For Batch 2016-17 Onwards
SCHEME OF EXAMINATION

for

BACHELOR OF VOCATION

In

(AUTOMOBILE)

5th SEMESTER and 6th SEMESTER

Offered by

University School of Information, Communication & Technology

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]
www.ipu.ac.in

The Scheme and Syllabus for B.Voc (Automobile)(3rd Year) has been approved in 45th BOS Meeting of USICT held on 16th March, 2017 and 43rd Academic Council Meeting held on 25th May, 2017. The Scheme and Syllabus is applicable for the batch admitted in the Academic Session 2016-17 onwards, w.e.f., 1st August, 2018

NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC

1. **ET** stands for Engineering and Technology.
2. **V** stands for Vocation.
3. **MC** stands for Mobile Communication.
4. **SD** stands for Software Development.
5. **AE** stands for Automobile.
6. **CE** stands for Consumer Electronics.
7. **PT** stands for Printing Technology.
8. **CT** stands for Construction Technology.
9. **RA** stands for Refrigeration & Air-Conditioning.
10. **PD** stands for Power Distribution Management.
11. **ID** stands for Interior Design.
12. **AA** stands for Applied Arts.
13. **CS** stands for Computer Science.
14. **MS** stands for Management Studies.
15. **EN** stands for Environmental Engineering
16. **PH** stands for Physics
17. **AS** stands for Applied Science.
18. **HS** stands for Humanities and Social Sciences.
19. **SS** stands for Social Services.
20. **L/T** stands for Lecture and Tutorial
21. **P** stands for Practicals.
22. **S/D** stands for Drawing/Studio
23. **P/D** stands for Practical/Drawing

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

BACHELOR OF VOCATION
(AUTOMOBILE)
FIFTH SEMESTER EXAMINATION
(LEVEL-VII)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVHS-701		Technical English (Common to all disciplines)	3	0	3
ETVAE-701		Vehicle Body Engineering	3	0	3
CORE ELECTIVE-II (Select any one)					
ETVAE-703		Corrosion Prevention & Vehicle Body Paint Technology	3	0	3
ETVAE-705		Elements of Noise, Vibration & Harshness Control	3	0	3
CORE ELECTIVE-III (Select any one)					
ETVAE-707		Modern Vehicle Technology	3	0	3
ETVAE-709		Mechanics of Vehicles	3	0	3
GENERAL ELECTIVE-II (Select any one)*					
ETVSS-751		NCC	0	2	1
ETVSS-753		NSS	0	2	1
ETVSS-755		Sports	0	2	1
ETVSS-757		Community Services	0	2	1
ETVSS-759		ECO Club	0	2	1
ETVSS-761		YOGA	0	2	1
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-II)					
ETVAE-753		Corrosion Prevention & Vehicle Body Paint Technology Lab	0	3	3
ETVAE-755		Elements of Noise, Vibration & Harshness Control Lab	0	3	3
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-III)					
ETVAE-757		Modern Vehicle Technology Lab	0	3	3
ETVAE-759		Mechanics of Vehicles Lab	0	3	3
PRACTICAL/VIVA VOCE					
ETVHS-751		Language Lab (Common to all disciplines)	0	3	3
ETVAE-751		Vehicle Body Engineering Lab	0	3	3
ETVAE-761		Minor Project	0	8	4
ETVAE-763		Industrial Training-IV	0	2	4
TOTAL			**12**	**24**	**33**

NOTE:
There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

***Non University Examination System (NUES)**

BACHELOR OF VOCATION
(AUTOMOBILE)
SIXTH SEMESTER EXAMINATION
(LEVEL-VII)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVAE-702		Automotive Electricals & Electronic System	3	0	3
CORE ELECTIVE-IV (Select any one)					
ETVAE-704		Electric and Hybrid Vehicles	3	0	3
ETVAE-706		Automobile Refrigeration & Air Conditioning	3	0	3
CORE ELECTIVE-V (Select any one)					
ETVAE-708		Vehicle Safety Engineering	3	0	3
ETVAE-710		Autotronics	3	0	3
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-IV)					
ETVAE-754		Electric and Hybrid Vehicles Lab	0	4	4
ETVAE-756		Automobile Refrigeration & Air Conditioning Lab	0	4	4
PRACTICAL/VIVA VOCE					
ETVAE-752		Automotive Electricals & Electronic System Lab	0	4	4
ETVAE-758		Industrial Training-V	0	2	4
ETVAE-760		Major Project#*	0	24	12
TOTAL			**09**	**34**	**33**

NOTE:
There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

#*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports. Seminar related to major project should be delivered one month after staring of Semester. The progress will be monitored through seminars and progress reports. ***The students may be allowed to do Industrial Major Project on-site during 5 days in a week and class work should be completed in 2 working days in the respective institution. If in case, the classes are held during Saturday /Sunday then faculty should be given off in lieu of Saturday/Sunday.***

For Award of Diploma:

1. The total number of the credits of the Diploma (Automobile) Programme = 63.
2. Student shall be required to appear in examinations of all courses. However, to award the Diploma (Automobile) a student shall be required to earn a minimum of 60 credits.

For Award of Advanced Diploma:

1. The total number of the credits of the Advance Diploma (Automobile) Programme = 126.
2. Student shall be required to appear in examinations of all courses. However, to award the Advanced Diploma (Automobile) a student shall be required to earn a minimum of 120 credits.

For Award of B. Voc Degree:

1. The total number of the credits of the B. Voc. (Automobile) Programme = 192.
2. Student shall be required to appear in examinations of all courses. However, to award the B. Voc. (Automobile) degree, a student shall be required to earn a minimum of 180 credits.

TECHNICAL ENGLISH
(Common to all Disciplines)

	L	T/P	C
Paper Code: ETVHS-701			
Paper: Technical English	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives:

- *To equip students to recognize, explain, and use the rhetorical strategies and the formal elements of specific genres of technical communication, such as technical abstracts, data based research reports, instructional manuals, technical descriptions etc.*
- *To help students understand the process of collection, analysis, documentation, and reporting of research clearly, concisely, logically, and ethically and understand the standards for legitimate interpretations of research data within scientific and technical communities.*
- *To initiate students into critical and creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information towards meaningful and effective communication*
- *To help students understand ethical considerations in technical and professional writing, realizing the consequences of various communication acts.*

Learning Outcomes: *Upon successful completion of the course the student shall be able to:*

- *Understand and demonstrate composing processes through invention, organization, drafting, revision, editing, and presentation as evidenced in satisfactory completion of all the written, visual, web-based, and oral discourses to be submitted in this course.*
- *To recognize and use the rhetorical and stylistic elements necessary for the successful practice of scientific and technical communication;*
- *Create various products most frequently used in scientific and technical communication.*
- *Develop ethical problem-solving communication skills in professional situations.*

UNIT-I

Technical Writing: Definition, Purpose and Characteristics of Technical Writing.
Technical Writing Skills: Methods and means of the Pre-writing stage, the Writing Stage and the Post-writing Stage.

[T1, T2][No. of Hrs. 12]

UNIT-II

Formal Formatting: Arrangement of Formal Elements, Front Material, Format Devices in the Body of Formal Report-Heading, Pagination, End Material – Citations, References and Bibliography, Appendix.

[T1, T2][No. of Hrs. 10]

UNIT-III

Writing and Designing for Electronic Media: Use of Internet as a Writing tool; designing and writing for multimedia applications and the World Wide Web.

[T1, T2][No. of Hrs. 12]

UNIT-IV

Research and Writing Ethics: Explaining Forms and Consequences of Plagiarism, Introduction to Intellectual Property Right and Copy Right Laws.

[T1, T2][No. of Hrs. 11]

Text Book(s):

[T1] Sides, Charles H., "How to Write and Present Technical Information", Cambridge Univ. Press, 1999.
[T2] Basu, B. N., "Technical Writing", PHI Learning Pvt. Ltd., 2007.

Reference Book(s):

[R1] Beer, David F. and David A. McMurrey, "A Guide to Writing as an Engineer", New York: Wiley, 2005.
[R2] Gibaldi, Joseph, and Walter S. Achtert, "MLA Handbook for Writers of Research Papers, Thesis, and Dissertations", Modern Language Association, 1980.
[R3] Rubens, Philip, "Science and Technical Writing: A Manual of Style", Routledge, 2002.
[R4] Anderson, Marilyn, Pramod K. Nayar, and Madhucchandra Sen, "Critical Thinking, Academic Writing and Presentation Skills", Pearson. 2010.

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VEHICLE BODY ENGINEERING

Paper Code: ETVAE-701	**L**	**T/P**	**C**
Paper: Vehicle Body Engineering	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *To familiarize the students with the fundamentals of vehicle body. Students should have studied subjects such as elements of automobile engineering, Engineering Materials and Mechanics of solids, Automotive Chassis etc.*

Learning Outcomes: *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. Demonstrate the various types of bus body construction, seating layout, regulations and comfort. Correlate the various heavy vehicle bodies, driver's visibility and cabin design. Distinguish the different types of materials and painting techniques for vehicle body*

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.

[T1, T2][No. of Hrs. 11]

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.

[T1, T2][No. of Hrs. 12]

UNIT-III

Body Materials- requirement of body material, type- specification, Timber- plywood fibre board, Steel, Mild steel – angle, channel, strips, Aluminium alloy- sheets, strips, channel etc., Rivets/ screws, glass- coloured glass, toughened glass, fibre reinforced

[T1, T2][No. of Hrs. 11]

UNIT- IV

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

[T1, T3][No. of Hrs. 11]

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

Reference Book(s):

[R1] John Fenton, "Vehicle Body Layout & Analysis", Hutchinson, London.
[R2] J Powloski, "Vehicle Body Engineering", Business Books Ltd., London.
[R3] J.G. Giles, "Body Construction and Design", Vol. 6.,llefe Books/ Butterworth & Co. London
[R4] Crouse W. H. & Anglin D. L., "Automotive Chassis", McGraw-Hill Int. Book Co.

CORROSION PREVENTION & VEHICLE BODY PAINT TECHNOLOGY
(Core Elective-II)

Paper Code: ETVAE-703	**L**	**T/P**	**C**
Paper: Corrosion Prevention & Vehicle Body Paint Technology	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as Elements of Automobile Engineering, Automobile Service & Maintenance and Chemistry. This subject provides knowledge about prevention and control of corrosion in automobiles and vehicle body paint technology in the trade.*

Learning Outcomes: *The students after studying this subject will be able to identify and implement different methods of preventing and controlling the corrosion in automobiles and the concept of car body design, passenger safety, crumple zone and crash testing, vehicle body optimization techniques to reduce drag, familiarize the various types of bus body construction, seating layout, regulations and comfort, understand the various heavy vehicle bodies, driver's visibility and cabin design, know the different types of materials and painting techniques for vehicle body.*

UNIT-I

Corrosion, consequences of corrosion, chemistry of corrosion, factors that control the corrosion rate, corrosion prevention-conditioning the metal, conditioning the corrosive environment, electrochemical control.

[T1][T2] [No. of Hrs. 11]

UNIT-II

Different methods to remove paints, removing paint with disk grinder, paint removal, masking- precautions while masking, masking- trims and hardwares, molding and beading, windshield, panel, windows, upholstery, head lights, wheels, front end etc.

[T1][T2] [No. of Hrs. 12]

UNIT-III

Painting Materials- acrylic lacquer, acrylic enamel, urethane enamel, synthetic enamel, comparison of cost, primer surfaces, primers, sealer, metallic, thinners and reducers, putty, wax polish and grease remover scrubbing compound, determining type of old finish. Prepare surface for paint.

[T1][T2] [No. of Hrs. 11]

UNIT-IV

Preparing paint and matching colours- colour identification, preparing the paint, colour matching, matching colour with spray gun. Spray painting equipment- spray gun- details, selection of air gap, fluid tip, fluid needle adjustment, care of spray gun, air for painting, hose size, pressure drop, spray booth, paint drying equipment. Using a spray gun, air pressure, spraying temperature, Paint defects.

[T1] [T2] [No. of Hrs. 11]

Text Book(s):

[T1] Bill Toboldt, "Auto Body Repairing and Repainting The Good Hearth", Willcox Company Inc.
[T2] Anil Chhikara, "Auto Body Repairing and Repainting", Satya Prakashan, New Delhi

Reference Book(s):

[R1] Baldev Raj, Ukamachi Mudali, S. Rangarajan, "Corrosion Prevention and Control", Narosa Publication, 2009
[R2] R. Talbert, "Paint Technology Handbook", Taylor & Frances Publications.

ELEMENTS OF NOISE, VIBRATION & HARSHNESS CONTROL
(Core Elective-II)

Paper Code: ETVAE-705	**L**	**T/P**	**C**
Paper: Elements of Noise, Vibration & Harshness Control	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as elements of automobile engineering, engineering materials & mechanics of solids. This subject provides knowledge of basics of noise, vibration and harshness and their control in automobiles.*

Learning Outcomes: *After studying this subject, the student shall be able to diagnose different noises, vibration in vehicles and suggest suitable and specific controlling measures.*

UNIT-I

Introduce the concepts relating to Noise, Vibration and Harshness (NVH)**:** Define NVH terminology, necessity for NVH diagnosis, Concepts of the transmission of vibration and sound, concepts of preventing excessive vibration and noise. Develop skills in associating NVH symptoms to the: Sensation, Frequency range, Operating conditions, Causes, Vibrating system.

[T1, T2][No. of Hrs. 12]

UNIT-II

Vibration- Characteristics of vibration, Oscillation, Cycle, Dissipation of Energy from a Single Impact, Sensors Signal, Calculating Component Frequency, Amplitude, vibration measurement, Natural frequency, Resonance-resonance point, resonance graph (frequency – vehicle speed), Dampers,

[T1, T2][No. of Hrs.11]

UNIT-III

Vibrations due to road roughness, vehicle ride model, Human response to vibrations, sprung & unsprung mass, pitch & bounce, roll centre & roll axis. Introduction to random vibrations, Evaluation of vehicle, vibration in relation to ride comfort criterion. Beating/ Phasing/ Growl, vibration order- tire frequencies, engine vibrations.

[T1, T2][No. of Hrs.11]

UNIT-IV

Harshness, transmission path of harshness, NVH in Automobiles- Engine, Driveline, wheels , Common NVH Symptoms, causes and remedies for- Body Shake, Steering Flutter and Shimmy, Accelerator pedal vibration, Shift lever vibration, Harshness, Road noise, Tire pattern noise, Body Booming noise, Engine noise, Body Beating noise, Transmission gear whine, differential whine, clutch judder, brake vibration, brake squeak.

[T1, T2][No. of Hrs. 11]

Text Book(s):

[T1] N. L. Meirovitch, "Elements of Vibration Analysis", Mc Graw Hill New York, 1986.
[T2] Irwin & Garf, "Industrial Noise & Vibration Control", Prantice Hall, 1979

Reference Book(s):

[R1] J.P. Den Hartog, "Mechanical Vibration", 4th Edition, Mc Graw Hill, New York 1985.
[R2] Daniel J. Inman, "Engineering Vibration", Prentice Hall, NJ
[R3] Grover G. K., "Mechanical Vibration", Nem Chand & Brothers, Roorkee
[R4] Julian Happian Smith, "An Introduction to Modern Vehicle Design", Butterworth-Heinemann, Oxford.

MODERN VEHICLE TECHNOLOGY
(Core Elective-III)

Paper Code: ETVAE-707	**L**	**T/P**	**C**
Paper: Modern Vehicle Technology	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as Physics, General Science, Basics of Electrical and Electronics Engineering and Elements of automobile engineering. This subject provides knowledge of different advances being used in automobiles. The objective of this subject is to make the student understand the modern technologies adopted in motor vehicles.*

Learning Outcomes: *The student after studying this subject should be able to diagnose different faults in modern vehicles.*

UNIT-I

Suspension Brakes and Safety: Air Suspension–Closed Loop Suspension, Antiskid Braking System, Retarders, Regenerative Braking Safety Cage – Air Bags – Crash Resistance - Passenger Comfort.

[T1] [T2] [No. of Hrs.11]

UNIT-II

Trends in Power Plants: Hybrid Vehicles – Stratified Charged/ Learn Burn Engines – Hydrogen Engines – Battery Vehicles – Electric Propulsion With Cables – Magnetic Track Vehicles.

[T1] [T2] [No. of Hrs. 12]

UNIT-III

Advance Techniques in Traffic Management: Vehicle & traffic navigation system, global positioning system, advanced traffic control devices, Intelligent Transport System.

[T1] [T2] [No. of Hrs. 11]

UNIT-IV

Control systems in Automobiles- Automotive application of sensors, Engine management systems, Electronic transmission control, Multiplex wiring systems, On-board navigation systems.

[T3] [No. of Hrs. 11]

Text Book(s):

[T1] Crouse W and Anglin D, "Automotive Mechanics", 10th Edition, McGraw Hill Publication, 2004.
[T2] Robert Bosch, "Bosch Hand Book", 3rd Edition, SAE, 1993.
[T3] Julian Happian, "An Introduction to Modern Vehicle Design", Smith Butterworth-Heinemann, Oxford

Reference Book(s):

[R1] J. B. Heywood, "Fundamentals of I.C. Engines", McGraw Hill International Edition
[R2] Tom Denton, "Automobile Electrical & Electronic Systems", SAE International
[R3] A. W. Judge, "Modern Petrol Engine", B.I. Publications. 1983
[R4] Michel Westbrook, "The Electric and Hybrid Electric Car", SAE International

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MECHANICS OF VEHICLES
(Core Elective-III)

	L	T/P	C
Paper Code: ETVAE-709			
Paper: Mechanics of Vehicles	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as Physics, General Science, Mechanics of Solids and Elements of automobile engineering. This subject provides knowledge of different advances being used in automobiles. The objective of this subject is to make the student understand different basic principles of simple mechanism, various types of motions, power transmission, forces acting on movingvehicles,vehiclebraking,balancingandvibrationinrotatingbody etc .as these concepts are essential for Automobile Engineers.*

Learning Outcomes: *The student after studying this subject should be able to diagnose different faults related to simple mechanism, power transmission, suspension, vehicle braking, balancing and vibration in modern vehicles.*

UNIT-I

Definition of Link, kinematics pair, kinematics chain, Mechanism, inversions and machines, Degree of freedom, Simple examples of mechanism with: Lower pairs, four bar chain and inversion Slider crank chain and inversion, Double slider crank chain and it's inversion, Higher pairs. Ackerman steering principle, Davis steering mechanics.

[T1, T2][No. of Hrs. 11]

UNIT-II

Air, grade and rolling resistances, tractive effort, traction, Inertia load, draw bar pull and power required to propel a vehicle, calculations of acceleration and tractive effort required in case of front wheel drive, rear drive and four – wheel drive, centrifugal force and its effects on vehicle stability.

[T1, T3][No. of Hrs. 11]

UNIT-III

Braking friction and limits of braking, retardation and braking force, calculations in case of front wheel, rear wheel and all wheel braking, weight transfer during braking, stopping distance and stopping time.

[T1, T3][No. of Hrs. 11]

UNIT-IV

Fly wheel – its types, weight and moment of inertia, fluctuation of energy for flywheel, concepts of static and dynamic balancing.

[T1, T2][No. of Hrs. 12]

Text Book(s):

[T1] Rattan S.S., "Theory of Machines", 4th Edition, McGraw Hill Pub. Co. Ltd., New Delhi,
[T2] Rao J. S., Dukkipati R. V., "Mechanism and Machine Theory", Wiley Eastern Ltd.
[T3] Dr. N. K. Giri, "Automotive Mechanics", Khanna Publishers, 2004

Reference Book(s):

[R1] Thomas D. Gillespie, "Fundamentals of Vehicle Dynamics", Published by SAE Inc.
[R2] J. Y. Wong, "Theory of Ground Vehicles", John Willey & Sons, NY
[R3] J. G. Giles, Steering, "Suspension & Tyres", llefe Books Ltd., London
[R4] W. Steed, "Mechanics of Road Vehicles", llefe Books Ltd. London

NCC/ NSS/ SPORTS/ COMMUNITY SERVICES/ ECO CLUB
(General Elective-II)

Paper Code: ETVSS-751/ 753/ 755/ 757/ 759	**L**	**T/P**	**C**
Paper: NCC/NSS/ Sports/ Community Services/ ECO Club	**0**	**2**	**1**

Students should actively participate in either of the above activities of the institute during academic session. Credits shall be awarded accordingly based on final assessment by internal institute committee constituted by the Principal/ Director of the respective institutes. Students are encouraged organize events and awards if any shall be distributed to students during annual day/ specific function day accordingly

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YOGA
(General Elective-II)

Paper Code: ETVSS-761	**L**	**T/P**	**C**
Paper: Yoga	**0**	**2**	**1**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Introduction: Yoga education in Schools/Colleges/ Institutions/ Organizations/Universities etc. can immensely contribute to health of children by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

The Paper on YOGA has been initiated by USET for the students in a new skill development programme known as B.Voc programme. Currently, launched in 09 Govt. Institutions affiliated to GGSIP University.

Aim and Objectives:

The aim of the Paper is to introduce Yoga. The specific objectives are:

- To impart Yoga education in schools/colleges/Institutions for prevention of disease and promotion of health;
- To train faculty members in Yogic principles and practices.
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health.

UNIT-I

- Brief introduction to origin of Yoga, Psychological aspects leading to origin of Yoga, Hindu Mythological concepts about origin of Yoga
- History and Development of Yoga
- Etymology and Definitions of Yoga, Aim and Objectives of Yoga, Misconceptions about Yoga, True Nature of Yoga
- General Introduction to Schools of Yoga
- Principles of Yoga, Yoga Practices for Health and Harmony

UNIT-II

Yoga Traditions and Classical Schools of Yoga.

- Yoga's Traditional Source
- Different's traditions of Yoga.
- Contemporary Yoga Practice.
- Concepts and Practices of Yoga in others religions.

UNIT-III

Experimental Study Yoga:

- Aasan, Surya Namaskar, Pranayam, Sukshm-Kriya, Dhyan-Mudra.Shatkarma

UNIT-IV

Yoga and You

- **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- **Aarogya -** Prevention, Cure and Remedies.
- Life Management and Development.

Reference Book(s)

[R1] Singh S. P & Yogi Mukesh, "Foundation of Yoga", Standard Publication, New Delhi, 2010
[R2] Radhakrishnan S,"Indian Philosophy", (Vol. I & II) II Edition, Oxford University, UK, 2008.
[R3] Swami Devvarata, "Ashtang Yog", 119, Guttam Nagar.
[R4] Prof. Ram Harsh Singh, "Swasth Viritam"
[R5] Swami Prabhavanand, "Spiritual Heritage of India (English)", Sri Ramkrishna Math, Madras, 2004

YOGA PRACTICAL
I.A

I. RECITATION OF HYMNS & HASTA MUDRA

1.1 Recitation of Pratah-smaran and Shanti Mantras

1.2 Recitation of Pranava Japa and Soham Japa

1.3 Recitation of Hymns from Upanishad & Yoga Texts

1.4 Hasta Mudra: Chin, Jnana, Hridaya, Bhairav, Yoni

II. SHATKARMA

2.1 Dhauti (Kunjal, Vamana Dhauti, Vastra Dhauti)

2.2 Neti (Jalneti, Sutraneti)

2.3 Kapalbhati and its variants

2.4 Agnisara

III. BREATHING PRACTICES

3.1 Breath Awareness: Shwas-prashwas Sanyaman

3.2 Abdomen, Thoracic & Clavicular Breathing, Abdomen + Thoracic Breathing, Abdomen + Thoracic + Clavicular Breathing

3.3 Yogic Breathing: Pause Breathing (Viloma Pranayama), Spinal Passage Breathing (Sushumna Breathing)

3.4 Practice of Puraka, Rechaka & Kumbhaka (Antar & Bahya Kumbhaka)

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YOGA PRACTICAL
I.B

YOGIC SUKSMA AND STHULA VYAYAMA, NABHI PAREEKSHA

1.1 YOGIC SUKSMA VYAYAMA

1. Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)
2. Prarthana (Prayer)
3. Buddhi-tatha-dhritishakti-vikasaka (for developing will power)
4. Smaranashakti-vikasaka (for improving the memory)
5. Medhashakti-vikasaka (for improving the intellect and memory)
6. Netrashakti-vikasaka (for the eyes)
7. Kapolashakti-vardhaka (for the cheeks)
8. Karnashakti-vardhaka (for the ears)
9. Grivashakti-vikasaka (for the Neck) (i) (A & B)
10. Grivashakti-vikasaka (for the Neck) (ii) (A & B)
11. Grivashakti-vikasaka (for the Neck) (iii)
12. Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)
13. Bhuja-bandhashakti-vikasaka
14. Kohinishakti-vikasaka
15. Bhuja-vallishakti-vikasaka
16. Purna-bhujashakti-vikasaka (for the arms)
17. Mani-bandhashakti-vikasaka
18. Kara-prsthashakti-vikasaka
19. Kara-talashakti-vikasaka
20. Anguli-mulashakti-vikasaka (for the fingers) (A & B)
21. Anguli- shakti-vikasaka (for the fingers) (A & B)
22. Vaksa-sthalashakti-vikasaka (for the chest) (1)
23. Vaksa-sthalashakti-vikasaka (for the chest) (2)
24. Udarashakti-vikasaka (for the abdomen) (i)
25. Udarashakti-vikasaka (for the abdomen) (ii)
26. Udarasakti-vikasaka (for the abdomen) (iii)
27. Udarashakti-vikasaka (for the abdomen) (iv)
28. Udarashakti-vikasaka (for the abdomen) (v)
29. Udarashakti-vikasaka (for the abdomen) (vi)
30. Udarashakti-vikasaka (for the abdomen) (vii)
31. Udarashakti-vikasaka (for the abdomen) (viii)
32. Udarashakti-vikasaka (for the abdomen) (ix)
33. Udarashakti-vikasaka (for the abdomen) (x) (A, B & C)
34. Kati shakti-vikasaka (for the waist) (i)
35. Kati shakti-vikasaka (for the waist) (ii)
36. Kati shakti-vikasaka (for the waist) (iii)

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37. Kati shakti-vikasaka (for the waist) (iv)
38. Kati shakti-vikasaka (for the waist) (v)
39. Muladhara-chakra-suddhi (for the rectum)
40. Upasthatatha-svadhisthana-chakra-suddhi (for the genital organs)
41. Kundalinishakti-vikasaka (for the kundalini)
42. Janghashakti-vikasaka (for the thighs) (i) (A & B)
43. Janghashakti-vikasaka (for the thighs) (ii) (A & B)
44. Janushakti-vikasaka (for the knees)
45. Pindalishakti-vikasaka (for the calves)
46. Pada-mulashakti-vikasaka (A & B)
47. Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)
48. Padangulishakti-vikasaka (for the toes)

1.2 YOGIC STHULA VYAYAMA

1. Rekha-gati (Walking in a Straight line)
2. Hrid-gati (Injanadaur – the Locomotive Exercise)
3. Utkurdana (Jumping Exercise)
4. Urdhva-gati (Upward Movement)
5. Sarvanga-pusti (Developing the Entire body) &

1.3 NABHI PAREEKSHA

II. SURYA NAMASKARA

III. YOGASANA (Standing Postures and body alignment)

3.1 Tadasana, Vrikshasana, Urdhva-Hastottanasana, Kati Chakrasana

3.2 ArdhaChakrasana, Paada Hastasana

3.3 Trikonasana, Parshva Konasana

3.4 Veerabhadrasan and its variations

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YOGA PRACTICAL
II.A

I. SHATKARMA

1.1 Dhauti

1.2 Neti

1.3 Nauli Madhyama, Vama, Dakshina and Nauli Chalana

1.4 Trataka (Jatru and Jyoti)

II. PRANAYAMA

2.1 Nadi Shodhana (Technique 1: Same Nostril Breathing)

2.2 Nadi Shodhana (Technique 2: Alternate Nostril Breathing)

2.3 Nadi Shodhana (Technique 3: Alternate Nostril Breathing + Antar Kumbhak)

2.4 Nadi Shodhana (Puraka + Antar Kumbhak + Rechaka + Bahya Kumbhak) (1:4:2:2)

2.5 BHRAMARI PRANAYAMA

III. PRACTICES LEADING TO MEDITATION

3.1 Pranav and Soham Japa

3.2 Yoga Nidra (1, 2, 3)

3.3 Antarmauna

3.4 Ajapa Dharana (Stage 1, 2, 3)

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YOGA PRACTICAL
II.B

I. YOGASANA (Sitting Postures)

1.1 Dandasana, Swastikasana, Padmasana,Vajrasana, Supta Vajrasana

1.2 Kagasana, Utkatasana, Gomukhasana,Ushtrasana, Shashankasana,

1.3 Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana

1.4 Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

II. YOGASANA (Supine lying Postures)

2.1 Pavanamuktasana

2.2 Utthana-padasana, Ardha Halasana,

2.3 Halasana

2.4 Setubandha Sarvangasana

2.5 Sarvangasana

2.6 Matsyasana

2.7 Chakrasana

2.8 Shavasana

III. YOGASANA (Prone lying Postures)

3.1 Makarasana

3.2 Bhujangasana

3.3 Shalabhasana

3.4 Dhanurasana

3.5 Kapotasana

3.6 Raja Kapotasana

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YOGA PRACTICAL
III.A

I. BANDHA

- Jivha Bandha
- Jalandhara Bandha
- Uddiyana Bandha
- Mula Bandha
- Maha Bandha
- Tri Bandha

II PRANAYAMA (with Antar & Bahya Kumbhaka)

2.1 Surya-bhedi and Chandra-bhedi Pranayama

2.2 Ujjayi Pranayama

2.3 Sheetali Pranayama

2.4 Shitkari Pranayama

2.5 Bhastrika Pranayama

III. PRACTICES LEADING TO MEDITATION

3.1 Ajapa Dharana (Stage 4, 5, 6)

3.2 Yoga Nidra (4, 5)

3.3 Practices leading to Breath Meditation

3.4 Practices leading to Om Meditation

3.5 Practices leading to Vipassana Meditation

Practices leading to Preksha Meditation

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YOGA PRACTICAL
III.B

I. YOGASANA

1.1 Siddhasana, Bhadrasana,

1.2 Baddha Padmasana, Uttitha Padmasana,

1.3 Bhunamanasana, Hanumanasana

1.4 Bakasana, Kukkutasana, Garbhasana

1.5 Matsyendrasana, Marjariasana,

1.6 Padangusthasana, Hastapadangusthasana

1.7 Garudasana, Vatayanasana, Natarajasana

1.8 Mayurasana, Padma Mayurasana

1.9 Sirshasana and its variations

1.10 Ekapada and Dwipada Kandarasana

II. MUDRAS

2.1 Yoga Mudra

2.2 Maha Mudra

2.3 Shanmukhi Mudra

2.4 Shambhavi Mudra

2.5 Kaki Mudra

2.6 Tadagi Mudra

2.7 Vipareet Karni Mudra

2.8 Simha Mudra

GURU GOBIND SINGH
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CORROSION PREVENTION & VEHICLE BODY PAINT TECHNOLOGY LAB
(Core Elective-II)

Paper Code: ETVAE-753	**L**	**T/P**	**C**
Paper: Corrosion Prevention & Vehicle Body Paint Technology Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Practice on corrosion treatment of sheet metal interior and exterior surface.
2. Practice on paint removal using chemical, striping, media blasting.
3. Practice to mask the parts of a vehicle by using different masking techniques.
4. Practice on different ways to mix paint or other materials paint mixing sticks.
5. Practice on use of viscosity cup.
6. Practice on Adjusting Knobs, Testing Spray Pattern, Effect of Spray on Gun stroke, Gun Speed, Gun Triggering, Gun Direction, Spray Overlap, Gun Handling Problems - Heeling, Arcing.
7. Practice on spray gun cleaning.
8. Practice on Checking Paint Thickness.
9. Identify different paint defects.
10. Practice on maintains on spray booth.
11. Preparation of repair estimate using estimating guide book.

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ELEMENTS OF NOISE, VIBRATION & HARSHNESS CONTROL LAB
(Core Elective-II)

Paper Code: ETVAE-755	**L**	**T/P**	**C**
Paper: Elements of Noise, Vibration & Harshness Control Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Demonstration of washing & greasing of vehicle
2. Chassis Greasing of light / heavy duty vehicle
3. Engine oil change & periodic maintenance of vehicle
4. Clutch overhaul of light / heavy duty vehicle
5. Suspension steering overhaul of light / heavy duty vehicle
6. Dismantling & assembly of constant mesh gearbox
7. Dismantling & assembly of synchromesh gearbox
8. Drive line overhaul (universal joint, propeller shaft, slip joint)
9. Final drive & differential overhaul
10. Rear axle hub greasing
11. Door adjustments.

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MODERN VEHICLE TECHNOLOGY LAB
(Core Elective-III)

Paper Code: ETVAE-757	**L**	**T/P**	**C**
Paper: Modern Vehicle Technology Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Study air suspension system and its application.
2. Study Antiskid Braking System.
3. Study Regenerative Braking system.
4. Study Hydrogen Engines.
5. Study Intelligent Transport System.
6. Identification and function of different sensors.
7. Study multiplex wiring system.
8. Study engine management system of a petrol car.
9. Study engine management system of a heavy duty vehicle.
10. Practice on-board testing of a modern car.

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MECHANICS OF VEHICLES LAB
(Core Elective-III)

Paper Code: ETVAE-759	**L**	**T/P**	**C**
Paper: Mechanics of Vehicles Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Experiment on inverrsims of slider crank mechanism.
2. Problems on Epicyclic gear train using tabular method.
3. Balancing of rotary masses.
4. Experiment on whirling of shafts.
5. Study of Davis Steering Mechanism.
6. Study of Ackerman Steering Mechanism.
7. Calculation of stopping distance and stopping time.
8. Calculation of tractive effort and accelerative effort. In case of FWD/RWD/AWD Automobile.
9. Calculation of stopping time/ Braking force. In case of FWD/RWD/AW Braking system.
10. Driving practice of a vehicle.

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LANGUAGE LAB
(Common to all Disciplines)

Paper Code: ETVHS-751	**L**	**T/P**	**C**
Paper: Language Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Exercises:

1. **Fundamentals of Inter-personal Communication and Building Vocabulary**
   - Self introduction and introducing others
   - Situational Dialogues: Starting a dialogue and responding relevantly & appropriately
   - Role-Play-Expressions in various situations
   - Social and Professional Etiquette: greetings, apologies, requests etc
   - Telephone Etiquette.
2. **Non-verbal Communication**
   - Gesture, posture and body language
   - Facial Expressions.
   - Paralinguistic Skills
   - Proxemics
   - Eye Gaze.
   - Haptics
   - Appearance.
3. **Reading Comprehension and Listening Exercise**
   - General vs Local Comprehension
   - Skimming, Scanning
   - Inference drawing
   - Critical reading
   - Listening , Hearing
4. **Presentation Skills**
   - Oral presentation
   - Seminar/ conference Paper Presentation
   - PPTs and Written presentation through poster/projects/reports/e-mails/assignments etc
   - Camera ready presentation
5. **Group Discussion**
   - Dynamics of Group Discussion
   - Intervention
   - Summarizing
   - Body Language and Voice, Intonation
6. **Interview Skills**
   - Interview etiquette
   - Body posture and body language
   - Voice, intonation and modulation
   - Fluency and organization of ideas
   - Rubrics for evaluation: Concept and process, pre-interview planning, opening strategies, answering techniques,
   - Interview through tele-conferencing and video-conferencing
   - Mock interview
   - Campus placement interview
7. **Public and Professional Speaking**
   - Extempore
   - Public Speech
   - Professional speech/lecture
8. **Articulation and Management**
   - Time management
   - Articulation and expression
   - Assertiveness
   - Psychometrics
   - Stress management

VEHICLE BODY ENGINEERING LAB

	L	T/P	C
Paper Code: ETVAE-751			
Paper: Vehicle Body Engineering Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Study of typical Car - body construction with sketches.
2. To study and prepare layouts of ordinary passenger bus.
3. To study and prepare layout of luxury coach.
4. To study seats used in automobile, its requirement and construction.
5. To study the construction of typical truck body and draw sketches.
6. To demonstrate constructional and operational features of power window.
7. To prepare the analysis of vehicle body weight and weight distribution.
8. To study the ergonomics of human beings, driver's seat position, size and construction.
9. Calculation of aerodynamic forces and pitching, rolling, yawing moments
10. Study/Measurement of drag, lift force of a scaled model in wind tunnel.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

MINOR PROJECT

Paper Code: ETVAE-761	**L**	**T/P**	**C**
Paper: Minor Project	**0**	**8**	**4**

Objectives*: The main aim of the major project shall be to:*

a) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

b) Develop understanding of subject based knowledge given in the class room in the context of its application at work places

c) Develop first-hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.

d) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

This should be considered as ritual for the fulfillment of above objectives. Institute may establish close linkage with relevant organizations for providing such an experience with the use of its training placement division. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Project Lab has to be developed and nurtured. Various testing equipment such as non-destructive testing equipment, water analysis testing equipments etc., may be procured for enhancing project lab for the benefit of students. Also project works should be designed in such a way so that existing laboratories may be utilized optimally. Enhancement of project lab is a continuous process and need base upgradations are necessary.

Students may choose a project based on any subject of Automobile Engineering. The students will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format.

The project work will be a design project for possible implementation of project including field surveying a computer oriented project on any of the topics of civil engineering interest. It will be a group project.

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AUTOMOTIVE ELECTRICALS & ELECTRONIC SYSTEM

Paper Code: ETVAE-702	**L**	**T/P**	**C**
Paper: Automotive Electricals & Electronic System	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as General Science, Physics, mathematics and have the basic knowledge about automobile engineering to have an enhanced exposure. This subject provides knowledge about the different electrical and electronic components in automobiles.*

Learning Outcomes: *This knowledge will be helpful to the student in co-relating molecular structures with the properties of the solid materials and the ways to enhance the properties of the materials, understanding and solving the various engineering problems.*

UNIT-I

Storage Battery

Principle of lead acid cells, plates and their characteristics containers and separators, electrolyte and their preparation, voltmeter, effect of temperature on electrolyte, specific gravity, capacity and efficiency, methods of charging from D.C. mains, defects and remedies of batteries, care of idle and new batteries. Recent development in batteries.

[T1, T2][No. of Hrs. 11]

UNIT-II

Generator/ Alternator

Principle of generation of direct current, AC generator details, DC generator, Charging circuit, voltage and current regulators, cutout -construction, working and adjustment.

[T1, T2][No. of Hrs. 11]

UNIT-III

Starter Motor & Drives

Battery motor starting system, condition at starting, behavior of starter during starting, series motor and its characteristics, consideration affecting size of motor, types of drives, starting circuit.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Wiring and Lighting System:

Insulated and earth return systems, 12 volts system, fusing of circuits, low and high voltage automobile cables, diagram of typical wiring system. Principle of automobile illumination, head lamp mounting and construction, sealed beam auxiliary lightings, horn, windscreen-wipers, signaling devices, electrical fuel pump, fuel, oil and temperature gauge (Dash board instruments).

[T1, T2][No. of Hrs.12]

Text Book(s):

[T1] Tom Denton, "Automobile Electrical and Electronic Systems", SAE Publication, 2000.
[T2] P. L. Kohli, "Automotive Electrical Equipment", Tata McGraw Hill, New Delhi.

Reference Book(s):

[R1] Heinz Heisler, "Advanced Engine Technology", SAE Publications, 1995.
[R2] Ulrich Adler, "Automotive Electronic Systems", Robert Bosch, GMBH, 1995
[R3] A.P. Young & Griffiths, "Automobile Electrical Equipment", ELBS & Newnes Butterworths, London.
[R4] A.W. Judge, "Modern Electrical Equipment-Motor Manuals", Vol.6, Chapman & Hall Ltd.
[R5] Parker and Smith S., "Electrical Equipment for Automobiles", Chapman & Hall Ltd. 1927

ELECTRIC AND HYBRID VEHICLES
(Core Elective-IV)

Paper Code: ETVAE-704	**L**	**T/P**	**C**
Paper: Electric and Hybrid Vehicles	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *The purpose of this subject is to impart adequate knowledge on Electrical & Hybrid Vehicle. Student should have studied subjects such as elements of automobile engineering, General Science, Physics, Chemistry, automotive electrical & electronics etc.*

Learning Outcomes: *This knowledge will be helpful to the student in understanding various aspects of hybrid and electric drive trains such as their configuration, type of electric machines that can be used, energy storage devices etc.*

UNIT-I

Introduction: define fuel economy, carbon foot print, factors affecting fuel economy, possible actions, alternative energy sources- hybrid in history, hybrid cars. Basic concept of electric traction, introduction to various electric drive train topologies.

[T1, T2][No. of Hrs. 12]

UNIT-II

Drivetrain structure: Conventional drive train, parallel drive train, series hybrid Drivetrain, combined (split) hybrid, all wheel drive hybrid, merits and demerits of different drive trains.

[T1, T2][No. of Hrs. 11]

UNIT-III

Components of a hybrid electric drive train: Electric energy storage devices- lead acid, nickel based, lithium based batteries, merits and demerits of different type of batteries, battery wear, battery management, electrical machines, power electronics, electrified auxiliary system, additional mechanical devices- power split.

[T1, T2][No. of Hrs.11]

UNIT-IV

Case Studies: Design of a hybrid car, Design of an electric car, Specifications and salient features of Toyota Prius, Toyota- Camry, Honda- Insight, Maruti- Ciaz Mahindra- e_2O etc. merits and demerits.

[T1, T2][No. of Hrs. 11]

Text Book(s):

[T1] Emadi Ali, "Vehicular Electric Power System", Marcel Dekker, Inc. 2004
[T2] Robert Bosch, "Bosch Automotive Handbook", 7th Edition, John Wiley & Sons.

Reference Book(s):

[R1] Emadi Ali, "Vehicular Electric Power System", Marcel Dekker, Inc. 2004
[R2] Robert Bosch, "Bosch Automotive Handbook", 7th Edition, John Wiley & Sons.
[R3] Alternative Fuels: "Fuel Cells and Natural Gas-Society of Automotive Engineers", Incorporated, 600.
[R4] Thipse S. S, "Alternative Fuels: Concepts, Technologies and Developments"- Jaico Publishing House,

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

AUTOMOBILE REFRIGERATION & AIR CONDITIONING
(Core Elective-IV)

Paper Code: ETVAE-706	**L**	**T/P**	**C**
Paper: Automobile Refrigeration & Air Conditioning	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *Student should have studied subjects such as elements of automobile engineering and thermal engineering etc. This subject provides knowledge about refrigeration and air conditioning in automobiles. The student will be capable of performing handling, servicing and maintenance of these vehicles..*
Learning Outcomes: *After completion of the course, the student shall be able to- revise the fundamentals of applied thermodynamics and explain its application to refrigeration and air conditioning, analyze and distinguish the various systems and processes in refrigeration and air conditioning, compare important thermodynamic and environmental properties influencing refrigerant selection for various applications, select the refrigeration equipments for refrigeration and air conditioning system.*

UNIT-I

Refrigeration Principles of refrigeration, Performance parameters, Types of refrigeration systems, Study of simple Vapor compression refrigeration system, and System components, Applications of refrigeration- Need of transport refrigeration, introduction to food preservation, Types of transport refrigeration systems.

[T1, T2][No. of Hrs. 12]

UNIT-II

Refrigerants Definition, desired properties like thermodynamic, chemical & physical and classification. Selection of refrigerants, Effect on ozone depletion and global warming, introduction to alternative refrigerants.

[T1, T2][No. of Hrs. 11]

UNIT-III

Psychometric Psychometric properties of air, Use of Psychometric charts & tables, Representation, of psychometric processes on the chart such as heating and Cooling with humidification and dehumidification, adiabatic dehumidification, chemical dehumidification and mixing processes.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Air conditioner-Heating Systems Factors contributing the Cooling/ Heating in automobiles (car/bus). Concept of bypass factor, Sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF), summer, winter and year round air conditioning systems

[T1, T2][No. of Hrs. 11]

Text Book(s):

[T1] Arora, C.P., "Refrigeration & Air Conditioning", 2nd Edition, Tata McGraw Hill, 2013
[T2] William, H., Course, Donald, L., Anglin, "Automotive Air Conditioning", Tata McGraw Hill, 2012

Reference Book(s):

[R1] McQuiston, Parker and Spitler, Heating, "Automotive Air Conditioning, Analysis and Design", Wiley 6thEdition Wiley Student Edition.
[R2] Stoecker, W.F., "Refrigeration & Air Conditioning", 2nd Edition, Tata McGraw Hill, New York, 2009
[R3] Tom, Birch, "Automotive Heating and Air Conditioning", Prentice Hall, 2010
[R4] Mitchel Information Services, Inc., Mitchell, "Automatic Heating and Air Conditioning Systems", Prentice Hall, Inc., 2010

VEHICLE SAFETY ENGINEERING
(Core Elective-V)

Paper Code: ETVAE-708	**L**	**T/P**	**C**
Paper: Vehicle Safety Engineering	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *The main objective of this subject is to make the student able to understand vehicle safety. The pre-requisites for this subject is that he/she should have the basic study of automobile engineering and industrial management.*

Learning Outcomes: *This student will be able to work in transport organization in various capacities.*

UNIT –I

Automotive vehicle testing for Safety: Introduction to active & passive vehicle safety systems, occupant safety system- seat belts and belt tighteners, front air bag, side air bag, rollover protection system

[T1, T2][No. of Hrs.11]

UNIT –II

Braking test (asperIS11852-2001), ABS performance & Traction control test Seatbelt anchorage testing, Horn, lighting installation and mirror, test.

[T1, T2][No. of Hrs. 11]

UNIT –III

Collapsible steering column testing: Frontal crash test, side door intrusion, interior and exterior test. Body block test (S-11939-1996), Introduction to the offset, Frontal impact test (IS-11939-1996 & (ECE94), Lateral Impact (ECER95), AIS-029: Survival space for occupants, pedestrian protection test and other upcoming standards.

[T1, T2][No. of Hrs. 11]

UNIT –IV

Motor Vehicle Act (1988), Central Motor Vehicles Rules (1989) and subsequent amendments

[T1, T2][No. of Hrs. 12]

Text Book(s):

[T1] U.W. Seiffert M. Gonter, "Integrated Automotive Safety Handbook", SAE-International ISBN (978-07680-6437-7)

[T2] M.V. Act 1988 - Central Law Agency, Allahabad

Reference Book(s):

[R1] U. W. Seiffert M. Gonter, "Integrated Automotive Safety Handbook", Published by SAE-International ISBN (978-07680-6437-7)

[R2] Robert Bosch, "Bosch Automotive Handbook", 7th Edition, John Wiley & Sons.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

AUTOTRONICS
(Core Elective-V)

Paper Code: ETVAE-710	**L**	**T/P**	**C**
Paper: Autotronics	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question. No. 1 rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives and Pre-requisites: *The main objective of this subject is to make the student able to understand importance of electronics in an automobile. The pre requisites for this are that he/she should have the basic study of Physics, Basic programming, basic electrical and electronics, elements of automobile engineering automotive electrical and electronics systems, etc.*

Learning Outcomes: *The student will be able to get a respectable position in automobile industry and can be suitably self-employed.*

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.

[T1, T2][No. of Hrs. 11]

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.

[T1, T2][No. of Hrs. 12]

UNIT –III

Automotive Electronic Systems Electronic Ignition systems, Electronic injection systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, EPS

[T1, T2][No. of Hrs. 11]

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.

[T1, T2][No. of Hrs. 11]

Text Book(s):

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

[T2] William B. Riddens, "Understanding Automotive Electronics", 5thEdition, Butter Worth Heinemann Woburn, 1998.

Reference Book(s):

[R1] Bechhold, "Understanding Automotive Electronics", SAE- 1998.

[R2] Crouse, W. H., "Automobile Electrical Equipment", Tata Mc Graw Hill Book Co., Inc., New York, 3rd Edition.

[R3] Aditya P. Mathur, "Introduction to Microprocessors", 3rdEdition, Tata Mc Graw-Hill Publishing Co. Ltd., New Delhi, 1989.

ELECTRIC AND HYBRID VEHICLES LAB
(Core Elective-IV)

Paper Code: ETVAE-754	**L**	**T/P**	**C**
Paper: Electric and Hybrid Vehicles Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Study of hybrid vehicle.
2. Study of solar vehicle.
3. Study of an electric vehicle.
4. Study of fuel cell technology.
5. Study of regenerative braking system of a hybrid car.
6. Experiment on squirrel cage induction motor.
7. Study of lithium based batteries.
8. Study of Nickel based batteries.
9. Testing and maintenance of Lead Acid batteries.
10. Study of different Drivetrain structures.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

AUTOMOBILE REFRIGERATION & AIR CONDITIONING LAB
(Core Elective-IV)

Paper Code: ETVAE-756	**L**	**T/P**	**C**
Paper: Automobile Refrigeration & Air Conditioning Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Study of various methods of transport refrigeration systems.
2. Study components and layout of car & bus air conditioning systems.
3. Study of compressors used in automotive refrigeration and air-conditioning systems.
4. Study of condensers & Evaporators used in automotive refrigeration and air-conditioning system.
5. Study of expansion valves used in automotive refrigeration and air-conditioning systems
6. Study and demonstration of various controls in refrigeration (on refrigeration bench).
7. Trail on air conditioning system
8. Study and demonstration of air-conditioning charging methods.
9. Study and trial on vapor absorption system.
10. Study of defrosting methods.
11. Industrial visit to refrigeration or air-conditioning plant (Optional).

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

AUTOMOTIVE ELECTRICALS & ELECTRONIC SYSTEM LAB

Paper Code: ETVAE-752	**L**	**T/P**	**C**
Paper: Automotive Electricals & Electronic System Lab	**0**	**3**	**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Demonstration of automotive electrical and electronic systems layout.
2. Demonstration of battery charging & battery testing.
3. Demonstration and testing of alternators
4. Demonstration & testing of starting motors.
5. Demonstration of electronic ignition system
6. Demonstration of dash board panel instruments & controls.
7. Demonstration of headlight beam alignment.
8. Testing of auto electrical components on multifunction tester.
9. Testing of CDI coil, spark plug and armature.
10. Demonstration of microcontroller 8051
11. Demonstration of electric bike and hybrid vehicle.
12. Demonstration of ECU diagnostic system

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

MAJOR PROJECT

Paper Code: ETVAE-760	**L**	**T/P**	**C**
Paper: Major Project	**0**	**24**	**12**

Objectives*: The main aim of the major project shall be to:*

a) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.

b) Develop understanding of subject based knowledge given in the class room in the context of its application at work places

c) Develop first-hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.

d) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

Institute may establish close linkage with relevant organizations for providing such an experience with the use of its training placement division. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Project Lab has to be developed and nurtured. Various testing equipment such as non-destructive testing equipment, water analysis testing equipments etc., may be procured for enhancing project lab for the benefit of students. Also project works should be designed in such a way so that existing laboratories may be utilized optimally. Enhancement of project lab is a continuous process and need base up-gradations are necessary.
Students may choose a project based on any subject of Automobile Engineering. The students will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format.

The project work will be a design project for possible implementation of project including field surveying a computer oriented project on any of the topics of Automobile engineering interest. It will be a group project. The topic of the project preferably different from the minor project or extension of the same.

The assessment of the project will be done at the end of the semester by a departmental committee consisting of 3-4 faculty members/experts specialized in various fields of Automobile Engineering. The students will present their project work before the committee. The complete project report is to be submitted prior to the practical exams of 6th semester. However, an interim report based on the work carried out will have to be submitted by the students within two weeks of first mid semester exam of 8thSemester to the Project Guides based on the Assessment after submission of interim report, but prior to commencement of Theory/Practical exams.

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