KALINGA UNIVERSITY

RAIPUR | INDIA

SCHEME & SYLLABUS FOR

Bachelor of Vocational Studies (B. Voc.) Engine Testing

NAAC GRADE B+ Accredited University | nirf RANKING 2024 Ranked in Top 151-200 Universities

Kalinga University, Naya Raipur, Chhattisgarh

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B.VOC IN
ENGINE TESTING

Semester - I							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET101	Communication Skills	3	0	3	30	70	100
BVET102	Fundamentals of Information Technology	3	0	3	30	70	100
BVET103	Manufacturing Technology-I	3	0	3	30	70	100
BVET104	Motor Vehicle Technology-I	3	0	3	30	70	100
BVET105P	**Industrial Training/On Job Training/Workshop**	0	36	18	50	150	200
Total		**12**	**36**	**30**	**170**	**430**	**600**

Semester - II							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET201	Automobile Electrical Equipment	3	0	3	30	70	100
BVET202	Environmental Science	3	0	3	30	70	100
BVET203	Two and Three Wheeler	3	0	3	30	70	100
BVET204	Motor Vehicle Technology-II	3	0	3	30	70	100
BVET205P	Industrial Training/ On Job Training/ Workshop	0	36	18	50	150	200
Total		**12**	**36**	**30**	**170**	**430**	**600**

Semester - III							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET301	Automotive NVH-I	3	0	3	30	70	100
BVET302	Automobile Maintenance Service & Repairs -I	3	0	3	30	70	100
BVET303	Modern Electric& Hybrid Vehicles	3	0	3	30	70	100
BVET304	Alternative Fuel & Emission Control	3	0	3	30	70	100
BVET305P	Industrial Training/On Job Training/Workshop	0	36	18	50	150	200
Total		**12**	**36**	**30**	**170**	**430**	**600**

Semester - IV							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET401	Automotive NVH-II	3	0	3	30	70	100
BVET402	Automobile Maintenance Service & Repairs -II	3	0	3	30	70	100
BVET403	Garage Organization & Transport Management	3	0	3	30	70	100
BVET404	Automobile Drawing & Design	3	0	3	30	70	100
BVET405P	Industrial Training/ On Job Training/ Workshop	0	36	18	50	150	200
Total		**12**	**36**	**30**	**170**	**430**	**600**

Semester - V							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET501	Automobile Electrical System	4	0	4	30	70	100
BVET502	Automobile Engine Systems	4	0	4	30	70	100
BVET503	Auto Body Repair, Denting & Painting	4	0	4	30	70	100
BVET504P	Industrial Training/ On Job Training/ Workshop	0	36	18	50	150	200
Total		**12**	**36**	**30**	**140**	**360**	**500**

Semester - VI							
Subject Code	**Subject**	**L**	**T/P**	**Credits**	**Internal Marks**	**External Marks**	**Total**
BVET601	Automotive Refrigeration and Air Conditioning	4	0	4	30	70	100
BVET602	Vehicle Performance and Testing	4	0	4	30	70	100
BVET603	Quality Control	4	0	4	30	70	100
BVET604P	Industrial Training/ On Job Training/ Workshop	0	36	18	50	150	200
Total		**12**	**36**	**30**	**140**	**360**	**500**

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SEMESTER-I

COMMUNICATION SKILLS

BVET101

Course Objective:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course outcome:

1. The purpose of this course is to introduce students to the theory, fundamentals and tools of communication
2. To develop vital communication skills which should be integral to personal, social and professional interactions.
3. One of the critical links between human beings.
4. An important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal.
5. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

CONTENTS

Unit I: Introduction: **06**

Theory of Communication, Types and modes of Communication, Mediums and channels of communication, barriers to communication, English as a Global language, the Lingua Franca, Social influences on English

Unit II: Language of Communication: **06**

Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication, Varieties of English, Language, Accent, Dialect, Colloquialism, Historical influences on English

Unit III: Speaking Skills: **06**

Monologue Dialogue Group Discussion Effective Communication/ Mis- Communication Interview Public Speech, Regional influences on English, Convergence and divergence, Linguistic Imperialism,

Unit IV: Reading and Understanding- **06**

Close Reading, Reading analysis of a text - Audience and purpose, Content and theme, Tone and Mood, stylistic devices, structure Comprehension- Analysis and Interpretation Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts

Unit V: Writing Skills **06**

Documenting Report Writing Making notes Letter writing, Writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters It will enhance Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, notetaking etc. While, to an extent, the art of communication is natural to all living beings, intoday's world of complexities, it has also acquired some elements of science. It is hoped that after studying this course, students will find a difference in their personal and professional interactions.

REFERENCE BOOKS:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. RanjanaKaul, Dr. Brati Biswas

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FUNDAMENTALS OF INFORMATION TECHNOLOGY

BVET102

Unit I:

Computer characteristics: Speed, storage, accuracy, diligence; Digital signals, Binary System, ASCII; Historic Evolution of Computers; Classification of computers: Microcomputer, Minicomputer, mainframes, Supercomputers; Personal computers: Desktop, Laptops, Palmtop, Tablet; Hardware & Software; Von Neumann model.

Unit II:

Hardware: CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory; Auxiliary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD/DVD-Writer; Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen Voice Input, Joystick, Optical readers, bar code reader; Output devices: Display device, size and resolution; CRT, LCD, LED; Printers: Dot-matrix, Inkjet, Laser; Plotters, Sound cards & speaker.

Unit III:

Software: System software, Application software; concepts of files and folders, Introduction to Operating systems, Different types of operating systems: single user, multitasking, time-sharing multi-user; Booting, POST; Basic features of two GUI operating systems: Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases; Application software: Generic Features of Word processors, Spread sheets and Presentation software; Generic Introduction to Latex for scientific typesetting; Utilities and their use; Computer Viruses & Protection, Free software, open source.

Unit IV:

Computer Networks and Internet: Connecting computers, Requirements for a network: Server, Workstation, switch, router, network operating systems; Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips; Internet connections: ISP, Dial-up, cable modem, WLL, DSL, leased line Wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, Web pages, Web Programming Languages.

Unit V:

Information Technology And Society: Indian IT Act, Intellectual Property Rights, issues. Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel management, Education, Video games, Telephone exchanges, Mobile phones, Information kiosks, special effects in Movies.

Programming Concepts & Techniques: Program Concept, Characteristics of Programme, Stages in Program Development, Tips for Program Designing, Programming Aids, Algorithms, Pseudo code, Notations, Design, Flowcharts, Symbols, Rules, compiler & Interpreter. Introduction to programming techniques, Top-down & Bottom-up approach, Unstructured, & Modular programming, Cohesion, Coupling, Debugging, Syntax & Logical Errors, Linking and Loading, Testing and Debugging, Documentation.

Reference Books:

1. Programming in C, R.S. Salaria, Khanna Publishing House

2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House

3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

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MANUFACTURING TECHNOLOGY - I

BVET103

Unit-I

(A) General Introduction: (a) Scope of subject "Workshop Technology" in engineering (b) different shop activities and broad division of the shops on the basis of nature of work done such as (i) Wooden Fabrication-carpentry (ii) Metal Fabrication (shaping and Forming,Smithy, sheet metal and Joining-welding, Riveting, Fitting and Plumbing).

(B) Carpentry: (a) Fundamental of wood working operations

(b) Common Carpentry Tools- Their classification, size, specification (name of the parts and use only): (i) Marking and measuring tools (ii) Holding and supporting tools: (iii) Cutting and Sawing Tools: (iv) Drilling and Boring Tools (v) Striking Tools-Mallet and Claw hammer (vi) Turning Tools & Equipment (vii) Miscellaneous Tools

Unit-II

(A) Joining of Timber Components for Fabrications Works: Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet, Groove, Tongue, Dowel, operations in assembly-simple lap and butt, Mortise, Tenon, Dovetail, Miter &briddle joints.

Metal Fabrication

(B) Metal Shaping-Smithy: (i) Operations involved (concept only) (ii) Tool and equipment used (Names, size, specification for identification only) (iii) Heating and fuel handling equipment (iv) Holding and supporting tools (v) Striking Tools (vi) Cutting tools (vii) Punching & Drifting Tools (viii) Bending Tools and figures (ix) Forming & Finishing Tools (x)

Defects Occurring & its remedy

Unit-III

Sheet metal working-Tools and operation:

(1) Operations involved (Names and concept only)

(2) Sheet metal joints

(3) Tools and equipment used (Name, size, specifications foridentification only)

(4) Marking tools

(5) Cutting and shearing Tools

(6) Straightening tool

(7) Striking Tools

(8) Holding Tools

(9) Supporting Tools

(10) Bending tools

(11) Punching-Piercing and Drafting tools

(12) Burring Tools-Files

(13) Defects Occurring & itsremedy

Unit-IV

(A) Metal Joining During Fabrication-

(a) Permanent Joining:

(i) Welding methods

(ii) Electric welding

(b) Soldering & Brazing:

(i) Its concept, comparison with welding as joining method and classification

(ii) Soldering operation

(iii) Materials Used

(iv) Defects Occurring & its remedy

(B) Riveting-

(i) Its comparison with welding as joining method.

(ii) Rivets and Materials.

(iii) Operation involved

(iv) Tools and equipment used (Names, Size, specification and uses)), Elementary knowledge about working of pneumatic, hydraulic and electric riveter. Temporary Joining (Fasteners & their uses), General Idea about temporary fasteners & their uses

(C) Familiarity with the Use of Various Tools Used in Mechanical Engineering Workshop

(a)Marking & Measuring Tools

(b) Holding Tools

(c) Cutting Tools

(d) Files

(e) Thread Cutting Tools

(h) Miscellaneous Tools

They should be shown physically to each student for familiarity.

Unit-V

(A) Protection of Fabricated Structures From Weather:

(a) Painting: Its need, Introduction to methods of painting (classification only) operations involved description steps only, surface preparation materials, tools and equipment used (name, size specification for identification), Brushes-round and flat wire brush, scraper, trowel, spray gun, compressor, Defects likely to occur in painting and their remedies

(b) Varnishing & Polishing: Its need, operation involved (description of steps only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and sprit polish, copal varnish, Defects likely to occur.
Safety of Personnel, Equipment & Tools to be observed

(B) Foundry Work: Elementary idea of patterns, green sand moulds and moulding, tools and equipment used in green sand moulding

Reference Books:

1. Workshop Technology, Vol. I: Hazra& Chaudhry
2. Workshop Technology, Vol. I: BS Raghuwanshi
3. KaryashalaTakniki: JK Kapoor

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MOTOR VEHICLE TECHNOLOGY-I

BVET104

UNIT1: INTRODUCTION & CHASSIS LAYOUT

General study of the motor vehicle with functions of its main components and assemblies (engine excluded), Development of a Tractor and its basic function and H.P. requirements, Conventional layout of chassis Front wheel drive, four wheel drive, rear engine vehicle,their advantages and disadvantages, Layout of Maruti car chassis and tractor chassis, Definitions of items-wheel track, wheel base, front and rear overhang, kerb weight, ground clearance.

UNIT2: CLUTCH SYSTEM

Layout of conventional transmission system, Maruti car transmission system, Tractor transmission system, clutch - necessity, functions, requirements, types, Constructional details and working of single plate, multiple plate, diaphragm clutches, fluid coupling, Centrifugal and semi-centrifugal clutch, Tractor clutch, Clutch pedal free play. Torque transmitted by clutch. Simple numerical problems. Clutch defects, probable causes, remedies.

UNIT3: GEAR BOX

Function and necessity, Construction and working details of sliding mesh, constant mesh, synchromesh gear boxes; epicyclic gear box - its applications and advantages. Over drive, Torque convertor, Maruti-800 car gear box, tractor gear box and P.T.O. shaft, 4 wheel drive auxiliary gear box. Gear ratio

UNIT4: FINAL DRIVE

Torque tube drive, Hotchkiss drive, Universal joints, constant velocity joints, slip joints, Propeller shaft. Differential, slip differential, double reduction differential, final drive ratio.Tractor final drive construction and working, Rear axles-Fully floating, semi-floating, three quarter floating, Tractor axles

UNIT5: WHEELS AND TYRES

Road-wheels - Rim types and sizes, Tyres-conventional, radial, Tubeless tyre its advantages, Tyre sizes, wheels-front and rear, Tyre retreading, Tyre wear, wheel balancing, Tyrepressure, Advantages of filling nitrogen in tyres.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

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INDUSTRIAL TRAINING/ON JOB TRAINING/WORKSHOP

BVET105P

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SEMESTER – II

AUTOMOBILE ELECTRICAL EQUIPMENT

BVET201

Unit 1: Automobile Wiring Systems & Cables

Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems. Positive and negative earthing. Cables-starting systems cables, general purpose cables and high-tension cables; specifications and colour codes. Diagram of a typical wiring system. Wiringharness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits. Fuses in circuits.

Unit 2: Storage Battery

Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound.

Electrolyte: specific gravity of electrolyte and itsvariation with temperature. Effect of charging and discharging of specific gravity. Capacity of battery. Efficiency of battery. Methods of charging of battery. Internal circuit of battery charger. Care and maintenance of batteries. Checking for cell voltage and specific gravity of electrolyte. Battery tests- high discharge test, cranking motor test, open-circuit voltage test,cadmium test, life test. Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery. Alkaline type batteries. Fuel cell and its types, Battery Life enhancer.

UNIT 3: Dynamo

Principle of generation of D.C. Constructional details of a Dynamo. Armature reaction. Principle of commutation. Construction of commutator. Types of wound field generator-series, shunt and compound wound. Other types of D.C. generators-four brush & four pole,interpole, split field and bucking field. Dyna-Starter, Generator drive.

UNIT 4: Alternator

Principle of generation of A.C. Constructional details of an alternator. Working of alternators. Advantages over dynamo. Types of alternators. Charging of battery with an alternator. Regulator for alternators.

UNIT 5: Regulators

Constant current and constant voltage systems, Double-contact and compensated voltage- control regulators. Current-and-voltage regulator, Cut-out

Reference Books:

1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. **Automotive Electrical Equipment:** PL Kohli
3. **Modern Electrical Equipment:** AW Judge
4. **Automotive Electrical Equipment:** WH Crouse

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ENVIRONMENTAL STUDIES

BVET202

Unit 1: Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies.
- Scope and importance; Concept of sustainability and sustainable development.

Ecosystems

- **What is an ecosystem?** Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.

Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 2: Natural Resources: Renewable and Non-renewable Resources

- **Land resources and landuse change:** Land degradation, soil erosion and desertification.
- **Deforestation:** Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- **Water:** Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).
- **Energy resources:** Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 3: Biodiversity and Conservation

- **Levels of biological diversity:** genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- **India as a mega-biodiversity nation:** Endangered and endemic species of India
- **Threats to biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;

Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

- **Ecosystem and biodiversity services:** Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 4: Environmental Pollution

- **Environmental pollution:** types, causes, effects and controls; Air, water, soil and noise pollution.
- Nuclear hazards and human health risks.
- **Solid waste management:** Control measures of urban and industrial waste.

- Pollution case studies.

Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- **Environment Laws:** Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.

  International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 5: Human Communities and the Environment

- **Human population growth:** Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- **Disaster management:** floods, earthquake, cyclones and landslides.
- **Environmental movements:** Chipko, Silent valley, Bishnois of Rajasthan.
- **Environmental ethics:** Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999.Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams(pp. 29--64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971.Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.Environment. 8th edition. John Wiley & Sons.

13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.

14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.

15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.

17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.

18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.

19. Wilson, E. O. 2006.The Creation: An appeal to save life on earth. New York: Norton.

20. World Commission on Environment and Development. 1987.Our Common Future. Oxford University Press.

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TWO AND THREE WHEELER

BVET203

Unit I: The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

Unit II: Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self starter system, Recent technologies

Unit III: Chassis and Sub-Systems

Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems, Shock absorbers, Panel meters and controls on handle bar, Freewheeling devices

Unit IV: Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and its Types, Front and Rear brake links layouts. Brake actuation mechanism. Spoked wheel, cast wheel, Disc wheel & its merits anddemerits.

Tyres and tubes Construction & its Types. Steering geometry

Unit V: Two & Three Wheelers – Case Study

Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van,Delivery van and Trailer, Servicing and maintenance, recent developments

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MOTOR VEHICLE TECHNOLOGY –II

BVET204

UNIT 1: FRAME AND BODY

Function and construction of frame. Cross-section of frames. Unitized construction (monocoque) types of bodies. Terms - Turning radius, lock-to-lock angle, centre pointsteering, positive steering, gradeability. Idea of Safety features in a modern car.

UNIT 2: SUSPENSION SYSTEM

Function. Types - conventional and independent. Spring types - coil, leaf - elliptical, semi- elliptical; helper springs, transverse springs. Spring camber; spring material. Torsion bar, stabiliser bar. Shock absorbers- telescopic and gas. Maruti suspension system and shockers. Anti-roll bars. Nitrox suspension.

UNIT 3: STEERING SYSTEM AND FRONT AXLE

Principle - Ackermann and Davis. Function, requirements. Steering gear box - types. Construction and working details of worm and sector, rack and pinion, worm and wheel, worm and recirculating ball type. Tractor steering. Power steering. Electronic Steering.Front axle - rigid front axle. Stub axle. Elliot and reverse elliot type. Lemoine and reverse lemoine type. Tractor front axle. Maruti steering system. Wheel alignment - castor angle, camber angle, K.P.I., Toe-in, toe out. General values of these.

UNIT 4: BRAKING SYSTEM

Braking terms - braking efficiency, stopping distance, stopping time, weight transfer during braking, leading/trailing shoe of brake. Determination of braking torque. Effect of braking on steering. Types of braking systems- constructional details and working of mechanicalbrakes, hydraulic brakes, parking brake, vacuum, pneumatic, air-hydraulic brakes; tractorbrakes. Drum and disc brakes. Master cylinder, tandem master cylinder, wheel cylinder. Brake lining and brake fluid. Brake defects, their causes and remedies. Anti Lock Braking System (ABS) & Electronic Brake Distribution (EBD).

UNIT 5: AUTOMOBILE POLLUTION AND ITS CONTROL

Effects and extent of pollution caused due to stationary and automobile engines. Harmful products and their causes in petrol & diesel engines. Measures to control exhaust emissions from two-stroke engines, four-stroke engines, and diesel engines. Turbocharger. Productswhich cause de-activation of catalysts in catalytic converters. Unleaded petrol. Emission measuring instruments for petrol and diesel engines. Limits specified in Motor Vehicles Act. Recent trends in Automobile Pollution Control-Exhaust Gas Recirculation. Air Injection, Reactor System. Positive Crankcase Ventilation. Evaporative Emission Control System.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C. Sharma, T.R. Banga, Khanna Publishing House

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INDUSTRIAL TRAINING/ON JOB TRAINING/WORKSHOP

BVET205P

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SEMESTER III

AUTOMOTIVE NVH-I

BVET301

Unit-I: Introduction to NVH: Noise, Vibration and Harshness (NVH) and its role in automotive design and development. Physiological effects of noise and vibration, sources of vibration and noise in automobiles,

Unit II Vibrations

Basic concepts of vibration, time period, frequency, SHM, types of vibration, Natural frequency, resonance, damping, mathematical models.

Unit-III: Vibration Analysis: Formulating the equations of motion - linear and torsional system. Damped and undamped single degree of freedom system, undamped two degree of freedom systems derivation, coordinate coupling, generalized coordinates.

Unit IV Vibration Control

Different types of dampers, vibration absorbers, centrifugal pendulum, dry friction, untuned viscous, vibration isolation

Unit V: Vibration measurement: Instruments, vibrometer, velocity pick-ups, frequency measurement instrument. one applications: isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft.

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AUTOMOBILE MAINTENANCE SERVICE & REPAIRS-I BVET302

Unit 1:Workshop Equipment
Equipment for testing electrical accessories: Electric test bench, growler, coil tester, ignition and cam-dwell-angle tester; wiring harness tester. Ampere-hour battery tester,voltmeter tester, Layout of diesel injector and F.I.P. reconditioning shop, Tools andequipment required

Unit 2: Lubrication and Maintenance Schedule
Necessity for routine maintenance, Importance of service manuals, Specification of engines- petrol and diesel vehicles

(a) Engine (b) Clutch (c) Gear Box (d) Propeller shaft (e) Universal joints (f) Differential
(g) Axles and hubs

Unit 3: Lubrication and Maintenance Schedule
(a) Suspension system (b) Steering system (c) Tyre (d) Chassis (e) Brake-drum and disc
(f) Battery (g) Self starter (h) Dynamo

Unit 4: Fuel System
Maintenance Schedule of diesel engine fuel injector, hot plugs, rotary and reciprocating type of fuel injection pump, fuel injection pump of single cylinder engines, hoses & pipe lines, priming unit, tanks. Electricals: Maintenance Schedule of batteries, starter motor, dynamo, ignition system,wiper motor, electrical fuel pump, alternator, horn, flasher unit.

Unit 5: Engine Tuning
(a) Engine tuning of conventional and MPFI petrol engine. Adjustments of spark plug gap, valve tappet clearance, head bolts, Use of vacuum and compression gauge, Air cleaner cleaning, Ignition timing setting by timing light, Pollution checking, Troubleshooting

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

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MODERN ELECTRIC& HYBRID VEHICLES

BVET303

Unit 1: Introduction

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

Unit 2: Electric and Hybrid Electric Drive Trains

Basic concept of electric and hybrid traction, Introduction to various electric and hybrid electric drive train topologies, Advantages and disadvantages

Unit 3: Power Flow

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

Unit4: 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: Regenerative Braking System (RBS)

Introduction and need of Regenerative Braking System, Advantages and disadvantages of RBS, Working of RBS, Concept of Regenerative Braking using Piezoelectric material, Using shock absorbers as vibration energy harvesters.

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, Ali Emadi

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ALTERNATIVE FUEL & EMISSION CONTROL

BVET304

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, thermodynamics of fuel combustion - introduction to chemical thermodynamics, chemical reaction - fuels and combustion, enthalpy of formation and enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, 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/vehiclemodifications 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 andsafety, discussion on air and water vehicles.

Unit–III: Emission Control (SI Engine):

Emission formation in S.I. engines - Hydrocarbons, carbon monoxide, oxides of nitrogen, poly-nuclear aromatic hydrocarbon,effects of design and operating variables on emission formation in spark ignition engines,controlling of pollutant formation in engines exhaust after treatment, charcoal canister control for evaporative emission control, emissions and drivability, positive crank caseventilation 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 lnt. Measurement and test procedure (ndir analyzers, fid, chemiluminescencenox 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 perBharat Standard up to BS – IV.

Reference Books:

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

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INDUSTRIAL TRAINING/ON JOB TRAINING/WORKSHOP

BVET305P

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SEMESTER – IV

AUTOMOTIVE NVH-II

BVET401

Unit 1: **Noise Fundamentals:** Fundamentals of acoustics – general sound propagation – structure borne sound and air borne sound, plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity, spherical wave propagation – acoustic near and far fields, reference quantities, the decibel scale

Unit 2: **Sound Analysis:** Anatomy of human ear, mechanism of hearing, loudness, weighting networks, equivalent sound level, relationship among sound power, sound intensity and sound pressure level,summation of pure tones, decibel addition, subtraction and averaging, effects of reflectingsurfaces on sound propagation, octave band analysis,

Unit 3: **NVH Measurements:** Vibration and Noise Standards – Pass/Drive by noise, noise from stationary vehicles, interior noise in vehicles, NVH measurement tools and techniques,Modal parameter (natural frequency, mode shape and damping) estimation techniques,signal and system analysis

Unit 4: Automotive Noise Sources Methods for control of engine noise, transmission noise, intake and exhaust noise, aerodynamic noise, tyre noise, brake noise

Unit 5: **Automotive Noise Control Techniques**
Noise control strategy, noise control at source – along the path – isolation, damping, balancing, resonators, absorption, barriers and enclosures

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AUTOMOBILE MAINTENANCE SERVICE & REPAIRS – II

BVET402

Unit 1: Fault Diagnosis

Diagnostic Trouble Codes, ECM Power and Ground Circuit Check, MAP Sensor Circuit, VSS Circuit Check, Fuel Pressure Check, Fuel Injection Circuit Check, Evaporative Emission Control system Check, Inspection of ECM & its Control.

Unit 2: **Overhaul and Reconditioning Procedures -1**

Overhaul and reconditioning procedures of engine, clutch, gear box

Unit 3: **Overhaul and Reconditioning Procedures - 2**

Propeller shaft & universal joints, differential, axles, and hubs, Overhaul and reconditioning procedures of steering and suspension system components including McPherson strut.Overhaul and reconditioning procedures of drum and disc brakes

Unit 4: **Overhaul and Reconditioning Procedures -3**

Service, overhaul and testing of starter motor, alternator, ignition system, wiper motor, electrical fuel pump, horn, flasher unit, wiring harness, condenser, H.T. coil, spark plug.

Unit 5: **Reconditioning**

Overhaul, and testing of diesel fuel injector, single and multi cylinder fuel injection pumps. Calibration, phasing, and spray tests.Air-conditioning and heating equipment: Faults and their remedies.

Reference Books:

1. Automobile Mechanics, A.K. Babu, S.C.Sharma, T.R. Banga, Khanna Publishing House

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GARAGE ORGANIZATION & TRANSPORT MANAGEMENT BVET403

UNIT 1: LAYOUT OF GARAGE AND TOOLS & EQUIPMENT REQUIRED

Location of modern automobile garage. Layout of a fully equipped modern garage. Major equipment used in repair, testing, and reconditioning of automobiles. Service Stationequipment (compressor, washer, hydraulic ramp and other lifting devices etc.) Denting andpainting tools and equipment. Layout of fuel filling station-cum-service station. Workshop safety.

UNIT 2: **GARAGE PROCEDURE**

A typical garage organisation chart. Duties of garage foreman. Vehicle selling- dealership, showroom, Terms of Warranty, after-sales service, advertising, and salesmanship. Diagnosing and estimating repairs. Booking of repairs. Job card, time card. Inspection and testing of repaired vehicles. Billing of repairs. Customer record. Purchase and sale of used vehicles. Insurance and accidental jobs. Safety in garages. Customer satisfaction. Time management.

UNIT 3: **STORE ORGANISATION**

Stores and store-keeping procedure. Day book, ledger, stock register. Indenting and issue of spares and materials. Inventory control. Stocking of material - shelves, racks, bins; fuels andinflammable materials. Handling of liquids and acids. Duties and responsibilities of store- keeper and purchase officer. Tools-Storing and issuing.

UNIT 4: **FLEET MANAGEMENT**

Types of vehicles in a fleet - goods vehicles, tankers and carriers, delivery vans, fire fighting vehicles, break-down service vehicles, buses and luxury vehicles. Layout of a fleet maintenance depot, Duties of driver, conductor and mechanic, Scheduling the maintenance of a fleet. Estimating the operating cost of transport vehicles

UNIT 5: **MOTOR VEHICLE ACT**

Definition of vehicles, testing and certifying procedures, Registration of vehicles, Permits for passenger and goods vehicles, Licensing, Transfer of ownership. Essentials of driving and traffic regulations; signals and traffic signs

Reference Books:

1. **Fleet Maintenance & Management:** AW Clair

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AUTOMOBILE DRAWING & DESIGN

BVET404

Unit 1

Drafting of sectional views of the following assemblies:

(a) Cylinder block and crankcase of 2-wheeler
(b) Poppet valve assembly of a 4-stroke engine
(c) Piston assembly
(d) Connecting rod assembly
(e) Spark plug
(f) Injector

Unit 2 Free hand line diagram of the following systems:

(a) Fuel system of petrol engine
(b) Fuel system of diesel engine
(c) Cooling system of a multi-cylinder engine
(d) Lubricating systemof a multi-cylinder engine
(e) Steering system of Maruti
(f) Suspension systems of Maruti
(g) Hydraulic Braking System of Maruti Zen
(h) Air Hydraulic Braking System of TATA
(i) Block diagram of Electronic Fuel Injection (EFI) system
(j) Block diagram of Common Rail Direct Injection (CRDI) system
(k) Oxygen sensor
(l) Fuel injector of EFI

Unit 3

Drafting of sectional views of the following assemblies

(1) Master cylinder
(2) Wheel cylinder
(3) Universal joint

Unit 4

Sketch layouts of

(a) Depot
(b) F.I. pump reconditioning shop
(c) Electrical Workshop

Unit 5

Design of the following components of an automobile engine

(1) Piston assembly
(2) Connecting rod assembly
(3) Crank shaft
(4) Flywheel

Reference Books:

1. **Automobile Drawing:** RB Gupta

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INDUSTRIAL TRAINING/ON JOB TRAINING/WORKSHOP

BVET405P

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SEMESTER V

AUTOMOBILE ELECTRICAL SYSTEM

BVET501

UNIT 1: STARTING SYSTEM

Principle, construction and working of starter motor. Series motor and its characteristics, Compound wound motor, Engine starting circuit, Starter drives-Bendix (torsion, compression), over-running clutch and sliding armature types. Starter switch - manual,solenoid, Factors affecting the starting of engines, Torque terms. Starting torque and power required, Motor efficiency, Armature reaction, Typical motor specifications

UNIT 2: IGNITION SYSTEM OF SPARK-IGNITED ENGINES

Types of ignition systems- battery-and-coil, magneto ignition systems. Ignition circuit. Details of the ignition system-ignition coil, distributor, condenser, contact breaker points, rotor, distributor cap, distributor drive. Firing order. Ignition timing. Ignition advance and retard, need, and factors it depends upon. Methods for obtaining advance and retard- vacuum and mechanical. Optical sensor for spark timing.

UNIT 3

Spark plugs-constructional details; types used in automobiles, conditions of working of spark plugs. Glow plugs of diesel engines. Magneto-rotating armature and rotating magnettypes. Electronic ignition of cars & motor-cycles (CDI), Idea of Distributor-less Direct ignition system.

UNIT 4: LIGHTING SYSTEM

Requirements of automobile lighting. Head lamp - mounting and construction; Plastic headlamp Lens, sealed beam assembly. Asymmetrical head light, dipper and full beam, care of headlamp, Lens cleaners. Dynamic headlight beam control, Advanced Front lighting system (AFS) Types of bulbs. Reflector optics. Light sources – tungsten light Sources, tungsten halogen light sources, halogen infra-red reflective light sources, HID light sources (Xenon and bi-xenon), LED light sources, Blue vision head lamp. Auxillary lights, Brake light, Fog light, Flasher unit, warning lights and panel lights.

UNIT 5: ACCESSORIES

Fuel and oil pressure gauge, cooling water temperature gauge, electrical speedometer, amperemeter, wind-screen wiper, electrical horn and relay, cigarette lighter, Odometer, wind-shield washing equipment, engine rpm meter, glow plug indicator, cluster assembly. Radio and television Interference suppressors, electrical switches. Central locking of doors,power winding of window panes, car heaters AC, blower and air flow controls, Rear defogger.

Reference Books:

1. **Automotive Electricals** and Electronics, A.K. Babu, Khanna Publishing House
2. **Automotive Electrical Equipment:** PL Kohli
3. **Modern Electrical Equipment:** AW Judge
4. **Automotive Electrical Equipment:** WH Crouse

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AUTOMOBILE ENGINE SYSTEMS

BVET502

UNIT 1

STARTING SYSTEM: Idea of engine starting-system circuit. Kick-starting system of 2 wheelers. Starting of mopeds.

IGNITION SYSTEM: Idea of Battery-and-coil ignition circuit and its working. Compressionignition of diesel engines.

LUBRICATION SYSTEM: Lubrication in 2 stroke engines -petroil and oil-injection. Lubrication in 4 stroke multi-cylinder petrol/diesel engines. Dry and wet sump lubrication. Full pressure and semi-pressure lubrication. Oil pump types. Oil pump drive, relief valve;pressure gauge. Oil filters. Full-flow and by-pass type filtering systems. Crankcase dilution, crankcase ventilation. Positive Crankcase Ventilation. Properties and functions of a good lubricating oil. Additives. Gradation of lubricating oil dueto viscosity. SAE numbers. Service rating. 2T and Super 2T oils for use in 2-s engines.

UNIT 2

COOLING SYSTEM: Necessity of cooling of I.C. engines. Methods of cooling-air cooling, water cooling, liquid cooling. Shape of cooling fins. Field of application of air cooling.Water cooling system - Thermosiphon system, pump system, thermostat system of cooling.Thermostat - types. Radiators-different types, their construction and function. Pressurized cooling system; radiator pressure-cap, surge tank. Cooling water temperature gauge. Anti- freeze and anti-corrosive additives. Coolants. Flushing of cooling system.

AUTOMOBILE ENGINE FUELS: Types of fuels. Influence of structure. Calorific value.Requirements in fuels for I.C. engines. Properties. Fuel rating. Additives for S.I. and C.I. engine fuels. Specifications of petrol and diesel. Leaded and un-leaded petrol, Low Sulphur diesel. Enhancing Power output- Nitrox injection.Non-conventional fuels - LPG, CNG ethanol-mixed petrol. Properties, method ofmanufacture and their performance as I.C. engine fuels. Engine modifications required. Dual mode engine.Idea of Electric Vehicles and Hybrid Vehicles.

UNIT 3

FUEL SYSTEM OF DIESEL ENGINES: Fuel supply system. Filters (primary and secondary); positioning of filters. Feed pump. Solid and air injection system. Fuel injection pump, different types- plunger, distributor pump, their construction and working. Injectors. Governors. Types of governing. Combustion process in diesel engine. Diesel knock.Electronically Controlled Diesel Injection Pump. Common Rail Direct Injection. Piezoelectric effect and its use in CRDI.

UNIT 4

FUEL SYSTEM OF PETROL ENGINES: Gravity feed system used in 2-wheelers. Fuel supply circuit of 4-wheelers. Mechanical and electrical fuel pump. Electric fuel gauge. Petrol fuel filter. Air/fuel ratio. Variation of air/fuel ratio with speed. Air cleaners (wet & dry). Cyclone filter.

CARBURETOR - Function and principle of working of simple carburetor. Carburetor controls- throttle, choke. Types of Carburetors- fixed jet carburetor (Solex type) and constant vacuum carburetors used in YAMAHA motorcycle. Twin-barrel carburetors. Classification of carburetors. Disadvantages of carburetors. Phenomenon of combustionand detonation. Pre-ignition.

UNIT 5

FUEL INJECTION SYSTEMS (PETROL ENGINE): TBI, MPI; the Electronic Module. Advantages of Electronic Fuel Injection (EFI). Block diagram of the EFI. The Air Intake System and theIdle Air Control System. Fuel Delivery System. Various sensors used with the ECM, theirlocation and purpose. Fuel Injector. Idea of Gasoline Direct InjectionENGINE

PERFORMANCE AND TESTING: Various losses in an engine. Heat balance, Morse method of finding IHP, Calculation of various quantities like IHP, BHP, mechanical efficiency, thermal efficiency, relative efficiency, overall efficiency, specific fuelconsumption. Performance curves.

Reference Books:

1. **Automotive Engines, A.K. Babu, Khanna Publishing House**

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AUTO BODY REPAIR, DENTING & PAINTING

BVET503

Unit-I

Safety precautions and first aid, Properuse, care and maintenance of tools and equipments Introduction on types, function of body and panels, Procedure for inspection, removing and refitting of body components panels, doors and other body parts, Arc welding-basic electricity and welding power source.

Unit-I

Electrodes types, description and specification. arc welding procedure Gas welding-gas welding, brazing and soldering procedures Description of gas cutting, Resistance welding-resistance welding, process-spot, seam and butt welding Details of MIG welding, Method of fixation of wind screen, glass Procedure for cut open, beat out, dents, stripping of old paints, sanding at different stages, smooth surface preparation at different stages, putty application &primer application at different stages of affected area(chronological order for repair of auto body) fitment of repaired part and aligning to the original shape

Unit-III

Personal safety – three key areas of risk eyes, skin and inhalation Details of personal protective, equipments-RPE, PPE Details of ingredients of paint, Procedure of refinishing process, Selection of consumable for doing painting work Procedure for doing painting(in chronological order),selection of materials, tools and equipments application of body filler for surface preparation, sanding on the affected area for smooth surface preparation, primer coating on the affected area, preparing affected surfaces for base coating, applying Base coat painting, clear coat painting for metallic paints, rubbing and polishing,

Unit-IV

Application of paint production, treatment/anti rust treatment Procedure for inspection of painting, work and fixing the wind screen glass Details of spray gun-types-standard air, gap design-different sizes of nozzles, Details of different types sanding - 15 equipments Different types of sand paper-grades, Possible defects in painting, objects, causes and its cure

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INDUSTRIAL TRAINING/ON JOB TRAINING/WORKSHOP

BVET504P

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SEMESTER – VI

AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING

BVET601

Unit-I: Refrigeration Fundamentals: Introduction to refrigeration and vapour compression system, cycle diagram (Carnot cycle, Reverse Carnot cycle, Simple vapour compression cycle, bell Coleman cycle), effects of various operating parameters on performance of A/C System, Vapour absorption refrigeration system (No numerical), Applications of refrigeration and air conditioning.

Unit-II: Refrigerants and Air Conditioning Components: Environmental concerns/Legislation for automotive A/C systems, types and properties of refrigerants, refrigerant oils, refrigerant piping. Future refrigerants, Air conditioning components: Compressors, Condensers, flow control devices, evaporators – Design guidelines, types, sizing and their installation. Accumulators, receiver driers and desiccants, Refrigerant charge capacity determination

Unit-III: Air distribution system: Comfort conditions, Air management and heater systems, air distribution modes (Fresh/Recirculation, Face, Foot, Defrost, and Demist), A/C ducts and air filters. Blower fans, Temperature control systems (manual/semiautomatic, automatic). Vehicle operation modes and Cool-down performance

Psychrometry: Psychometric properties, tables, charts, Psychometric processes, Processes, Combinations and Calculations, ADP, Coil Condition line, Sensible heat factor, Bypass factor.

Unit-IV: Load analysis and control devices: Load Analysis, Outside and inside design consideration, Factors forming the load on refrigeration and air conditioning systems, Cooling and heating load calculations, Load calculations for automobiles, Effect of air conditioning load on engine performance, Air conditioning electrical and electronic control, pressure switching devices, sensors and actuators.

Unit-V: Diagnostics, Trouble Shooting, Service and Repair: Initial vehicle inspection, temperature measurements, pressure gauge reading and cycle testing, leak detection and detectors, Sight glass. Refrigerant safety/handling, refrigerant recovery; recycle and charging, system oil, system flushing, odour removal, retrofitting. Removing and replacing components, Compressor service.

Reference Books:

1. Refrigeration & Air Conditioning, Sadhu Singh, Khanna Publishing House

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VEHICLE PERFORMANCE AND TESTING

BVET602

Unit-I: Vehicle Performance Parameters: Vehicle Performance parameters: Fuel economy, acceleration, deceleration, gradability, top speed, handling, comfort, life durability, EGR systems.

Impact of vehicular systems on performance: Suspension system, Steering system, Brakes, Tyres, carriage unit. Catalytic converters function andconstruction, Lambda close loop control system for gasoline vehicles.

Unit-II: Drive train and Component testing: Vehicular transmission performance: comparison of automotive clutches.

Epicyclic transmission, torque converter, final drive and differential, testing of vehicle components: clutch, gear box (for noise and shifting force), brake testing, wheels and tyre testing – tyre wear pattern identification and causes.

Unit-III: Vehicle testing: Vehicle Testing - Road test, free acceleration test, coast down test, passer by noise test, road load data acquisition for vehicle.

Test tracks: Proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water

Laboratory testing: Testing on chassis dynamometer, transition testing (Euro III onwards),accelerated testing, virtual testing, evaporative emission testing, oil consumption testing, endurance test, high speed performance test.

Collisions and Crash Testing:

Crash testing: Human testing, dummies, crashworthiness, polecrash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition, braking distance test.

Unit-IV: Comfort, Convenience and Safety:

Seats: types of seats, driving controls accessibility, and driver seat anthropometry. Steering: steering column angle, collapsible steering, and power steering. Adaptive cruise control, navigation system, adaptive noise control, driver information system,

Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety.

Unit-V: Noise Vibration and EMI:

Noise and vibration: Mechanism of noise generation, engine noise and vibration, causes and remedies on road shocks, wind noise and measurement.

Automobile testing instrumentation: Sensors types and selection, instrumentation for functional tests, model test and full scale testing.

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QUALITY CONTROL

BVET603

COURSE OBJECTIVE

The course provides basic techniques of total quality control as control chart, product tools and standard sampling plans. After going through the course, the student will be able to use statistical techniques for controlling the quality of a product in industry.

UNIT-I

Basic Concept of Quality

Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of on formance, History of quality control, Quality policy and objectives, Economics of quality. Statistical Concept of Variation Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and weibull distribution, pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.

UNIT-II

Quality Assurance

Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planningfor quality, Quality function deployment(QFD). Statistical Quality Control Objectives, Growth and applications of S.Q.C.,S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts for variables and attributes and their analysis, process capability, concept of six sigma.

UNIT-III

ACCEPTANCE SAMPLING

Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans, LTPD, AOQL,AOQ.

UNIT -IV

Total Quality Management

Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM,

UNITV

Quality system

Quality system, need for quality system, ISO 9000 Quality Management Standards, ISO 9000:2000 requirement, Quality Auditing, ISO 14000, Benefits of ISO14000.

TEXT BOOKS

1. Quality Planning and Analysis by Juran J.M. and Gryana FM. – McGraw Hill, NewYork
2. Statistical Quality Cntrol – R.C. Gupta – Khanna Publishers,Delhi
3. Statistical quality control – E. L. Grant and R. S. Leavenworth – Mc. Graw Hill, NewYork

REFERENCE BOOKS

1. Engineering Statistics and quality control – I. W. Burr, Mc. Graw Hill, NewYork
2. Managing for Total quality from Deming to Tguchi and SPC. - Logothetis – Prentice Hall ofIndia

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