Books/ Reference Books:

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: Mehrdadsani, Yimingao, AliEmadi.

Web Links:

Note: It is recommended that some part of the syllabus is to be covered in online mode.

AM-401 INDUSTRIAL MANAGEMENT

B. Voc.(Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

Unit 1. 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 2. 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 3. Wages & incentives:

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.

Unit 4. 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.

Unit 5. Material management:

Introduction, Scope of Material Management selective control techniques-ABC analysis, Material handling, inventory control, Essential steps in inventory control, quality standards

Reference Books: 1. Industrial Management, S.C. Sharma, Khanna Publishing House

AU-402 AUTOMOBILE WORKSHOP-IV

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	40 Marks		
L	T	P	Total	Practical:	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To introduce automobile basics.
2. To understand repairing of suspension and steering systems.
3. To study the repairing of automobile wheels and tyres.
4. To perform the vehicle overhauling.

Course Contents:

1. To Follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshooting problems in a vehicle.
2. To conduct inspection of the engine and aggregates to diagnose the need for repairs or adjustment in various engine aggregates.
3. To Conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement
4. 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.
5. To Understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gearbox, transmission systems, propeller shaft etc.)
6. To Service, repair and overhaul of the steering system.
7. To Service, repair and overhaul of suspension system.
8. To Service, repair and overhaul of tyres.
9. To Service, repair and overhaul of wheels.
10. To Service, repair and overhaul diesel Engines and its fuel system.
11. To Service, repair and overhaul petrol Engines and its fuel system.

12. To Service, repair and overhaul of cooling system and radiator
13. To Service, repair and overhaul of emission and exhaust system.
14. To Service, repair and overhaul of gearbox, drive-train assembly and transmission systems (manual, automatic etc.)
15. To Service, repair and overhaul of brake system.
16. To Service, repair and overhaul of pneumatic brakes.
17. To Service, repair and overhaul of hydraulic brakes.
18. To Service, repair and overhaul of clutch assembly.
19. To Service, repair and overhaul of single plate and multi plate clutches.
20. To Service, repair and overhaul of hydraulic and pneumatic system and various lubrication systems.
21. Repair and overhaul of electronic control unit
22. To Repair and overhaul of electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc.
23. To Repair and overhaul safety systems.
24. Repair and overhaul of hydraulic and pneumatic systems.

Course Outcomes:

1. To learn about vehicles and its repair.
2. To improve understanding about different parts and their functions.
3. To perform vehicle wheel balancing.
4. To be able to rectify about vehicle pollution and do its control

BSC-401 PROJECT

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	40Marks		
L	T	P	Total	Theory:	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

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.

OEC-401 ENTREPRENEURSHIP

B. Voc.(Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To introduce the Entrepreneurship concept.
2. Introduction to start-up's.
3. To understand the Role of state finance corporation,
4. To understand the role of a project report.

Course Contents:

Unit-1: Entrepreneurship and entrepreneur: Entrepreneurship concept and process, Entrepreneur, Essential Characteristics of a good Entrepreneur, Types of entrepreneur, Industrial Policy, Classification of industries- Micro, small scale, Medium scale, Large scale, Product identification/ selection, Site selection, Plant layout, Pre-market survey.

Unit-2: Entrepreneurship Support System and Start-ups: Introduction to start-up's, Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMML, Role of state finance corporation, state electricity corporations, pollution control board, BIS, I.S.O. etc.

Unit-3 Introduction to Tax System, and Acts: Idea of income tax, Goods and Services Tax and custom duty, Introduction to Industrial Acts, factory Act, Workmen's Compensation Act 1923, Apprentices Act 1961, Environmental Protection Act 1986

Unit-4: Project Report Preparation: Procedure of preparing a project report, Format of project report, Preparation of project report, Introduction to ISO: 9000 Series of Quality System

Outcome:

1. Students will be aware about the concepts of entrepreneurship development and significance of entrepreneurship in economic development.
2. It will help students to know about various acts related to an industry.

3. Students will be able to prepare a project report.
4. They will be able to know the support available from the Govt. to start a new venture.

Reference Books:

1. Khanka S.S., "Entrepreneurship Development" S.Chand.
2. Desai, A N. "Entrepreneur & Environment" Ashish, New Delhi.
3. Drucker, Peter. "Innovation and Entrepreneurship" Heinemann, London.
4. Kumar, S A. "Entrepreneurship in Small Industry" Discovery, New Delhi

OEC-402: TRENDS IN TECHNOLOGY

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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 Familiarize with the central concepts in innovation.
- CO2 Learn about critical digitized components.
- CO3 Know about the future trends based on technology outlooks – where are we now and where are we heading.
- CO4 Critically analyze, even practice “how to enable” innovation.

Course Contents:

Unit 1: 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 2: E-mail & Internet

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

Unit 3: 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 4: E – Governance & E – Agriculture

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 redresses System, (Information Kiosk, IVR, etc.), Case Study.

Unit 5: E-learning

Models WBT, CBT, Virtual Campus, LMS & LCMS, Video Conferencing, Chatting Bulletin, Building Online Community, Asynchronous / Synchronous Learning, Case Study.

Text Books/ Reference Books:

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 GISBook:GeorgeB.Karte.
6. Management Information System: Laudon & Laudon

OEC-403 WASTE MANAGEMENT

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

Course Objectives:

1. To introduce about Sources of solid and hazardous wastes
2. To study about Waste exchange.
3. To understand storage and collection of municipal solid wastes

Course Contents:

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

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

UNIT V WASTE DISPOSAL

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

Course Outcomes:

1. To learn various source of the solid waste.
2. To improve understanding handling of waste.
3. To acquire knowledge about steering and suspension system.
4. To be able to understand Disposal in landfills.

Reference Books:

1. George Tchobanoglous 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 Thiesen Ellasen; *Solid Waste Engineering Principles and Management*, McGraw - Hill 1997.

OEC-404 INDUSTRY 4.0

B. Voc. (Automobile) IV Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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:

1. Understand the concept of Industry 4.0
2. Learn about Industry 4.0 Technologies.
3. Understand the concepts of Internet of Things.
4. Understand the concepts AI

Course Contents:

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: Machine to Machine, Difference between IoT and M2M, Software define Network.

Unit-V Introduction of Artificial intelligence: Foundations, scope, problems, and approaches of AI, Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents.

Text Books:

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

PEC-AU-401 ALTERNATIVE FUEL & EMISSION CONTROL

B. Voc.(Automobile) 4th Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To introduce alternate fuels.
2. To understand the automobile emission control system.
3. To study emission measurement and control.

Course Contents:

Unit-I: 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: 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 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 crank case ventilation system for ubhc emission reduction.

Unit-IV: 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, controlling of emissions, emissions and drivability, exhaust gas recirculation, exhaust after treatment – doc, dpf, scr and Int. Measurement and test procedure (ndir analyzers, fid, chemiluminescence nox analyzer,

oxygen analyzer, smoke measurement, constant volume sampling, particulate emission measurement, orsat apparatus.)

Unit-V: 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.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House

PEC-AU- 402 VEHICLE BODY ENGINEERING

B. Voc.(Automobile) 4th Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To familiarize the students with the fundamentals of vehicle body.
2. After completion of the course, the student shall be able to explain the concept of car body design, passenger safety, crumple zone and crash testing. Identify the concepts of wind tunnel testing and vehicle body optimization techniques to reduce drag.
3. To demonstrate the various types of bus body construction, seating layout, regulations and comfort.

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 fiber board, Steel, Mild steel – angle, channel, strips, Aluminium alloy- sheets, strips, channel etc., Rivets/ screws, glass- coloured 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.

Text Book(s): [T1] Sydney F. Page, "Body Engineering", 3rd Ed. Chapman & Hill Ltd., London. [T2] P.L. Kohli, "Automotive Chassis and Body", McGraw Hill Publication Co.

[T3] J Fairbrother, "Fundamentals of Vehicle Body work", Hutchinson, London

PEC-AU-403 AUTOTRONICS

B. Voc. (Automobile) 4th Semester

No. of Credits:	3	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To understand the importance of electronics in an automobile.
2. To study Automotive Sensors & Actuators.
3. To study Automotive Electronic Systems.

UNIT –I 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 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 Electronic Ignition systems, Electronic injection systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, EPS

UNIT –IV 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.

Text Book(s):

[T1] Ramesh Goankar S., “Microprocessor Architecture Programming and Applications”, Willey Eastern Ltd.

[T2] William B. Riddens, “Understanding Automotive Electronics”, 5th Edition, Butter Worth Heinemann

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	30	40	60	OJT
	Total	30	40	60	

Students will go in 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	30	40	60	OJT
	Total	30	40	60	

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