

# SCHEME OF EXAMINATION

And

## SYLLABI

for

### **BRIDGE COURSE (Automobile) LEVEL IV SKILL COMPONENT**

Offered by

**University School of Engineering and Technology**

**1<sup>st</sup> SEMESTER to 2<sup>nd</sup> SEMESTER**



**GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY**

**Guru Gobind Singh Indraprastha University  
Sector 16-C, Dwarka, Delhi – 110078 [INDIA]**

**[www.ipu.ac.in](http://www.ipu.ac.in)**

**NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC**

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

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## BACHELOR OF VOCATION IN AUTOMOBILE COURSE PREAMBLE

**Preamble:** Indian Automobile industry is one of the competitive manufacturer and exporter of automobiles in the various segments. The automobile industry comprises of a large number of automobile original components provider for the automobile manufacturers as well as to the spare parts market. In India at present there are 3 or 4 main automobile clusters in and around the following cities and regions.

- i) Chennai
- ii) Mumbai & Pune
- iii) Delhi NCR
- iv) Gurgaon, Manesar & Noida

The automobile industry is very much in need of educated and trained man power in automobile discipline. The B.Voc program caters to this need of the industry by providing well educated and trained automobile Graduates. The Automobile vocational program provides students with theoretical knowledge and practical training to install, service, maintain and update Automobile systems. Upon successful completion of the program, the graduate will receive a University Diploma, Advance Diploma & Bachelor Degree in 01 year, 02 years and 03 years respectively. The vocational learning outcomes articulate a range of skills necessary for entry level positions in the automobile industry. Graduates of the program may obtain employment as senior technicians/ Supervisor/Manager. Employment may also occur in sales, design, technical support, or as maintenance personnel in residential, commercial, institutional, and industrial settings.

### **Aims & Objectives: Adequate Skilling in Automobile Field:**

Skill Categories to capture essential skills, the following six categories define the important areas where graduates must demonstrate skills and knowledge.

1. Communication
2. Numeracy
3. Critical Thinking & Problem Solving
4. Information Management
5. Interpersonal
6. Personal

All graduates of Automobile become a senior technicians /Supervisor/Manager with Bachelor degree at par with other Graduation programs of the University. The programs of instruction must have achieved the 3 vocational learning outcomes to provide better employability skills and to develop Entrepreneur skills in the areas of Automobiles

### **Program Structure:**

i) Diploma in Automobile	Duration	01 Year
ii) Advance Diploma in Automobile	Duration	02 Year
iii) Bachelor of Vocation in Automobile	Duration	03 Year

Scheme and Syllabi for B. Voc., (Automobile), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31<sup>st</sup> July, 2015.

**Program Outcome:****a) Outcome of first year:**

1. Work safely and in accordance with all applicable acts, regulations, legislation, and codes to ensure personal and public safety.
2. Select and use a variety of Automobile tools and equipment safely and properly.
3. Operate power and service tools safely and properly including and not limited to car washer, Hydraulic hoist, oil dispenser, power drills, screw guns, material lifts, and man lifts operate and read test instruments including and not limited to vacuum gauge, compression gauge, spark plug tester, multi meter.
4. Operate maintenance tools safely and correctly the grease guns, manual oilers, lubrication equipment.

**b) Outcome of Second year:**

1. Solve math and applied science problems required to effectively measure the wear and tear in the automobile components so that decision can be taken about the serviceability of a component.
2. Prepare and interpret Automobile Engineering drawings.
3. Identify and prioritize tasks assigned by supervisors and report on activities completed.
4. Communicate in written, graphic, and oral forms to provide an appropriate degree of detail and accuracy
5. Employ strategies for good customer relations that build on respect and integrity
6. Apply writing, speaking, and listening skills to develop and strengthen relationships within the field
7. Summarize and communicate technical information for supervisors, coworkers, and customers.
8. Clarify repair and reconditioning project specifications accurately from graphic and written data that may include sketches, drawings, tables, and plans.
9. Identify the problems in the various systems of automobiles; devise the rectification of these problems by repairs, reconditioning or replacement of the components.

**c) Outcome of third year:**

1. Relate effectively to automobile supervisors, coworkers, and customers.
2. Install, service, and troubleshoot automobile systems, and associated components.
3. Develop strategies for ongoing personal and professional development that will lead to enhanced work performance and career opportunities, and keep pace with industry changes.
4. Interpret numerical information for supervisors, coworkers, and customers.
5. Comply with occupational expectations related to appearance and hygiene.

**BACHELOR OF VOCATION  
AUTOMOBILE  
BRIDGE COURSE FOR (10+2 PCM)/10+ITI STUDENTS  
(FIRST SEMESTER EXAMINATION)**

Paper Code	Paper ID	Course Name	L/T	P	Credits
ETVAE-401		Automobile Vehicle Service	4	0	4
ETVAE-451		Automobile Vehicle Service Lab	0	8	8
<b>TOTAL</b>					<b>12</b>

No. of hours: 12 x 15 =180

**BACHELOR OF VOCATION  
AUTOMOBILE  
BRIDGE COURSE FOR (10+2 PCM)/10+ITI STUDENTS  
(SECOND SEMESTER EXAMINATION)**

Paper Code	Paper ID	Course Name	L/T	P	Credits
ETVAE-402		Automotive Electrical Repair	4	0	4
ETVAE-452		Automotive Electrical Repair Lab	0	8	8
<b>TOTAL</b>					<b>12</b>

No. of hours: 12 x 15 =180

**Note:** The students are advised to mandatorily complete the bridge course along with LEVEL-V regular course. The credits earned are of qualifying nature and should be completed within four semesters (2 years) for obtaining Diploma/Advanced Diploma/ B. Voc Degree, as a pre-requisite. A certificate to this affect shall be issued by the Principal/Director of affiliated Institutes to be submitted to COE. NSQF LEVEL-IV certification may be done through the respective agencies involved.

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**AUTOMOBILE VEHICLE SERVICE**

**Paper Code: ETVAE-401**  
**Paper: Automobile Vehicle Service**

L	T/P	C
4	0	4

**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.

**Objectives and Pre-requisites:** This subject provides a basic knowledge about the automobile power unit, transmission system, braking system and wheel & tyres. Students should have studied subjects such as General Science, Physics, Mathematics etc. to have an exposure about automobile.

**Learning Outcomes:** The student will be able to understand the construction, function and working of individual component and the system in which it functions. The student will also be able to understand the need of maintenance service to prevent or remove the defects that may come up.

**UNIT-I**

**Automobile Chassis:** Introduction to automobiles, their utility and classification. Main components of an automobile, their constructional details, functions and working. Various mechanisms and systems in an automobile, their working and possible causes of defects. Scheduled and preventive maintenance. Servicing washing and polishing of a vehicle.

**[T1, T2][No. of Hrs. 08]****UNIT-II**

**Engine System:** Automobile engine, its main components, their construction and working. Types of engines – two stroke/ four stroke cycle, petrol / diesel fuel. Engine cooling system, lubrication system. Spark ignition system, petrol fuel injection system, diesel fuel injection system. Engine oil change, oil filter replacement. Servicing of all engine system components.

**[T1, T2][No. of Hrs.08]****UNIT-III**

**Transmission System:** Function and working of single and multi plate clutches. Clutch pedal/lever adjustment. Servicing, testing and adjustment of clutch unit. Construction, function and working of a gearbox. Synchromesh types of gearbox. Manual shifting and automatic transmission. Troubles in gear box, rectifications and servicing.

**[T1, T2][No. of Hrs.08]****UNIT-IV****Steering System:**

Function of steering system. Types of steering systems. Components of steering system- steering linkage, steering gear. Manual and power steering. Rack and pinion type power steering. Steering geometry and wheel alignment. Servicing and adjustments of steering system.

**[T1, T2][No. of Hrs. 08]****UNIT-V**

**Suspension System:** Suspension system, its function, types and components. Independent suspension system, springs and shock absorbers. Macpherson Strut type of suspension system. Checking for defects and servicing the suspension system.

**[T1, T2][No. of Hrs.08]****UNIT-VI**

**Braking System:** Function and principles of braking system, classification of various brakes used in automobiles, Constructional details and working of mechanical, hydraulic, pneumatic, air-assisted hydraulic brake, disc brakes, parking brake; braking distances, speed, road conditions.

**[T1, T2] [No. of Hrs. 08]****UNIT-VII**

**Wheel and Tyres:** Types of wheels/rim, constructional details etc., constructional features of different types of tyres, Tyres specifications, Causes of tyre wear and their remedies, Effect of air pressure in tyre on vehicle performance. Tyre maintenance, Tyre retreading.

**[T1, T2][No. of Hrs.08]****Text Book(s):**

Scheme and Syllabi for B. Voc., (Automobile), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31<sup>st</sup> July, 2015.

- [T1] R. K. Singhal, "Automobile Engineering", S. K. Kataria & Sons, New Delhi  
 [T2] K. K. Ramalingam, "Automobile Engineering", Scitech Publication, Chennai

**Reference Book(s):**

- [R1] James D. Halderman, Chase D. Mitchell, Jr. "Automotive Engines – Theory and Servicing" by Pearson Publishers  
 [R2] Jack Erjavec, "Automotive Technology- A Systems Approach" by Thomson Delmar Learning Publishers, Singapore  
 [R3] S Srinivasan, "Automotive Mechanics" by McGraw Hill, New Delhi  
 [R4] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Ed., Routledge (T&F Group) Publications.



**AUTOMOBILE VEHICLE SERVICE LAB****Paper Code: ETVAE-451****Paper: Automobile Vehicle Service Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>8</b>	<b>8</b>

**List of Experiments:**

1. Safe working practices in workshop
2. Use of various servicing tools and equipment
3. Washing and servicing of a car
4. Inspection of an engine and fluids top up
5. Handling and use of general and special tools used in automobile servicing
6. Handling and use measuring tools and instruments- feeler gauge, calipers and micrometer
7. Compression and vacuum test of an engine
8. Clutch unit testing and adjustments
9. Gear operation testing and adjustments
10. Steering system servicing and adjustments
11. Wheel alignment testing and adjustments
12. Servicing of differential unit and its adjustments
13. Suspension system testing and servicing
14. Testing of hub, wheel, tyre and their servicing
15. Testing, servicing and adjustment of brake system

**Note-** Faculty concerned is advised to deliver a lecture on topic to be covered including the procedure to perform the job, use of different tools and safety precautions thereof.

**Text Book(s):**

- [T1] R. K. Singhal, "Automobile Engineering", S. K. Kataria & Sons, New Delhi  
 [T2] K. K. Ramalingam, "Automobile Engineering", Scitech Publication, Chennai

**Reference Book(s):**

- [R1] James D. Halderman, Chase D. Mitchell, Jr. "Automotive Engines – Theory and Servicing" by Pearson Publishers  
 [R2] Jack Erjavec, "Automotive Technology- A Systems Approach" by Thomson Delmar Learning Publishers, Singapore  
 [R3] S Srinivasan, "Automotive Mechanics" by McGraw Hill, New Delhi  
 [R4] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Ed., Routledge (T&F Group) Publications.



### **AUTOMOTIVE ELECTRICAL REPAIRS**

**Paper Code: ETVAE-402**  
**Paper: Automotive Electrical Repairs**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>4</b>

#### **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.

***Objectives and Pre-requisites:** This subject provides knowledge about the working principles of automotive electrical and electronic system. This will help the students to understand the working of various electrical and electronic components in an automobile, the possible causes of defects and their repairs. The students should have studied subjects such as general science, physics and mathematics so that they can understand the working of the system components and possible reasons of defects.*

***Learning Outcomes:** The students will be able to understand the working of the system components, possible causes of defects and their repairs.*

#### **UNIT-I**

**Automobile Electrical System:** The automobile direct current (DC), 12 Volt, vehicle body earth returns electrical system. Basic circuits of automotive electrical system. Automotive wiring. Low-tension and high-tension cables. Colour coding of wires. Electrical symbols.

[T1, T2][No. of Hrs.08]

#### **UNIT-II**

**Battery:** Lead-acid type battery. Working, materials, battery ratings, battery testing, battery chargers, battery defects, battery maintenance.

[T1, T2][No. of Hrs.08]

#### **UNIT III**

**Charging System:** Components of charging system and their functions. Construction and working of alternator and cutout-relay. Regulators for alternators. Voltage regulators. Maintenance of charging system.

[T1, T2][No. of Hrs.08]

#### **UNIT-IV**

**Starting System:** Construction, function and working of starting motor, starter switches and starter drives. Types of starting motors, drives and switches. Service and maintenance of starter motor.

[T1, T2][No. of Hrs.08]

#### **UNIT-V**

**Ignition System:** Types of ignition system. Electronic, transistorized coil ignition system (TCI), capacitive discharge ignition system (CDI). Ignition system testing- ammeter test, voltmeter test and resistant test for finding faults in ignition system, Spark plug testing, ignition timing testing and setting.

[T1, T2][No. of Hrs.08]

#### **UNIT-VI**

**Lighting System:** Various types of lighting lamps and bulbs in an automobile. Construction, function of various components and working of head lamp, side light, stop light, tail light, indicator light etc. Lighting switches, relays, fuses, wiring harness cables and connectors. Adjustment of headlights. Maintenance and fault rectification in lighting system.

[T1, T2][No. of Hrs.08]

#### **UNIT-VII**

##### **Electrical Accessories:**

Construction, function and working of gauges and meters – fuel gauge, temperature gauge, oil pressure gauge, speedometer, windscreen wiper, horn and relay. Indicators and warning lights. Faults in electrical accessories and their rectification.

[T1, T2][No. of Hrs.08]

#### **Text Book(s):**

- [T1] Raj Kumar Chouhan “Automotive Electrical & Electronics Equipments”, Ishan Publications  
 [T2] P.L. Kohli, “Automotive Electrical Equipments” McGraw Hill, New Delhi

**Reference Book(s):**

- [R1] Jack Erjavec, “Automotive Technology- A Systems Approach” Thomson Delmar Learning Publishers, Singapore
- [R2] Anil Chhikara, “Automobile Engineering” Vol.2 Satya Prakashan, New Delhi
- [R3] Tom Denton, “Automobile Electrical and Electronics Systems” Indian Ed., Routledge (T&F Group) Publications



**AUTOMOTIVE ELECTRICAL REPAIRS LAB****Paper Code: ETVAE-452****Paper: Automotive Electrical Repairs Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>8</b>	<b>8</b>

**List of Experiments:**

1. Safe working practices in electrical repairs lab
  2. Inspection of electrical components in an automobile
  3. Practice on use of general tools of electrical repairs
  4. Use of measuring instruments – hydrometer, multi meter, timing light
  5. Battery testing and its maintenance and charging
  6. Testing of alternator and its servicing
  7. Starter motor testing and servicing
  8. Testing all electrical light lamps and switches for proper functioning
  9. Testing the ignition system components for proper functioning and their servicing
  10. Testing the ignition timing and adjustments, as specified
  11. Checking indication lights and instruments on the dashboard
  12. Checking wind shield wiper and other auxiliary systems for proper functioning and their service
- Faculty concerned is advised to deliver a lecture on topic to be covered including the procedure to perform the job, use of different tools and safety precautions thereof.

**Text Book(s):**

- [T1] Anil Chhikara, “Automobile Engineering” Vol.2, Satya Prakashan, New Delhi  
 [T2] K.K. Ramalingam, “Automobile Engineering”, Scitech Publication, Chennai  
 [T3] S Srinivasan, “Automotive Mechanics”, McGraw Hill, New Delhi  
 [T4] P.L. Kohli, “Automotive Electrical Equipments”, McGraw Hill, New Delhi

**Reference Book(s):**

- [R1] Jack Erjavec, “Automotive Technology”, Thomson Delmar Learning Publishers, Singapore  
 [R2] Tom Denton, “Automobile Electrical and Electronics Systems” Indian Ed., Routledge (T&F Group) Publications  
 [R3] Tom Denton, “Advance Fault Diagnosis” Indian Ed., Routledge (T&F Group) Publications

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Sector 16-C, Dwarka, Delhi – 110078 [INDIA]****[www.ipu.ac.in](http://www.ipu.ac.in)**

**BACHELOR OF VOCATION  
(AUTOMOBILE)  
FIRST SEMESTER EXAMINATION  
(LEVEL-V)**

Paper Code	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETVAE-501		Elements of Automobile Engineering	3	1	4
ETVAE-503		Manufacturing Technology	2	1	3
ETVHS-519		Communication Skills (Common to all disciplines)	2	1	3
<b>OPEN ELECTIVE-I (Select any one)</b>					
ETVAE-505		Basics of Electrical & Electronic Engineering	3	0	3
ETVAE-507		Urban Transport Requirement & Planning	3	0	3
<b>GENERAL ELECTIVE-I (Select any one)</b>					
ETVHS-513		Human Values and Professional Ethics	2	1	2
ETVHS-515		Life Skills	2	0	2
ETVHS-517		Personality Development & Behavioural Science	2	0	2
<b>PRACTICAL/VIVA VOCE (Select any one Lab based on OPEN ELECTIVE-I)</b>					
ETVAE-555		Basics of Electrical & Electronic Engineering Lab	0	3	3
ETVAE-557		Case Study-Urban Transport Requirement & Planning Lab	0	3	3
<b>PRACTICAL/VIVA VOCE</b>					
ETVAE-551		Elements of Automobile Engineering Lab	0	3	3
ETVAE-553		Manufacturing Technology Lab	0	3	3
ETVCS-559		Basic Programming Lab (Common to all disciplines except MC,SD, CT)	0	2	2
ETVAE-561		Vocation Workshop	0	4	4
<b>TOTAL</b>			<b>12</b>	<b>19</b>	<b>30</b>

**^Industrial Training-I:**

The students are advised to undergo two weeks training in house/industry/ Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) during winter Vacation and should submit training report for evaluation during the second semester.

**\*\*General Elective –II (Select any One):**

**NCC, NSS, YOGA, Sports, Community Services, ECO Club**

**Note:** The student can opt to take General Elective-II during the first to fifth semesters and can earn credits and /or certificate as per the requirements of the course opted for during the fifth semester. *The camps or classes for the said programme can be held either during weekend/holidays or winter/summer Vacations. If in case, the classes are held during Saturday/Sunday then faculty should be given off in lieu of Saturday/Sunday.* Those students who complete General Electives-II shall be given certificate if they opt out of the programme taking Diploma/Advanced Diploma.

**Note for Project Work:**

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.

**Note:**

**It is very important to decide the General Elective(s), Core Elective(s) and Open Elective(s) to be offered in the next semester well before the completion of current semester. General/Core/Open Elective Paper(s) will be floated if about 50% (Not Less than 1/3<sup>rd</sup>) of the total students opt for the same in each case.**



**BACHELOR OF VOCATION  
(AUTOMOBILE)  
SECOND SEMESTER EXAMINATION  
(LEVEL-V)**

Paper Code	Paper ID	Paper	L	T/P	Credits
<b>THEORY PAPERS</b>					
ETVAE-502		Engineering Materials & Mechanics of Solids	3	1	4
ETVAE-504		Automobile Servicing and Maintenance	3	0	3
ETVEN-502		Environmental Science (Common to all disciplines)	3	0	3
<b>OPEN ELECTIVE-II (Select any one)</b>					
ETVAE-506		Elements of Fluid Mechanics & Machines	3	0	3
ETVAE-508		Elements of Aesthetics Design of Devices	3	0	3
<b>PRACTICAL/VIVA VOCE (Select any one Lab based on OPEN ELECTIVE-II)</b>					
ETVAE-556		Elements of Fluid Mechanics & Machines Lab	0	2	2
ETVAE-558		Elements of Aesthetics Design of Devices Lab	0	2	2
<b>PRACTICAL/VIVA VOCE</b>					
ETVAE-552		Engineering Materials & Mechanics of Solids Lab	0	2	2
ETVAE-554		Automobile Servicing & Maintenance Lab	0	3	3
ETVEN-552		Environmental Science Lab / Field work (Common to all disciplines)	0	2	2
ETVAE-560		Project-I	0	3	3
ETVAE-562		Industrial Training-I <sup>^</sup>	0	0	2
ETVAE-564		Graphics For Automobile Engineering	1	3	4
<b>TOTAL</b>			<b>13</b>	<b>16</b>	<b>31</b>

**^^Industrial Training-II:**

The students are advised to undergo 6-8 weeks training in industry/ Skill Knowledge Provider (SKP)/ Sector Skill Council (SSC) during summer Vacation and should submit training report for evaluation during the Third semester and credits will be posted during third semester.

**Note for Project:**

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.

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## ELEMENTS OF AUTOMOBILE ENGINEERING

**Paper Code: ETVAE-501**

**Paper: Elements of Automobile Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>4</b>

### **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.

**Objectives and Pre-requisites:** Student should have studied subjects such as General Science, Physics, Mathematics and have the basic knowledge about automobile to have an enhanced exposure. This subject provides knowledge about the elements of automobile engineering.

**Learning Outcomes:** This knowledge will be helpful to the student in co-relating various systems with each other and understanding the individual system in a better manner.

### **UNIT-I**

**Introduction:** Classification of automobiles- according to number of wheels, propulsion systems, transmission drives, type of fuels, application & capacity, study of main specifications. Components of an automobile- functions & layout of frame, frameless construction, axles, steering system, suspension system, braking system, power train & drives, clutch, gear box, final drive, propeller shaft, u-joints, vehicle body, wheels, tyres & tubes.

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

### **UNIT-II**

**Power Unit:** Selection of engine for two wheeler, three wheeler & four wheeler vehicles; constructional & working details of two strokes & four stroke petrol & diesel engines, fuel system, ignition system, starting system, charging system, lighting system, cooling system, lubrication system, combustion & combustion chambers.

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

### **UNIT-III**

**Steering System and Suspension System:** Steering system- requirements, front axle details & steering geometry, castor, camber, toe in, toe out steering axis inclination, steering linkages, and different types of steering gear boxes, their constructional & working details. Concept and working of power steering. Need, types of suspension systems, constructional details, characteristics of laminated, coil springs. Introduction to independent suspension, front & rear suspension systems of the vehicle, shock absorbers.

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

### **UNIT-IV**

**Wheels, Tyres & Braking System:** Wheel requirements, types of wheels, their constructional & working details, rims & tyres, types of tyres, tyre selection, ordinary, radial tyres tubeless tyres, their constructional details, comparison & application, wheel balancing. Need and classification of brakes, drum brakes and disc brakes, constructional & working details, introduction to hydraulic brake, parking brake, vacuum assisted hydraulic brakes, air assisted hydraulic brakes, air brakes, leading & trailing brake shoes, self energizing brakes & ABS, working of master cylinder, wheel cylinders, tandem master cylinder, characteristics of brake fluid.

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

### **Text Book(s):**

- [T1] K.K. Ramalingam, "Automobile Engineering", Scitech Publication, Chennai
- [T2] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Ed., Routledge(T&F Group)Pub
- [T3] P.L. Kohli, "Automotive Chassis & Body", Tata McGraw Hill, New Delhi

### **Reference Book(s):**

- [R1] Newton Steeds and Garrot "Motor Vehicles", Butterworths, London.
- [R2] Judge A.W, "Mechanism of the Car", Chapman and Halls Ltd., London.
- [R3] Crouse W.H, "Automotive Chassis and Body", McGraw –Hill, New York.
- [R4] K.K. Jain, R.B. Asthana, "Automobile Engineering", Tata McGraw Hill, New Delhi
- [R4] Dr. Kirpal Singh, "Automobile Engineering (Vol-1)", Standard Publisher Distributors.

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## MANUFACTURING TECHNOLOGY

**Paper Code: ETVAE-503**  
**Paper: Manufacturing Technology**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>3</b>

### **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.

**Objectives and Pre-requisites:** Students should have studied subjects such as General Science, Physics, chemistry etc. and have the basic awareness of manufacturing products used in everyday life. This subject provides knowledge about different manufacturing processes viz, casting, welding, sheet metal work, metal forming and latest technology as powder metallurgy.

**Learning Outcomes:** This knowledge will be helpful to the student in understanding the manufacturing processes involved in production of different automobile components.

### **UNIT-I**

**Casting Processes:** Principles of metal casting, pattern materials, type of patterns and allowance; study of moulding sand, moulding tools, moulding materials, classification of moulds, core, elements of gating and rising system, Casting defects, description and operation of cupola: special casting processes e.g. die casting, Permanent mould casting, centrifugal casting, investment casting.

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

### **UNIT-II**

**Welding & Metal Joining:** Classification of welding processes - Principles and equipments used in the following Processes - Gas Welding - Oxyacetylene gas welding, equipments and field of application. Arc Welding - Metal Arc, Carbon Arc, Submerged Arc and Atomic Hydrogen welding. Resistance Welding - Spot, Seam, Butt, Percussion Welding; Thermit welding – Soldering, Brazing. Standard welding symbol, Flux: Composition, Properties and Function; Electrodes, Types of Joints and Edge Preparation, Brazing and Soldering.

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

### **UNIT-III**

**Sheet Metal Work:** Common Processes, tools and equipments; metals used for sheets, Standard Specification for Sheets, Spinning, Bending, Embossing and Coining.

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

### **UNIT- IV**

**Metal Forming and Powder Metallurgy:** Basic Concepts and Classification of Forming Processes – Principles-Equipment used and Application of Following Processes-Forging, Rolling, Extrusion, Wire Drawing, Spinning. Powder Metallurgy steps involved and applications.

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

### **Text Book(s):**

- [T1] Campbell J. S., “Principles of Manufacturing Materials & Processes”, Tata Mc-Graw Hill Pvt. Ltd.  
 [T2] Ghosh A; Mallik A.K., “Manufacturing Science”, Affiliated East-West Press Pvt. Ltd., New Delhi.

### **Reference Book(s):**

- [R1] K.P. Sinha, D.B. Goel, “Foundry Technology”, Roorkee Publishing House.  
 [R2] Richard L. Little, “Welding and Welding Technology”, Tata McGraw Hill Ltd.  
 [R3] Rosenthal, “Principle of Metal Casting”, Tata McGraw Hill, New Delhi.  
 [R4] Ostwald Phillip F., Munoz Jairo, “Manufacturing Processes and Systems”, John Wiley & Sons.  
 [R5] P.N. Rao, “Manufacturing Technology-Foundry, Forming and Welding”, Tata McGraw Hill.  
 [R6] B.S. Nagendra Parasher, RK Mittal, “Elements of Manufacturing Processes”, Prantice Hall India ND

**COMMUNICATION SKILLS**  
**(Common to All Disciplines)**

**Paper Code: ETVHS-519**  
**Paper: Communication Skills**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>3</b>

**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.

**Objectives and Pre-requisites:** Students should have studied General English up to secondary level and the subject aims at developing communication skills in writing, speaking as well as body language.

**Learning Outcomes:** The students should be able to communicate effectively to his/her superiors as well as juniors at work place in his/her professional field.

**UNIT-I**

Recognizing and Understanding Communication Styles: What is Communication?, Passive Communication, Aggressive Communication, Passive-Aggressive Communication, Assertive Communication, Verbal and Non Verbal Communication, Barriers and Gateways to Communication.

[T1, T2][No. of Hrs. 08]

**UNIT-II**

**Listening Skills:** Types of Listening (theory /definition), Tips for Effective Listening Academic Listening- (lecturing), Listening to Talks and Presentations, Basics of Telephone communication

**Writing Skills:** Standard Business letter, Report writing, Email drafting and Etiquettes, Preparing Agenda and writing minutes for meetings, Making notes on Business conversations, Effective use of SMS, Case writing and Documentation.

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

**UNIT-III**

**Soft Skills:** Empathy (Understanding of someone else point of view), Intrapersonal skills, Interpersonal skills, Negotiation skills, Cultural Aspects of Communication.

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

**UNIT-IV**

**Group Communication:** The Basics of Group Dynamics, Group Interaction and Communication, How to Be Effective in Groups, Handling Miscommunication, Handling Disagreements and Conflicts, Constructive Criticism.

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

**Text Book(s):**

[T1] Mckay, M., Davis, M. & Fanning, P.(2008). Messages: The Communication Skills Book, New Harbinger Publications

[T2] Perkins, P.S., & Brown, L. (2008). The Art and Science of Communication: Tools for effective communication in the workplace, John Wiley and Sons

**Reference Book(s):**

[R1] Krizan et al (2010). Effective Business Communication, Cengage Learning.

[R2] Scot, O. (2009). Contemporary Business Communication, Biztantra, New Delhi.

[R3] Chaney & Martin (2009). Intercultural Business Communication, Pearson Education

[R4] Penrose et al (2009). Business Communication for Managers, Cengage Learning.



**BASIC OF ELECTRICAL & ELECTRONICS ENGINEERING**  
**(Open Elective-I)**

**Paper Code: ETVAE-505**

**Paper: Basic of Electrical & Electronics Engineering**

<b>L</b>	<b>T/P</b>	<b>C</b>
3	0	3

**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.

**Objectives and Pre-requisites:** Student should have studied subjects such as Physics, General Science and Mathematics. This subject provides knowledge of different principals of electrical engineering, basic idea of different electronic components, semi conducting devices, transducers and digital electronics used in the industry.

**Learning Outcomes:** This knowledge will be helpful to the student in co-relating electrical engineering fundamentals and basic knowledge of electronics to the application in automobiles and industry in general.

**UNIT-I**

**Fundamentals of DC & AC Circuits:** Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchhoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division. Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phase or representation, Introduction to three phase systems - types of connections, relationship between line and phase values. Introduction to magnetic circuits-Simple magnetic circuits-Faraday's laws, induced emfs and inductances.

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

**UNIT-II**

**Electrical Machines & Measuring Instruments:** Working principle, construction and applications of DC machines and AC machines, transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors. Basic principles and classification of instruments-Moving coil and moving iron instruments.

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

**UNIT-III**

**Electronic Components & Semiconductor Devices:** Resistors, capacitors & inductors (properties, common types, I-V relationship and uses), Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell)

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

**UNIT-IV**

**Transducers & Digital Electronics:** Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

**Number systems:** binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

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

**Text Book(s):**

- [T1] Dash S.S, Subramani C, Vijayakumar K, "Basic Electrical Engineering", First Edition, Vijay Nicole Imprints Pvt. Ltd
- [T2] Thyagarajan T, SendurChelvi K.P, Rangaswamy T.R, "Basic Electronics Engineering", Third Edition New Age International,
- [T3] Somanathan Nair B, Deepa S.R, "Basic Electronics", I.K. International Pvt. Ltd.



**Reference Book(s):**

- [R1] Smarajit Ghosh, “Fundamentals of Electrical & Electronics Engineering”, Second Edition, PHI Learning
- [R2] Metha V.K, Rohit Metha, “Basic Electrical Engineering”, Fifth Edition, S. Chand & Co
- [R3] Kothari D. P. and Nagrath I. J., “Basic Electrical Engineering”, Second Edition, Tata McGraw-Hill
- [R4] Bhattacharya S. K, “Basic Electrical and Electronics Engineering”, First Edition, Pearson Education.
- [R5] Thomas L. Floyd, “Electronic Devices”, Ninth Edition, Pearson Education.
- [R6] Rajput R.K, “Basic Electrical and Electronics Engineering”, First Edition, Laxmi Publications.



**URBAN TRANSPORTATION REQUIREMENT & PLANNING**  
**(Open Elective-I)**

**Paper Code: ETVAE-507**

**Paper: Urban Transportation Requirement & Planning**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**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.

**Objectives and Pre-requisites:** Student should have studied subjects such as Physics, General Science and Mathematics. This subject provides knowledge of different principals of electrical engineering, basic idea of different electronic components, semi conducting devices, transducers and digital electronics used in the industry. The objective of this subject is to make the student understand the transportation requirement in the urban areas and to be aware of the basics of planning. The student should have basic knowledge about street, road and highways.

**Learning Outcomes:** The student after studying this subject should be able to plan the transportation and should be able to design the roads or pathways accordingly.

**UNIT-I**

**Introduction & Urban Transportation System Planning:** Role of transportation in urban development, Transportation problems in urban areas, Purpose of transportation planning, Transportation planning process and factors affecting it, Travel demand and factors affecting it, Urban transport forecasting.

[T1][No. of Hrs. 10]

**UNIT II**

**Transportation Plan Preparation:** Definitions: corridor, corridor traffic forecasting, corridor traffic study, count, segment, point, segment capacity, screen line, Corridor identification, Mass transit system, Urban mass rapid transit system, Rail based transit – Metro, Light rail transit system (LRT), Mono rail, Sky rail, Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City Bus.

[T1][No. of Hrs. 12]

**UNIT-III**

**Traffic Management and Control:** Traffic Management measures; Arterial Management; Traffic Signs - principles, types and design considerations, road markings; Traffic Signals - types, optimal cycle length and signal settings, warrants; Regulation of Traffic - speed regulation, regulation of vehicle, parking regulations.

[T1][No. of Hrs. 11]

**UNIT-IV**

**Transport and Environment:** Traffic noise - factors affecting noise, abatement measures, standards; air pollution - factors affecting air pollution levels, abatement measures, standards; Traffic Safety- accident reporting and recording systems, factors affecting road safety; Transport Planning for Target groups - Children, adults, handicapped and women; Norms and Guidelines for highway landscape.

[T1][No. of Hrs. 12]

**Text Book(s):**

[T1] Kadiyali, L. R., "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi

**Reference Book(s):**

- [R1] Hutchison, B. G., "Introduction to Transportation Engineering and Planning", Tata McGraw-Hill Pvt. Ltd.
- [R2] Morlok, Edward K., "Introduction to Transportation Engineering and Planning", Tata McGraw-Hill Pvt. Ltd.
- [R3] Vuchic, Vukan R., "Urban Public Transit System and Technology", PHI Learning, New Delhi
- [R4] Dickey, John W., "Metropolitan Transportation Planning", Tata McGraw-Hill Pvt. Ltd

**HUMAN VALUES & PROFESSIONAL ETHICS**  
**(General Elective-I)**

**Paper Code: ETVHS-513**

**Paper : Human Values & Professional Ethics**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>2</b>	<b>1</b>	<b>2</b>

Non-University Examination Scheme (NUES)

Note: There will be no End-Term External University Examination. Marks are to be given on the basis of two internal sessional test of 30 marks each and one final Viva-voce project report Examination of 40 marks.

**Objectives:**

*This introductory course input is intended*

- a. *To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
- b. *To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.*
- c. *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.*

**UNIT-1: Introduction to Value Education**

1. Understanding the need, basic guidelines, content and process for value education.
2. Basic Human Aspirations: Prosperity and happiness
3. Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
4. Practice Session – 1.

[T1], [R1], [R4][No. of Hrs. 07]

**UNIT-2: Harmony in the Human Being**

1. Co-existence of the sentient "I" and the material body–understanding their needs–Happiness & Conveniences.
2. Understanding the Harmony of "I" with the body–Correct appraisal of physical needs and the meaning of prosperity.
3. Programme to ensure harmony of "I" and Body-Mental and Physical health and happiness.
4. Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.
5. Understanding society and nation as extensions of family and society respectively.
6. Practice Session – 02

[T2], [R1],[R2][No. of Hrs. 08]

**UNIT-3: Basics of Professional Ethics**

1. **Ethical Human Conduct** – based on acceptance of basic human values.
2. **Humanistic Constitution and universal human order** – skills, sincerity and fidelity.
3. **To identify the scope and characteristics of people** – friendly and eco-friendly production system, Technologies and management systems.
4. Practice Session – 03.

[T1],[R4] [No. of Hrs. 07]

**UNIT-4: Professional Ethics in practice**

1. **Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.
2. **Engineering Profession and Ethics** - Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
3. **Professional Responsibilities** – Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing
4. Practice Session – 04

[T1], [T2], [T3], [R3][No. of Hrs. 08]

**Text Books:**

- [T1] Professional Ethics, R. Subramanian, Oxford University Press.
- [T2] Professional Ethics & Human Values: [Subhash Bhalchandra Gogate](#), Vikas publication
- [T3] Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.
- [T4] Professional Ethics & Human Values: S.B. Srivastha, SciTech Publications (India) Pvt. Ltd. New Delhi.

**References:**

- [R1] Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMARTstudent.
- [R2] Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzinger, School of Engineering, University of California, Irvine.
- [R3] Human Values: A. N. Tripathy (2003, New Age International Publishers)
- [R4] Value Education website, <http://www.universalhumanvalues.info>[16]
- [R5] Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.
- [R6] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers' Manual by the same author.

**\*PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS** will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi. )

**CONTENT OF PRACTICE SESSION****Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education**

**PS-1:** Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

**Expected Outcome:**

The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

**PS-2:** Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man-made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?

On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

**Expected Outcome:**

The students start finding out that technical education with study of human values can generate more solutions than problems. They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

**PS-3:** 1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following:

- a) What is naturally acceptable to you in relationship – feeling of respect or disrespect?
- b) What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?

2. Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

**Expected Outcome:**

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify the right or wrong, and referring to any external source like text or instrument or any other person cannot enable them to verify with authenticity, it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.



- The students are able to see that lack of right understanding leading to lack of relationship is the major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

## Module 2: Understanding harmony in human being – Harmony in myself!

**PS-4:** Prepare the list of your desires. Observe whether the desires are related with self “I” or body. If it appears to be related with the both, see which part of it is related to self “I” and which part is related to body.

### Expected Outcome:

The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to “I” and “body” distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to “I” while the physical facility is related to the body. They are also able to see that “I” and “body” are two realities, and most of their desires are related to “I” and not with the “Body”; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of “I” too.

### PS-5:

- Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
  - In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
- List Down all your activities. Observe whether the activity is of “I” or of “body” or with the participation both “I” and “body”.
- Observe the activities with “I”. Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

### Expected Outcome:

- The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
- The students are able to see that activities like understanding, desires, thoughts and selection are the activities of “I” only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of “I”, while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both “I” and “body”
- The students become aware of their activities of “I” and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

- PS-6:**
- Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
  - Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

### Expected Outcome:

The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildy growing in and around the campus which can be beneficial in curing the different diseases.

## Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

**PS-7:** Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

Scheme and Syllabi for B. Voc., (Automobile), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31<sup>st</sup> July, 2015.



S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	1.b.	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	2.b.	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	3.b.	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	4.b.	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

#### Expected Outcome:

The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

#### PS-8:

1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

#### Expected Outcome:

The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.

All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

#### PS-9:

1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child.  
Evaluate it in a group.
2. Develop three chapters to introduce "social science", its needs, scope and content in the primary education of children.

#### Expected Outcome:

The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

#### Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -

**PS-10:** Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

#### Expected Outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

**PS-11:**

1. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
2. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

**Expected Outcome:**

The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

**Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.**

**PS-12:** Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

**Expected Outcome:**

The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

**PS-13:**

1. Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected Outcome:**

The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

**PS-14:** The course is going to be over now. Evaluate your state before and after the course in terms of-

- Thoughts
- Behavior
- Work and
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected Outcome:**

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

**LIFE SKILLS)**  
**(General Elective-I)**

**Paper Code: ETVHS-515**  
**Paper: Life Skills**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>

**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.

**Objectives and Pre-requisites:** Students should have studied subjects such as General languages, social studies and Moral education at school level. The objective of this subject is to prepare the students to become a good citizen and a professional useful to the society.

**Learning Outcomes:** The knowledge of this subject will give the student a value system which will help him in taking decisions in professional and social life for the benefit of society at large.

**UNIT-I**

**Introduction:** Definition and importance of Life Skills, Livelihood Skills, Survival Skills, Life Skills Approach, Life Skills based education, Life Skills Training- Implementation Models

[T1,T2][No. of Hrs. 07]

**UNIT-II**

Learning and Performance, Cognitive Development, Maturation, Adult Learning, Approaches to Learning Pillars of Education and Life Skills- Four Pillars: Learning to Know, Learning to Do, Learning to Live Together, Learning to be learning throughout Life

[T1,T2][No. of Hrs. 08]

**UNIT-III**

**Social Skills and Negotiation Skills:** Self Awareness, Empathy, Effective Communication, Interpersonal Relationships

**Thinking Skills:** Nature, Element of Thought, Types, Concept Formation, Reasoning, Creative and Critical Thinking

[T1,T2][No. of Hrs. 08]

**UNIT-IV**

**Coping Skills:** Coping with Emotions, Coping with Stress, Integrated use of thinking skills, social skills and coping skills

[T1,T2][No. of Hrs. 07]

**Text Books:**

- [T1] Rajasenan, N.V. (2010). Life Skills, Personality and Leadership, Rajiv Gandhi National Institute of Youth Development, TamilNadu
- [T2] Duffy, Grover,K., Eastwood, A. (2008). Psychology for Living-Adjustment, Growth and Behavior Today, Pearson Education

**Reference Books:**

- [R1] Debra McGregor, (2007), "Developing Thinking; Developing Learning - A Guide to Skills in Education", Open University Press, New York, USA
- [R2] Singh Madhu, (2003). "Understanding Life Skills, Background paper prepared for Education for All: The Leap to Equality"
- [R3] Nair. A. Radhakrishnan, (2010). "Life Skills Training for Positive Behaviour", Rajiv Gandhi National Institute of Youth Development, Tamil Nadu.
- [R4] Dahama O.P., Bhatnagar O.P, (2005). "Education and Communication for Development, (2nd Ed.)", Oxford& IBH Publishing Co. Pvt. Ltd. New Delhi

**PERSONALITY DEVELOPMENT & BEHAVIORAL SCIENCE (From USMS)**  
**(General Elective-I)**

**Paper Code: ETVHS-517**

**Paper: Personality Development & Behavioral Science**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>

**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.

**Objectives and Pre-requisites:** Students should have studied subjects such as General languages, social studies and Moral education at school level. The objective of this subject is to prepare the students to become a good citizen and a professional useful to the society.

**Learning Outcomes:** The knowledge of this subject will give the student a value system which will help him in taking decisions in professional and social life for the benefit of society at large.

**UNIT-I**

Definition and Basics of Personality, Understanding Traits and Types of Personality, Analyzing strength and weakness (SW), Body Language

[T1, T2][No. of Hrs. 07]

**UNIT-II**

Business Etiquettes and Public Speaking: Business Manners. Body Language Gestures, Email and Net Etiquettes, Etiquette of the Written Word, Etiquettes on the Telephone, Handling Business Meetings; Introducing Characteristic, Model Speeches, Role Play on Selected Topics with Case Analysis and Real Life Experiences.

[T1, T2][No. of Hrs. 08]

**UNIT-III**

How to Make a Presentation, the Various Presentation Tools, along with Guidelines of Effective Presentation, Boredom Factors in Presentation and How to Overcome them, Interactive Presentation & Presentation as Part of a Job Interview, Art of Effective Listening.

Resume Writing Skills, Guidelines for a Good Resume, How to Face an Interview Board, Proper Body Posture, Importance of Gestures and Steps to Succeed in Interviews. Practice Mock Interview in Classrooms with Presentations on Self; Self Introduction – Highlighting Positive and Negative Traits and Dealing with People with Face to Face.

[T1, T2][No. of Hrs. 08]

**UNIT-IV**

Coping Management, Working on Attitudes: Aggressive, Assertive and Submissive Coping with Emotions, Coping with Stress

[T1, T2][No. of Hrs. 07]

**Text Books:**

- [T1] McGraw, S. J., (2008), "Basic Managerial Skills for All, Eighth Edition", Prentice Hall of India.  
 [T2] The Results-Driven Manager (2005). Business Etiquette for the New Workplace: The Results-Driven Manager Series (Harvard Results Driven Manager)

**Reference Books:**

- [R1] Pease, A. & Pease, B. (2006)., "The Definitive Book of Body Language", Bantam Books.  
 [R2] Scannell, E. & Rickenbacher, C. (2010)., "The Big Book of People Skills Games: Quick, Effective Activities for Making Great Impressions, Boosting Problem-Solving Skills and Improving Customer Service", McGraw Hill Education



**BASIC OF ELECTRICAL & ELECTRONICS ENGINEERING LAB**  
**(Open Elective-I)**

**Paper Code: ETVAE-555**

**Paper: Basic of Electrical & Electronics Engineering Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**List of Experiments:**

1. Measurement of energy (using single phase and three phase energy meter)
2. Measurement of electrical quantities (like voltage, current, power, power factor in RLC circuits)
3. Study of earthing and measurement of earth resistance.
4. Study of trouble shooting of electrical equipments (fan, iron box, mixer grinder etc)
5. Study of various electrical gadgets (Induction motor, transformer, CFL, LED, PV cell, etc)
6. Testing of the following popular components with: -
 

a) Resistor	b) Potential meter	c) Inductor (Only continents)
d) Capacitor	e) Diode	f) BJT
g) LED	h) SCR	i) Few digital ICs and analog ICS.
7. Techniques of Soldering.
8. Familiarization of the following equipment.
  - a) Multi-meter:- voltage, current, resistance measurement.
  - b) Regulated Power Supply: - Set up for certain output voltage and measure it with multimeter.
  - c) Signal generator and CRO: - check the signal generator frequencies and amplifier with CRO.
9. V.I. Characteristics of the following components:- a) Rectifier diode b).Zener Diode
10. V.I. Characteristics of SCR.
11. Programming of 8085.
12. 555 application.

**Text Book(s)**

1. Department Laboratory Manual.

**References Book(s)**

1. 1. "Electrical Engineering Practice Laboratory Manual". Subhransu Sekhar Dash & K.Vijayakumar, Vijay Nicole Imprints Private Ltd
2. 2. "A Primer on engineering practices Laboratory", Jeyachandran K, Natarajan S & Balasubramanian S, Anuradha Publications.
3. 3. "Engineering practices Laboratory manual", Jeyapooan T, Saravanapandian M & Pranitha S, Vikas Publishing House Pvt., Ltd.

**Note:- Any 12-15 Experiments out of the list may be chosen.**



**CASE STUDY-URBAN TRANSPORT REQUIREMENT & PLANNING**  
**(Open Elective-I)**

**Paper Code: ETVAE-557**

**Paper: Urban Transport Requirement & Planning Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**Case Studies required.**

**Note:- Any 12-15 Experiments out of the list may be chosen.**



**ELEMENTS OF AUTOMOBILE ENGINEERING LAB****Paper Code: : ETVAE-551****Paper: Elements of Automobile Engineering Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**List of Experiments:**

- i. Identification of different chassis components of a vehicle.
- ii. Identification of different components of S.I. engine.
- iii. Identification of different components of C.I. engine.
- iv. Identification of different components of lubrication system of an engine.
- v. Identification of different components of cooling system of an engine.
- vi. Identification of different components of fuel supply system of S.I. engine.
- vii. Identification of different components of fuel supply system of C.I. engine.
- viii. Identification of different components of ignition system of S.I. engine.
- ix. Identification of different components of starting system of an engine.
- x. Identification of different components of transmission system of a car.
- xi. Identification of different components of steering system of a car.
- xii. Identification of different components of suspension system of a car.
- xiii. Identification of different components of braking system of a car.

**Text Book(s):**

- [T1] S Srinivasan, "Automotive Mechanics", Tata McGraw Hill, New Delhi  
 [T2] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Edition, Routledge (Taylor & Francis Group) Publication,

**Reference Book(s):**

- [R1] Newton Steeds and Garrot, "Motor Vehicles", Butterworths, London.  
 [R2] Crouse W.H, "Automotive Chassis and Body", Tata McGraw-Hill, New York.  
 [R3] K.K. Jain, R.B. Asthana, "Automobile Engineering", Tata McGraw Hill, New Delhi  
 [R4] Dr. Kirpal Singh, "Automobile Engineering" (Vol-1), Standard Publisher Distributors

**Note:- Any 12-15 Experiments out of the list may be chosen.**

**MANUFACTURING TECHNOLOGY LAB****Paper Code: ETVAE-553****Paper: Manufacturing Technology Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**List of Experiments:****UNIT I****Fitting:** Tools & Equipments – Practice in filing. Making Vee Joints, Square etc.**UNIT II****Sheet Metal:** Tools and equipments– practice. Making rectangular tray, hopper, scoop, cabinet, dust bin, etc.**UNIT III****Welding:** Tools and equipments – Arc welding of butt joint, Lap joint, Tee fillet. Demonstration of gas welding, TIG & MIG welding.**Text Book(s):**

[T1] Gopal T.V, Kumar T, and Murali G, “A first course on workshop practice –Theory, Practice and Work Book”, Suma Publications

**References Book(s):**

- [R1] Kannaiah P, and Narayanan K. C, “Manual on Workshop Practice”, Scitech Publications, Chennai
- [R2] Venkatachalapathy V.S, “First year Engineering Workshop Practice”, Ramalinga Publications, Madurai

**Note:- Any 12-15 Experiments out of the list may be chosen.**

GURU GOBIND SINGH  
INDRAPRASTHA  
UNIVERSITY

**BASIC PROGRAMMING LAB**  
**(Common to all Disciplines except MC, SD, CT)**

**Paper Code: ETVCS-559**  
**Paper: Basic Programming Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>2</b>

**Objectives:** In order to enable the student's use of computer effectively in problem solving, this course offers the model programming language along with exposure to various application of computer. The knowledge of C language will be reinforced by the practical exercises.

**Pre-requisites:** Basic understanding about using Computers, using computers.

### **UNIT-I**

Introduction of "C" language- Structure of a "C" program, some simple "C" programs, procedure to execute a "C" program. Data type, constants and variables Character sets, Identifiers and keywords, Date type constants, variables, expression, statement, symbolic constants. Operators and expressions, Arithmetic operators, Relational and logical operators, Unary Operators, Assignment operators, Conditional operators.

[T1, T2][No. of Hrs. 08]

### **UNIT-II**

Data Input and output, Library functions, unformatted input output-getchar, putchar, gets, puts, getch and getche. Formatted input output-Scanf, printf, Control statements and loop structure,

**Branching:** The if-else statement,

**Looping:** while, do-while for. Nested control structure. Switch statement. Break. Continue, exit. Comma operator.

**Jumping:** go to statement,

**Function:** Inductions to function, need of functions, function definition, function declaration and prototype, passing arguments to function. Passing arguments by value, recursion, Arrays-Introduction to Arrays. array declaration, single and multidimensional array Examples: array order reversal, removal of duplicates from an ordered array, binary search, matrix multiplication.

[T1, T2][No. of Hrs. 08]

### **UNIT-III**

**Strings:** Introduction to strings, string constants, variables, input, output of string date, standard library string function strlen (), strcat () strcpy () strcmp (),Pointers-Introduction to pointers, address operator and indirection operator, declaring and initialize pointers, pointers in parameter passing, call by reference, pointers and one dimensional array, operation on pointers and one dimensional arrays, dynamic memory location malloc, calloc, structure and unions-Introduction to structure, declaration of structure, accessing structure, members initialization Arrays of structure, user defined data type (typedef), Introduction to unions.

[T1, T2][No. of Hrs. 08]

### **UNIT-IV**

Files-Introduction to file handling-fopen, fclose, fscanf, fprintf, getc, putc Additional feature of c: Enumerations, macro, c pre-processor.

[T1, T2][No. of Hrs. 06]

### **Text Book(s):**

- [T1] Byron C. Gottfried, "Programming with C", McGraw-Hill Education
- [T2] Yashwant Kanetkar, "Let us C", Infinity Science Press, 2008
- [T3] Moolish Cooper, "Sprit of C", Jaico Publishing House
- [T4] Herbert Schildt, "Teach yourself C", Tata Mc Graw hill

### **Reference Book(s):**

- [R1] Stephen G. Kochan, "Programming in C", Pearson Education
- [R2] Kerning & Ritchie, "C Programming Language", Prentice Hall; 2<sup>nd</sup> Edition
- [R3] Balaguruswamy, "Ansi C", Tata Mc Graw Hill

### **List of Experiments:**

1. Programming exercises on executing and editing c programs.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetical, relational operators.
4. Programming exercises on arithmetic expression and their evaluation.
5. Programming exercises on formatting input/out using printf and scanf.
6. Programming exercises using if-statement.

Scheme and Syllabi for B. Voc., (Automobile), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31<sup>st</sup> July, 2015.



7. Programming exercises using if-else statement.
8. Programming exercises on switch statement.
9. Programming exercises on do-while statement.
10. Programming exercises on for statement.
11. Programs on 1 dimensional array.
12. Programs on 2 dimensional arrays.
13. Programs on strings (Copying, Concatenation, Compare, Character frequency, string Length Count etc).
15. Simple programs using pointers.
16. Simple programs using structures.
17. Simple programs using files.



**VOCATION WORKSHOP**

**Paper Code: ETVAE-561**  
**Paper: Vocation Workshop**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>4</b>	<b>4</b>

**List of Experiments:**

- i. Practice in use of common tools used in an automobile workshop, safety precautions.
- ii. Introduction to different special tools used in automobile workshop- application, safety precautions.
- iii. Practice in use of different equipment used in an automobile workshop, safety precautions.
- iv. Practice in use of bench vice and metal cutting using hacksaw.
- v. Practice in Surface preparation of a flat object using flat file.
- vi. Practice in Surface preparation of a curved surface using suitable file.
- vii. Practice in drilling holes using portable/ bench type drilling machine.
- viii. Practice in drilling holes using portable/ bench type drilling machine.
- ix. Practice in use of bench type grinding machine.
- x. Practice in use of different types of lifting jacks in automobiles.
- xi. Practice in use of workshop crane mechanical/ hydraulic type in automobile workshop.
- xii. Practice in use of two/ four post electric lift in automobile workshop.

**Text Book(s):**

- [T1] Gopal T.V, Kumar T, and Murali G, "A First Course on Workshop Practice –Theory, Practice and Work Book", Suma Publications
- [T2] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Edition, Routledge (Taylor & Francis Group) Publication

**Note:- Any 12-15 Experiments out of the list may be chosen.**

GURU GOBIND SINGH  
 INDRAPRASTHA  
 UNIVERSITY

**ENGINEERING MATERIALS & MECHANICS OF SOLIDS****Paper Code: ETVAE-502****Paper: Engineering Materials & Mechanics of Solids**

L	T/P	C
3	1	4

**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.

**Objectives and Pre-requisites:** Student should have studied subjects such as General Science, Physics, Mathematics and have the basic knowledge about different engineering materials being used in daily life to have an enhanced exposure. This subject provides knowledge about the different molecular structures, properties of engineering material and their effect on the strength and behavior of solids under load.

**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**

**Crystal Structure, Metallic Conduction and Semi Conductors:** Bravice lattices, Miller indices, simple crystal structures, Different kind of bonding, Energy distribution of electrons in a metal, Fermi level, Conduction process, Band theory of solids, P and N type of semiconductors, Statistics of holes and electrons, Hall effect, Effect of temperature on conductivity, Life time and re- combination, drift and diffusion in PN junction. Ferro magnetism, Antiferro, Semi and Super- conducting materials, Properties, Type of super-conducting materials.

**[T1,T2][No. of Hrs. 12]****UNIT-II**

**Conventional Engineering Materials and Composites:** Introduction to engineering materials for mechanical construction, Composition, mechanical and fabricating characteristics and applications of various types of cast irons, plain carbon and alloy steels, copper, aluminum and their alloys like duralumin, brasses and bronzes, cutting tool materials, super alloys thermoplastics, thermosets, limitations of conventional engineering materials, role of matrix in composites, classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fiber-reinforced composites, environmental effects on composites, applications of composites.

**[T1,T2][No. of Hrs. 11]****UNIT-III**

Concept of stress and strain, Hooke's law - Tension, Compression, and Shear, stress-strain diagram - Poisson's ratio, elastic constants and their relationship - Deformation of simple and compound bars. Thermal stresses – simple and Composite bars. Principal plane, principal stress, maximum shearing stress - Uniaxial, biaxial state of stress - Mohr's circle for plane stresses.

**[T1,T2][No. of Hrs. 10]****UNIT-IV**

**Torsion Of Shafts:** Theory of pure torsion, torsion of circular shafts and composite shafts.

**[T1,T2][No. of Hrs. 08]****Text Book(s):**

- [T1] Kittel; J., "Solid State Physics", Seventh Edition, W. & Sons Publication.
- [T2] Kenneth G. Budinski, Budinshi; "Engineering Materials: Properties and Selection", 7<sup>th</sup> Edition, Pearson Singapore (Prentice Hall)
- [T3] Bansal R.K., "A Text Book of Strength of Materials", Lakshmi Publications Pvt. Limited, New Delhi

**Reference Book(s):**

- [R1] Donald R. Askeland, Pradeep P. Phule; "Essentials of Material Science and Engineering", Thomson.
- [R2] A. P. Gupta, "Polymer Composites", M.C.Gupta; New Age Publication.
- [R3] Shigley J. E, "Applied Mechanics of Materials", International Student Edition, McGraw Hill Koyakusha Limited
- [R4] Prabhu T.J, "Mechanics of Solids", Private Publication, 2002.

**AUTOMOBILE SERVICE AND MAINTENANCE**

**Paper Code: ETVAE-504**  
**Paper: Automobile Service and Maintenance**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**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.

**Objectives and Pre-requisites:** Student should have studied subjects such as Basic of automobile, elements of automobile engineering, General Science, Physics etc. and have the basic knowledge about automobile to have an enhanced exposure. This subject provides knowledge about servicing and maintenance of automobile.

**Learning Outcomes:** This knowledge will be helpful to the student in understanding maintenance schedules, maintaining records, maintenance of engine, other mechanical and electrical systems beside co-relating various systems with each other and understanding the individual system in a better manner.

**UNIT-I**

**Maintenance:** Importance of maintenance, types- preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedules. Safety precautions in maintenance. Knowledge of free and paid service schedules, fault diagnosis, job cards, warranty procedures, log sheets and other forms.

**[T1,T2][No. of Hrs. 11]****UNIT-II**

**Engine Maintenance:** Lubrication system – lubricating/ engine oil top up, oil changing, cleaning methods, visual and dimensional inspections, minor/major adjustments of various components, maintenance of engine accessories- air filter, battery, cooling system, electrical wiring in engine compartment. Engine tune up, top overhauling, dismantling of engine components, cleaning, visual and dimensional inspections, minor/major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance/ overhauling, Servicing and maintenance of cooling systems, lubrication system.

**[T1,T2][No. of Hrs. 12]****UNIT-III****Maintenance of other assemblies**

lubrication system – lubricating/ gear oil top up, oil changing, cleaning methods, visual and dimensional inspections, minor/major adjustments of various components of transmission system, Servicing and maintenance of clutch, gear box, propeller shaft, differential. Servicing and maintenance of suspension system, brake system, steering system, wheel alignment and wheel balancing.

**[T1,T2][No. of Hrs. 11]****UNIT-IV****Electrical System Maintenance**

Checking of electrical components for functioning, checking of battery, electrolyte top up, terminal cleaning & protection methods, checking of starter motor, checking of charging systems- fan belt tension checking and adjustment, Testing methods for checking of ignitions system, lighting system, fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

**[T1,T2][No. of Hrs. 12]****Text Book(s):**

- [T1] K.K. Ramalingam, “Automobile Engineering”, Scitech Publication, Chennai
- [T2] S Srinivasan, “Automotive Mechanics”, Tata McGraw Hill, New Delhi
- [T3] Tom Denton, “Automobile Mechanical and Electrical Systems” Indian Edition, Routledge (Taylor & Francis Group) Publication.

**Reference Book(s):**

- [R1] Newton Steeds and Garrot, “Motor Vehicles”, Butterworths, London.
- [R2] Judge A.W, “Mechanism of the Car”, Chapman and Halls Ltd., London.
- [R3] Crouse W.H, “Automotive Chassis and Body”, McGraw –Hill, New York.
- [R4] K.K. Jain, R.B. Asthana, “Automobile Engineering”, Tata McGraw Hill, New Delhi
- [R5] Dr. Kirpal Singh, “Automobile Engineering” (Vol-1), Standard Publisher Distributors

Scheme and Syllabi for B. Voc., (Automobile), w. e. f. batch 2015-16, approved in the 24th BOS of USET & AC Sub Committee Meeting of USET held on 31<sup>st</sup> July, 2015.



**ENVIRONMENTAL SCIENCE**  
**(Common To All Disciplines)**

**Paper Code: ETVEN-502**  
**Paper: Environmental Science**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**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.

**Objective:** The objective of this course is to make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.

**UNIT-I**

**Environmental Studies: Ecosystems, Bio-diversity and its Conservation**

**(i) The Multidisciplinary Nature of Environmental Studies**

Definition, scope and importance of Environmental Studies, Biotic and a biotic component of environment, need for environmental awareness.

**(ii) Ecosystems**

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structures and function of the following ecosystem:

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

**(iii) Bio-diversity and its Conservation**

Introduction to biodiversity - definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity : Habitat loss, Poaching of wildlife, man-wildlife conflicts, rare endangered and threatened species (RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.

[T1], [R3] [No. of hrs. 12]

**UNIT-II**

**Natural Resources: problems and prospects**

Renewable and Non-renewable Natural Resources; Concept and definition of Natural Resources and need for their management

- **Forest resources:** Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
- **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- **Mineral resources:** Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- **Food resources:** World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies.
- **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

[T1], [R3] [No. of hrs. 11]

**UNIT-III****Environmental Chemistry and Pollution Control****(i) Chemistry of Environment**

(a) *Green Technology*: Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies, clean development mechanisms (CDM), concept of environmental impact assessment,

(b) *Eco-Friendly polymers*: Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

**(ii) Environmental Pollution**

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

**Chemical toxicology**-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment.

[T1], [R3] [No. of hrs. 11]

**UNIT-IV****Disaster Management, Social Issues, Human Population and the Environment****(i) Disaster Management**

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, *case studies*.

**(ii) Social Issues, Human Population and the Environment**

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, Wasteland reclamation. Population growth, problems of urbanization, Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and

Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management, system standards-ISO 14000 series.

[T1] [No. of hrs. 11]

**Text Book(s):**

[T1] E. Barucha, Textbook of Environmental Studies for Undergraduate Courses, Universities Press (India) Pvt. Ltd., 2005.

[T2] S. Chawla, A Textbook of Environmental Studies, McGraw Hill Education Private Limited, 2012

**References Book(s):**

[R1] G. T. Miller, Environmental Science, Thomas Learning, 2012

[R2] W. Cunningham and M. A. Cunningham, Principles of Environment Science: Enquiry and Applications, Tata McGraw Hill Publication, N. Delhi, 2003.

[R3] R. Rajagopalan, Environmental Studies: From Crisis to Cure, 2<sup>nd</sup> Edition, Oxford University Press, 2011.

[R4] A.K. De, Environmental Chemistry, New Age Int. Publ. 2012,,

[R5] A. Kaushik and C.P. Kaushik, Perspectives in Environment Studies, 4<sup>th</sup> Edition, New Age International Publishers, 2013

[R6] Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2010.

**ELEMENTS OF FLUID MECHANICS & MACHINES**  
(Open Elective-II)

**Paper Code: ETVAE-506**

**Paper: Elements of Fluid Mechanics & Machines**

L	T/P	C
3	0	3

**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.

**Objectives and Pre-requisites:** Student should have studied subjects such as General science, Mathematics and Physics, General Science etc. This subject provides knowledge about properties of fluids used in automobiles which helps in better handling of materials and equipments during the servicing and maintenance of automobile.

**Learning Outcomes:** This knowledge will be helpful to the student in understanding the properties of fluids and this will help in enhancing the ability of the student to handle the fluids and equipment during the servicing and maintenance of automobile.

**UNIT-I**

**Properties of fluids and fluid statics:** Fluid properties: Mass density, specific weight, specific volume, specific gravity, viscosity, vapours pressure, compressibility, surface tension and capillarity. Fluid statics: fluid pressure at a point, variation of pressure within a static fluid, hydrostatic law - Pressure head, Pascal's law. Measurement of pressure - Piezometric tube, manometry.

[T1, T2,T3][No. of Hrs. 11]

**UNIT-II**

**Fluid kinematics and fluid dynamics:** Fluid kinematics: Lagrangian and Eulerian description of fluid flow - Velocity and acceleration of fluid particles - Different types of fluid flow. Description of flow pattern: Stream line, streak line, path line. Principle of conservation of mass - Continuity equation. Fluid dynamics: Euler's equation of motion along a stream line - Bernoulli's equation. Practical applications of Bernoulli's equation in flow measurement devices like venturimeter, orificemeter and pitot tube. Concept of impulse momentum equation & angular momentum principle with applications.

[T1, T2,T3][No. of Hrs.11]

**UNIT-III**

**Flow through pipes:** Laminar and turbulent flow characteristics, laminar flow through circular pipes - Hagen Poiseuille law, major and minor losses in pipes, pipe friction, Darcy - Weisbach equation, parallel, series and branched pipes.

[T1, T2,T3][No. of Hrs. 11]

**UNIT-IV**

**Hydraulic machines:** Hydraulic turbine: Classification, difference between impulse and reaction turbine. Construction and working of Pelton turbine, Francis turbine and Kaplan turbine, velocity triangle, heads and efficiencies. Pumps: classification, difference between positive and non-positive displacement pumps. construction and working of reciprocating pump. Centrifugal pump-heads of a centrifugal pump, priming, velocity triangle, work done, efficiencies of centrifugal pump, Check valve, Servo valves, Proportional valves and Cartridge valves, cut off Valves.

[T1, T2,T3][No. of Hrs. 11]

**Text Book(s)**

- [T1] Rajput R. K, "A Text Book of Fluid Mechanics and Hydraulic Machines", S. Chand & Company Ltd.  
[T2] Bansal R. K, "Fluid Mechanics and Hydraulics Machines", Laxmi publications (P) Ltd., New Delhi

**Reference Book(s)**

- [R1] White F.M, "Fluid Mechanics", McGraw-Hill, 5th Edition, New Delhi  
[R2] Streeter V. L, and Wylie E.B, "Fluid Mechanics", McGraw Hill  
[R3] Modi P.N, & Seth S.M, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi  
[R4] Shiv Kumar, "Fluid Mechanics & Fluid Machines: Basic Concepts & Principles", Ane Book(s) Pvt. Ltd.  
[R5] Yunus A Cengel & John M. Cimbala, "Fluid Mechanics", Tata McGraw Hill Edition, New Delhi



**ELEMENTS OF AESTHETICS DESIGN OF DEVICES**  
**(Open Elective-II)**

**Paper Code: ETVAE-508**

**Paper: Elements of Aesthetics Design of Devices**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**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.

**Objectives and Pre-requisites:** The main objective of this subject is to make the student able to appreciate the aesthetics and design a required device accordingly. The pre requisites for this is that he/she should have the basic sense of point, line, form, colour, space and texture.

**Learning Outcomes:** This student will be able to make a design which will be suitable , functional and aesthetic.

**UNIT- I**

**Elements and Principles of Design:** Elements of Design - point, line, shape, space, form, value, color and texture. Principles of Design - balance, scale, proportion, contrast, emphasis, pattern, movement, rhythm, harmony and unity on the basis of elements of Design. Development of design aptitude thorough understanding of the elements and principles of design and their co-relationship.

[T1, T2,T3][No. of Hrs. 11]

**UNIT-II**

**Ergonomics of interior spaces:** Introduction to human body, Anthropometrics and its application to vehicle ergonomics and cockpit design.

[T1, T2,T3][No. of Hrs. 10]

**UNIT- III**

**Driver/ passenger comfort & amenities:** Driver comfort – seating, visibility, man-machine system, Psychological factors – stress, attention, Passenger comfort - spaciousness, ventilation, temperature control, dust and fume prevention and vibration. Interior features and conveniences

[T1, T2,T3][No. of Hrs. 11]

**UNIT-IV**

**Vehicle Safety:** Safety issues- active and passive safety features in vehicle

[T1, T2,T3][No. of Hrs. 10]

**Text Book(s):**

- [T1] B.Peacock, “Automobile Ergonomics”, Waldemar Karwowski, CRC; 1 Edition, 1993
- [T2] S.P. Taylor C.M. Haslegrave, “Vision in Vehicles VI”, North Holland; 1 edition, 1998
- [T3] Cristy Ho, Charles Spenser, “The multisensory Drives: Implication for Ergonomics Car Interface Design” CRC press

**Reference Book(s):**

- [T4] Don Harris (Editor): Engineering Psychology and Cognitive Ergonomics”, 8th International conference”, Springer; 1 Edition



**ELEMENTS OF FLUID MECHANICS & MACHINES LAB**  
**(Open Elective-II)**

**Paper Code: ETVAE-556**

**Paper: Elements of Fluid Mechanics & Machines Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>2</b>

**List of Experiments:**

1. Measurement of Pressure Head with the help of Manometers.
2. Measurement of Pressure Head with the help of U tube and inclined tube.
3. Measurement of Pressure Head with the help of Piezometer, Bourdon Type Pressure Gauge.
4. Measurement of Flow with:-Venturimeter and Orifice Meter.
5. Verification of Bernoulli's Theorem.
6. To find  $C_c$ ,  $C_v$  and  $C_d$  small rectangular Orifice.
7. Study on performance characteristics on Single-Stage Centrifugal Pump.
8. Study on performance characteristics on Single-Stage reciprocating Pump.
9. Study on performance characteristics on Pelton Wheel.
10. Study on performance characteristics on Francis Turbine.
11. Study on performance characteristics on Kaplan Turbine.

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**ELEMENTS OF AESTHETICS DESIGN OF DEVICES LAB**  
**(Open Elective-II)**

**Paper Code: ETVAE-558**

**Paper: Elements of Aesthetics Design of Devices Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>2</b>

**List of Experiments:**

1. Drawing of Free hand sketches with pencil for practice on point and different line.
2. Drawing of Free hand sketches with pencil for practice on different shapes
3. Drawing of Free hand sketches with pencil for practice on different space.
4. Drawing of Free hand sketches with pencil for practice on different form.
5. Practice with paint on paper for
  - (a) sense of colour
  - (b) various shades of a colour
  - (c) colour matching
  - (d) colour combination
  - (e) colour contrast
6. Free hand sketches of human body in correct proportions.
7. Scale Drawing practice with measurement of human body in different position.
8. Ergonomically design a seat for a given range size and shape of driver and passenger.
9. To Study the different safety features of automobiles and suggest the aesthetics modifications

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**ENGINEERING MATERIALS & MECHANICS OF SOLIDS LAB****Paper Code: ETVAE-552****Paper: Engineering Materials & Mechanics of Solids Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>2</b>

**List of Experiments**

1. Specimen preparation for metallographic examination
2. Study of metallurgical microscope, different types and their operations
3. Micro-Structural study of ferrous materials like low, medium and high carbon steels, quenched and tempered steel, Stainless steel, Malleable iron, Grey CI, White CI and Cold worked and re-crystallized specimens.
4. Micro-structural study of non-ferrous materials like Al, Brass, Bronze
5. Micro-structural study of steel weldment
6. Study of hardness of heat treated steel.
7. Grain size measurement by comparison with ASTM Charts
8. Tensile Test on Bars of Mild Steel and Aluminium.
9. Shear Test on Specimen of Two Different Metals.
10. Bending Tests on a Steel Bar or a Wooden Beam.
11. Impact Test on Metals: a) Izod Test b) Charpy Test.
12. Torsion Test on Specimens of different metals for determining the angle of Twist for a given Torque.
13. To determine the Stiffness of a helical spring and to plot a graph between Load and Extension.
14. Hardness Test on metal and Finding the Brinell and Rockwell Hardness.



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**AUTOMOBILE SERVICING & MAINTENANCE LAB****Paper Code: ETVAE-554****Paper: Automobile Service & Maintenance Lab**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**List of Experiments:**

1. Replacing a punctured tyre, repairing of puncture in tubed and tube less tyres.
2. Replacement of Gear oil and differential oil
3. Petrol Engine- Carburetor setting.
4. Engine tune up.
5. Checking and Adjustment in MPFI system.
6. Dismantling & assembling of shifting mechanism of gear box.
7. Fuel injectors cleaning and testing.
8. Replacement of thermostat valve and water pump.
9. Maintenance & repair practices for Leakage of oil, coolant and overheating.
10. Lubrication, maintenance of Suspension system.
11. Practice for wheel balancing.
12. Repair & maintenance of propeller shaft “U” joints and centre bearing.
13. Practice for wheel alignment: toe in, toe out, caster and camber.
14. Practice for replacement of brake pads.
15. Maintenance & repair of ignition system.
16. Maintenance & repair of electrical system.
17. Measurement of percentage of pollutants from petrol vehicles with the help of exhaust gas analyzer.
18. Measurement of percentage of pollutants from diesel vehicles with the help of smoke meter.

**Text Book(s):**

- [T1] S Srinivasan, “Automotive Mechanics”, McGraw Hill, New Delhi
- [T2] Tom Denton, “Automobile Mechanical and Electrical Systems” Indian Edition, Routledge (Taylor & Francis Group) Publication

**Reference Book(s):**

- [R1] Newton Steeds & Garrot, “Motor Vehicles”, Butterworths, London.
- [R2] Crouse W.H, “Automotive Chassis and Body”, McGraw-Hill, New York.
- [R3] K.K. Jain, R.B. Asthana, “Automobile Engineering”, Tata McGraw Hill, New Delhi
- [R4] Dr. Kirpal Singh, “Automobile Engineering” (Vol-1), Standard Publisher Distributors



**ENVIRONMENTAL SCIENCE LAB/ FIELD WORK**  
**(Common to All Disciplines)**

**Paper Code: ETVEN-552**

**Paper: Environmental Science Lab/ Field Work**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>2</b>	<b>2</b>

**List of Experiments**

1. Determination of pH, conductivity and turbidity in drinking water sample.
2. Determination of pH and conductivity of soil/sludge samples.
3. Determination of moisture content of soil sample.
4. Determination of Total Dissolved Solids (TDS) of water sample.
5. Determination of dissolved oxygen (DO) in the water sample.
6. Determination of Biological oxygen demand (BOD) in the water sample.
7. Determination of Chemical oxygen demand (COD) in the water sample.
8. Determination of Residual Chlorine in the water sample.
9. Determination of ammonia in the water sample.
10. Determination of carbon dioxide in the water sample.
11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
12. Determination of the molecular weight of polystyrene sample using viscometer method.
13. Base catalyzed aldol condensation by Green Methodology.
14. Acetylation of primary amines using eco-friendly method.
15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

**P.S.:** For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

**Suggested Book(s):**

- [T1] [A. I. Vogel, G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5<sup>th</sup> Edition, 1989.
- [T2] [dst.gov.in/green-chem.pdf](http://dst.gov.in/green-chem.pdf) (monograph of green chemistry laboratory experiments).
- [T3] S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3<sup>rd</sup> Edition, 2008.
- [T4] S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2<sup>nd</sup> Edition, 2003.
- [T5] W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
- [T6] A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4<sup>th</sup> Edition, New Age International Publishers, 2013.

**Note:- Any 10-12 Experiments out of the list may be chosen.**

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**PROJECT-I****Paper Code: ETVAE-560****Paper: Project-I**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>3</b>	<b>3</b>

**Project Report on any one of the followings:**

1. Manufacturing an auto component/subassembly.
2. Setting up an automobile garage/farm equipment service center.
3. Setting up fuel filling and service station.
4. Setting up retrofitting of CNG / LNG / LPG kits.
5. Setting up an accident survey and repair center.
6. Setting up a unit for repair & calibration of F.I.P. center.
7. Setting up an auto electrical equipment center.
8. Setting up an auto body fabrication shop.
9. Refurbishing of vehicle body and cabin shop.
10. Operation of transport fleet high passenger vehicle and cabs.
11. Fabrication of automobile working models.
12. Any other project of relevant to auto industry.



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**INDUSTRIAL TRAINING-I**

**Paper Code: ETVAE-562**  
**Paper: Industrial Training-I**

<b>L</b>	<b>T/P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>

**The objective of this training is to:**

1. Expose the student to industrial training / field procedures and practices and so as to have appreciation of the size and scale of operations.
2. Co-ordinate concepts, principles and practices taught in the classroom in their application in solving field / industrial tasks / problems.

For this purpose, students are required to be sent for a period of two weeks to industry involved in servicing, manufacturing or assembling of automobile.

For effective planning and implementation of this practical training it is proposed to:

1. Identify adequate number of industrial / field organization where students will be sent for practical training.
2. Prepare a workbook, which can be used by student for guiding student to perform definite task during the practical training.
3. Identification of teachers who would supervise the student and provide guidance during practical training.
4. Design a schedule of training, to be followed by a student. Copy of this training programme is to be given to training in-charge of the organization for implementation and proper training.



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### GRAPHICS FOR AUTOMOBILE ENGINEERING

**Paper Code: ETVAE-564**

**Paper: Graphics for Automobile Engineering**

L	T/P	C
1	3	4

**Objectives and Pre-requisites:** The students should have studied subjects such as Mathematics with Geometry and Engineering Graphics. The course is aimed at developing basic graphic skills to enable them to draw basic automotive components and to learn about the intricacies of dimension and designs. The emphasis while imparting instruction should be to develop conceptual skills in the students.

**Learning Outcomes:** The students should be able to read automobile engineering drawings and student should be in a position to understand the intricacies of the component design.

#### **UNIT-I**

**Joints Pulleys & Engine Bearings:** Universal Joint, Slip Joint, Stepped or Cone Pulley, V-Belt Pulley, Bush Bearing, Split Bearing, Thrust Bearing, Ball Bearing, Roller Bearing, Straight and Needle

#### **UNIT-II**

**Dimensional Drawing of Engine Components:**

- Four Stroke Petrol Engine Piston
- Two Stroke Petrol Engine Piston
- Four Stroke Diesel Engine Piston
- Connecting Rod
- Crank Shaft of 4 Cylinder Engines
- Crank Shaft of Single Cylinder Engines

#### **UNIT-III**

**Free Hand Sketching:** spark plug, water pump, oil pump, fuel pump, over head and side valve mechanism, clutch assembly- single plate, coil and diaphragm spring, gear box synchronizing unit, differential assembly, leaf spring, cylinder liner, steering system of a car.

Battery ignition, magneto ignition, charging circuit, starting circuit, oil, temperature and fuel gauge circuit, lighting circuit of a car

#### **UNIT-IV**

**Gears:** Drawing of gear tooth profile for spur gear, nomenclature (using approximate method).

#### **Text Book(s)**

[T1] R B Gupta; "Automobile Engineering Drawing", Satya Prakashan, New Delhi

#### **Reference Book(s):**

[R1] P. S. Gill; "Machine Drawing" B D Kataria and Sons, Ludhiana

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