**Department of Mechanical Engineering**

**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

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| **COURSE OUTLINE TEMPLATE** |
| **Course Title** |  **OIL HYDRAULICS AND PNEUMATICS** |
| **Course Code** | **MEPE 24** | **No. of Credits** | **3** |
| **Department** | **MECHANICAL** | **Faculty** | **M.UDAYAKUMAR** |
| **Pre-requisites****Course Code** | **NIL** |
| **Course Coordinator(s)****(if, applicable)** |  |
| **Other Course****Teacher(s)/Tutor(s)****E-mail** | **muday@nitt.edu** | **Telephone No.** | **9487257871** |
| **Course Type** |  **Core course Elective course (X)****XXX**X |
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| **COURSE OVERVIEW** |
| **Exposes and trains the students to basics of fluid power systems. Based on the constuctional and woking features of components like pumps, valves and actuators, knowledge is imparted to build efficient hydraulic / pneumatic systems. Also practical aspects like filteration, sealing and plumbing and review of different conrol systems included in this course.**  |
| **COURSE OBJECTIVE** |
| 1. **To Expose and trains the students to basics of fluid power systems**
2. **To is impart knowledge to build efficient hydraulic / pneumatic systems.**
3. **Expose students to practical aspects like filteration, sealing and plumbing and review different conrol systems**
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| **COURSE OUTCOMES (CO)** |
| **Course Outcomes** | **Aligned Programme Outcomes (PO)** |
| **1. Recall various fluid properties and identify the appropriate fluid power system for particular application.** | **PO\_1, PO-2, PO-3, PO-4** |
| **2. Recognize the suitable pump and actuators for particular application.** | **PO-1, PO-2, PO-4, PO-5, PO-6** |
| **3. Select various control valves such as pressure control, flow control, direction control valves and use them in hydraulic and pneumatic circuit development and analyze the hydraulic and pneumatic circuit for energy efficiency** |  **PO-3, PO-4, PO\_5, PO-6, PO-8**  |
| **4. Select the appropriate control system like electrical, electronics, and PLC to control the fluid power system** | **PO\_6, PO-7, PO\_8, PO-9, PO-10** |
| **5. Trouble-shoot and identify maintenance problems associated with fluid power system.** | **Po-8, PO-9, PO-10, PO-11, PO-12** |
| **COURSE TEACHING AND LEARNING ACTIVITIES** |
| **S.No.** | **Week** | **Topic** | **Mode of Delivery** |
| **1** | **Week-1** | **Introduction to fluid power and the components, design principles for fluid power systems, review of fluid mechanics and m/c tool principles** | **Chalk and talk** |
| **2** | **Week-2** | **Calculation of motor power, pressure drop in hydraulic lines, properties of hydraulic fluids, seals and seal materials** | **Chalk and talk** |
| **3** | **Week-3** | **Conductors and connectors, reservoir sizing and construction, conditioning of fluids. Introduction to pumps** | **Chalk and talk** |
| **4** | **Week -4** | **Gear pumps, vane pumps, reversibility, pressure compensated flow, axial piston pumps , radial piston pumps, pump performance**  | **Chalk and talk** |
| **5** | **Week-5** | **TEST-1. Pressure relief values, direct, pilot operated, sequence, unloading types. Application circuits for counter balance and sequence**  | **Chalk and talk** |
| **6** | **Week-6** | **High-low ckt employing unloading valves. DC valves, check, pilot check, application ckts.** | **Chalk and talk** |
| **7.** | **Week-7** | **2W, 3W, 4W, 2and 3 position valves. Different neutral positions- application circuits** | **Chalk and talk** |
| **8** | **Week-8** | **Cartridge valves, applications, pressure compensated flow control valves and pumps, servo valves** | **PPTs** |
| **9** | **Week-9** | **Types of filters, locations for filters, videos on working of difft pumps, poppet valves, applications, pr. Reducing valves. TEST-2** | **PPTs** |
| **10** | **Week-10** | **Types of hyd. Cylinders, end cushion, hyd. Motors, press ckts, hyd. Ckts like fail safe, cont. reciprocation, hyd. Static transmission** | **PPTs** |
| **11** | **Week-11** | **Gain calculation for servo, accumulators-applications, intensifiers -ckt.**  | **PPTs** |
| **12** | **Week-12** | **Air compressors, types, size of air receiver, pr. drop in air lines, filter, regulator and lubricator** | **PPTs** |
| **13** | **Week-13** | **Pneumatic vales difft. Types, construction and working, application ckt. RE TEST** | **PPTs** |
| **COURSE ASSESSMENT METHODS** |
| **S.No.** | **Mode of Assessment** | **Week/Date** | **Duration** | **% Weightage** |
| **1** | **Cycle test-1** | **6** | **1 hour** | **20** |
| **2** | **Cycle test-2** | **10** | **1 hour** | **20** |
| **3** | **seminars** | **12 week onwards** | **Each 25 min presentation** | **10** |
| **4** | **End semester** | **15** | **3 hour** | **50** |
| **5** |  |  |  |  |
| **ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc** |
| **1. Esposito. A., Fluid Power with Applications, 6 th ed., Pearson Education, 2014.** **2. Industrial Hydraulics, Vickers - Sperry Manual, 2002** |
| **COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)** |
| 1. Students can meet the faculty at any stage in the course duration in case he/she finds difficulty in understanding the concept.
2. Feedback form issued to students to express their comments about the course after completing the syllabus. Students are requested to give genuine feedback about the course.
3. Student knowledge about the topic covered in this course will be judged during continuous assessments based on the marks obtained in the written examination.
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| **COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)** |
| * Students must attend all the classes regularly.
* Students should present individual seminars using ppt as per the given instructions at the class. Postponement of presentation is not permitted.
* The Institute follows relative grading with flexibility given to teachers to decide the mark ranges for grades.
* All assessment of this course will be done on the basis of marks.
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| **ADDITIONAL COURSE INFORMATION** |
| The Course Instructor is available for consultation at all times over mobile/ phone or over email.  |
| **ATTENDANCE POLICY: (A uniform attendance policy as specified below shall be followed)****• At least 75% attendance in each course is mandatory.** **• A maximum of 10% shall be allowed under On Duty (OD) category.** **• Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.** |
| **FOR SENATE’S CONSIDERATION** |
| **Course Faculty \_\_\_\_\_\_\_\_\_\_ CC-Chairperson \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ HOD \_\_\_\_\_\_\_\_\_\_\_\_** |

Course Code : MEPE24 Course Title : OIL HYDRAULICS AND PNEUMATICS Number of Credits : 3 Prerequisites (Course code) : MEPC18 Course Type : PROGRAMME ELECTIVE

Course Learning Objectives

 1. The cognitive objective of this course is for each student to comprehend foundational knowledge needed to perform stated entry-level industry competencies.

 2. The performance objective of this course is for each student to apply foundational knowledge to hydraulic and pneumatic problems and exercises encountered in class.

Course Content Basic concepts of fluid power system design - Hydraulic oils and fluid properties – Seals and Seal materials - Filters and Filtration. Hydraulic pumps, cylinders, and motors - Construction, sizing, and selection. Control valves; pressure, flow, and direction - Servo-valves. Basic hydraulic circuits, hydrostatic transmission - Cartridge valve circuits. Control of hydraulic circuits - Electrical, electronics, and PLC - Pneumatic components and basic circuits.

Reference Books: 1. Esposito. A., Fluid Power with Applications, 5 th ed., Pearson Education, 2003.

1. Industrial Hydraulics, Vickers - Sperry Manual, 2002.

Course Outcomes 1. Recall various fluid properties and identify the appropriate fluid power system for particular application.

2. Recognize the suitable pump and actuators for particular application.

3. Select various control valves such as pressure control, flow control, direction control valves and use them in hydraulic and pneumatic circuit development and analyze the hydraulic and pneumatic circuit for energy efficiency.

4. Select the appropriate control system like electrical, electronics, and PLC to control the fluid power system.

5. Trouble-shoot and identify maintenance problems associated with fluid power system.