Maharashtra State Board of Technical Education, Mumbai

K-2

# LABORATORY PLAN (LP)

**Academic Year: 2025-26**

Date: 09/12/2025

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078) Class: TYCH

Program and Code: Chemical Engineering (CH) Course Index: CO606

Course Name: **PETROCHEMICAL TECHNOLOGY** Course Code &. Abbr.: 316306(PCT)

Total Hrs: 45 Semester: 6th Scheme: K Name of Faculty: Mrs. A. B. Shaikh

- **INDUSTRY EXPECTED OUTCOME**

Develop expertise in food processing, preservation techniques, oil-seed technology, additive use, and compliance with food laws and regulations in food processing industries.

- **COURSE LEVEL LEARNING OUTCOMES (COS)**

- CO606.1 - Identify the components of petroleum.
- CO606.2 - Identify fractions and its properties after fractionation of petroleum.
- CO606.3 - Use the different refinery processes to enhance the properties of refinery fractions.
- CO606.4 - Demonstrate the manufacturing of pure chemicals from C1 to C4 chemicals through flow chart.
- CO606.5 - Use Udex process to separate aromatic hydrocarbons from reformate.

## • Teaching and Examination Scheme:

| Course Code | Course Title | Abbr | Course Category/s | Learning Scheme | | | | | Credits | Paper Duration | Assessment Scheme | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Actual Contact Hrs/Week | | | SLH | NLH | | | Theory | | | | Based on LL & TSL Practical | | | | Based on SL | | Total Marks |
| | | | | | | | | | | | FA-TH | SA-TH | Total | | FA-PR | | SA-PR | | SLA | | |
| | | | | CL | TL | LL | | | | | Max | Max | Max | Min | Max | Min | Max | Min | Max | Min | |
| 316306 | PETROCHEMICAL TECHNOLOGY | PCT | DSE | 3 | - | 2 | 1 | 6 | 3 | 03 | 30 | 70 | 100 | 40 | 25 | 10 | 25# | 10 | 25 | 10 | 175 |

Abbreviations: CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

## • Laboratory Learning Outcome (LLO)

| LLO No. | Title of LLO |
|---|---|
| LLO 1.1 | Measure specific gravity of given sample using digital weight balance and then evaluate API gravity. |
| LLO 2.1 | Measure the time required to collect 50 ml of sample. By using the time, calculate viscosity of given sample at different temperatures. |
| LLO 3.1 | Measure the minimum temperature at which the vapours of given oil will give momentary flash and oil will burn at least for 5 seconds on the application of standard flame. |
| LLO 4.1 | Measure the minimum temperature at which the vapours of given oil will give momentary flash and oil will burn at least for 5 seconds on the application of standard flame. |
| LLO 5.1 | Measure the minimum temperature at which the vapours of given oil will give momentary flash and oil will burn at least for 5 seconds on the application of standard flame. |
| LLO 6.1 | Measure the maximum height of the flame in millimeter at which the vapours of given oil will burn without giving smoke. |
| LLO 7.1 | Measure the minimum temperature at which the equal volume of anhydrous aniline and given oil sample is completely miscible. |
| LLO 8.1 | Measure the minimum temperature at which oil appears a cloudy nature and ceases to flow. |

| | |
|---|---|
| LLO 9.1 | Measure the weight of carbon residue of given sample on digital balance by evaporating light components from it by means of heating. |
| LLO 10.1 | Measure initial and final boiling point of given sample. |
| LLO 11.1 | Measure the minimum temperature at which the wax melts and drop falls within test tube by providing paraffin liquid bath as a heating media. |
| LLO 12.1 | After the completion of reaction, ethyl acetate layer is washed with water, filter it with filter paper and after drying then measure the yield of ethyl acetate. |
| LLO 13.1 | After the completion of reaction, PF resin layer is washed with water, filter it with filter paper and after drying measure the yield of phenol formaldehyde resin. |
| LLO 14.1 | Separate the layer of biodiesel and glycerine by means of separating funnel and then measure the volume of biodiesel layer. |
| LLO 15.1 | Separate benzene-toluene liquid mixture using DWSIM chemical process simulator. |
| LLO 16.1 | Measure the API gravity and aniline point of given sample and then calculate diesel index mathematically. |

- **COs, Practical Laboratory Learning Outcome (LLOs) and Mapping:**

| PR. No | Relevant COs | Practical - Laboratory Learning Outcome (LLO) | Practical Titles | Planned Dates | | Actual Date of conduction | Remark/ Assess-ment Date with Staff sign |
|---|---|---|---|---|---|---|---|
| | | | | From | To | | |
| 1 | CO1 CO2 CO4 CO5 | LLO 1.1 | Determination of API gravity of given petroleum sample using density bottle. | A-19/12/25 | A-26/12/25 | | |
| | | | | B-20/12/25 | B-27/12/25 | | |
| 2 | CO1 CO2 CO4 CO5 | LLO2.1 | Determination of viscosity of given petroleum sample at different temperatures using Redwood viscometer. | A-26/12/25 | A-02/01/26 | | |
| | | | | B-27/12/25 | B-03/01/26 | | |
| 3 | CO2 | LLO 4.1 | * Determination of the flash point and fire point of the given sample using Abel's apparatus. | A-02/01/26 | A-09/01/26 | | |
| | | | | B-03/01/26 | B-10/01/26 | | |
| 4 | CO2 | LLO 6.1 | * Determination of smoke point of given sample. | A-09/01/26 | A-16/01/26 | | |
| | | | | B-10/01/26 | B-17/01/26 | | |
| 5 | CO2 CO5 | LLO 7.1 | * Determination of aniline point of the given sample. | A-16/01/26 | A-23/01/26 | | |
| | | | | B-17/01/26 | B-24/01/26 | | |
| 6 | CO2 CO3 | LLO 8.1 | * Determination of cloud point and pour point of the given sample. | A-23/01/26 | A-30/01/26 | | |
| | | | | B-24/01/26 | B-31/01/26 | | |
| 7 | CO1 CO2 | LLO 9.1 | * Determination of carbon residue of a given sample using Conradson apparatus. | A-30/01/26 | A-06/02/26 | | |
| | | | | B-31/01/26 | B-07/02/26 | | |
| 8 | CO2 | LLO 11.1 | * Determination of drop melting point of wax | A-06/02/26 | A-13/02/26 | | |

| PR. No | Relevant COs | Practical - Laboratory Learning Outcome (LLO) | Practical Titles | Planned Dates | | Actual Date of conduction | Remark/ Assess-ment Date with Staff sign |
|---|---|---|---|---|---|---|---|
| | | | using drop point apparatus. | B-07/02/26 | B-14/02/26 | | |
| 9 | CO3 | LLO 12.1 | Synthesis of ethyl acetate from acetic acid and ethyl alcohol using the esterification process. | A-13/02/26 | A-20/02/26 | | |
| | | | | B-14/02/26 | B-21/02/26 | | |
| 10 | CO3 | LLO 13.1 | * Preparation of phenol formaldehyde resin. | A-20/02/26 | A-27/02/26 | | |
| | | | | B-21/02/26 | B-28/02/26 | | |
| 11 | CO4 | LLO 14.1 | * Preparation of biodiesel from used vegetable oil using a transesterification process. | A-27/02/26 | A-06/03/26 | | |
| | | | | B-28/02/26 | B-07/03/26 | | |
| 12 | CO1 CO2 CO5 | LLO 16.1 | * Determination of the diesel index of a given sample. | A-06/03/26 | A-13/03/26 | | |
| | | | | B-07/03/26 | B-14/03/26 | | |
| 13 | | | **Beyond Syllabus Practical.** | A-13/03/26 | A-20/03/26 | | |
| | | | | B-14/03/26 | B-21/03/26 | | |

- **ASSESSMENT METHODOLOGIES/TOOLS**

**A. Formative assessment (Assessment for Learning)**

- Two Class Test of 30 Marks Each, Term Work Assessment of 25 Marks, and Self learning assessment of 25 marks.

**B. Summative Assessment (Assessment of Learning)**

- End Term Theory Examination, End Term Practical Examination

## Laboratory Equipment / Instruments / Tools / Software required

| Sr. No. | Equipment Name with Broad Specifications | Relevant LLO Number |
|---|---|---|
| 1 | Specific gravity bottle , capacity of 10ml / 25 ml. | 1,16 |
| 2 | ASTM distillation set up as per ASTM standard. | 10 |
| 3 | Drop point apparatus: Drop Point apparatus as per IP-132 and ASTM-D-566 20 to 120 °C x 1°C Or 100 to 230 °C x 1°C. | 11 |
| 4 | Conical flash (500 ml), beaker (500 ml), separating funnel, filter paper, weighing balance, dropper. | 12,13,14 |
| 5 | DWSIM Chemical process simulator | 15 |
| 6 | Redwood viscometer: electronic digital indicator and controller and FHP motor stirrer. | 2 |
| 7 | Pensky Marten Flash Point Apparatus: electric heater with temp, regulator. Suitable for operation on 220 Volts 50 cycles AC Circuits. | 3 |
| 8 | Abels Flash Point Apparatus: It is supplied with oil cup, cover fitted with stirrer, thermometer socket S.S.Water Bath, Stand. An electric heater is fitted at bottom for range -18°C to +70°C with Refrigeration System | 4 |
| 9 | Cleveland open cup flash point apparatus: as per ASTM standards | 5 |
| 10 | Smoke point apparatus: as per ASTM standards | 6 |
| 11 | Aniline Point Apparatus: Power: 10W, Supply Voltage: 220V/50Hz, 01 no. | 7,16 |

| | | |
|---|---|---|
| | Transformer Unit Electrical heater with variable heat control, Multi-test verification material. Spares Kit, glassware, electrically heated with motorized stirrer | |
| 12 | Cloud & Pour Point Apparatus: glass bath jar, polished brass cylinder mounted on metal tripod base, glass test cylinder, cork bottom disc and top rings, thermometer (H-2600.5F -36° to 120°F) fitted into cork for sealing test cylinder. | 8 |
| 13 | Conradson Carbon Residue Apparatus: The apparatus consists of spun sheet iron crucible 25cc Capacity, Sheet Iron hood and sheet iron block on a stand with triangular wire, and gas Burner. Elect heating with separate regulator control. | 9 |

- **References:**
- **Suggested Learning Materials / Books:**

| Sr. No. | Author | Title of Book | Publication |
|---|---|---|---|
| 1 | B. K. Bhaskara Rao | Modern Petrochemical Refining processes | Oxford – IBH Publications, Delhi ISBN:9788120417115 |
| 2 | B. K. Bhaskara Rao | A Text on Petrochemicals | Khanna Publishers, Delhi ISBN- 9788174090444 |
| 3 | W. L. Nelson | Petroleum Refinery Engineering | McGraw Hill, New York Publications, ISBN: 9780070855366 |
| 4 | Gary, James H Glenn E Handwork Mark J Kai sen | Petroleum Refining Technology and Economics | CRC Press, USA Publications, ISBN - 9780849370380 |
| 5 | M. Gopal Rao and Sitting, Marshal | M. Gopal Rao and Sitting, Marshal | East-West Press Pvt. Ltd., Delhi Publications, ISBN- 9788185938790 |
| 6 | Austin G.T. | Shreve's Chemical Process Industries | McGraw Hill India, Pune Publications, ISBN-9781259029455 |
| 7 | Dr. Ram Prasad | Petroleum Refining Technology | Khanna Publishers, Delhi ISBN- 9788174090645 |
| 8 | Sukumar Maiti | Introduction to Petrochemicals | Oxford - IBH Publications, Delhi ISBN:9788120406636 |
| 9 | James G. Speight | Handbook of petrochemical processes | CRC Press Publications, ISBN: 10: 1498729703 |

- **Learning Websites & Portal**

| Sr. No | Link / Portal | Description |
|---|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc23_ch64/preview<br>https://nptel.ac.in/courses/103105221<br>https://nptel.ac.in/courses/114106042<br>https://www.youtube.com/watch?v=Js4cxZRtk5Q<br>https://archive.nptel.ac.in/courses/103/102/103102022/<br>https://archive.nptel.ac.in/content/syllabus_pdf/103102022.p<br>df http://digimat.in/nptel/courses/video/103107081/L15.html<br>http://kcl.digimat.in/nptel/courses/video/103103220/L19.html<br>https://www.youtube.com/watch?v=az-q9ga5M0g<br>https://www.youtube.com/watch?v=JAZTQhIoEd8<br>https://www.youtube.com/watch?v=CZCdDpm3SmE<br>https://www.youtube.com/watch?v=LpWRMYgSatw<br>https://archive.nptel.ac.in/courses/103/107/103107082/<br>https://onlinecourses.nptel.ac.in/noc23_ch46/preview<br>https://archive.nptel.ac.in/courses/103/103/103103217/<br>https://archive.nptel.ac.in/courses/103/107/103107082/<br>https://digimat.in/nptel/courses/video/103107081/L27.html<br>http://acl.digimat.in/nptel/courses/video/103107212/L58.html<br>https://www.youtube.com/watch?v=s1N_VhgbWv4 | Petrochemical Technology |

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