# GANPAT UNIVERSITY

## FACULTY OF ENGINEERING & TECHNOLOGY

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|---|---|---|---|---|---|---|---|---|
| Programme | Diploma Engineering | | | | Branch | Mechanical Engineering | | |
| Semester | III | | | | Version | 1.0.0.0 | | |
| Effective from Academic Year | | | 2019-20 | | Effective for the batch Admitted in | | | June 2019 |
| Subject code | 1ME2302 | | Subject Name | | Thermodynamics | | | |
| Teaching scheme | | | | | Examination scheme (Marks) | | | |
| (Per week) | Lecture(DT) | | Practical(Lab.) | Total | | CE | SEE | Total |
| | L | TU | P | TW | | | | |
| Credit | 3 | 0 | 0 | 0 | 3 | Theory | 40 | 60 | 100 |
| Hours | 3 | 0 | 0 | 0 | 3 | Practical | 0 | 0 | 0 |

| Pre-requisites: |
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| To know rules of basic laws of physics, chemistry and mathamatics with unit system are requirement. Student must able to know about various elements of mechanical engineering |

| Course Learning Outcomes: |
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| The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes:<br>CO1. To understand knowledge of mathematics, science and engineering fundamentals to model the energy conversion phenomenon used in thermodynamics.<br>CO2. To apply the first law of thermodynamics for a closed system and its applications.<br>CO3. To develop an understanding the various ideal gas laws & thermodynamic processes.<br>CO4. To Understand second law of thermodynamics in real life problems and importance of entropy.<br>CO5. To Understand various gas and vapor power cycles. |

| Course Content | | | | |
|---|---|---|---|---|
| Name of UNIT | Unit Content | Unit Learning Outcomes | Marks | Hrs |
| **UNIT – 1<br>Basic concepts of thermodynamics** | 1.1 Define engineering, thermodynamics and engineering thermodynamics.<br>1.2 Thermodynamic system, control volume, Thermodynamic Properties & their units.<br>1.3 Differentiate Processes and cycles.<br>1.4 Concept of energy, exergy, heat, work and simple numerical examples.<br>1.5 Zeroth law of thermodynamics and its application. | 1a. Identify thermodynamic property with units.<br>1b. Describe zeroth law of thermodynamics and its application.<br>1c. Differentiate Processes and cycles, heat and work. | 10 | 7 |
| **UNIT – 2<br>First law of thermodynamics** | 2.1 Explain first law of thermodynamics with Joule's experiment,<br>2.2 Define internal energy and Internal energy is a properties.<br>2.3 PMM1, Limitations of first law of thermodynamics, First law for open and closed system.<br>2.4 Explain SFEE (Steady flow energy equation)<br>2.5 Steady flow energy equation applied to | 2a. Explain first law of thermodynamics.<br>2b. Apply first law of thermodynamics to real life situations.<br>2c. Identify equation for steady flow energy with applied different processes. | 12 | 8 |

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|---|---|---|---|---|
| | nozzle, diffuser, boiler, turbine, compressor, pump, heat exchanger and throttling process and Simple numerical examples | | | |
| **UNIT – 3 Ideal gases and thermodynamic processes** | 3.1 Define ideal gas and explain various ideal gas laws.<br>3.2 Characteristic gas equation, Avogadro's law and Universal gas constant.<br>3.3 Specific heats & their relationship.<br>3.4 Different thermodynamic processes, their representation on P-V and T-s diagram<br>3.5 Equations for PVT relationship | 3a. List various ideal gas laws<br>3b. Explain various thermodynamic processes represent on P-V and T-s diagram.<br>3c. Identify gas constant and universal gas constant. | 12 | 10 |
| **UNIT – 4 Second law of thermodynamics** | 4.1 Define Heat reservoir, Refrigerator, Heat pump, Source, Sink.<br>4.2 Second law of thermodynamics with Kelvin-Planck and Clausius statement and their equivalence.<br>4.3 PMM2, causes of irreversibility,<br>4.4 Define entropy and entropy is a point function. | 4a. Describe second law of Thermodynamics.<br>4b. Apply second law of thermodynamics in real life problems<br>4c. Describe importance of entropy | 12 | 10 |
| **UNIT – 5 Thermodynamic cycles** | 5.1 Classification of cycle<br>5.2 Explain Carnot cycle, Otto cycle, Diesel cycle, Brayton or Joule cycle with representation on P-V & T-S diagram.<br>5.3 Limitations, applications & comparison of above cycles based on different parameters | 5a. Identify thermodynamic processes in a cycle.<br>5b. Derive expression for efficiency.<br>5c. Solve simple examples of power producing cycle | 14 | 10 |

| List of Reference Books | | | |
|---|---|---|---|
| No | Title of Reference Books | Authors | Publication |
| 1 | Thermodynamics | R. B. Varia | Atul Prakashan. |
| 2 | Thermodynamics | Yunus A. Çengel | Tata McGraw Hill Education Pvt. Ltd. |
| 3 | Engineering Thermodynamics by | P. K. Nag | McGraw-Hill Education |
| 4 | Applied Thermodynamics | R. C. Patel | Acharya Book Depot |
| 5 | Thermodynamics | R. Yadav | Central Publishing House |
| 6 | Fundamentals of Engineering Thermodynamics | E. Radhakrishna | Prentice Hall of India Pvt. Ltd., New Delhi |
| Link of Learning Web Resource | | | |
| 1 | http://www.nptel.iitm.ac.in/ | | |
| 2 | http://www.thermofluids.net/ | | |
| 3 | http://www.learnerstv.com/Free-Engineering thermodynamics-Video-lectures-ltv301-Page1.htm | | |
| 4 | http://www.grc.nasa.gov/WWW/k-12/airplane/thermo.html | | |
| 5 | http://www.youtube.com/watch?v=kJlmRT4E6R0 | | |

**CO'S AND PO'S MAPPING**

| PO'S/CO'S | | CO1 | CO2 | CO3 | CO4 | CO5 |
|---|---|---|---|---|---|---|
| **PO1** | Proficiently applies concepts, theories and techniques of the relevant natural, physical sciences and knowledge in mathematics. | **SUB** | **SUB** | **SUB** | **SUB** | **SUB** |
| **PO2** | Use basic principles of statics, dynamics, fluid mechanics, engineering materials, strength of materials engineering standards and manufacturing processes to aid in the design, characterization, analysis and troubleshooting of mechanical system. | **SUB** | **SUB** | **SUB** | **SUB** | **SUB** |
| **PO3** | Apply their engineering knowledge, critical thinking and problem solving skills in professional engineering practice or in non-engineering fields, such as law, medicine or business. | **SUB** | **SUB** | **SUB** | **SUB** | **SUB** |
| **PO4** | Continue their intellectual development, through, for example, graduate education or professional development courses | **MED.** | **MED.** | **MED.** | **MED.** | **MED.** |
| **PO5** | Use of appropriate computer languages, modern tool and application software that pertain to Mechanical engineering technology systems. | **SLI** | **SLI** | **SLI** | **SLI** | **SLI** |
| **PO6** | Ability to identify problems, conducts experiments, gather data, analyze data and produce results. | **MED.** | **MED.** | **MED.** | **MED.** | **MED.** |
| **PO7** | Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly evolving challenges of the 21st century | **NONE** | **NONE** | **NONE** | **NONE** | **NONE** |
| **PO8** | Design a system component or process to meet desired need within realistic constraints, such as economic, environmental and social. | **MED.** | **MED.** | **MED.** | **MED.** | **MED.** |
| **PO9** | Values the need for, and demonstrates, ethical conduct and professional accountability. | **NONE** | **NONE** | **NONE** | **NONE** | **NONE** |
| **PO10** | Demonstrates effective communication to professional and wider audiences. | **SLI** | **SLI** | **SLI** | **SLI** | **SLI** |
| **PO11** | Appreciates entrepreneurial approaches to engineering practice. | **NONE** | **NONE** | **NONE** | **NONE** | **NONE** |
| **PO12** | Apply commitment to quality, timeliness, and continuous improvement. | **SLI** | **SLI** | **SLI** | **SLI** | **SLI** |