**Lesson Plan**

**Subject : Thermodynamics**

Lesson plan Duration : 15 Weeks

Work load (lecture/Practical) per week (in hours): Lectures:3 hours

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| **Lecture No** | **Theory** |
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| 1 | Brief detail regarding syllabus and overview of subject, books required |
| 2 | Unit-I, introduction to thermodynamics concept,macroscopic and microscopic analysis in thermodynamic system. |
| 3 | Concept of system, boundary and surrounding,thermodynamic system and detailed study of its types. |
| 4 | Thermodynamic properties and types: intensive and extensive properties, thermodynamic equilibrium and types. |
| 5 | Definition and concept of state, process,cycle, path,point and path function. |
| 6 | Quasi-static process and explanation, reversible and irreversible processes with examples. |
| 7 | Workingsubstance and its importance, concept of thermodynamic work and heat, zeroth law and its utility. |
| 8 | Energy and its forms, law of conservation of energy, first law of thermodynamics and representation with help of diagram. |
| 9 | Concept of internal energy, enthalpy, 1st law applied to non-flow processes |
| 10 | Steady and transient flow processes and its applications. |
| 11 | Throttling and free expansion processes, numerical. |
| 12 | unit-II, limitations of first law of thermodynamics, thermal reservoir, heat source and heat sink and heat engines. |
| 13 | Heat pump and refrigerator,statements of second law of thermodynamics: Clausius and kelvin plank etc. and their equivalence. |
| 14 | Perpetual motion machine of second kind,Carnotcycle ,Carnot heat engine and heat pump and Carnottheorem. |
| 15 | Corollaries of carnot theorem, thermodynamic temperature scale and numerical. |
| 16 | Clausius in equality and introduction to entropy, principle of entropy increase, T-S, plot etc. |
| 17 | Entropy change in different processes and introduction to third law of thermodynamics. |
| 18 | unit-III, available energy and unavailable energy, low- and high-grade energy, irreversibility and equilibrium concepts. |
| 19 | loss of available energy due to heat transfer through finite temperature difference. |
| 20 | Availability of non-flow or closed system, availability of a steady flow system |
| 21 | Helmholtz and Gibbs functions effectiveness and irreversibility, numerical. |
| 22 | Pure substance and its properties phase and phase transformation, vaporization, evaporation and boiling etc. |
| 23 | Saturated and superheated steam, solid, vapour and liquid equilibrium-V, P-T plots during steam formation. |
| 24 | Properties of dry, wet and superheated steam,properties changes during steam processes-S plot. |
| 25 | H-S plot, throttling and measurement of dryness fraction of steam, |
| 26 | Numericals on steam, using mollier chart / steam table. |
| 27 | Unit-IV, brief description of thermodynamic relations, tds equations of first and second type. |
| 28 | Enthaply and internal energy relation. |
| 29 | Relation between cp and cv. |
| 30 | Clapeyron equation derivation. |
| 31 | Maxwell relations etc. |
| 32 | Gas power cycles, air standard efficiency, otto cycle. |
| 33 | Diesel cycle and its derivation, numerical. |
| 34 | Dual cycle, concept, mathematical derivation and numerical problems. |
|  | Atkinson and Stirling cycle and numericals. |
| 35 | Eriction cycle and detail. |
| 36 | Joule cycle and process, numerical problem. |
| 37 | Lenoir cycle and expressionand numerical problems. |
| 38 | Revision, queries and doubts of students. |
| 39 | Revision, queries and doubts of students. |
| 40 | Revision, queries and doubts of students. |
| 41 | Brief detail regarding syllabus and overview of subject, books required |