

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
2023-24

ABOUT THE COMMUNITY COLLEGE OF SKILL DEVELOPMENT

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

ABOUT THE PROGRAM

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

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

PROGRAMME OUTCOMES (POs)

After completion of the program, the student will:

1. Be trained to NSQF level 5.5 in at least one job/profile in the field of automotive skills.
2. Be trained for multiple skill sets under the domain of automotive skills like Body repair, refinishing painting technology, wheel care, engine emission system, automotive electrical

circuit designing, vehicle dynamics etc.

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

PROGRAMME SPECIFIC OUTCOMES (PSOs):

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

SCHEME OF EXAMINATION

FIRST SEMESTER

Subject Code	Subject Name	L-T-P	Credit	Marks Weightage		Course Type
				Internal	External	
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	PCCT
AM-102	Engineering Science	3-0-0	3	25	75	PCC
AU-103	Basics of Automobile Technology	3-0-0	3	25	75	PCC
AW-104	Automobile Workshop - I	0-0-10	5	30	70	SDP
Total		15-0-10	20	155	445	

SECOND SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-204-BS	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
AW-202	Automobile Workshop - II	0-0-10	5	30	70	SDP
MAC-201 to 203	Mandatory Audit Course	3-0-0	3	25	75	MAC
Total		15-0-10	20	155	445	

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
AW-303	Automobile Workshop - III	0-0-10	5	30	70	SDP
Total		15-0-10	20	155	445	

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
AW-402	Automobile Workshop - IV	0-0-10	5	30	70	SDP
BSC-401P	Project	0-0-6	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		12-0-16	20	155	445	

FIFTH SEMESTER

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

SIXTH SEMESTER

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

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
MAC-201	Human Value and Professional Ethics
MAC-202	Balanced Diet and Nutrition
MAC-203	Environmental Science
MAC-204	Srimad Bhagavad Geeta

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

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
BS-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	0-0-10	5	30	70	SDP
Total		15-0-10	20	155	445	

BSC-105 EL: ENGLISH LITERACY
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: 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 part 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, Vocabulary building.

Unit 2: Literacy Skills

Preposition, Conjunction, Interjection, Story Telling.

Unit 3: Fragment of Tenses

Present tense, Past Tense, Future Tense, Oral Drilling of simple commands and statements, Developing LSR(Listening, Speaking, Reading)skills.

Unit 4: Sentence Formation

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

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 the basics of mathematics, provide knowledge on the application of trigonometry, integration and differentiation and to understand the use of matrices, trigonometry, integration and differentiation to solve formulated mathematical problems.

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

CO1 Use trigonometry functions, ratios and their application in real world scenarios.

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: Quantitative Aptitude

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

Unit 2: 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 3: 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 4: 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.

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 textbook of Engineering Mathematics", Laxmi Publications, Reprint, 2010.

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

Course Outcomes: 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 risk.

CO4 Students will learn about 5's 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, OHSAS 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, labeling 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	Sessional:	25 Marks		
L	T	P	Total	Theory:	75 Marks
3	0	0	3	Total:	100 Marks
				Duration of Exam:	3 Hours

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

Course Outcomes: 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: Basic Chemistry

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

Unit 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, wastewater treatment – domestic and industrial. Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control. Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

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	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 know the basics of automobiles, to understand about the suspension and steering system and wheels and tyres.

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

- CO1 To introduce automobile basics.
- CO2 To understand the suspension and steering system
- CO3 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, Anti locking 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:	30 Marks		
L	T	P	Total	Practical:	70 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

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

Course Outcomes:

- CO1 To introduce the automobile and its classifications.
- CO2 To improve understanding about different parts of automobiles and their functions.
- CO3 To learn vehicle repairing/servicing.
- CO4 To be able to rectify vehicle pollution and do its control.

A) 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 diesel engines, petrol engines, electrical vehicles, 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 wheels.
5. To Service, repair and overhaul of cooling system and radiator
6. To Service, repair and overhaul of emission and exhaust system.
7. To Service, repair and overhaul of gearbox, drive-train assembly and transmission systems (manual, automatic etc.)
8. To Service, repair and overhaul of brake system, pneumatic brakes, hydraulic brakes.
9. To Service, repair and overhaul of clutch assembly.
10. To Service, repair and overhaul of single plate and multi plate clutches.
11. To Service, repair and overhaul of hydraulic and pneumatic systems and various lubrication systems.

B) 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.

Reference Books:

1. Vehicle Maintenance and Garage Practice by [Doshi J.A](#)

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	Automobile Workshop II	0-0-10	5	30	70	SDP
MAC-201 to 203	Mandatory Audit Course	3-0-0	3	25	75	MAC
Total		15-0-10	20	155	445	

LIST OF MANDATORY AUDIT COURSE

Course Code	Course Name
MAC-201	Human Value And Professional Ethics
MAC-202	Balance Diet And Nutrition
MAC-203	Environmental Science
MAC-204	Srimad Bhagavad Geeta

BSC-204 BS: BEHAVIORAL SKILL

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: English Literacy

Successive: Basic reading and writing skills.

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

Course Outcomes: 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 majors to overcome them.

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 skills, 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-205T: TYPOGRAPHY AND COMPUTER APPLICATION

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 and 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 Systems.
3. Russell A Stultz, Fundamentals of Computer Systems.

AM-201: 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 to learn concepts of Units, Laws of vectors, parallel forces, moment of force, couple, to Learn the fundamentals of properties and behavior of the materials, understand different types of communication systems and to know the fundamentals of advanced communication systems.

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

- CO1 Identify the force systems for given conditions by applying the basics of mechanics.
- CO2 Create knowledge of properties of matter applicable to engineering.
- CO3 Analyze the different concepts of waves and vibration in the field of engineering
- CO4 Analyze the recent trends in physics related to engineering.

Course Contents:

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

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

Unit– III Transmission of heat: Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, coefficient of thermal conductivity (K) and its S.I unit. Applications of conduction, convection and radiation.

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 Nanotechnology.

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

AU-201: INTERNAL COMBUSTION ENGINES

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

- CO1 To learn the concepts of IC Engine.
- CO2 To understand the concept of combustion in SI and CI engines.
- CO3 To acquire knowledge about two stroke engines.
- CO4 To check the performance parameters of IC engines.

Course Contents:

UNIT 1: INTRODUCTION TO IC ENGINE

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

AU-202 AUTOMOBILE WORKSHOP – II

B. Voc. (Automobile) II Semester

No. of Credits:	10	Sessional:	40 Marks			
L	T	P	Total	Practical:	60 Marks	
0	0	10	10	Total:	100 Marks	
					Duration of Exam:	3 Hours

Course Objectives: After completing this course, students will be able to introduce automobile basics, to understand repairing of suspension and steering systems, to study the repairing of automobile wheels and tyres, to perform vehicle overhauling.

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

CO1 To learn about the difference between 2-stroke and 4-stroke engines.

CO2 To learn about basic components of the I.C engine.

CO3 To understand the working principle of S.I and C.I engines.

CO4 To understand the mechanical efficiency and how it is calculated.

CO5 To understand the drive system of EV vehicles and Hybrid vehicles.

CO6 To understand the valve time and how to set valve timing.

Course Content:

1. To understand the working of two stroke and four stroke diesel engines, perform overhauling and repair operations.
2. To understand the working of two stroke and four stroke petrol engines, perform overhauling and repair operations.
3. Find the mechanical efficiency of a multi-cylinder engine by Morse Test.
4. Tune a multi-cylinder petrol engine and set dwell, rpm, ignition timing, CB point gap, spark plug gap, and tappet clearance.
5. Check the condition of the given battery as regards: (i) cell voltage (ii) specific gravity (iii) ampere-hour capacity (iv) Level of electrolyte. Use a battery capacity tester. Clean the battery and charge it. Prepare a maintenance schedule.
6. Dismantle study, assemble and check for proper working the following: (a) Electric horn (b) Wiper motor (c) Starter motor (d) dynamo (e) alternator.
7. Test the following on the electrical test bench: (a) Dynamo (b) Starter motor (c) Alternator. Also study the working of a growler.
8. Dismantle, inspect and assemble the magneto of a 2-wheeler. Set the ignition timing using dial gauge.
9. Dismantle and assemble the given electrical fuel pump. Check it for proper working. 8. Set the cut-out and regulator of a vehicle.
10. Dismantle, study, and re-assemble multi-cylinder F.I. pump.
11. Test a multi-cylinder F.I. pump on the calibrating machine and check it for proper phasing. Set the injection timing on the engine.
12. Test a diesel fuel injector and set injection pressure. Grind needle and seat.
13. Study and sketch rotary F.I. pump.

14. Study of working of electric vehicles.
15. Study and sketch the Electrical Wiring System of a Car.

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, honesty and integrity, harmony and 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)

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

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 to tackle 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.

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 Gheranda

Samhita and Hath Pradeepika; Satvik, Rajsik and Tamasik diet as describe in Bhagwadgeeta; Pathya and Apathya food according to the texts of Yoga; Role of yogic diet in healthy living; Diet according to nature of the body – Vata, Pitta and Kapha.

Text Books/ Reference Books:

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

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 on the importance of ecosystem and biodiversity for maintaining ecological balance, and to learn about various attributes of pollution management and waste management practices.

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

- CO1 Get the information about the 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 the 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 knowledge about the different types of pollution and their control technologies, Wastewater 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.

MAC-204: Srimad Bhagavad Geeta

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: The objective of studying this course is:

To provide knowledge, to become a person with a stable mind, pleasing personality and determination and get the spiritual knowledge to get higher success in life.

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

- CO1 Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.
- CO2 To become a person with stable mind, pleasing personality and determination
- CO3 The person who has studied Geeta will lead the nation and mankind to peace and prosperity

Course contents:

Unit 1:

Approach to day to day work and duties.

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,

Chapter 3-Verses 13, 21, 27, 35,

Chapter 6-Verses 5,13,17,23, 35,

Chapter 18-Verses 45, 46, 48.

Unit 2:

Statements of basic knowledge.

Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Unit 3:

Personality of Role model. Shrimad Bhagwad Geeta:

Chapter2-Verses 17,

Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39

Chapter18 – Verses 37,38,63

Text Books/ Reference Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.

SYLLABUS & SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
BSC-302 ES	Employability Skill	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 & Electronics	3-0-0	3	25	75	PCC
AU-303	Automobile Workshop - III	0-0-10	5	30	70	SDP
Total		15-0-10	20	155	445	

BSC-302-ES: EMPLOYABILITY 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.
Prepare for an interview.
- CO2 Effectively communicate through verbal and nonverbal communication.
- CO3 Deals with various types of behaviors in effective manners.
- CO4 To acquire knowledge on Voices and Sentence Making.

Course Contents:

Unit 1: Employability Skills

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

Unit 2: Personality Development and Presentation Skills

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

Unit 3: Communicating with Stakeholders

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

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, Perna and Halder, Deb. Communication Skills: Theory and Practice.

BSC-203: METROLOGY

B. Voc. (Automobile) III Semester

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

Pre – Requisite: Nil

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

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

- CO1 To understand the various type of measuring instrument
- CO2 To understand the principle of measurement and taking measurement.
- CO3 To understand GD & T.

Unit 1- Introduction to Measurement

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

Unit 2- Linear and Angular Measurements

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

Unit 3- Measurement of properties

Temperature, Force, weight, pressure & flow, Noise, Lux and vibrations, concept of fitting, tightening and torquing in a line and its equipment.

Unit 4- screw thread and Gear teeth metrology

Screw measurements: Introduction, screw thread terminology, screw thread measurement

Gear Measurement: Introduction, type of gears, gear terminology, gear teeth measurements, errors in gears, advanced measurements of spur gear.

Unit 5- linear tolerance and GD&T

Limits, fits and tolerance: interchangeability, selective assembly, limits, fits and tolerance, limit gauging, design of limit gauges, computer aided tolerance

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

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

Reference books:

1. Thomas, "Engineering Metrology", Butthinson & Co., 1984.
2. Graham T. Smith, "Industrial Metrology", Springer-Verlag London Ltd, 2002
3. White house, D.J, "Handbook of Surface & Nanometrology", The institute of physics London, 1994.
4. Mahajan. M., "A text-Book of Metrology", Dhanpat Rai & Co. (P) Ltd., 2006.

AU-301: MOTOR VEHICLE TECHNOLOGY

B. Voc. (Automobile) III Semester

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

Pre- Requisite: Nil

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

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

- CO1 To learn various components of automobiles.
- CO2 To improve understanding about the power unit of automobiles.
- CO3 To acquire knowledge about steering and suspension systems.
- CO4 To be able to check the wheel is unbalanced.

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 Gasses, Secondary Air Injection System, Three Way Catalytic Converter (TWC), Exhaust Gas Analyzer, Smoke Meter, Exhaust Emission, Standards for Pollution, Control Fuel Quality Standards, Fuel Additives.

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
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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

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

- CO1 Students will be able to understand various Automobile Electrical Equipment.
- CO2 Students will be able to understand ignition systems.
- CO3 Students will learn about electronic ignition systems.
- CO4 Students will understand about auto bile wiring, lighting and sensors.

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.

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
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

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

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

- CO1 To study the introduction of CIM and CAD analysis
- CO2 To study the CNC machine and its components.
- CO3 To learn about the manual and computer assist part programming.
- CO4 To study Robotics.

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*, Eastern Economy Edition.

AU-303: AUTOMOBILE WORKSHOP-III

B. Voc. (Automobile) III Semester

No.of Credits:	10	Sessional:	30 Marks		
L	T	P	Total	Practical:	70 Marks
0	0	10	10	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objective : The main objective of this course is to familiarize the students with tools like auto cad and solidworks so students are able to design and manufacture the product.

Course Outcome: At the end of this course student will able to know:

CO1 How to take measurements by using various measuring instruments.

CO2 Learn the basics of Auto CAD 2D + 3D.

CO3 Learn the basic Solid works commands.

METROLOGY LAB

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

CAD/CAM Lab Experiment:

I. AUTOCAD

1. Create a 2D view of the given diagram using Auto CAD.
2. Create a 2D view of the given diagram using Auto CAD.
3. To create a 2D view of the given diagram using Auto CAD.
4. To create a 2D view of the given diagram using Auto CAD.
5. To create a 2D view of the given diagram using Auto CAD.
6. To create a 2D view of the given diagram using Auto CAD.
7. To create a 3D view of the given diagram using Auto CAD. (Elbow)
8. To create a 3D view of the given diagram using Auto CAD. (Piston)

9. To create a 3D view of the given diagram using Auto CAD. (Helical spring)
10. To make a draft view of the given diagram using Auto CAD. (Piston)

II. SOLID WORKS

1. Draw the basic sketch of the solid model.
2. Draw the basic sketch for the revolved solid model.
3. Draw the sketch for the 3D modeling of solid work given dimension.
4. Draw the sketch for the 3D modeling of solid work given dimension. (by using feature tools.)
5. Draw the sketch for the 3D modeling of solid work given dimension. (surface modeling)
6. Draw the sketch for the 3D modeling of solid work given dimension. (sheet modeling)
7. Draw the sketch for the 3D modeling of solid work given dimension. (weldments)
8. Make an assembly of bench-vice.
9. Use simulation in solid works.
10. Use of Drafting in solid works.

SYLLABUS & SCHEME OF EXAMINATION

FOURTH SEMESTER

Subject Code	Subject Name	L-T-P	Credits	MarksWeightage		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	0-0-10	5	30	70	SDP
BSC-401	Project	3-0-0	3	25	75	SDP
OEC-405 to 408	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	15-0-10	20	155	445	

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

L	T	P	Total	Theory:	75 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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

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

CO1 Electric and hybrid vehicle operation and architectures

CO2 Design of hybrid and electric vehicles.

CO3 Energy requirement for vehicles.

CO4 Vehicle characteristics, operating modes, and performance parameters of the vehicle

CO5 Different subsystems of hybrid and 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, current status of EVs, EVs companies and models.

Unit 2: ELECTRIC AND HYBRID ELECTRIC DRIVE TRAINS

Types of EVs, Battery Electric Vehicle (BEV), Hybrid Electric Vehicle (HEV), Plug-in Hybrid Electric Vehicle (PHEV), Fuel Cell Electric Vehicles (FCEVs), Series hybrid, Parallel hybrid Combined hybrid.

Unit 3: POWER FLOW

Power flow control in electric and hybrid electric drive train topologies, Interconnections of various EV components and their functioning, Regenerative braking systems.

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: ENERGY STORAGE SYSTEMS

Battery management systems (BMS), Charging infrastructure and technologies,

Supercapacitors and other energy storage alternatives.

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: Mehrdadehsani, Yimingao, AliEmadi.

AM-401: INDUSTRIAL MANAGEMENT

B. Voc.(Automobile) IV Semester

L	T	P	Total	Theory:	75 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Pre- Requisite: Nil

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

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

CO1 To understand material management.

CO2 To know the cost associated with the production process.

CO2 To understand Labour, industrial and tax laws.

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

L	T	P	Total	Practical:	60 Marks
0	0	3	3	Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives: The aim of this course is to Electric vehicle Engineering, maintenance and repair.

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

CO1 To learn about electric vehicles, hybrid vehicles and its repair.

CO2 To improve understanding about different parts and their functions.

CO3 To understand the battery management system.

Course Contents:

1. To understand the different types of Electric Vehicle (BEV,FCEV,EREV,PHEV,HEV).
2. To understand the working of different types of batteries like Lead-acid batteries, Nickel-cadmium batteries, Sodium-sulfide batteries, Molten salt batteries.
3. To understand the working principle of the battery management system.
4. To understand the working of the battery charging system, repair and maintenance.
5. To Conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement.
6. 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.
7. 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.)
8. To Service, repair and overhaul of the steering system.
9. To Service, repair and overhaul of suspension system.
10. To Service, repair and overhaul of tyres.
11. To Service, repair and overhaul of wheels.
12. To Service, repair and overhaul diesel Engines and its fuel system.
13. To Service, repair and overhaul petrol Engines and its fuel system.
14. To Service, repair and overhaul of cooling system and radiator
15. To Service, repair and overhaul of emission and exhaust system.

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

BSC-401 PROJECT
B. Voc. (Automobile) IV Semester

No.of Credits:	3	Sessional:	40 Marks		
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-405 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

Pre- Requisite: Communication Skills, soft skills.

Successive: Business and Industrial management.

Course Objectives:

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

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

- CO1 Students will be aware about the concepts of entrepreneurship development and significance of entrepreneurship in economic development.
- CO2 It will help students to know about various acts related to an industry.
- CO3 Students will be able to prepare a project report.
- CO4 They will be able to know the support available from the Govt. to start a new venture.

Course Contents:

Unit 1: Entrepreneurship and Entrepreneur

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

Unit 2: Key Skills for successful Entrepreneurship

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

Unit 3: Serving the Society

Roles of Entrepreneurs in society, Selfless Entrepreneurship, Factors affecting entrepreneurial business, Business Networking and its advantages, entrepreneurial work ethics, Success

Story of Mumbai Dabbawala and Steve Jobs (Discuss more Success failure stories of famous entrepreneurs)

Unit 4: Regulatory and Legal Issues in Entrepreneurship

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

Text Books/ Reference Books:

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

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

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

- CO1 To learn various sources of the solid waste.
- CO2 To improve understanding of handling waste.
- CO3 To acquire knowledge about steering and suspension systems.
- CO4 To be able to understand Disposal in landfills.

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

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

- CO1 Understand the concept of Industry 4.0
- CO2 Learn about Industry 4.0 Technologies.
- CO3 Understand the concepts of Internet of Things.
- CO4 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: The main objective of this course is to get knowledge of different types of fuels used in automobiles and to emission control.

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

CO1 To introduce alternate fuels.

CO2 To understand the automobile emission control system.

CO3 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 crankcase 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: The main objective of course is to familiarize about the auto body, body structure, body material and safety standards.

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

CO1 To familiarize the students with the fundamentals of vehicle body.

CO2 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.

CO3 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 fiberboard, 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 Objective: The objective of studying this course to get the knowledge of electronics, automotive sensors and actuators

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

- CO1 To understand the importance of electronics in an automobile.
- CO2 To study Automotive Sensors & Actuators.
- CO3 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, Anti Lock 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):

1. Ramesh Goankar S., “Microprocessor Architecture Programming and Applications”, Willey Eastern Ltd.
2. William B. Riddens, “Understanding Automotive Electronics”, 5thEdition, 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	20	350	150	OJT
	Total	20	350	150	

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

SIXTH SEMESTER

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

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