


|   |   |                                |                                 |
|---|---|--------------------------------|---------------------------------|
|  | <b>Course Title: ENERGY RESOURCES &amp; ALTERNATIVE FUELS</b> |                                |                                 |
|   | <b>Scheme (L:T:P) : 4:0:0</b>                                 | <b>Total Contact Hours: 52</b> | <b>Course Code: 15AT54B</b>     |
|   | <b>Type of Course: Lectures, Self Study &amp; Quiz</b>        | <b>Credit :04</b>              | <b>Core/ Elective: Elective</b> |
| <b>CEE:25 Marks</b>   |   | <b>SEE:100 Marks</b>           |                                 |

### Pre-requisites:

**Fundamentals of Chemistry, Thermal Engineering & Internal Combustion Engine**

### Course Objectives:

The student will be able appraise the need of different energy resources and alternative fuels in the present scenario.

*On successful completion of the course, the students will be able to attain CO:*

| Course Outcome |   | CL           | Linked PO             | Teaching Hrs |
|----------------|---|--------------|-----------------------|--------------|
| CO1            | Discuss the need of energy conversion and the various methods of energy storage.                    | <i>R/U/A</i> | 1,2,5,6               | 08           |
| CO2            | Explain Solar energy conversion processes with their applications.                                  | <i>R/U/A</i> | 1,2,5,6               | 10           |
| CO3            | Explain the principle of Wind energy conversion and different wind mills.                           | <i>R/U/A</i> | 1,2,5,6               | 08           |
| CO4            | Express the need, limitations and types of alternative fuels.                                       | <i>U/A</i>   | 1,2,5,6               | 06           |
| CO5            | Acquire the knowledge of manufacturing, properties, storage & emission of Bio fuels                 | <i>R/U/A</i> | 1,2,5,6               | 10           |
| CO6            | Acquire the knowledge of manufacturing, properties, storage, and emission of Hydrogen, CNG and LPG. | <i>R/U/A</i> | 1,2,5,6               | 10           |
|                |   |              | <b>Total sessions</b> | <b>52</b>    |

### COURSE-PO ATTAINMENT MATRIX

| Course                          | Programme Outcomes |   |   |   |   |   |   |   |   |    |
|---------------------------------|--------------------|---|---|---|---|---|---|---|---|----|
|                                 | 1                  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Alternate fuels for IC engines. | 3                  | 3 | - | - | 3 | 3 | - | - | - | -  |

**Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.**

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If  $\geq 40\%$  of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3.

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2.

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1.

If  $< 5\%$  of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

**COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE**

| Unit No | Unit Name                      | Hour | Questions to be set For Sem End Exam |    |    | Marks weightage(%) |
|---------|--------------------------------|------|--------------------------------------|----|----|--------------------|
|         |                                |      | R                                    | U  | A  |                    |
| I       | Energy conservation& storage   | 08   | 5                                    | 10 | 5  | 13.7               |
| II      | Solar energy                   | 10   | 5                                    | 15 | 10 | 20.6               |
| III     | Wind energy                    | 08   | 5                                    | 5  | 10 | 13.7               |
| IV      | Alternative fuels-An over view | 06   | 5                                    | 5  | 5  | 10.3               |
| V       | Bio-fuels                      | 10   | 5                                    | 15 | 10 | 20.6               |
| VI      | Gaseous fuels                  | 10   | 5                                    | 15 | 10 | 20.6               |
|         | Total                          | 52   | 145                                  |    |    | 100                |

**Legend: R; Remember, U: Understand A: Application**

**Course Delivery:** The course will be delivered through lectures, Presentations and Classroom discussions.

**Course Content:**

### UNIT I

#### **ENERGY CONSERVATION & STORAGE 08 hrs**

Energy- Energy Sources & their Availability - Importance of Renewable Energy Resources - Principles of energy conservation- Energy storage- Necessity of energy storage-Energy storage methods- Mechanical Energy storage -Pumped storage-Compressed air storage- Electrical Storage -Lead Acid Battery -Chemical Storage -Energy storage via hydrogen - Electromagnetic energy storage.

### UNIT II

#### **SOLAR ENERGY 10 HRS**

Solar energy - Introduction-Solar constant- Solar Radiation at the Earth's surface-measurements of solar radiation- pyronometer- pyrhelimeter- sunshine recorder -Solar collectors-Classification-liquid flat plate collector-construction-effect of various parameter on its performance-Concentrating collector-Focusing and non-focusing type-Applications of Solar Energy - solar water heater- Solar Cooker-Box type- Solar dryer-solar greenhouse—Summer and winter greenhouse-solar electric power generation-Solar photovoltaic.

### UNIT III

#### **WIND ENERGY 08 HRS**

Introduction- Basic Principles of Wind energy conversion-The nature of wind- The power in the wind ( No derivations )- Forces on the Blades ( No derivations )-Site Selection considerations-Basic components of a wind energy conversion system (WECS)-Advantages & Limitations of WECS-Wind turbines (Wind mill )-Horizontal Axis wind mill-Vertical Axis wind mill-performance of wind mills-Environmental aspects

## UNIT IV

### ALTERNATIVE FUELS - AN OVERVIEW

7Hrs

Introduction-need -classification, Business driving factors for alternative fuels, implementation barriers for alternative fuels, Government promotion of alternative fuels, stakeholders of alternative fuels.

## UNIT V

### BIO- FUELS

10 hrs

Methanol–Introduction-properties-Manufacture-types, from lignite or coal-layout-working principle, from municipal solid wastes-layout-working principle, properties, storage, advantages &disadvantages of methanol, methanol emissions.

Ethanol–Introduction-properties-manufacture of ethanol from food grains-layout-working principle, ethanol from sugarcane-layout-working principle, properties, storage of ethanol, advantages & disadvantages of ethanol, ethanol diesel blends(E-diesel)-concept-need, ethanol gasoline blends (Gasohol)-concept-need-merits-demerits, emissions from ethanol,

Biodiesel -introduction-sources, biodiesel production-Process layout-working principle, properties of biodiesel, biodiesel storage, material compatibility, advantages and disadvantages of biodiesel, biodiesel emission.

## UNIT VI

### GASEOUS FUELS

09 Hrs

Gaseous fuel-types, Bio gas-Introduction-composition-properties-production, biogas plants-types, Dome type-construction-working, floating drum type-construction-working, biogas storage-types, advantages-disadvantages, emissions.

Hydrogen-introduction- properties-advantages-disadvantages-hazards, list production process types , electrolysis of water-working principle, storage methods-types, emissions of hydrogen, CNG- Introduction-production-properties-storage-advantages-disadvantages,CNG kit-layout, emissions from CNG, LPG-introduction-production, properties-storage-dispensing & transportation-advantages and disadvantages, LPG Fuel kit layout, emission from LPG.

### Reference books:

| SN | Title of the book                                 | Author                                 | Publisher  |
|----|---|--|--|
| 1. | Non-Conventional energy sources.                  | G.D.Rai                                | Khanna Publishers  |
| 2. | Non-Conventional energy sources-2 E               | B.H.Khan                               | Tata McGraw Hill   |
| 3. | Renewable Energy Sources & Emerging Technologies. | D P Kothari, KC Singal & Rakesh Ranjan | Prentice Hall India                                      |
| 4  | Solar energy.                                     | H.P.Garg                               | McGraw Hill-Education                                    |
| 5  | Alternative fuels                                 | Thipse                                 | Jaico publications                                       |
| 6  | Alternative Fuels & the Environment               | Frances S. Sterrett                    | Hardback   |
| 7  | Internal combustion Engine                        | M.L. Mathur and R.P. Sharma            | DhanpatRai Publications                                  |
| 8  | Alternative fuels                                 | V.Ganeshan                             | McGraw Hill Education (India) Private Limited, New Delhi |
| 9  | Automobile Engg (V-I, engines)                    | Anil Chikara                           |  |
| 10 | Alternative fuel Technology                       | Erjavec and Arias<br>CENAGE Learning   |  |

### **Websites:**

- xi. download other power plant related videos from youtube.com for study purpose
- i. <http://nptel.ac.in/courses/112105051/>
- ii. [https://www.youtube.com/watch?v=Ota2\\_LUuar0](https://www.youtube.com/watch?v=Ota2_LUuar0)
- iii. [https://www.youtube.com/watch?v=Ota2\\_LUuar0](https://www.youtube.com/watch?v=Ota2_LUuar0)
- iv. <https://www.youtube.com/watch?v=3dJAtHaSQ98>
- v. <https://www.youtube.com/watch?v=xokHLFE96h8>
- vi. <http://www.tatapower.com/businesses/renewable-energy.aspx>
- vii. <http://www.cleanlineenergy.com/technology/wind-and-solar>
- viii. <https://www.youtube.com/watch?v=kbuLfXgw4Gs>
- ix. <https://www.youtube.com/watch?v=r9q80sSHxKM>
- x. [https://www.youtube.com/watch?v=GZKKWz\\_tX1c](https://www.youtube.com/watch?v=GZKKWz_tX1c)
- <http://cleantechnica.com/2012/03/08/top-eight-alternative-fuels/>
- <http://www.intechopen.com/books/authors/alternative-fuels-technical-and-environmental-conditions/combustion-of-gaseous-alternative-fuels>

### **Student Activities to be performed to award five marks in continuous internal evaluation:**

1. Identify the solar intensity and wind speed in your institute locality and calculate the intensity of Solar/Wind Power can be generated.
2. Visit to web site of ministry of renewable energy ,Government of India: <http://mnre.gov.in/>  
make a Study on ‘Developmental Impact and Sustainable Governance aspects of Renewable Energy Projects’
3. Visit solar power plant /wind power plant available in your locality/ nearer to your institute and understand different elements, working, and note the power generation by these plants
4. Prepare a chart on comparative study of properties of alternative fuels.
5. Prepare a report on different feedstock selection to produce alternative fuels.
6. Analyze combustion of different alternative fuels and submit a report of the comparative analysis.
7. Run the engine with different alternative fuels and prepare performance report.
8. Prepare a report on engine modifications for different alternative fuels.
9. Prepare a chart on comparative study of emissions of alternative fuels.
10. Visit nearby biogas/bio fuel plants and prepare a report.
11. Draw the Layout of different vehicles runs on alternative fuels analyse and submit report.

### **Note:**

1. Student should prepare a report on any one of the above/similar activity, which helps in achieving above course outcomes.
2. The report prepared should be approved by the concerned staff and HOD.
3. The activity group should consist of maximum of three students.

**MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

**RUBRICS MODEL**

| Student Name :                                       |  |   |  |  |  | Reg No:              |
|--|--|---|--|--|--|----------------------|
| <b>RUBRICS FOR ACTIVITY( 5 Marks)</b>                |  |   |  |  |  |                      |
|  | <b>Unsatisfactory</b>                                  | <b>Developing</b>   | <b>Satisfactory</b>  | <b>Good</b>  | <b>Exemplary</b>   | <b>Student Score</b> |
|  | <b>1 Mark</b>  | <b>2 Mark</b>   | <b>3 Mark</b>  | <b>4 Mark</b>  | <b>5 Mark</b>  |                      |
| <b>Collectio<br/>n of data</b>                       | Does not collect any information relating to the topic | Collects very limited information; some relate to the topic     | Collect much information; but very limited relate to the topic | Collects some basic information; most refer to the topic | Collects a great deal of information; all refer to the topic | Ex:<br>4             |
| <b>Fulfill<br/>team's<br/>roles<br/>&amp; duties</b> | Does not perform any duties assigned to the team role  | Performs very little duties but unreliable.                     | Performs very little duties                                    | Performs nearly all duties                               | Performs all duties of assigned team roles                   | 5                    |
| <b>Shares<br/>work<br/>equally</b>                   | Always relies on others to do the work                 | Rarely does the assigned work; often needs reminding            | Usually does the assigned work; rarely needs reminding         | Normally does the assigned work                          | Always does the assigned work without having to be reminded. | 3                    |
| <b>Listen to<br/>other<br/>Team<br/>mates</b>        | Is always talking; never allows anyone else to speak   | Usually does most of the talking; rarely allows others to speak | Talks good; but never show interest in listening others        | Listens, but sometimes talk too much                     | Listens and speaks a fair amount                             | 2                    |
| <b>Average / Total =marks=(4+5+3+2)/4=14/4=3.5=4</b> |  |   |  |  |  |                      |

**Note: This is only an example for one student. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.**

### Course Assessment and Evaluation Scheme:

| Method              | What                                 |          | To whom  | When/Where (Frequency in the course)     | Max Marks | Evidence collected    | Course outcomes  |
|---------------------|--------------------------------------|----------|----------|--|-----------|-----------------------|--|
| Direct Assessment   | CIE (Continuous Internal Evaluation) | IA       | Students | Three IA Tests; (Average of three Tests) | 20        | Blue books            | 1,2,3,4,5,6  |
|                     |                                      |          |          | Activity                                 | 05        | Activity report       | 1,2,3,4,5,6  |
|                     | SEE (Semester End Examination)       | End Exam |          | End of the course                        | 100       | Answer scripts at BTE | 1,2,3,4,5,6  |
| Indirect Assessment | Student Feedback on course           |          | Students | Middle of the course                     |           | Feedback forms        | 1,2 & 3 Delivery of course   |
|                     | End of Course Survey                 |          |          | End of the course                        |           | Questionnaires        | 1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods |

**Note:** I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

**Note to IA verifier:** The following documents to be verified by CIE verifier at the end of semester

1. Blue books ( 20 marks)
2. Student suggested activities report for 5 marks evaluated through appropriate rubrics.
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods

## MODEL QUESTION PAPER (CIE)

Note to Course co-coordinator: The course coordinator has to follow the question paper blue print given in above table

| Test/Date and Time                              | Semester/year  | Course/Course Code               | Max Marks |         |
|---|--|----------------------------------|-----------|---------|
| Ex: I test/6 <sup>th</sup> week of sem 10-11 Am | VI semester  | Alternative fuels for IC engines | 20        |         |
|   | Year: 2015-16  | Course code:15AT54B              |           |         |
| Name of Course coordinator : Units:1,2 Co: 1,2  |  |                                  |           |         |
| <b>Note: Answer all questions</b>               |  |                                  |           |         |
| Q No  | Question   | CL                               | CO        | PO      |
| 1   | 1. List the various Renewable and non renewable energy sources . 5 marks<br>OR       | A                                | 1         | 1,2,5,6 |
|   | 1. State the advantages and limitations of non conventional energy sources<br>5marks | A                                | 1         | 1,2,5,6 |
| 2   | 2. Sketch and label parabolic collector . 5marks<br>OR                               | A                                | 2         | 1,2,5,6 |
|   | 2. Define solar constant, and explain briefly 5marks                                 | A                                | 2         | 1,2,5,6 |
| 3   | 3. Explain compressed air storage system with a schematic diagram<br>10marks<br>OR   | A                                | 2         | 2       |
|   | 3 Explain with a neat sketch typical flat plate liquid collector<br>10marks          | A                                | 2         | 1,2,5,6 |

### MODEL QUESTIONPAPER (SEE)

#### VI Semester Diploma Examination Alternative fuels for IC engines {Elective Theory}

[Time:3 Hours]

[MaxMarks:100]

**Note:** Answer any **SIX** Questions from Part-A and any **SEVEN** Questions from Part-B

#### Part A

6x5=30Marks

1. What are the barriers in implementing alternative fuels?
2. Write a short note on the energy security of a nation.
3. What are the different methods for storage of hydrogen?
4. List the advantages and limitations of CNG.
5. State the necessity of energy conservation and list its various aspects
6. List the advantages and disadvantages of wind turbines
7. Mention the applications and advantages of flat plate collector
8. List the composition of biogas.
9. State the emissions by methanol.

#### Part B

7X10=70 Marks

1. Explain about the solar collectors and its types
2. a) State the advantages and limitations of conventional energy sources  
b) Sketch and label parabolic collector
3. Explain with a neat sketch solar air heater and air collector

4. a) List the advantages and limitations of horizontal wind turbine.  
b) List the barriers in implementing alternative fuels.
5. Describe with neat sketch the working of a wind energy conversion system(WECS) with main components
6. With a block diagram explain the manufacture of ethanol from food grains.
7. List the advantages and disadvantages of biogas as a fuel.
8. With a block diagram explain the layout of LPG Kit
9. a) State the properties of methanol  
b) Explain process of storage of ethanol.
10. Explain pumped hydro electric energy storage system with a schematic

## **MODEL QUESTIONS**

**CO1: Discuss the need of energy conversion and the various methods of energy storage.**

### **REMEMBERING**

1. Define primary and secondary energy sources.
2. Define Renewable and non renewable energy sources.
3. List out the primary and secondary energy sources
4. List the various Renewable and non renewable energy sources
5. State the advantages and limitations of conventional energy sources
6. State the advantages and limitations of non conventional energy sources
7. List the categories of energy storage system

### **UNDERSTANDING**

1. Explain conventional energy sources.
2. Explain the concept of renewable energy
3. Explain the primary sources and secondary sources and their availability
4. Explain the importance of renewable energy sources compared to Non renewable energy sources.
5. Explain the necessity of energy conservation. Explain its various aspects.
6. Explain various principles of energy conservation.
7. Explain energy storage concepts and devices available
8. Explain the necessity of energy storage system
9. Explain pumped hydro electric energy storage system with a schematic
10. Explain compressed air storage system with a schematic diagram
11. Explain lead acid battery, with a neat sketch
12. Explain chemical energy storage via hydrogen



## APPLICATION

1. Prepare the per capita energy consumption related with standard of living.
2. Compute the sources of commercial energy.
3. Explain the primary sources and secondary sources and their availability
4. Analyse the necessity of energy conservation. Explain its various aspects

## CO2: Explain Solar energy conversion processes with their applications.

### REMEMBERING

1. Define solar constant, and explain briefly.
2. Define beam, diffused and global radiation
3. Define solar irradiance, solar constant, extra terrestrial and terrestrial radiations
4. Define solar collectors and list the types of collectors
5. Mention the applications and advantages of flat plate collector
6. Sketch and label parabolic collector
7. State the advantages and disadvantages of concentrating collector over flat plate collector.
8. State the advantages and disadvantages of flat plate collector

### UNDERSTANDING

1. Explain solar energy engineering
2. Explain the amount of solar energy available at the earth's surface with suitable equation
3. Predict the average amount of solar energy available at the day time.
4. Explain about solar radiation measurements
5. Discuss beam and diffused radiation and global radiation
6. Discuss the reasons for variation in solar radiation reaching the earth than received at outside of the atmosphere
7. Explain pyrliometer and pyronometer
8. Explain the construction and principle of operation of a sunshine recorder
9. Explain principle of conversion of solar energy into heat.
10. Explain basic features required in an ideal pyronometer.
11. Explain with a neat sketch typical flat plate liquid collector.
12. Explain with a neat sketch solar air heater and air collector.
13. Explain parabolic focussing collector.
14. Explain non focussing collector (Flat plate collector augmented with mirrors).
15. Explain the effect of various parameters on the performance flat plate collector.
16. Explain the effect of various parameters on the performance concentrating collector.
17. Explain with a neat sketch solar water heater.
18. Explain with a neat sketch box type solar cooker.
19. Explain with a neat sketch working of solar dryer.
20. Explain solar greenhouse.
21. Explain briefly about the supply of adequate amount of CO<sub>2</sub> maintained in greenhouse.
22. Explain with a neat sketch winter green house.
23. Explain with a neat sketch summer green house.
24. Explain the principle of solar electric power generation (solar photo voltaic).
25. Explain selective coatings used in solar collectors.

## APPLICATION

1. Explain the effect of tilting a flat plate collector on the collection of solar energy.
2. Sketch Pyranometer and Pyrheliometer and label the parts.
3. Analyse the effect of sun tracking of flat plate solar collector on collection of solar energy.
4. Explain the types of greenhouses with sketches.
5. Explain Selective coating used in solar collectors.
6. Discuss about the solar collectors and its types.
7. Write about the effects of various parameters on the performance concentrating collector.
8. Illustrate about the applications of solar energy with at least two examples.

## CO3: Explain the principle of Wind energy conversion and different wind mills.

### REMEMBERING

1. List the forces responsible for determining the speed and direction of global winds.
2. List the factors led to accelerated development of wind power?
3. List the factors affecting the distribution of wind energy system on the surface of the earth.
4. List the advantages and disadvantages of wind turbines.
5. List the advantages and limitations of horizontal wind turbine.
6. List the advantages and limitations of vertical wind turbine.
7. Comment on the environmental impacts of wind energy.

### UNDERSTANDING

1. Indicate the circulation of global winds with a help of schematic diagram.
2. Explain the mechanism for production of local winds.
3. Discuss the range of wind speed is considered favourable for wind power generation.
4. Explain the basic principle of wind energy conversion.
5. Explain the forces acting on wind blades.
6. Explain the concept of lift and drag.
7. Explain the relative features of lift and drag type machines.
8. Describe the main considerations in selecting a site for wind generators.
9. Describe with neat sketch the working of a wind energy conversion system (WECS) with main components.
10. Explain the components of wind energy conversion systems.
11. Explain with neat sketch horizontal and vertical axis wind system.
12. Explain the present prospectus of wind energy in India.

### APPLICATION

1. Write about the favourable sites for installing the wind turbines.
2. Explain the main considerations in selecting a site for wind generators.
3. Explain the working of a wind energy conversion system (WECS) with neat sketch.
4. Explain the horizontal and vertical axis wind system with an neat sketch.
5. Write the main considerations in selecting a site for wind generators.
- 6.

## CO4: Express the need, limitations and types of alternative fuels.

## REMEMBERING

1. List the needs for alternative fuels.
2. What are the barriers in implementing alternative fuels?
3. Write a short note on the energy security of a nation.
4. List five prominent alternative fuels.

## UNDERSTANDING & APPLICATION

1. Explain business driving factors for alternative fuels.
2. Explain the implementation barriers for alternative fuels.

## CO5: Acquire the knowledge of manufacturing, properties, storage & emission of Bio fuels

## REMEMBERING

1. What is the composition of biogas?
2. Write the properties of biogas.
3. List the factors affecting the biogas generation.
4. Explain biogas suitability as fuel for IC engine.
5. State the properties of methanol.
6. List the advantages and disadvantages of methanol as a fuel.
7. Explain the method of storage of methanol.
8. State the emissions by methanol.
9. List the advantages and disadvantages of ethanol as a fuel.
10. Explain process of storage of ethanol.
11. What are E-diesel and Gasohol?
12. Explain engine modifications required for ethanol usage.
13. List the emission advantages of ethanol.

## UNDERSTANDING & UNDERSTANDING & APPLICATION

1. Explain any one type of biogas production.
2. List the advantages and disadvantages of biogas as a fuel.
3. With a block diagram explain the production of methanol from lignite or coal.
4. With a block diagram explain the production of methanol from Municipal solid waste.
5. With a block diagram explain the manufacture of ethanol from food grains.
6. With a block diagram explain the production of ethanol from sugarcane.

## CO6: Acquire the knowledge of manufacture, properties, storage, and emission of Hydrogen, CNG and LPG.

## REMEMBERING

1. Why is hydrogen referred to as a “freedom fuel.”
2. What are the different methods for storage of hydrogen.

3. List the advantages and disadvantage of hydrogen as fuel.
4. List the hazards caused by hydrogen.
5. State some important properties of CNG.
6. State the properties of CNG.
7. Explain the method of storage of CNG.
8. List the advantages and limitations of CNG
9. State the important properties of LPG.
10. Write a short note on storage facilities for LPG.
11. List the emission advantage of LPG.
12. List the advantage and disadvantage of LPG as a fuel.

#### UNDERSTANDING & APPLICATION

1. Describe any electrolysis method of hydrogen production in detail.
2. With a block diagram explain the layout of CNG Kit.
3. Is CNG environmental friendly as compare to gasoline? Explain.
4. Explain the production process of LPG.
5. With a block diagram explain the layout of LPG Kit.